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Proceedings of the 9th International Scientific Conference INPROFORUM

„Common challenges - Different solutions - Mutual dialogue“

České Budějovice | November 5 – 6, 2015

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Common challenges - Different solutions - Mutual dialogue

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University of South Bohemia in České Budějovice
Faculty of Economics

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9th International Scientific Conference INPROFORUM
Common challenges - Different solutions - Mutual dialogue

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Common challenges - Different solutions - Mutual dialogue

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Session 8 Economic Impacts of Changes and Policies in the Fields of Finance, Accounting and Taxation

Preface

The International Scientific Conference INPROFORUM is a traditional event held by the Faculty of Economics, University of South Bohemia in České Budějovice. It is focused on the research achievements in the fields of Innovations, Enterprises, Regions and Organizations. The conference offers the opportunity to discuss relevant topics among academic and practising economists. This INPROFORUM edition was dedicated to the process of scientific understanding of contemporary multidisciplinary problems.

Aim of the conference was formulated like sharing of research news, projects information and scientific results. There were three steps of understanding this aim:

1) Common challenges - Identification of new research fields and scientific questions.
2) Different solutions - Diversity of methodological approach and research presentation.
3) Mutual dialogue - Discussion, comparison, research opinion exchange of and preparation for cooperation.

The approach from plenary session to sectoral session brings identification of problems and their relevance to research topics in the Faculty of Economics. Last round table was dedicated to discussion concerns obstacles of University in research policy. Three steps indicated above from identification of problem, through identification of methodological approach to identification of internal and external difficulties brings its fruits in terms of interesting discussions and well as papers.

It is our pleasure to offer the INPROFORUM result in this form and hope you will find it useful and interesting for your academic development.

(Miloslav Lapka)

Session 1

Multi-Modality in the Context of the Society and Economical Development

The International Scientific Conference INPROFORUM 2015, *November 5 - 6, 2015, České Budějovice*, 11-13, ISBN 978-80-7394-536-7.

Social Agriculture – Alternative Type of Production

Zdeněk Kučera

Abstract: *Social farming combines care of the land with care of people. The utilisation of agriculture farms as a elements of healthcare, social rehabilitation could be a solution for farm diversification. Working with animals and close to nature has long been considered as having a therapeutic value. Social farming is based on this therapeutic value and provides activities on agriculture farms to persons with special needs and offers an alternative to the more traditional health and care services. This report is a description and more an overview cost-benefit analysis of social farming. Such type of analysis is beyond the scope of this article, which serves to inform on the benefits and the related costs of providing supports by way of social agriculture.*

Key words: Social agriculture · green care · diversification of farming · economic valuation

JEL Classification: Q28

1 Introduction

Social agriculture is known as a social farming, green care, farming for health. It's a form of partnership between farmer and several communities concerning social, health and education. The agriculture production supply lot of activities which could support social handicapped person with the own importance. The dependence of animals and plants on the mans care could create very important feeling. This feeling could very helpful especially for young people with behaviour disturbance. Agriculture is a regular activity with very tight connection with nature. Such type of regularly work could be used as a proper basis for improving of mental and physical health. Very important is also the use of specific types of animals like horses, sheep, dogs. This animals cloud positively reacts on proper care and treatment and could arrange proper sensitive feedback. Social Farming utilises farming and agriculture as a therapeutic tool to provide health, social or educational care services. With respect to society social agriculture could be potential investment in the future.

Who is coming to social farm

Clients of services span a range of vulnerable groups including people suffering with mental health problems, physical disabilities, learning disabilities and drug/alcohol addition as well as adults and young people on probation. In the over-technical civilisation are lot of high educated and positioned people looking for escape from the daily stress. The responsible work with animals and plants, where you can identify directly the reaction and you result could be very often used as a healing means (SoFar 2007).

Very important for the providing of the social services is also communication and collaboration with specialised medical personnel ad necessary type of visitors. At the same time we could identify visitors from the education The educational activities are in socialising process very important.

In much cases is the social agriculture connected with religious organisations. They can support the whole social program and also provide the selection of clients. Very often are farmers themselves tight connected with the Church.

Benefits of social agriculture

In the Europe a wide range of people avail of social agriculture services including people with several health difficulties and people with disabilities like older people, children, people availing of drug/alcohol rehabilitation. However, the role of agriculture in social system is often neither understood nor recognized and as a result not scientifically quantified. Appropriate quantifying the benefits of social agriculture is necessary aim for the research. Hine et al. (2007) highlighted the shortage of economic data to accurately estimate the cost implications and total savings for social and healthcare from social agriculture (Kinsella 2014).

Nevertheless, much of the focus is placed on the health and social benefits for possible clients and also the economic and non-economic benefits for farm families who provide the services. Dessein and Bock (2010) in the report on 'The Economics of Green Care in Agriculture' examine the monetary and non-monetary benefits (and costs) of

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green care (social farming) from the perspectives of multifunctional agriculture, public health and social inclusion. Some of the crucial benefits include: containing health costs or providing more extended care contributing to the viability of farms, creating employment and benefiting the rural areas, contribution to new alternatives in health care and treatment, contribution to work training and capacity development to individuals, and enhanced social inclusion, self esteem and quality of life for service users (Kinsella 2014).

Benefits to common society

Social agriculture supports may provide for more efficient use of public finances and lead to a higher net social value for health care services through lower costs and higher benefits (Dessein and Bock, 2010).

Social agriculture can bring positive contribution to whole society by providing a wider range of health care opportunities to service users and greater access to the therapeutic qualities of nature. It is recognized that social farming can contribute to the fostering of a more inclusive and people focused society which benefits everyone. Social farming takes place in the open and engagement in these activities allows individuals with specific needs to demonstrate to the general public their abilities, which can lead to a greater understanding by the public of their needs and capabilities (Di lacovo and O'Connor, 2009). At an economic level, there are benefits to the rural economy from more diversified farm incomes and new employment opportunities. The involvement of clients/service users in activities on farms reduces the isolation for farmers and provides them with work companions in the daily farm activities. Experience gained in social farming enhances the employability of participants and increases their potential availability to participate in the general workforce (Dessein and Bock, 2010).

2 Methods

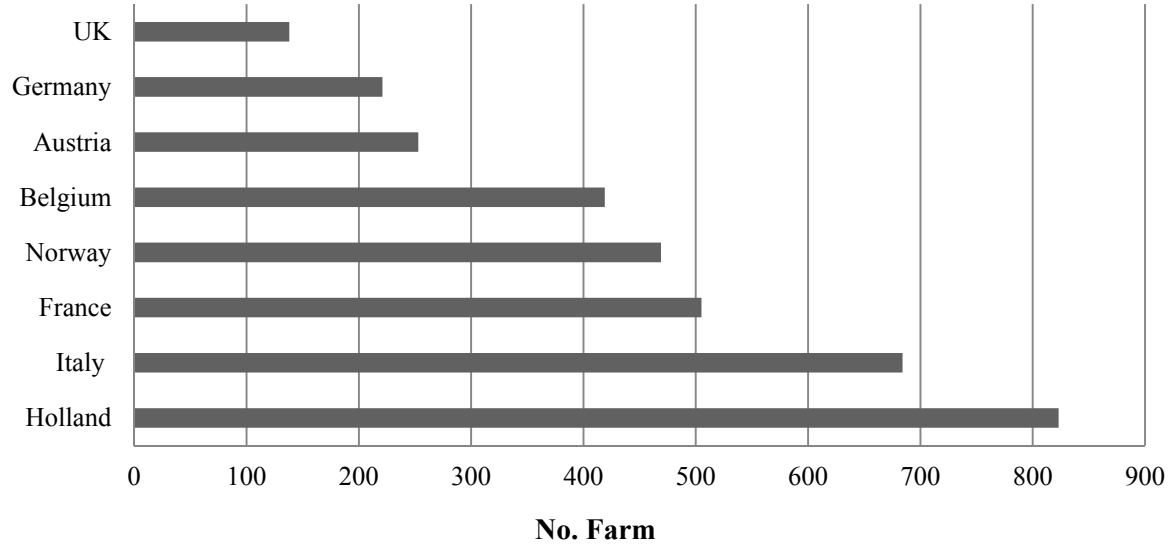
One of the important indicators for measuring efficiency of social agriculture could be the Social Return on Investment (SROI). It is an innovative way to measure and account for the value you create with your work. The methodology is relatively new, but it is attracting considerable interest from third sector organizations, government, funders, investors and commissioners because of its ability to tell a compelling story of change. This results in a ratio of total benefits (asum of all the outcomes) to total investments (Miller and Hall 2012).

Very important is to establish a framework of valuation indicators to evaluate an economic value of such social services. Such valuation will be a matter our future studies.

3 Research results

As you can see from the above showed chart, the social agriculture is mostly developed in Holland and Italy. Other countries just start with developing of the structure.

Figure1 Social farming in Czech republic



Source: UCD Dublin

In the Czech Republic we can find at present in pioneer status of Social farming matters. There are going few separate projects joining activities from social and agriculture parts. it mostly happens with very weak acceptance of official authorities and low either financial or methodical support. Common expression "Social farming" is almost unknown in the country, and you can only find some websites linked with our NGO and the agriculture authorities starts already the common discussion concerning the matter. There exist already same separate projects. Sometimes providers of Social programs know each other, but only in non-formal way – they spontaneously create unofficial community. Social farming is not still quite recognized as a distinctive topic to write articles or publications of it. Possible central governmental financial support of Employment office causes, that usual clients of Social farming programme are mostly persons with physical handicap. Target group is created by those the employer gets financial support for. Then these clients are described as disabled persons and must be so recognized by authorized physician. These persons are first trained in to at least get a job in open market of jobs and then assisted to keep it. The support is organized and fully covered by Employment office and lasts up to 24 months. It is rather matter of employment than social issue.

4 Conclusions

The evidence from other European countries confirms the potential for social farming from the perspectives of service provision. However, the future of social farming in Czech Republic requires a greater acceptance by all stakeholders - farmers, policy makers, service users, service providers/agencies and health authorities of the role it has to play in supporting individuals with specific needs. Social agriculture seems to be a potential possibility of agriculture farm development. Obviously additional economic resources for supporting individuals to engage in social agriculture are not available at present and require a change in state budget allocations and at firs in their priorities.

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New Features in Respect of the Economy and Security in the early 21st Century

Jaroslav Šetek

Abstract: *This paper deals with the global economy in the context of the role of the security alliance groupings. Economic cost and benefits of the alliance groupings are perceived in the context of the changing security environment in the world and in Europe.*

Key words: Alliance theory of alliances · alliances economy · cost sharing · freeloading

JEL Classification: B41

1 Introduction

According to historical facts are accumulated rich experience in economic security of armed conflict. Are concentrated primarily in military law, the state legislature, in the memoirs of prominent state officials and commanders. C. P. G. Clausewitz as a military theoretician and leader assessed the relationship of war and its economic base again in his famous work about the war in this way: "For the needs of troops, we must distinguish two categories: namely the need to provide each cultivated region, and others that the army can get just from their domestic resources. The former are mainly means of nutrition, the latter mainly accessories. The first can deliver even hostile country, the latter usually only their own country, eg. people, mostly weapons and ammunition as well. Army resembles a tree, the soil in which it grows, draws strength to live. If small, it can easily be transplanted, but it becomes increasingly difficult the more increasing. Small herd also has inlets through which it flows into life, but easily takes root where it is not. For large armies do not. The immediate need for food is important, but for the whole duration of the next period is more important replenishment, while food can provide a variety of ways. In parts of the country are creating special facilities for supplies and carry out the preparations for the regular intake of supplements of combat forces. This part of the country is therefore the army base, which is to be considered as a whole" (Clausewitz 2008).

Economics of security can be divided into micro level and macro level international plane. Micro level examines the structure of the defense industry in the economy, the production of weapons and disarmament mechanisms. The macro level analysis of defense spending and budgeting, mobilization in case of war or conversion of the defense industry. International economics plane defence compares each country between themselves and calculates aggregate data on global arms race.This paper aims interdisciplinary approach, social sciences, economics, sociology and, political science describe the new features in relation to the economy and security in the early 21st century. This applies in particular to the cohesion of the political and economic theories of security alliances, their specificity and effectiveness for use within the current risk reduction.

2 Methods

Contribution explores the relationship of the economy and security in a global dimension. Scientific knowledge of these relationships that analogy will help to reveal the causes of phenomena and laws. Therefore processing issues prevalent application of methods of analysis, comparison and use logical and historical context of the last 25 years in the security area of the world economy. Application of a combination of these methods to understand economic processes, while ensuring collective security. Its economic costs and benefits are seen in the context of the changing environment of security risks in the world and in Europe.

The economic dimension of security risks of the 21st century global space - forecast and reality

Different combinations of types of forecasts, the world economy at different times have created phasing of global forecasting, whose genesis dates back to the 60s of the 20th century, when the world begins to start for the future. Development of generation time can be divided between the three main time horizons:

- 1st Generation - turn of the 60s and 70s of the 20th century,
- 2nd Generation - turn of the 70s and 80s of the 20th century,
- 3rd generation - mid 90s of the 20th century (Šetek 2007).

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The first generation begins publications studies H. Kahn "2000 - A framework for thinking about the next thirty years" of 1967, the theoretical concept adopts the oldest futurology organizations - the World Federation of future studies. Theoretical concept H. Kahn developed the World Federation study on the future of the world's optimistic prognosis for the future without substantial qualitative changes when the world's population through major fear of thermonuclear conflict is attributed to political and economic stability.

On the other hand, at the initiative of influential Western European politicians and scientists created at the end of the 60s of the 20th century in the European region the Club of Rome and the Americas concepts:

- Anne and Paul Ehrlich (Humanity, resources and environment)
- A Forrestra (Dynamics of World)
- Dennis Meadows (Limits to Growth).

The aforementioned concepts prognostic 1st generation predict that world population growth and consumption, together with the induced pressures on natural resources and the natural environment, leading mankind to destruction, resulting in the sudden loss of population and the miserable living standards of those who survive.

The second generation of global forecasts of the late 70s and 80s of the 20th century, beginning with the establishment of institutions Interfutures under the auspices of the OECD and the Brandt Commission google dispute "North and South". In this generation forecasting is the contradiction between the catastrophic future and self-sufficiency companies left in the background. The reason for this was the fact that a chosen time horizon - the turn of the millennium is too close and during the first decade of the third millennium, there will be no unsolvable problems.

Third generation forecasts from the early '90s applied extensively exact simulation modeling and mathematical - statistical instrumentation. Evidence of the application of these methods are such prognostic studies:

- Globe 2000,
- A comprehensive economic prospects by the year 2000 (UNECE),
- Our Common Future (international team led by Norwegian Prime Minister HG Brudtlandt).

Along with these works he published a large number of specialized studies of international organizations – the World Bank, the OECD, the International Organization for Food and Agriculture. Among the most important artists of this generation includes a pair of Carsson I. and S. Ramphal, who for the period 1992 - 1995 worked publishing our common neighborhood, where lay a strategic goal for solutions adequate settlement of supranational structures in the face of the future development of most global problems, particularly the problems of war and Peace and future of humans due to the changing hierarchy of values of human society.

The aforementioned generation and for Future prospective studies over the last 40 years of the 20th century have confirmed that the future of the global problems of humanity at the beginning of the new millennium will reflect the area of universal social, economic, ethical, humanitarian and cultural aspects of development of human civilization. This will show a deepening rift between the types of companies - consumerism and poverty. This discrepancy can reach even to the global conflict (prognosis Ralf Dahrendorf). However, none of these concepts generations did not focus on the hypothesis that a serious global problem of mankind at the start of the new millennium, it becomes a question of international terrorism. Developments over the last 10 years of the 20th century to fully confirm this hypothesis, when the turn of 1989 and 1990 terrorist attacks directly affected 74 states and the incidents took place in 60 other countries. Fully confirmed this hypothesis for the real terrorist attacks on the US on 11 September 2001, when international terrorism has become a global problem. (Šetek 2007)

Theoretical concepts could be useful for early warning? Although none of the theoretical concepts of futurology and global science has established over the last three decades of the last millennium hypothesis that international terrorism has become a global problem of humanity set but fears of intensifying contradictions between consumer type of society in the Western world with the world of the prevailing poverty.

3 Research results

The newly created evil after the Cold War and their consequences on economic systems

The international system in the European region as an integral part of the Euro-Atlantic area, it was after the end of the Cold War, characterized by dynamism and a number of quantitative and qualitative changes that are both inside and outside the area took place. The disintegration of the Warsaw Pact and the Council for Mutual Economic Assistance accounted end of the bipolar division of the world. This process also initiated the establishment of a number of new states on the European continent. All this provoked a space for the emergence of new security threats,

as a result, which can reduce the overall level of security in the Euro-Atlantic area. Security on the European continent ceased to be based on a balance of two military-political and economic groupings. Ceased to be a stable and firm order, which was during the Cold War, the bipolar division of the world and Europe.

This way there in terms of exploring the interesting paradox. On the one hand, in the event of armed conflict (as of greatest risk of a bipolar world) at the end of the 20th century, we continue to be really new, as yet vaguely defined and definitely not established a social phenomenon that is characterized by the following factors:

- war conflicts began to move from the area of interstate in national,
- most wars taking place on the territory of a collapsed state in a situation of struggle of all against all,
- began to fade boundaries which separate the modern state legal war criminal and illegal activities, the sphere of internal and external security, civil and war zone
- alongside government troops are fighting a variety of irregular groups, often defined ethnically or religiously,
- trend of privatization of military violence is supported by the increasing participation of international mercenaries from all spheres - from professional warriors freelance adventurers through no cause to religious fanatics,
- terminates the policy application in terms of monitoring rationally defined national interest. (Šefčík 1998)

Such new types of security risks affecting the security of the country's economic base. While reducing the security risks of modern type of war requiring a central, autarkic system in the 20th century and also the total mobilization of resources from the war effort - thus maximizing the role of the state, postmodern type of economic base security of the state is quite different. It takes place in an environment of fragmentation and decentralization of the state. The economic system return and apply methods of making such sources as robbery, trafficking, smuggling embargoed commodities, extortion, looting of humanitarian aid and investments in post-conflict rehabilitation. In this way, forms a “new type of globalized informal economy, where there are external flows especially humanitarian aid and payments from abroad integrated into the local and regional economy.” On the economic base leads to the formation of “new dark type of social relations, where the economy is deeply intertwined with violence.”

Above political and economic changes brought to the European continent wide range of dispersed risk and threat of a lower order, especially in the European area (Southeastern Europe) or near immediate vicinity - North Africa, the Near and Middle East. All these regions have become for the European continent source of direct risk management - international terrorism, ethnic cleansing, proliferation of weapons of mass destruction, or even indirect risks - organized crime, economic collapse, waves of migration.

For this reason it became the duty and right of every democratic state to ensure the safety of its sovereignty, territorial integrity and citizens. Given the complexity of the resulting strategic environment there is one universal institution, organization, method or way that would be able to solve the whole spectrum of newly emerging security risks. Euro-Atlantic security system has grown to include multilateral military-political, economic and security organization - NATO, the European Union, the Western European Union, the Organization for Security and Cooperation in Europe. These organizations have been characterized by a series of dynamic processes and seek the optimal form of both the organizations and their mutual coexistence and cooperation at 3 levels:

1. The internal transformation of the individual multilateral security organizations, reform their institutional structures, organs, functions and tools,
2. External enlargement process of transformation characterized by individual organizations and the creation of various aid and support structures - Partnership for Peace and the Euro-Atlantic Partnership Council, the associated partnership in the Western European Union Association Agreement between the European Union and other candidates for membership,
3. Implementation of specific tasks in international missions deployed in crisis regions (Šefčík 1999)

“The current reality of economic power to ensure the safety versus geopolitical theory In the 21st century will be the future of the world to decide on its waters.” (Roos 1991)

Alfred Thayer Mahan: The Influence of Sea Power upon History

Since the mid-70s of the 20th century at conferences on maritime law under the auspices of the United Nations decided on the appropriation of more than one-fifth of the Earth's surface one hundred and thirty-two coastal and island states. As "the maritime" economic zone assumed the sea surface, including underneath lying areas of the seabed and the wealth that lies beneath the seabed (mainly oil, natural gas and other minerals) covering an area of over 110 million km2, which extend up to 200 nautical miles their banks into the open sea. Coastal States almost doubled its land territory over which they have political and economic sovereignty. For territorial were announced such large bodies of water such as total land area of the planet Earth and the open sea has decreased by more than a third. With this

annexation benefited states with long coastlines such as Australia, Japan, Canada, Norway and the United States (Roos 1991).

In addition to the maritime area became part of world energy markets - oil and gas from the seabed (opening in the last third of the 20th century), sailing oil tankers, pipeline network led by days the sea (to launch the first branch of the Nord Stream pipeline along the bottom of the Baltic Sea In 2011, the intention to show the South Stream pipeline along the bottom of the Black Sea). Terrestrial transmission grid electricity is complemented by undersea cable (Estlink 1 linking Estonia and Finland, in the same spirit of the agreement from 2010 to Estlink 2). In connection with the construction of energy infrastructure the maritime space can be in terms of geopolitical theories talk about an entirely new economic and geopolitical security concept, and interconnection of energy and sea (Šetek 2013).

Usage bottom of the sea as a means of transit of energy resources is also prevention of potential "business energy wars" in particular between suppliers and transit (e.g. The Russian-Ukrainian dispute in early 2009 for the supply of gas to the EU region). From the perspective of "biological or anatomical 'structure of the economy represents the maritime area as the area of infrastructure," vascular "system, energy" nervous "system. Because of economically important subject term on world energy markets (the sea in the dual position - sources of raw materials and the transit area) is also a "vascular" and nervous system. In terms of security functionality and economies are prerequisites for the functioning mechanisms of energy security pacts. Their creation is not within the structures of NATO and the European Union's united stance.

The aforementioned current reality is confirmed Mahan's prognosis about the strategic importance of the seas in the 21st century.

Economic aspects of the Alliance's security

Economic models of military alliances provide a foundation for understanding the burden sharing. In these models, the collective security as deterrence is regarded as a pure public good. These goods have two characteristics:

1. National security does not affect consumption achieved so far amount of consumption of other countries.
2. Once the goods are delivered, they are accessible to all; Exclusion is so expensive that it is not worth realization. This feature provides an incentive for countries "self-directed" if they know that other states provide sufficient coalition defense for their needs (Šefčík 1999).

The original version of the Alliance offered three different models and politically well-founded predictions leading to uneven burden-sharing. First, because the larger members of the alliance groupings give more value to the security services, often they will devote a larger share of their gross domestic product for security than smaller states and perhaps even their own interest. Second, parasitic problem that arises when a smaller alliances rely on the protection of the safety of large alliances, since the parasitic Alliance members consume more civilian production at the expense of other states. A third aspect of the later model was that there is no limit on the size of the alliance, because new members can not reduce benefits for existing alliance and can reduce the cost of other states provided their alliance in defense.

For the 50s and 60s of the 20th century supported parasitism security situation in NATO. Bigger and richer allies (United States, Germany, France, Great Britain) suffered disproportionate distribution of the costs of collective defense, so they allowed smaller states parasite. It was a time mutually secured destruction, nuclear deterrence.

In 1964, Olson and Zeckhauser examined the first hypothesis about the economic and financial security of NATO. Its essence consisted of the following contexts:

- some significant positive correlation between GDP alliance members in proportion to their military costs.
- an economically strong alliance members have a greater share of expenditure to ensure safety compared to economically weaker members.
- accused of feasting and "free-riding" on behalf of another was addressed to "weaker" members. (Olson 1966)

Subsequently provided suggestions to the formation of the cost of the defense alliance. The aim was to justify the fact that smaller members of the Alliance should take on a greater portion of the cost of defensive alliance.

Then provide feedback to the formation of the cost of the defense alliance. The aim was to justify the fact that smaller members of the Alliance should take on a greater portion of the cost of defensive alliance.

Since the early '70s, NATO is changing strategy of mutually secured the destruction of the adaptation response, which brought more confidence in conventional forces and thus reduce the possibility of riding, and reducing differences in sharing defense costs, which resulted from differences in the economies of NATO. Interpretation of this

fact, it is possible to model a pure public good that has been modified for defense, provided that the defense has a wide range of options ranging from only public to the private or regionally specific defense outputs. Disclosure difference lay in the fact that the model of pure public goods at the defense requires more than one outlet including deterrence. It also specifies protection and limited loss if deterrence fails, as well as state or private gain. More of these defensive outputs non-public (private) to allies (but public within the Alliance), more likely to be funded by the state, which contributes directly to the rider expected. Unlike nuclear deterrence, conventional forces are not pure public good, because they are conditioned by "the relative thinning" of forces, as they must defend more territory. Therefore, the effects of "relative depletion" may lead to restrictions meters on the side of the alliance. Joint production model assumes a lower-riding alliances. (Krč & Urban 2010)

In the 80s and 90s of the 20th century, there were many events that could operate on a cost-sharing. This gave the opportunity Reagan administration mounting US military forces and the Strategic Defense Initiative, the new weapon technologies, modernization of British and French nuclear forces at the end of the Cold War, the growth of NATO to include new members from the former Warsaw Pact and the adoption of new defensive role NATO crisis management, including peace-keeping. (Flachbart 2010)

Challenges for the common economic policy of NATO in the early 21st century

At the beginning of the 21st century, NATO remains the only international organization that has built a permanent military force structure and is directed against the threat of external threat to its members. Talk about cost sharing in NATO in terms of "What? And what should it be? "These are the current contribution of each country to the Alliance's collective defense and a fair contribution of each state. Questions of justice deposits are necessarily controversial, NATO will require collective international conventions that Member States should contribute to the alliance on the basis of income received or based on ability to pay for charges on a proportional or progressive basis. In fact, the Member States contribute to NATO in the form of cash payments for programs of security investments and political (civil) and military budgets. For 2014, revenues have combined budgets of NATO following:

- Civil: budget (217 million euros),
- Military: budget (1.4 billion euros),
- Security: Investment Programme (650 million euros).

Analyses of cost sharing required selection criteria or indicators of cost sharing. Selection criteria will depend on the measurement object. In fact, NATO's collective defense provides output in the form of peace, defense and security. Defence spending is input, which procure all forces to ensure that the final output of peace and security. Concentrating on the final output is assumed that both the military and civilian indicators may be included in the scope of cost sharing. It is typical that defense spending as a proportion of the gross domestic product are usually the most widely used measure of defense spending. However, it has limitations. Member States may vary in their definition of defense spending (eg. Pensions of former soldiers, defense research and development). At the same time, Member States may different mix of public and site-specific defense units as the image in the layout of its conventional forces between the home defense and NATO command. States could use the economic principle of substitution using alternative methods of protection contingent is representative of each national comparative advantages of own resources (eg. Equipment replaced human resources, Nuclear power replaced conventional forces). Differences are also generated efficiency with which countries convert various defense spending in the defense readiness of the armed forces.

4 Conclusions

The security of the Euro-Atlantic space at the beginning of the 21st century is characterized by significant changes in the dynamics of political security and economic level. For the purpose of a functional system in this area is necessary reduction of certain asymmetry in the military field between the regions of Europe and North America. While defensive investments of European NATO allies reach 60% of the expenditure of the United States, European real operational capability in comparison with the potential of the US one-fifth. NATO members in Europe have a 2 million soldiers, which is about 600 thousand. more than in the U.S. alone. This asymmetry indicates clearly that Europe uses its resources very inefficiently defense.

The high quality new Euro-Atlantic security system should be reduced to a minimum jurisdictional confusion and duplication especially between NATO and the European Union.

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The Reaction of Small and Medium-sized Industrial Enterprises on the Crisis Period

Tomáš Volek, Martina Novotná, Jan Krátoška

Abstract: *The article deals with the development of the economic situation of small and medium-sized industrial enterprises on the crisis period. The data source was Eurostat (National accounts) and the business database Albertina. The observed data were from the 7 year period (2008-2014). Analysis was focused on macroeconomic and macroeconomic point of view. It was found that the reaction of the various sectors to the crisis was different. Industry (group A2 - Medium Low and Low Technology) react very sensitively to the changes in real business cycle. During the financial crisis of 2009 there was a significant decrease in production (GVA). On the contrary, in the post-crisis years, performance of enterprises returned to the initial values.*

Key words: Industry · Crisis · SMEs · Performance

JEL Classification: M21 · D24 · J24

1 Introduction

Small and medium enterprises are an important part of national economy. Small and medium-sized businesses are often confronted with economics crisis of the economy. Their response to the crisis could be different from the reactions of large enterprises. The aim of this paper is to assess the response of SMEs to the economic crisis from the macroeconomic and microeconomic point of view.

Crisis of SMEs can be viewed from different perspectives. Separating the internal and external factors as well as separating those that arise and have an impact on technical and economic factors with those that are caused by personal, organizational and social factors (Löwhagen, 2015). The most important external factor for the past 10 year was the global financial crisis which hit most of European countries in 2009. The financial crisis has had a negative impact not only economic growth and unemployment (Sirůček and Pavelka, 2013), but also on the competitiveness of SMEs. Lawless, O'Connell and O'Toole (2015) have found that financial crisis had significant negative effects on SMEs performance, in particular firms investment, employment and indicators of financial distress. The effects were strongest for enterprises that were in the mid-lifecycle. The negative impact of the crisis was not on all small and medium-sized enterprises. The main importance here was the sector (branch). Enterprises operating in the industry were more affected than companies operating for example in waste management (Petrách and Leitmanová, 2013).

SMEs were generally more vulnerable in times of crisis for many reasons among which are:

- it is more difficult for them to downsize as they are already small;
- they are individually less diversified in their economic activities;
- they have a weaker financial structure (i.e. lower capitalisation);
- they have a lower or no credit rating;
- they are heavily dependent on credit and
- they have fewer financing options (OECD, 2009).

What are the possible responses to the crisis? Some companies do not react to the crisis. Other firms innovate and innovation give firms competitive advantage and enhance their evolutionary fitness (Makkonen et al., 2014). A significant role during the crisis played external and internal communications (Březinová and Vrchota, 2015). The evolution of competitiveness SMEs in crisis time depends on the ability to respond flexibly and proactively to the frequent changes (Pantilie, 2011).

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2 Methods

Sectoral division in terms of technological intensity were used for the analysis of response of SMEs on the crisis. Definition and classification of activities in economic activity in high-technology industries and knowledge-intensive services based on definitions created by the OECD on the basis of two or three levels of NACE (Eurostat indicators on High-tech industry and Knowledge - intensive services).

Based on this classification of economic activities are divided into 5 groups: A1 (Industrie: High and Medium High Technology), A2 (Industrie: Medium Low and Low Technology), B1 (Knowledge-intensive market services), B2 (Less knowledge-intensive market services), C (Agriculture, construction and utilities). Paper have analysed the crisis and post-crisis period firms in Group A2.

First attention was focused on the characteristics of a group of economic activities A2, especially regarding the impact of the global crisis on the basic economic characteristics ie. The development of value-added development costs of labour, development of investment activity measured as developing gross fixed capital formation and through ratios labour productivity (gross value added / compensation of employees), capital-labour ratio (compensation of employees / gross fixed capital formation). The source of data for this analysis was part of the national accounts -Eurostat.

Next part was assessed the development of SMEs in industry and the development of their performances in the years 2007-2012. The last part is focused on a particular enterprise in category of small and medium enterprises. The enterprise was chosen as a representative of group A2 and SMEs. This enterprise has illustrated a post crisis development.

For analysis of the contribution by groups of economic activities for the development of gross value added it is possible to use an additive ties between groups. The contribution of each of these groups is equal to the product of its growth rate (compare the intervals t-1) and the share of this sector in GVA interval t -1:

$$\left(\frac{GVA_{Si,t}}{GVA_{Si,t-1}}-1\right)*\frac{GVA_{Si,t-1}}{GVA_{t-1}}, \tag{1}$$

$GVA_{Si,t}$ the gross added value of the i-th group of economic activities at time t,

$GVA_{Si,t-1}$ the gross added value of the i-th group of economic activities at time t-1,

GVA_{t-1} the total aggregate gross value added at time t -1.

The total aggregate growth rate of GVA is then equal to the sum of contributions from each group (Jilek et al., 2005). The chosen company was characterized by development of the financial indicators: return on assets - ROA (earning after taxes / assets), inventory turnover (inventory / (total outputs / 365)), creditors payment period (short-term payables / (total outputs / 365)), debt ratio (total debt / assets), labour productivity (outputs total / labour costs), the current ratio (current Assets / (current liabilities + short-term bank loans)). The data source was Eurostat (National accounts) and the business database Albertina. The observed firm data were from the 7 year period (2008-2014).

3 Research results

Macroeconomics perspective

The first analysis deals with the development of performance in the industry - specifically group A2 (Industrie: Medium Low and Low Technology). The basic indicator for measuring the performance of each sector is gross value added. Table 1 illustrates the contributions of individual groups of economic activity to the change of total gross value added.

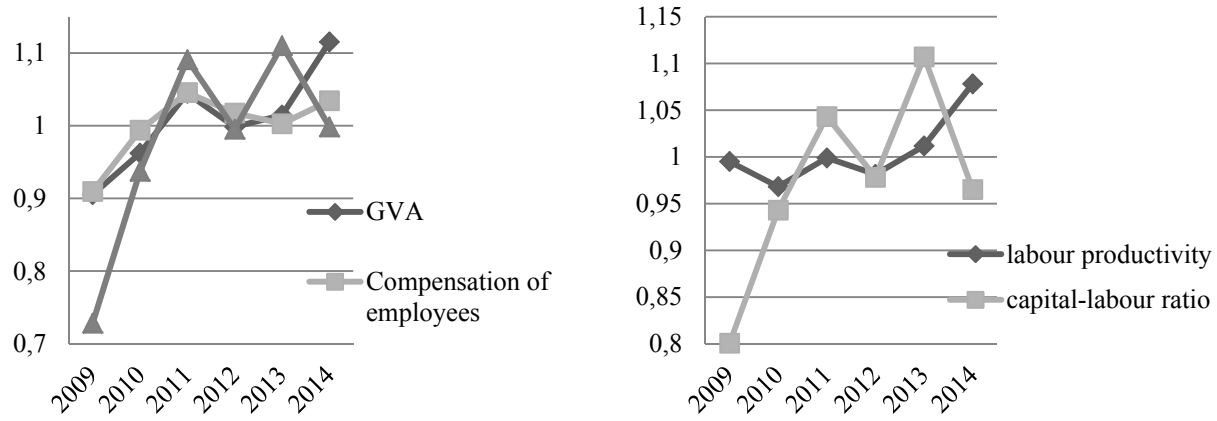
Table 1 Contribution of individual groups of economic activity to the change in GVA (%)

Group	2009	2010	2011	2012	2013	2014
Total	**-2.576**	**0.836**	**1.501**	**0.038**	**0.486**	**5.462**
A1	-0.939	1,262	0,836	0.361	0.071	1.625
A2	**-1.315**	**-0.486**	**0.549**	**-0.020**	**0.185**	**1.475**
B1	0.895	-0.082	0.282	-0.286	0.435	0.968
B2	-1.252	0.743	-0.351	0.120	-0.132	1.223
C	0.036	-0.602	0.185	-0.137	-0.074	0.171

Source: Own processing

Year of the global crisis (2009) is characterized by a declining or even negative increase in gross value added (GVA growth rate of <1). The group of industry (A2 - Industrie: Medium Low, Low and Technology) most contribute to the decline of GVA (2009 compared with 2008, this group contributed about 51% to the total decline in GVA). Only high knowledge intensity services B1 this year recorded a growth, while avoiding an even greater fall in GVA. Contribution groups A2 for growth GVA of whole economy begun since year 2013.

Figure 1 The growth rate of selected indicators of economic activity for the group A2 (index)

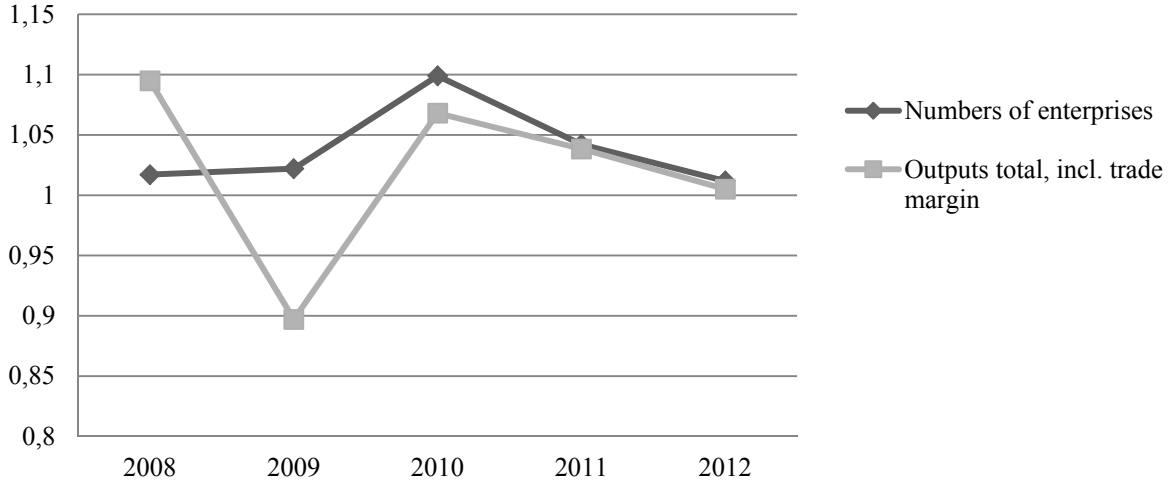


Source: Own processing

The left part of figure 1 descripe growth rates of selected indicators for group A2. There is a clear decline of absolute indicators in 2009. Value of indicators in comparison with the previous year is less than 1. Gross fixed capital even declined about 27%. Since 2011 value of absolute indicators were greater than 1. Since this year, the growth rates of these indicators stable or stagnant values of indicators oscillating around 1. Until the year 2014 indicates a slight growth in gross value added and labour productivity. Labour productivity (right side of Figure 1) within the group recorded until 2012 an annual decline and the growth rate of capital-labour ratio in followed years fluctuates.

Further analysis deals with small and medium-sized industrial enterprises in particular, their number and their outcomes in the form of the growth rate of output SMEs. Significant decline was recorded mainly in the size of the output (Figure 2).

Figure 2 The growth rate of selected indicators of small and medium industrial enterprises in the years 2007-2012 (index)



Source: Own processing

Microeconomic perspective

The second part is based on a case study of the impact of the financial crisis in 2009 on selected economic entity. The selected firm is a representative group of economic activities A2 and a representative of small and medium industrial enterprises. It's a firm from the South Bohemian region, which has three production factories. The activities of the cooperative's metalworking and engineering, the production from the plastics, making keys, engraving works,

purchase and sale of goods locksmith, plumbing, tool manufacture and repair tools. The firm currently has a stable production program and achieve positive economic results. An enterprise expects annual growth in turnover of about 2-3%. The enterprise has a stable group of customers, exports mainly to Germany to other EU countries, as well as in Bosnia and Herzegovina. The competitive advantage of cooperatives is particularly varied field of activity and diversification manufactures the products concerned. In 2009, also in this enterprise was hit by the global crisis. This year there was a decrease in consumption of products especially German companies. Customers' payment morale has worsened. The volume of irrecoverable debts has increased significantly

Causes: Global crisis - an external factor, significant declines in demand for products

Crisis management: The firm did not react strongly to the situation. As a result of the improved economic situation in the export territories, there was a gradual recovery in production, especially for the German market.

The impact of the crisis: the decline in sales did not affect the existence of the company, but leads to the growth of irrecoverable debts. The positive impact of the crisis was the orientation on products with higher quality. The positive impact was also the production cooperative due to the extinction of some companies get their contracts.

Economic development of the monitored firm is further described by selected financial ratios of financial analysis (see Methods)

Table 2 Selected financial indicators of the enterprise in the years 2008-2014

	ROA (%)	Debt Ratio (%)	Current Ratio	Labour Productivity	Creditors Payment Period	Inventory Turnover	GVA index
2008	-26.5	12.9	5.9	2.1	32.9	47.8	0.98
2009	-13.1	9.3	22.3	2.2	9.7	13.9	0.91
2010	-19.6	20.0	9.7	2.0	23.5	52.9	0.87
2011	-0.1	24.3	7.9	2.0	28.9	47.1	0.92
2012	48.6	15.8	6.7	1.2	72.5	55.9	1.1
2013	-4.2	7.3	10.8	2.3	22.4	54.2	1.07
2014	2.0	5.2	15.7	2.4	14.3	58.1	1.11

Source: Own processing

The crisis is mainly reflected growth in the GVA volume of business at the time of worsening receivables turnover and profitability. In the years following after the crisis the company returned to stable economic growth and economic results has improved.

4 Conclusions

It was found the same conclusion from a macroeconomic and microeconomic point of view and that small and medium-sized industrial enterprises in the group A2 react very sensitively to the changes in real business cycle. During the financial crisis of 2009 there was a significant decrease in production (GVA). On the contrary, in the post-crisis years, there has been a higher growth performance of enterprises (GVA) than labour productivity. Performance of enterprises returned in the post-crisis period to the initial values.

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Session 2

Regional and Global Aspects of Sustainability, Bio-Economy

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Rural Development and Sustainability in Rural Areas

Jaroslav Čmejrek

Abstract: *This paper focuses on the sustainability of rural areas from three points of view. The first is the confrontation between different discourses of rurality. This section of the paper is based on the concept of contesting development in rural areas by Michael Woods. The second perspective focuses on the role of agriculture in rural development. Is rural development possible without farm subsidies? How is the topic of rural development and farm subsidies reflected in the political programmes of Czech parliamentary parties? The low administrative capacity of Czech rural municipalities represents the third face of the sustainability of rural areas. Small rural municipalities have no chance of venturing into major economic projects; they can improve the appearance of municipalities and the level of social services, but the basic issues of the economic development of the locality are beyond their real horizon. Rural municipalities must face a high risk of indebtedness, which can result in a loss of their basic self-governing functions.*

Key words: Rural development · Discourses of rurality · Political programmes · Czech rural municipalities

JEL Classification: R11

1 Introduction

The concept of sustainability was born as a response to an obsession with growth in the period after World War II – it turned out that unlimited growth is a dangerous illusion. Since 1972 when the Club of Rome pointed out the limits to growth, efforts to avoid the risks of unlimited growth begun to strengthen, and to focus on a level of economic growth that is still sustainable and is not associated with high risks. The concept of sustainability is most often understood as ecological sustainability and is primarily associated with environmental protection. The antithesis between economic growth and its sustainability is also reflected in rural areas, which can assume the form of an antithesis between the development and sustainability of rural areas. In the submitted paper we focus on three aspects of this issue. One of them is the clash of discourses on rurality, the second is the relationship between rural development and the development of agriculture and the third aspect, which is especially urgent in the Czech Republic, is the low administrative capacity of rural communities and its implications.

2 Methods

This paper is based on the concept that Michael Woods called Contesting Rurality (Woods 2005). It allows for an understanding of the different discourses on rurality, different ways of perceiving and understanding rural realities, and different visions of rural development. We try to show to what extent the discourses identified by Woods in the context of rural development in the UK can also be applied to the conditions of Czech rural areas. To do this, we will primarily compare the political programmes of Czech political parties, both major and medium programmes, and electoral programmes from the period immediately after the accession of the Czech Republic to the EU (Čmejrek 2007). With regard to the sustainability of rural areas in terms of administrative capacity of rural communities, the paper is based on available electronic databases and other public sources, primarily on the MONITOR information portal of the Ministry of Finance of the Czech Republic, which contains budgetary and accounting information on all municipalities in the Czech Republic (Czech Ministry of Finance 2015a). Other sources of data include information from the Ministry of Finance on the development of the debts of regional budgets and monitoring of economic activities of municipalities (Czech Ministry of Finance 2015b). This paper is also based on qualitative research in three selected rural communities which face a high debt burden (Čmejrek & Čopík 2015).

3 Research results

Politics in the British Countryside, Michael Woods discusses the development of discourses relating to rural areas and brings in contrast firstly "development discourse", which dominated British agrarian politics for most of the 20th century, to "protectionist discourse," which began to be asserted in the last decades of the 20th century. In his monograph about politics in the British countryside published in 2005 called Contesting Rurality. In development discourse, rural areas are less populated areas in which activities occupying a lot of space or those hazardous

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to the environment can be developed more cheaply and with less impact on the environment and society than in the cities. Rural regions were therefore developed as areas suitable for the construction of dams, power plants, ore plants, waste incinerators, landfills and airports. In addition, residential construction began to pour into rural areas from urban agglomerations. This type of development was viewed as resolving key problems in rural areas - their peripherality, lack of infrastructure, unemployment.

A reaction to this type of rural development was the emergence of "protectionist" discourse, which is based on the belief that nature and the countryside are vulnerable and need protection from harmful human interference. In protectionist discourse, changes to the countryside via human intervention are considered acceptable only within certain limits. Human works should be basically built from organic materials, or local natural resources should be developed, but on a small scale, and taking into account the prevailing natural sensibility of the landscape (stone walls, secluded homesteads, etc.). Conversely, development which brings large amounts of foreign materials such as asphalt or metal, or modern technologies, causes disproportion with the morphology of the landscape, as well as noise and light pollution, and it is perceived as unnatural.

In the dispute between the two discourses - modernization of the countryside and its preservation - an extremely contentious issue became the question of housing in rural areas, or the expansion of satellite residential areas of an urban character at the expense of agricultural land and traditional rural communities. Another topic of conflict was brought about via the construction of wind turbines. Woods examines these issues at the local and regional levels (Buckinghamshire, Somerset), and at the national level. As a clash of conflicting discourses, he also included in his concept of rural development specific moments such as the role of the middle classes which defend the countryside as their space.

Wood's concept of the conflict of discourses can also be applied to Czech rural areas, and the concept of contesting rurality will not lose its explanatory potential. In the Czech case, the analysis of discourses on rural development may provide an even more plastic image as more factors enter into the conflict between development and protectionism or sustainability, in particular the consequences of collectivization and the entire era of "building socialism", complex reflections of the changes in the political system after 1989, establishing a market environment, accession of the Czech Republic to the EU, etc. In the programme clashes of Czech parliamentary parties in the 1990s, the clash between development and protectionist discourse was somewhat overshadowed firstly by the dispute on the issue of land ownership and of cooperative question, and later by the dispute between market regulation and liberalization, but it was, nevertheless, clearly present. Other important moments can be identified in the programme clashes of Czech parliamentary parties after 2000, which Woods speaks of in connection with British development. This mainly concerns the term of the "denationalisation" of rural policy, i.e. the transfer of government from the national level down to the regional and local levels and upward to the European Union, WTO and other supranational institutions. In the Czech Republic, this moment occurred around 2005, in particular in the approaches of KDU- ČSL, and to some extent in ODS. Among other things, it was manifested in the requirements to transfer management of the agricultural sector from the government level to the regional level (see Čmejrek 2007).

Role of agriculture in rural development

The agrarian question in political programmes since the beginning of the modern era, or the Industrial Revolution, reflected the antithesis between cities and rural areas, but it never set the agriculture and rural area in contrast. The development of agriculture was considered a self-evident basis for rural development. The aim was to integrate farmers and the entire rural society, as was expressed in Švehla's slogan "the countryside is one family" in the Czech agrarian movement. Agricultural and rural developments do not get into opposition even in the communist concept of agrarian issues. Collectivization of agriculture was primarily seen as political – it was to ensure the integration of rural areas into the "socialist society" and was to also allow for similar forms of economic management and planning as in the nationalized industries to be introduced in agriculture. Rural development also essentially identified with the development of agriculture in the programme clashes of the 1990s.

Only after 2000, tendencies expressed in the programme clashes of Czech parliamentary parties that corresponded to the shift from a rural (or agricultural) policy to the "rural policy" which Michael Woods mentions in the British political context. The contradiction between rural development and agricultural development unfolded in 2004 and 2005 in the programme debate of Czech parliamentary parties immediately after the accession of the Czech Republic to the EU. The issue was whether rural development should be ensured mainly via agriculture grant support. Whilst in the programme documents of KSČM and ČSSD the role of agriculture and (mass) production in rural development was emphasized, quality of life was in the background in rural areas. In the documents of ODS, US-DEU and KDU ČSL, there was much greater emphasis on the non-agricultural aspects of rural development. ODS expressed this in its

Blue Chance manifesto via the motto "from the policy of farmers to rural policy as a space for life" (Čmejrek 2007: 645). This wording is not very different from the subtitle of Wood's monograph. KDU-ČSL declared that it supported "non-food agricultural production and non-agricultural business activities", and in terms of support for agriculture, then it expected it only in connection with the maintenance of the countryside (Čmejrek 2007: 645).

After some time, until shortly before the elections in 2006, this shift also appeared in the policies of ČSSD, which overturned its priorities immediately before the election. Points relating to quality of life in rural areas came into prominence: "expand social care services in rural areas for the elderly as one of the job opportunities for rural areas", "increase the attractiveness of rural areas for women and young families by providing transportation services, access to education, including implementing school bus programmes, preservation of rural schools and kindergartens in cooperation with municipalities, improving access to health services, culture and the overall support of cultural and club activities of a regional nature". This was followed by a promise of the "support to small-scale agriculture for other than business purposes," programme, and creating of conditions for "activities of civic associations, whose importance continues to increase in the context of the transformation of rural areas". Traditional priorities of the Social Democratic agrarian policy such as increasing the competitiveness of Czech agriculture and the food industry, or the promotion of "ecologically viable agricultural mass production" were only introduced in the second half of the election programme. These points were also carefully placed in the context of landscape management, the environment and food safety (Čmejrek 2007: 647 ff.).

Sustainability of rural self-government

Sustainability of rural municipalities depends on the capacity of their public administration and services. The main problem lies in the settlement structure of the Czech Republic, which is very fragmented. There are about 6,250 municipalities in the Czech Republic. Small rural municipalities represent the majority of the Czech municipalities. According to the EU methodology, 80% of the total number of the Czech municipalities is located in rural areas with the rural areas covering 75 % of the country's territory. 22,3 % of the population of the Czech Republic lives in rural areas. Almost one third of all municipalities have less than 200 inhabitants (Czech Statistical Office). Small rural municipalities suffer low administrative capacity. Some of them are characterized by relatively high debt and risk management, and to this are usually related local problems in the functioning of the local democratic process, the collapse of local government authorities, problematic municipal elections and even the unwillingness of citizens to run for office.

In 2014 the debt of municipalities in the Czech Republic amounted to 88.9 billion CZK (Czech Ministry of Finance 2015b - indebtedness of local budgets). Although debt amount is not a problem for many of the municipalities, some of the municipalities are virtually paralyzed by the amounts of their debts. Excessive indebtedness and consequent insolvency represent the greatest risk for municipalities that have made wrong investment decisions, or they were tasked with levies for a breach of budgetary discipline (or both). The risks for the economic situations of municipalities often relate to their failure to comply with the conditions of grant projects supported by EU funds, or from national subsidy programmes. The leaders of municipalities may make mistakes in the preparation and implementation phase of projects. For projects supported by the EU, the sustainability of the project for

Since 2008, the Ministry of Finance monitors and evaluates the economic activities of municipalities. Risky municipalities are considered those with a share of current assets for short term liabilities in the interval between 0 and 1, and the proportion of liabilities to total assets of the municipality exceeding 25%. In 2012, economic situations of 68 municipalities were assessed as potentially risky. A year later there were 52 municipalities in the same situation. The majority (15) of them were from the Central Bohemian Region. In proportion to the total number of municipalities, the Karlovy Vary Region recorded the highest number of risky municipalities in its territory (1.5% of the total number of municipalities). More than two-fifths of the total number of economically-risky municipalities had 200 to 499 residents. A quarter of them had populations of 199 people or less (Ministry of Finance 2015b).

Smaller municipalities are generally more vulnerable to encountering potential issues with grants, and their volume often equals a substantial portion of their total income. If a municipality needs to return a grant due to breach of terms (does not receive it, pays a penalty), it will often find itself in an impossible situation (Ministry of Finance 2015b; Kameníčková, 2015). Yet higher indebtedness can also affect larger municipalities, economic problems and high debts particularly threaten smaller municipalities characterized by low administrative capacity. These municipalities have no chance of venturing into the major economic projects. As confirmed by other studies (Bernard et al. 2011) the local governments of small rural municipalities are usually well aware of this fact and do not give much hope for the success of efforts to implement local economic development projects. This also represents a significant limit to community-driven local development (CLLD), which can influence the spatial definition of its activities (Čmejrek and Čopík, 2014)

and improve the appearance of municipalities and the level of social services, but the basic issues of economic development of the locality are beyond its real horizon.

4 Conclusions

The confrontation of the development and conservation discourse in the programme clashes of Czech parliamentary parties peaked immediately after the accession of the Czech Republic to the EU. This also led to an obvious effort to detach rural development from dependence on subsidizing agricultural production. Another important element became the "denationalisation" of the rural policy requirement, i.e. the shift of governance from the national level down to the regional and local levels and upward to the multinational level. "Denationalization" also means a greater emphasis on active citizenship and partnership, but also the growing influence of the private sector. The "rural policy" is much more flexible than the old-fashioned "agricultural policy". It involves different groups and new types of participants. The concept of rurality remains the core of the rural political process, which creates a political framework shaping the decision-making process and motivates its participants. In terms of public administration, low administrative capacity of rural communities is becoming the biggest problem in terms of sustainability in rural areas, which is a tax for fragmented settlement structure in the Czech Republic.

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Sustainability Evaluation of the European Union

Magdaléna Drastichová

Abstract: *Recent production and consumption activities impose a heavy burden on the earth's capacity also in future. Therefore it is inevitable to deal with the impacts of economic activities on the natural resources which determine our future wellbeing and the survival by itself. In terms of sustainability and sustainable development concepts are used the measures which reflect the impacts of countries / regions on the available resources. The Ecological Footprint, total biocapacity measures, and their components are examined in the European Union (EU) and its countries and the EU region is compared with the other regions of the world. The aim of the Paper is to detect the level of sustainability in the EU and its countries by means of the Ecological Footprint, its comparison with the available resources, as well as its relations to the standard of living and the level of human development. Regarding the investigation of regions the highest Ecological Footprint per capita is typical of North America followed by the EU region. The results of the countries vary according to the varying levels of factors affecting the Ecological Footprint and their different biocapacities. The Northern countries dispose of largest biocapacities and are thus the largest resource creditors. The worst results of the Ecological Footprint – biocapacity relations are typical of Cyprus, Belgium, Netherlands and Italy. In addition to other factors, at least in the sample of the developed countries, the positive relations exist between the Ecological Footprint on the one side and standard of living / state of the human development on the other side.*

Key words: Sustainable Development ·Sustainability · Ecological Footprint · Biological Capacity · European Union

JEL Classification: Q51 · F56

1 Introduction

Current production and consumption activities impose a heavy burden on the Earth's capacity in the present times as well as in future. Sustainability, a nebulous but attractive concept, poses a guiding question for every activity, i.e. if this can continue. This means that activities such as production, consumption, and the related exhaustion of natural, physical or other forms of capital, with an unlimited time horizon, can be regarded as sustainable. Consumption is the process by which goods are, at last, provided to final use by people. It is at the end of the line of economic activities which starts with an evaluation of available resources and proceeds through production and distribution of goods. The effect of this consumption, including depletion of resources and generation of waste as well as enhancement of human survival and flourishing, determines the resource base for the future economic activities (Goodwin et al., 2008). Since for the analysis the cross-section data are only available the term "sustainability" is rather used than "sustainable development" (SD). The term sustainability can also be used to determine state, however, the level of the Ecological Footprint (EF) and its relations to the available biocapacity indeed determine the sustainability of development in the future and thus SD. Every human activity uses biologically productive land and/or fishing grounds which is reflected in the EF.

SD is a global challenge which requires a progressive transformation of economies (Hediger, 2006), specifically substantial changes in production processes and lifestyles in compliance with the idea that the global development cannot be only understood from the economic point of view (FEEM, 2011). According to the most quoted definition of the World Commission on Environment and Development (WCED, 1987), SD is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Although this term is still vague there is an emerging political consensus on the desirability of SD (Daly, 1996). SD is amongst the main policy priorities worldwide (FEEM, 2011). Already in 1997 SD became a fundamental objective of the European Union (EU) and in 2001 the EU Sustainable Development Strategy (EU SDS) was launched (European Commission, 2015).

In this Paper the footprint / biocapacity methodology is used to measure the sustainability and SD aspects whereas the EF is the basic composite index which can reflect the fundamental aspects of the SD of regions or countries. The aim of the Paper is to detect the level of sustainability in the EU and its countries by means of the EF, its comparison with the available resources, as well as its relations to the standard of living and the level of human development.

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2 Methods

2.1 Data

To obtain data on EF per capita in 2011 (global hectares (gha) per person) and Biocapacity per capita in 2011 (gha per person) as well as their component indicators the Results from the National Footprint Accounts: NFA 2015 Public Data Package, 2015 Edition Global Footprint Network (2015a) were used. The NFAs measure the ecological resource use and resource capacity of nations. The majority of the additional data used in this Paper are also included in this Package whereas original Human Development Index (HDI) data are 2011 values from United Nations Development Programme (UNDP, 2014) and Population data are from the Food and Agriculture Organization of the United Nations. Data on the National Footprint Accounts (Global Footprint Network, 2015a) include Gross domestic product (GDP) data in the form of 2011 values from the International Monetary Fund World Economic Outlook Database, published in October 2014. However, for the calculations carried out in this Paper where GDP per capita data are needed, the more recent database, i.e. International Monetary Fund, World Economic Outlook Database, published in April 2015 was used to obtain GDP based on purchasing-power-parity (PPP) per capita in current international dollar in 2011. This is due to the fact that the result of Global Footprint Network (2015a) does not include data from Malta and Luxembourg. However, the effort was made to elaborate the cross-section analysis for as many countries of the EU as possible. Using the more recent data, all the EU-28 countries were included.

2.2 Methodology

A valid tool to measure sustainability is a set of indicators (Singh et al. 2009). Due to their synthetic properties, indicators are widely used in policymaking. For the analysis in this Paper, the footprint and biocapacity methodology is applied to measure the sustainability in the EU and its countries. Moreover, the cross-section analysis is used to detect relations between the standard of living measured by GDP per capita, and the human development level measured by HDI, both as the explanatory variables, and their impact on resources measured by the EF as the explained variable.

Ecological Footprint and Biocapacity Analysis

The Ecological Footprint (EF) concept was introduced by Rees and Wackernagel (1994). The EF indicator serves as one of the primary guides for the evaluation if the examined subjects operate at a sustainable level. This evaluation is moreover enabled by the comparison of the EF with the available biocapacity and its components. The EF is a method for estimating the biologically productive area necessary to support current consumption patterns, given prevailing technical and economic processes (Holmberg et al., 1999). Thus the EF is a measure of the demand which human activities put on the biosphere. Concretely, it measures the extent of biologically productive land and water area required to produce all the resources an individual, a population, an activity, a region, or all of humanity consume, and to absorb the waste they generate, given prevailing technology and resource management practices (Global Footprint Network, 2015b). This area can then be compared with biocapacity, which is the amount of productive area that is available to generate these resources and to absorb the waste. Both are measured in global hectares (gha) whereas a gha represents a hectare with world average productivity. By comparing human impact with the planet's limited bioproductive area, this method tests a basic ecological condition for sustainability (Holmberg et al., 1999). The EF calculations have so far included land for energy supply, food, forest products, and the built environment, degraded areas, and sea space for fishing. For the waste side the land needed for sequestering CO2 is included in the EF. Ecological Footprint generally refers to the Ecological Footprint of consumption.

The concrete components of the EF include the following ones. Cropland is the most bioproductive of all the land-use types and consists of areas used to produce food and fibre for human consumption, feed for livestock, oil crops, and rubber. The *Cropland Footprint* includes crop products allocated to livestock and aquaculture feed mixes, and those used for fibres and materials. Recent Cropland Footprint calculations have not yet taken into account the extent to which farming techniques or unsustainable agricultural practices may cause long-term degradation of soil. This is due to lack of globally consistent data sets. Forest land provides for two competing services. Firstly, it is the *Forest Product Footprint,* which is calculated based on the amount of lumber, pulp, timber products, and fuel wood consumed by a population on a yearly basis. Secondly it is the *Carbon Footprint,* which represents the carbon dioxide emissions from burning fossil fuels in addition to the embodied carbon in imported goods. The Carbon Footprint component is represented by the area of forest land required to sequester these carbon emissions and recently it represents the largest portion of humanity's Footprint. The *Fishing Grounds Footprint* is calculated according to estimates of the maximum sustainable catch for a variety of fish species. The *Grazing land Footprint* is determined by grazing land which is used to raise livestock for meat, dairy, hide, and wool products. The *Built-Up Land Footprint* is calculated based on the area of land covered by human infrastructure: transportation, housing, industrial structures, and reservoirs for hydro-power. Moreover, built-up land may occupy what would previously have been cropland (Global Footprint Network, 2015a).

There are three complementary indicators created by means of the EF per capita and available biocapacity per capita which serve for sustainability assessment of the countries and regions:

$$Biocapacity\ Deficit/\ Reserve = Biocapacity - EF \quad (1)$$

$$Number\ of\ Countries\ required = \frac{EF}{Biocapacity} \quad (2)$$

$$Number\ of\ Earths\ required = \frac{EF}{Earth-Biocapacity} \quad (3)$$

where: EF – Ecological Footprint.

The first and second indicators are simply expressed as the difference (Eq. 1) and ratio (Eq. 2) of the EF and biocapacity of the individual country / region whereas the last indicator compares the EF of a country / region with the biocapacity of the world. While the EF represents the demand side and the biocapacity the supply side, the deficit occurs if the EF is higher than biocapacity in compliance with Eq. 1. This country works as a resource debtor. Regarding the remaining two ratio indicators, the deficit which reflects the debtor´s position is represented by the indicator higher than 1. Number of Earths required represents the number of Earths needed if everyone in the world lived the average lifestyle of a resident in this country. Number of Countries required indicates how many times the country's biocapacity is needed in order to provide for the country's consumption Footprint (Global Footprint Network, 2015a).

Before the analysis the biocapacity and EF factors should be shortly mentioned to explain the factors of their differences between the investigated regions and countries. The EF is driven by consumer habits and the efficiency of providing goods and services. The growing biocapacity deficit is defined as the situation when a population uses more biocapacity than can be supplied and regenerated in a year. It is driven by the combination of high consumption rates, i.e. consumption is growing more rapidly than improvements in efficiency, which leads to increase in people's footprint; and populations growing faster than the biosphere's capacity resulting in drop of biocapacity per person. Biocapacity as a supply side is expressed as the bioproductive area multiplied by its bioproductivy (per hectare) whereas these two are referred to as the biocapacity factors. Bioproductive area is the available area of cropland, grazing land, fishing grounds and forests. Bioproductivity per hectare is the area's productivity which depends on factors such as ecosystem's type, management and health, agricultural practices or weather and thus it can vary each year. Productivity can be advanced to achieve more biocapacity, however this is often at the expense of a larger EF. It means, energy-intensive agriculture and heavy reliance on fertilizer can increase yields, but it requires increased inputs and can generate more CO_2 emissions. The EF can be expressed *as population x consumption per person x footprint intensity,* whereas they represent the so called EF drivers. As to population growth, the growing number of consumers is a strong driver behind the growing EF. Moreover, population size also affects the biocapacity available to each person. Regarding consumption of goods and services per person, it is evident that different populations consume different quantities of goods and services, primarily based on their income level. Footprint intensity is the efficiency with which natural resources are turned into goods and services while the differences between products and of course between countries exist. (WWF et al., 2012)

Cross-Section Analysis

The cross-section model was created and the linear least-squares regression was applied to detect the relations between the Ecological Footprint and the HDI / GDP per capita. The countries included in the sample are the EU-28 plus Norway and Switzerland which are the countries of the European Economic Area (EEA). Moreover the United States (US) was included as an additional developed economy in order to compare the levels of sustainability. The applied formula to detect the relationship is as follows:

$$ln\,EF = a + b \times ln(HDI\ /\ GDP\ \ p.c.) + \mu_i, \quad (4)$$

where *EF* is Ecological Footprint in 2011 (gha per person), *HDI* is Human Development Index in 2011 and *GDP p.c.* is the Gross domestic product based on purchasing-power-parity (PPP) per capita in Current international dollar in 2011 dollar. Symbols *a* and *b* represent coefficients and *ln* represents the natural logarithm which is used to eliminate the effect of the different units of the variables. The assumptions of linear regression such as (1) statistical independence of the errors, (2) homoscedasticity (constant variance) of the errors, and (3) normality of the error distribution are proved with the suitable tests such as Breusch-Godfrey Serial Correlation LM Test for the first assumption, Breusch-Pagan-Godfrey, Harvey, Glejser and White test for the second one and the Jarque-Bera test for the third one.

3 Research results

The EF indicator represents a first step in the SD investigation and thus it is applied to the EU countries as well as to the overall EU. Moreover, to detect sustainability and SD the EF needs to be compared with the available resources.

3.1 Sustainability analysis in the EU and its countries using the Ecological Footprint

It is appropriate to start with the sustainability evaluation using the comparison of the EU with the regions of the world for which data are available. Table 1 summarizes the results for the EF and its component indicators together with the population data of the seven regions and the overall world. It is evident that regarding the size of the region the population of EU is the fourth highest, i.e. it is in the middle of the group. The Cropland, Grazing, Carbon and Fish Footprints of the EU are the third highest in the group of the regions. In the Cropland, Forest Product and certainly Carbon Footprint North America reached the highest levels. Finally, in the Grazing Footprint Latin America, and in Fish Footprint the Other Europe, dominate. Forest Product Footprint of the EU is the second highest following the North America region. The Built up Land of the EU is the highest and it is, of course, followed by North America. The highest total EF is typical of North America. It is followed by the EU and Other Europe. On the contrary, the developing regions of Africa and Asia-Pacific reach the lowest EF levels, i.e. lower than 2 gha. The lowest levels of several EF's components are typical of Africa including Cropland, Carbon Footprints and Built up Land as well as the overall EF. Asia-Pacific reached the lowest level of Grazing Footprint and Middle East/Central Asia, of course, the lowest Forest Product Footprint and also Fish Footprint. All these results comply with the standard of living and the stage of development as well as the economic structures and production and consumption patterns of these regions.

Table 1 Population (mil.), Ecological Footprint and its components (gha per person) in the world and the regions, 2011

Region	Pop. (mil.)	CrF	GF	FPF	CF	FF	BL	TEF
World	6997.99	0.56	0.21	0.26	1.46	0.08	0.07	2.65
Africa	1009.35	0.401	0.155	0.292	0.291	0.052	0.051	1.242
Asia-Pacific	3842.4	0.445	0.065	0.165	0.915	0.075	0.081	1.751
EU - 27	502.2	0.946	0.227	0.504	2.098	0.113	0.146	4.086
Latin America	598.42	0.557	0.543	0.393	0.813	0.075	0.083	2.465
Middle East/Central Asia	398.25	0.631	0.142	0.152	1.408	0.041	0.055	2.457
North America	349.47	1.088	0.267	0.714	4.452	0.12	0.101	6.742
Other Europe	238.72	0.951	0.103	0.399	2.24	0.149	0.069	3.911

Source: Global Footprint Network (2015a)
Notes: Pop. (mil.) = Population (millions); CrF = Cropland Footprint; GF = Grazing Footprint; FPF = Forest Product Footprint; CF = Carbon Footprint; FF = Fish Footprint; BL = Built up Land; TEF = Total Ecological Footprint.

The resource stock per capita, i.e. natural capital / wealth of the countries and regions, which is used to meet the needs, is the other side of the coin and these aspects are summarized in Table 2. North America disposes of the highest Cropland per capita. Latin America has the highest available areas of Grazing Land and, of course, Forest Land. Other Europe disposes of the largest area of Fishing Ground and EU of the Built up Land. This result of the EU is not positive, because for the built up land the other parts of biocapacity are used which limits its usage for alternative purposes. In Africa the lowest areas of Cropland and Built up Land per capita are available; in Asia-Pacific this is typical of Grazing Land, in Middle East/Central Asia of Forest Land and Fishing Ground. The largest total biocapacity is indeed typical of Latin America whereas this region is still the highest creditor and disposes of the largest Biocapacity Reserve. Regarding the highest deficits, North America is followed by the EU and then by Middle East/Central Asia whereas the first region is the only region with the deficit higher than 2 gha. The other two regions reached the deficit higher than 1 gha. These results are in compliance with the natural conditions including climate of these regions.

Table 2 Biocapacity and its components (gha per person) in the world and the regions, 2011

Region	CrL	GL	FL	FG	BL	TB	D/R	NE	NC
World	0.56	0.21	0.73	0.15	0.07	1.72	-0.93	1.54	
Africa	0.343	0.333	0.424	0.095	0.051	1.246	0.004	0.722	0.997
Asia-Pacific	0.419	0.081	0.178	0.1	0.081	0.864	-0.886	1.018	2.026
EU - 27	0.976	0.091	0.738	0.198	0.146	2.291	-1.795	2.375	1.783
Latin America	0.742	0.741	3.456	0.287	0.083	5.309	2.844	1.433	0.464
Middle East/Central Asia	0.448	0.2	0.164	0.095	0.055	0.976	-1.48	1.428	2.516
North America	1.597	0.245	2.175	0.612	0.101	4.73	-2.012	3.92	1.425
Other Europe	1.044	0.262	2.885	0.775	0.069	5.035	1.124	2.274	0.777

Source: Global Footprint Network (2015a)
Notes: CrL = Cropland; GL = Grazing Land; FL = Forest Land; FG = Fishing Ground; BL = Built up Land; TB = Total Biocapacity; D/R = Biocapacity (Deficit) or Reserve; NE = Number of Earths required; NC = Number of Countries required.

Finally Table 3 summarized the results of the EU in the component indicators, i.e. the differences between the relevant component biocapacity and footprint indicators according to Eq. 1. Although, there is still sufficiency of the Cropland and Fishing Grounds for meeting the needs, the Grazing and Forest Land, when also the role of forests

to sequester the carbon emissions is taken into account (see section 2.2.), is not available to a sufficient extent. The Forest Land only suffices to cover Forest Product Footprint, but not the sum of this one and Carbon Footprint. The EU's Cropland is the third highest; however, the Grazing Land is the second lowest among the monitored regions (see Table 2). This is in compliance with the position of the EU as a creditor or debtor in particular component footprints. As a built up land the other parts of the bioproductive area are used and thus the differences between area available and footprint indicator are equal zero. This footprint component in the EU reached the highest level among the examined regions by which the negative effects on the bioproductive areas being used for this purposes are emphasised (see Table 1).

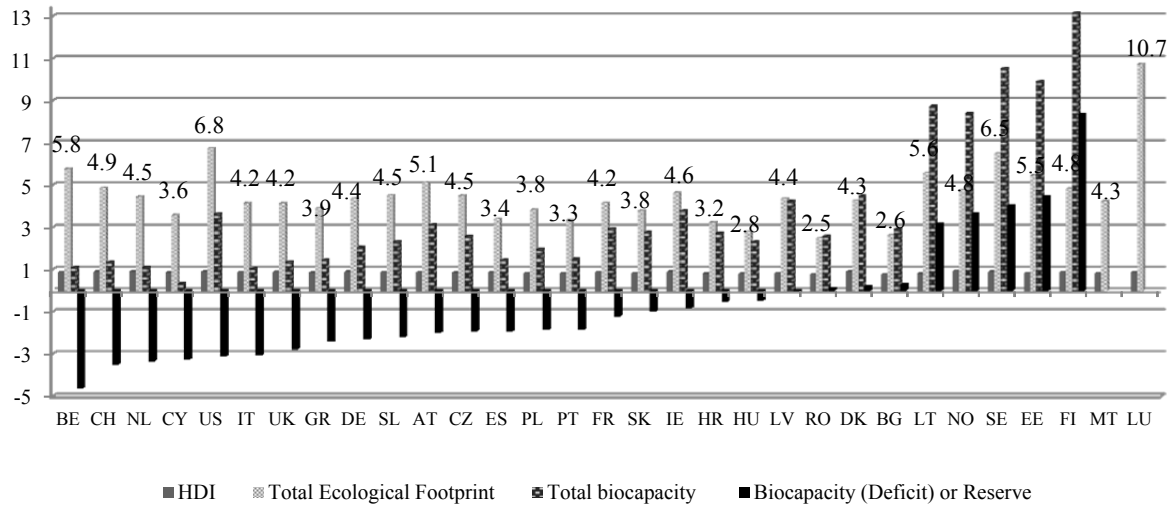
Table 3 Differences between the component biocapacity and footprint indicators, EU – 27, 2011

	CrL-CrF	GL-GF	FL-FPF	FL-(FPF+CF)	FG-FF
EU - 27	0.030073477	-0.136094584	0.234712664	-1.863635205	0.085364397

Source: Global Footprint Network (2015a), own calculation
Note: CrL = Cropland; GL = Grazing Land; FL = Forest Land; FG = Fishing Ground; CrF = Cropland Footprint; GF = Grazing Footprint; FPF = Forest Product Footprint; CF = Carbon Footprint; FF = Fish Footprint.

Next step is the analysis of the individual EU countries. As Figure 1 shows there are eight resource creditors among the EU countries. These are all Northern countries, i.e. developed EU countries such as Finland, Sweden and Denmark, together with Norway, two Baltic countries such as Estonia and Latvia, and also two least developed EU countries, i.e. Bulgaria and Romania. On the other hand, these countries, except Bulgaria and Romania, also showed the highest levels of biocapacity in the range from 4.5 gha in Denmark to even 13.2 gha in Finland. The last Baltic country Lithuania follows Denmark; its biocapacity was 4.2 gha. However, its EF was little bit higher, concretely 4.4 gha. Moreover, these countries, except (mainly) Bulgaria and Romania, also showed ones of the highest levels of the EF among the EU countries. Sweden showed the second highest EF after Luxembourg whereas these are the only EU countries with the EF higher than 6 gha. Such a high level is also typical of the US (see Figure 1). Two Baltic economies showed the EF higher than 5, concretely Latvia 5.6 and Estonia 5.5 gha. The remaining three Northern countries showed the EF higher than 4 gha. There are only three EU countries with the EF lower than 3 gha, i.e. Hungary (2.8), Bulgaria (2.6) and Romania (2.5). These countries also showed the lowest level of HDI and GDP per capita among the EU countries. Bulgaria and Romania are the only two EU countries with the high human development level, i.e. HDI lower than 0.8 (0.77 and 0.78 respectively), and the lowest levels of GDP per capita as well. There is a large number of the EU countries with the HDI between 0.8 and 0.9. The three Northern countries with large biocapacity areas as well as high EF levels, Norway, Denmark and Sweden, showed also very high HDI, i.e. Norway 0.94 and other two countries 0.9. Finland's HDI is little bit lower (0.88), however, this country has the highest available biocapacity and it is the highest EU creditor. Regarding these Northern countries the sequence of GDP per capita is quite consistent with that of HDI. Norway is a country with the highest GDP per capita among the Northern countries and it is followed by Denmark, Sweden and finally by Finland.

Figure 1 HDI, EF, Biocapacity and Biocapacity Deficit / Reserve in the EU countries, Norway, Switzerland, and the US, 2011



Source: Global Footprint Network (2015a)
Note 1: HDI data are 2011 values from UNDP Human Development Reports, 2014;
Note 2: The countries are ordered according to Biocapacity Deficit / Reserve. Data description is related to the EF indicator.
Note 3: For Malta and Luxembourg, data on HDI in 2011 and data on EF in 2008 are only available.

As regards Malta and Luxembourg the EF data are available only for the year 2008. Whereas the EF of Malta was 4.3 gha, Luxembourg showed the highest EF among the monitored countries, even higher than that of US, concretely 10.7 gha. However it must be pointed out that these results can be ambiguous because of low population and the high standard of living whereas the product is predominantly produced by foreign workers. Using the indicators composed of the EF and biocapacity by means of Eq. 2 and Eq. 3 the more detailed results of the EU and the other three developed countries are summarized in Table 4. The first indicator – Number of Countries required – measures if a country's resource exhaustion is in compliance with its own resource stock. This indicator is mainly dependent on the biocapacity wealth of the individual countries. On the one hand, the Northern countries, including the developed countries and the Baltic countries, dispose of the largest biocapacity and reach low level of the Number of Countries required (up to one). Finland has the largest available biocapacity per capita and thus achieved the best results. This indicator results reach up to one also in Bulgaria and Romania because of the lowest levels of the EF indicator. On the other hand the countries with the low biocapacity stock often represent the debtors, i.e. they need more area than the country provides to meet the needs of people. The worst results are typical of Cyprus, followed by Belgium, Netherlands, Italy and Switzerland.

The second indicator, the Number of Earths required, compares the countries' requirements with the average Earth's biocapacity. Only five countries reached the lower number than the value of 2. These are mostly the least developed EU countries such as Romania, Bulgaria, Hungary and Croatia together with one Southern economy – Portugal, which also showed the low EF level. However they still need more than 1 Earth to meet the needs of their inhabitants. Six countries need three and more than three Earths, concretely Austria, Estonia, Latvia, Belgium, Sweden and the US with 3.9 Earths required and thus with the highest biocapacity required compared to the world's average. Since this indicator is based on the same biocapacity for comparisons with countries' EFs, the impact of the countries on resources is more visible regardless of the resource stocks available in the individual countries.

Table 4 Number of Earths required, Number of Countries required by the EU countries, Norway, Switzerland and the US, 2011

C	NE	NC	C	NE	NC	C	NE	NC
FI	2.8	0.4	HU	1.6	1.2	PT	1.9	2.2
EE	3.2	0.5	IE	2.7	1.2	ES	2.0	2.3
NO	2.8	0.6	SK	2.2	1.3	GR	2.3	2.6
SE	3.8	0.6	FR	2.4	1.4	UK	2.4	3.0
LT	3.2	0.6	AT	3.0	1.6	CH	2.8	3.5
BG	1.5	0.9	CZ	2.6	1.7	IT	2.4	3.8
DK	2.5	1.0	US	3.9	1.9	NL	2.6	4.0
RO	1.5	1.0	PL	2.2	1.9	BE	3.4	5.1
LV	2.5	1.0	SL	2.6	1.9	CY	2.1	10.3
HR	1.9	1.2	DE	2.5	2.1			

Source: Global Footprint Network (2015a)
Note 1: NE = Number of Earths required; NC = Number of Countries required;
Note 2: countries are ordered according to the Number of Countries required from the lowest to the highest number.
Note 3: Malta and Luxembourg are not included because of lack of data.

The last part of the analysis is focused on the relations between the indicators, particularly, the standard of living / human development stage and the EF per capita. The less developed countries often show the lower level of the EF and conversely. Countries with the abundance of the natural resources can also show high levels of the EF levels in case of more intensive usage of them to meet the needs. These are often the developed countries; however, it is not always a rule. Countries with the abundance of natural resources are at the various levels of material and human development. Whereas the correlation coefficient (r) between the EF and biocapacity in the EU plus other three developed countries (except Luxembourg and Malta) reached 0.48, in the overall sample of 182 countries for which data of Global Footprint Network (2015a) are available, its level is minor (0.083). It can be at least claimed that the biocapacity abundance can determine wealth of the economy and its EF, whereas the EF is certainly affected by other factors as well (see section 2.2). The efficiency of the resource usage is especially of particular importance. The causality between the standard of living / level of development, the EF and biocapacity needs to be investigated more in detail using longer time series data. Using cross-section data in this Paper the basic dependences can only be detected.

3.2 Cross-section Analysis of the Relations between Ecological Footprint and Standard of Living / State of the Human Development

The cross-section model is applied to detect the dependence between the Ecological Footprint as the explained and the HDI and GDP per capita as the explanatory variables. Firstly, the effort was to create the model for the overall sample of 168 countries for which data of Global Footprint Network (2015a) are available. Although the positive relationships result from the regression analyses for both variables, the assumptions of the models are violated and are thus not

further presented. The positive relationships between the HDI / GDP per capita and the EF are evident, among others on the basis of the relatively high positive r values (for GDP per capita: 0.793; for HDI: 0.769; in the sample of 168 countries of the world with available data), but the significant outliers can be present in the sample and thus the relationships should be explored in the smaller samples including countries with more similar characteristics. This is beyond the scope of this Paper. Secondly the EU-28 countries plus three other developed economies, i.e. Norway, Switzerland and the US, were separately investigated. The results are as follows:

$$\ln EF = -3.936 + 0.52 \times \ln\ GDP\ \ p.c. + \mu_i, \tag{5}$$

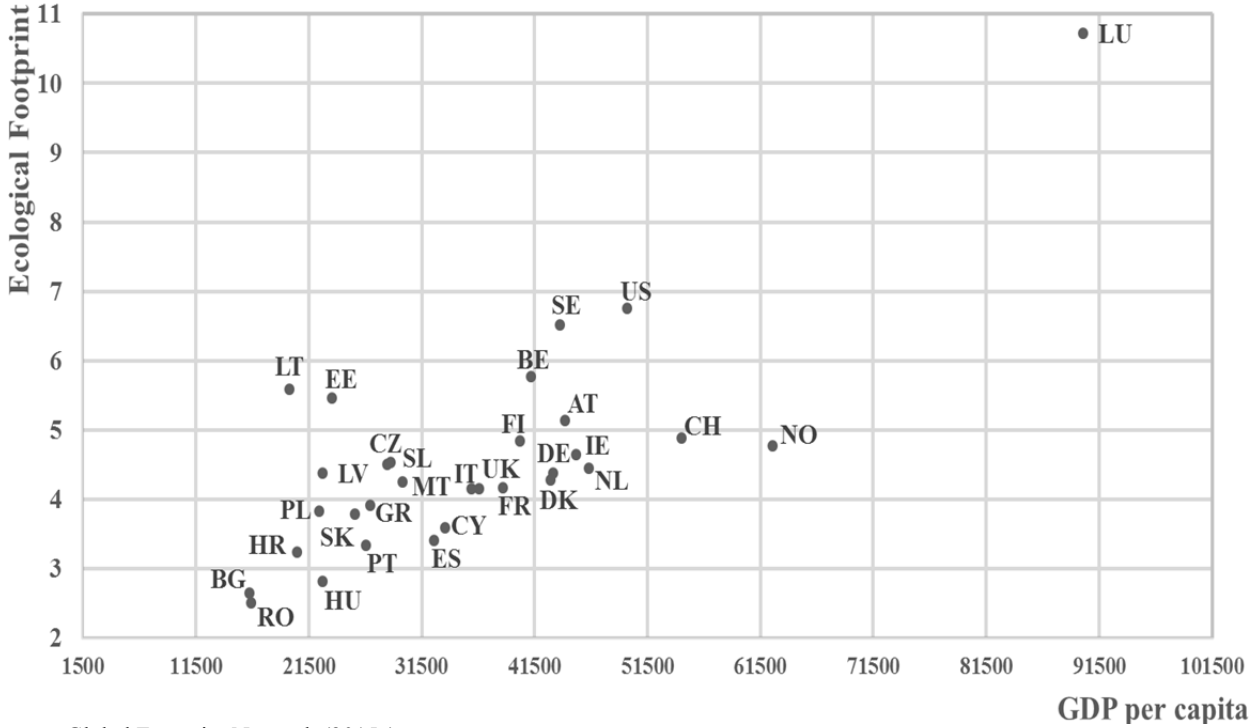
$$Obs.: 31;\ R^2 = 0.513;\ adjR^2 = 0.496;\ Prob.=\ 0;\ 0;\ Prob(F-stat.) = 0$$

$$\ln EF = 1.905 + 3.06 \times \ln HDI + \mu_i, \tag{6}$$

$$Obs.: 30;\ R^2 = 0.401;\ adjR^2 = 0.379;\ Prob.=\ 0;\ 0;\ Prob(F-stat.) = 0$$

In the first model (Eq. 5) all the assumptions of linear regression were met. In the second model (Eq. 6) Luxembourg was omitted from the analysis because its values of the variables are outliers (see Figures 2 and 3) and the normality of the error distribution assumption was violated. After its omission all the assumptions of the linear regression are met. The results indicate positive dependence of the EF on the HDI and the GDP per capita. The elasticity (b coefficient) is higher in Eq. 6 for HDI as an explanatory variable; however, the R^2 and r are lower in the model with the HDI as an explanatory variable. Thus the proportion of the EF variance explained by the regression model is higher in Eq. 5 when GDP per capita as an explanatory variable is used. Concretely, r = 0.575 between HDI and EF and r = 0.77 between GDP per capita and EF (31 countries) and moreover in the first case it would drop to 0.398 if Luxembourg was included in the sample. Indeed there are many other factors which determine the EF level in the countries. Although the EF level can be better explained by the GDP per capita, the HDI is significantly correlated with this indicator, i.e. it is one of its partial indicators. The EF is determined by the consumption which depends on production, however, also the productivity is important and this significantly affects sustainability and SD. It is more difficult to detect the relations between the other components of the human development included in HDI related to education and life expectancy.

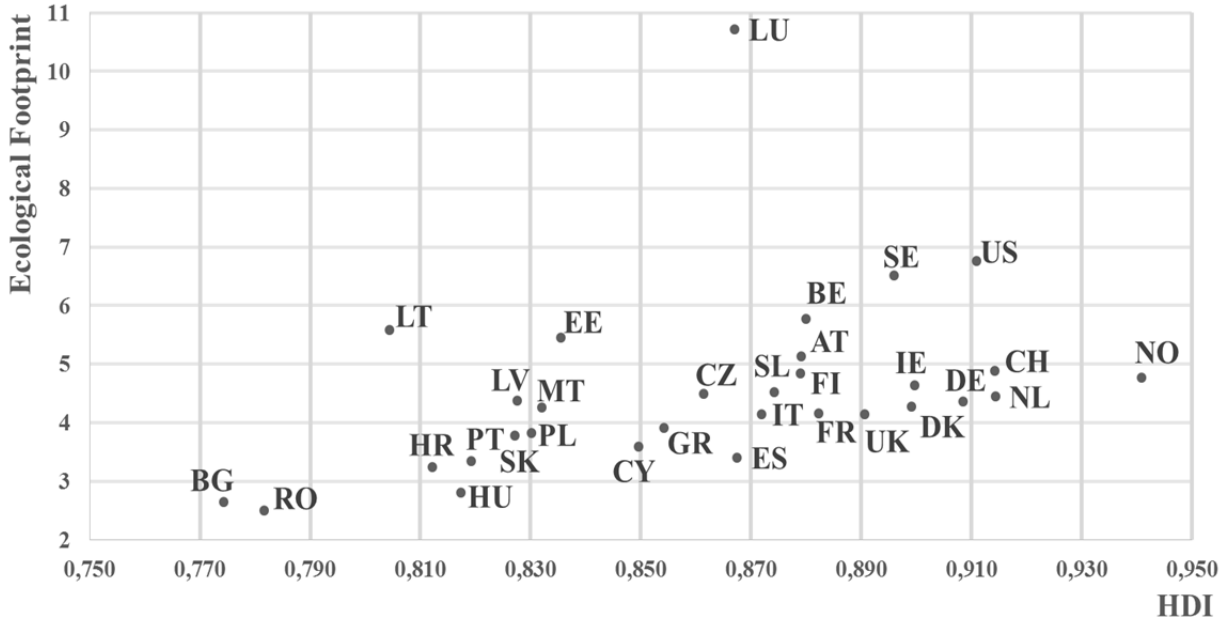
Figure 2 GDP per capita and Ecological Footprint in the EU countries, Norway and Switzerland, 2011



Source: Global Footprint Network (2015a)

Figure 2 and Figure 3 display the relations investigated by Eq. 5 and Eq. 6. The positive relationships can be seen in both cases, i.e. between GDP per capita / HDI on the one hand and the EF on the other hand. Luxembourg is the outlier in both cases with the highest EF and GDP per capita; however its HDI is lower than 0.9 and thus not one of the highest levels in the sample that significantly affects the cross-section analysis (Eq. 6). On the other hand, if it was left out from the model with GDP per capita (Eq. 5) the elasticity would further decrease to 0.414 as well as R^2 to 0.382.

Figure 3 HDI and Ecological Footprint in the EU countries, Norway and Switzerland, 2011



Source: Global Footprint Network (2015a)

To sum up in both Figures 2 and 3 there are few countries in the left bottom side. These are the countries with the lowest standard of living and level of human development together with the lowest EF levels, particularly, Romania, Bulgaria, Croatia and Hungary. Latvia which also showed the lowest levels of HDI and GDP per capita stands out of this group because its EF is one of the highest in the EU. In the right bottom part the countries with the highest HDI and GDP per capita levels as well as high level of resource usage can be particularly found. In addition to already mentioned Luxembourg, these countries are especially Norway, Switzerland, the US, Austria, Sweden, Netherlands and Belgium in both Figures 2 and 3 again (additional countries can also be included).

4 Conclusions

The aim of the Paper was to detect the level of sustainability in the EU and its countries by means of the EF, its comparison with the available resources, as well as its relations to the standard of living and the level of human development. Accordingly the main focus of the Paper was on the EU region and the EU-28 countries together with other three developed economies such as Norway, Switzerland and US, which were included in the sample, especially due to the better comparison possibilities.

Comparing the seven regions of the world it can be concluded that the results related to the Ecological Footprint and its components comply with the standards of living, the stages of development, as well as the structures of economies and the production and consumption patterns in these regions. In the EU the Built up Land as a footprint component reached the highest level among the examined regions that reduces its usage for the other purposes and thus this can be evaluated as a negative trend (aspect) in relation to sustainability and sustainable development. The Cropland, Grazing, Carbon and Fish Footprints of the EU are the third highest among the monitored regions. The Total Ecological Footprint of the EU is the second highest following North America which reached the highest overall Footprint per capita. The biocapacity stocks of the regions are in compliance with the natural conditions including climate in these regions as well, with the Latin America being the wealthiest region and the largest creditor as regards the bioacapacity area.

The indicators based on the Ecological Footprint and biocapacity reflect the position of the region / country in a resource management. The overall EU is a debtor with the Biocapacity Deficit of -1.795 gha and requiring 2.375 of the average Earth's biocapacity and 1.783 of its own biocapacy. The EU has still sufficiency of the Cropland and Fishing ground where the biocapacity exceeds the footprint. On the other hand, the Grazing Footprint surpasses biocapacity and this is also the case of the forest component when Carbon Footprint is also included, i.e. added to the Forest Product Footprint. The Northern countries including developed EU countries plus Norway, and the Baltic countries, dispose of the largest biocapacity and reach the low levels of the Number of Countries required, i.e. the figures reaching up to one. Accordingly, Finland which has the largest biocapacity also achieved the best results. The countries with the small biocapacity stock are often in the debtor position, i.e. they need more area than the country provides to meet the needs of people. The worst results are typical of Cyprus, followed by Belgium, Netherlands, Italy and Switzerland. Only five countries in the examined sample showed the Number of Earths required lower than 2. These are mostly the least developed EU countries such as Romania, Bulgaria, Hungary and Croatia together with one Southern economy – Portugal. However they still need more than 1 Earth to meet the needs of their inhabitants. Six countries need three and more than three Earths, concretely Austria, Estonia, Latvia, Belgium, Sweden and the US.

The main resource debtors are Belgium, Switzerland, Netherlands, Cyprus, the US and Italy; whereas all these countries except of the US have very small available biocapacity. However, the Footprint of the US is the second highest in the sample following Luxembourg. The main creditors are the above mentioned Northern countries which also dispose of the largest areas of biocapacity.

The positive relationship between GDP per capita / HDI and the Ecological Footprint can be confirmed at least in the group of the developed countries including EU countries, Norway, Switzerland and the US. The proportion of the Ecological Footprint variance explained by the regression model is higher when GDP per capita as an explanatory variable is used compared to HDI, although in the latter model the elasticity is higher. Luxembourg is a country with the extraordinary position reaching the highest Ecological Footprint and GDP per capita, however its HDI is lower than 0.9. In the examined sample the countries with the lowest standard of living and level of human development together with the lowest levels of the Ecological Footprint are especially Romania, Bulgaria, Croatia and Hungary. Countries with the highest levels of HDI and GDP per capita as well as high level of resource usage are especially Luxembourg, Norway, Switzerland, the US, Austria, Sweden, Netherlands and also Belgium.

Using the Footprint and biocapacity methodology together with the relevant macroeconomic indicators the basic economic – environmental (resource management) trends, reflecting also un/sustainability and un/sustainable development aspects, were detected. It is evident that the EU region cannot be regarded as the sustainable region and the large number of its countries cannot be considered to be sustainable as well, or at least the more detailed analysis would be required. Moreover, sustainability aspects need to be investigated from the more complex point of view. According to the analysis applied in this Paper, there is no country with sufficiently low level of Ecological Footprint together with very high levels of GDP per capita and HDI. According to all aspects investigated Finland can be regarded as the most sustainable economy in the sample.

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Public Service of Public Transport Connectivity in South Bohemian Regions from the Point of View of Municipalities between the Years 2004-2014

Jiří Dušek

Abstract: *Generally speaking, public transport connections between municipalities belong among the most important development criterias of municipalities. In the South Bohemian Region, this factor is even more important since it has a relatively high number of municipalities (623) and a great surface area, which makes it the region with the lowest population density in the whole Czech Republic. This fact, together with economic and political factors is the main reason why, in the South Bohemian Region, no universal integrated public transport system has been introduced, although there were several pilot projects.*

The contribution focuses on the problem area of public transport connectivity from the point of view of individual South Bohemian municipalities. After the introductory theoretical part, results of questionnaire surveys focused on analyses of selected problem areas of South Bohemian towns and municipalities are presented and discussed. These surveys took place in the years 2004 and 2014 with the intention of comparing and mapping changes in attitude of South Bohemian municipalities in the question of traffic and public transport connectivity. In conclusion, the results are interpreted not only from the point of view of development of opinions of individual municipalities on individual problem areas but also in the context of changes made in the area of traffic in the last 10 years.

Key words: municipality · public transport connectivity · public service · South Bohemian Region · traffic

JEL Classification: O18

1 Introduction

A fragmented settlement structure is a serious problem of some regions in the Czech Republic. On the one hand, fragmentation can be a sign of functional democracy, but on the other hand, it causes a lot of problems. Small municipalities are not able to generate enough tax revenues, they have worse access to returnable income, a major part of their financial resources is "swallowed" by administration costs, they are unable to use economies of scale to maintain services, it is difficult for them to get qualified staff. In this respect, the most significant downsides include the level of public transport services (Galvasová, 2007). Gradual reduction of public transport in the past years, cancellation of bus and railway lines or a decreasing number of connections, lack of financial resources to maintain transport services from regional or municipal budgets – these are all factors that significantly limit the extent, quality and development of services provided and have a crucial influence on further regional development of municipalities. According to Chabičovská, 2009, difficult traffic accessibility, insufficient transport services and remoteness of the areas cause inter- and intra-regional disparities. This is the reason why traffic accessibility and transport services are among the basic conditions necessary for the development of municipalities.

Bink, 2010, defines conditions necessary for development as the potential and the characteristics of a particular area. They can be viewed from different angles:

- Inhabitants of a municipality think the conditions necessary for development include the presence of factors that have a positive influence of their life, such as good traffic accessibility, high-quality housing, availability of services and free-time activities, job opportunities, quality of the environment, pleasant environment, quiet environment etc.
- From the point of view of an economic development, these are values that can attract new inhabitants, entrepreneurs and investors to the municipality, e.g. objects and plots suitable for running a business, high-quality roads, availability of a public supply system and transport network, qualified workforce, sales markets, natural, cultural, recreational attractions, etc.
- From the point of view of visitors, these are factors that influence the choice of an area to stay in or visit, e.g. attractiveness of a respective area, occurrence of natural, cultural and historic points of interest, possibilities to do sport, accommodation and eating capacities, etc.

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2 Methods

This work focuses on problems of transport services as seen by the respective municipalities in the South Bohemian Region. The introductory theoretical part is followed by a presentation and discussion of the results of a questionnaire survey aimed to analyse selected problems of municipalities and towns in the South Bohemian Region. The survey was done in 2004 and repeated ten years later, in 2014. The goal was to compare and map the changes in the attitude of municipalities in South Bohemia regarding transport and transport services. At the end, the established results are interpreted as regards the development of opinions the respective municipalities have on the problem areas, and also in the context of changes that were made in transport in the past years.

The research in 2004 was done in cooperation with the following subjects: South Bohemian Regional Authority, ČSAD Jihotrans a.s., České dráhy a.s. (Czech Railways), Jednota - spotřební družstvo České Budějovice (Jednota - Consumer Cooperative České Budějovice), Employment Office Písek, Union of Towns and Municipalities of the South Bohemian Region, RERA a.s., The University of West Bohemia in Plzeň and Czech University of Agriculture in Prague. The goal was to obtain relevant data related to the following selected topics:

a) transport services,
b) availability of basic goods and services,
c) management of villages and towns,
d) regional information system (RIS),
e) subsidies,
f) support of investment inflow,
g) attitude to national minorities,
h) legislation and efficiency of public administration,
i) education opportunities of public officers.

In 2004 the data was collected by students of College of European and Regional Studies (VŠERS), in 2014 the research was done in an electronic form in cooperation with Union of Towns and Municipalities of the South Bohemian Region. In the first research, 200 municipalities in South Bohemia were addressed (140 questionnaires were returned, i.e. 22.47% of all municipalities in the region). In the second research in 2014, a similar number of questionnaires were obtained – 141 (i.e. 22.63% of all municipalities in the region). In the latter case, all municipalities of the South Bohemian Region were addressed in an electronic form (due to higher effectivity of collecting and analysing dates, simple and user-friendly form of questionnaire). The respondents were elected representatives of municipalities and cities.

3 Research results

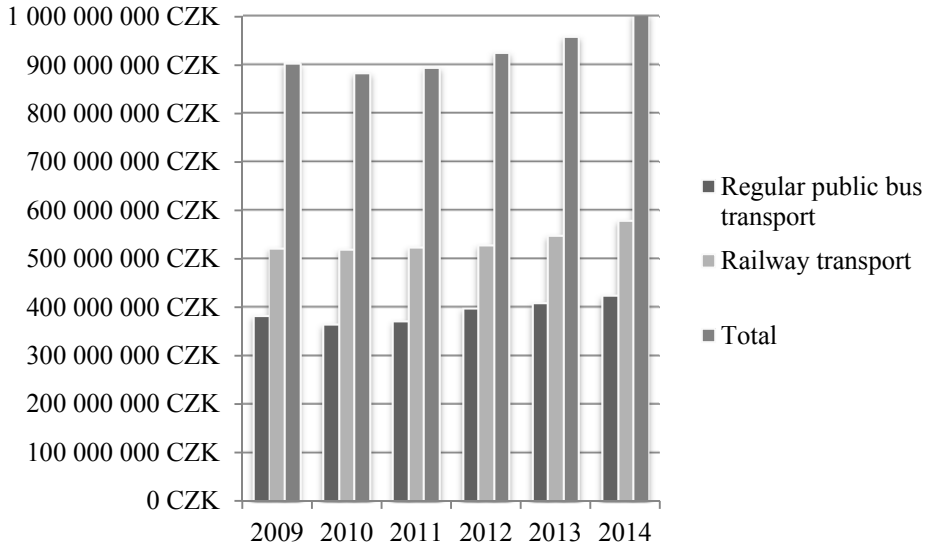
After 1989, gradual reduction of public transport, particularly buses, was a significant process with an economic and social impact. Until 1990, bus transport provided an everyday connection of a county town or another big town in the district with rural areas virtually every day, including weekends and public holidays. When the economic conditions were rectified after 1990, conditions for operating public bus transport started to change step by step since 1991. In the respective settlements the number of connections decreased to the maximum of two on weekdays and they were left entirely without any connections on weekends. The imminent further reduction of the number of connections leads to a situation where municipalities are pushed to co-finance the loss of the respective public transport companies from their municipal budget. The reduction of public transport also has a big social impact on some groups of population, whose mobility it significantly hinders. As the prices of public transport were rectified, fare prices were raised to the point where they constitute a major part of the operation costs of a family (Perlín, 1999).

As regards public transport, municipalities provide the so-called other transport services in the region, and also public transport in towns, if they decide so. The term “other transport services” means transport services that go beyond the basic transport services provided by regions. The share of regions in financing all expenditures on public transport of passengers is approx. 75%, which is definitely the largest part. In the course of time, the amount of finances given out from regional budgets slowly rises. Especially big increase has been recorded in railway transport. The main reason for this is the fact that targeted subsidies for railway transport are gradually being transferred from the state budget to the full financial responsibility of regional representations for railway transport in the region. The necessity to pay a fee for using the railway infrastructure to SŽDC (the national railway infrastructure manager), which was founded after the railways were taken out from the property of Czech Railways (Sláma, 2014), also plays a role.

Out of the total number of 623 municipalities in the South Bohemian Region only 5 municipalities, i.e. 0.8%, are not linked to public transport (the criterion is the distance to the nearest stop of public transport larger than 2km). With regard to the size of the region, a large number of bus stops (3,105) and railway stops (265) have higher requirements

for both management and coordination and financing the operation and transport (Jikord, 2011). While the region paid 903.34 million CZK for transport services in 2009, it was more than 1 billion CZK in 2014, which means that over 5 years the price increased by approx. 11%, divided in the ratio of 57.7% : 42.3% in favour of railway transport. The importance of providing transport services is proven not just by the amount of money, but its regular increase every year (with the exception of crisis) or the ratio of this amount of money to the general budget of the South Bohemian Region (1.003 billion CZK : 10.99 billion CZK), i.e. 10.94%.

Figure 1 Development of expenditures of the South Bohemian Region on transport services

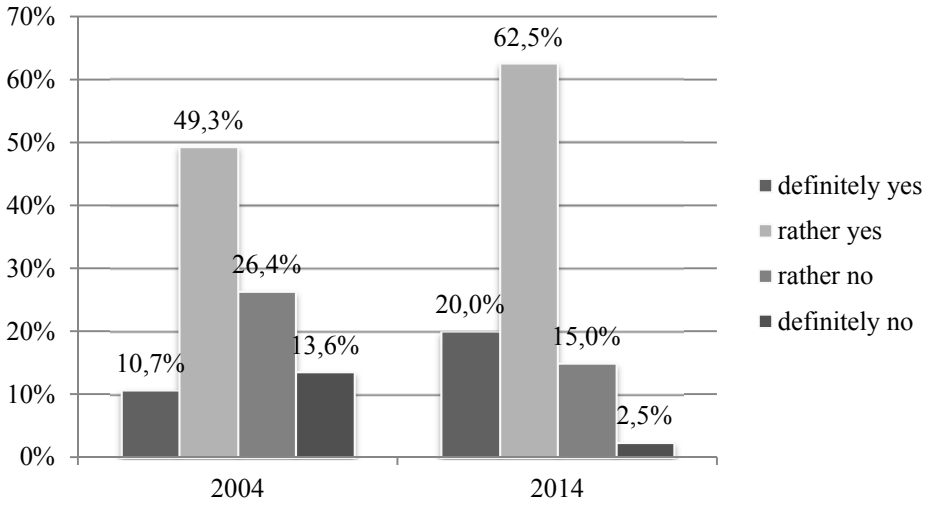


Source: Own processing

Although the region finances and influences a significant part of transport services, municipalities cannot be left out from these issues, as transport is a key factor for their development and in fact a basic condition for maintaining their sustainable development. According to Holeček, 2009, on the level of municipalities transport is among the issues that are dealt with most often, along with waste management and health services. As regards transport, municipalities were asked these 5 questions:

1. Are you satisfied with the way the basic transport services in the South Bohemian Region are financed and why?
2. The financial interest of a municipality/town in transport services is…
3. What do you suggest to improve the quality of transport services?
4. Do you like the idea of building a regional integrated public transport system?
5. Transport services in your municipality/town are …

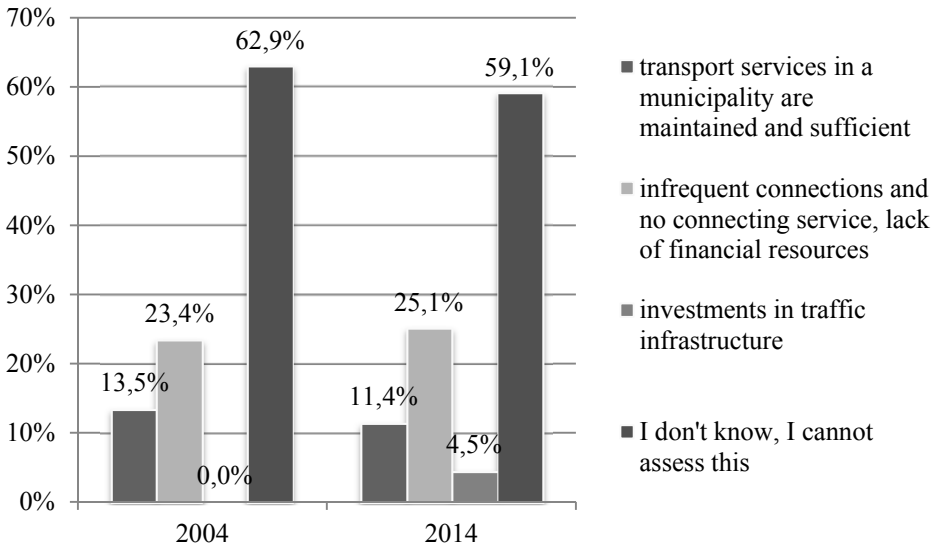
Figure 2 Satisfaction with the way the basic transport services in the South Bohemian Region are financed



Source: Own processing

The reform of public administration, the entry of the Czech Republic into the EU and implementation of a large number of principles (e.g. subsidiarity, decentralization, deconcentration and deetatization) led to some major changes in transport in the past years. Municipalities think that these changes have a positive impact on financing the basic transport services in municipalities. While in 2004, only 10.7% of municipalities were definitely satisfied, now it is 20%. Similar "positive" tendencies were also recorded in other answers. If we use the pattern *"1*definitely yes + 0,5*rather yes - 0,5*rather no - 1*definitely no"*, the level of satisfaction has changed from 8.55% to 41.25% over the past 10 years. Medium-sized municipalities are the most satisfied category. The opinion that the share of a municipality in financing transport services is "adequate and balanced" reached the level of 73.5% in 2004 and the level of 88.6% 10 years later. Dissatisfaction with financing transport services dropped mainly in small and middle-sized municipalities.

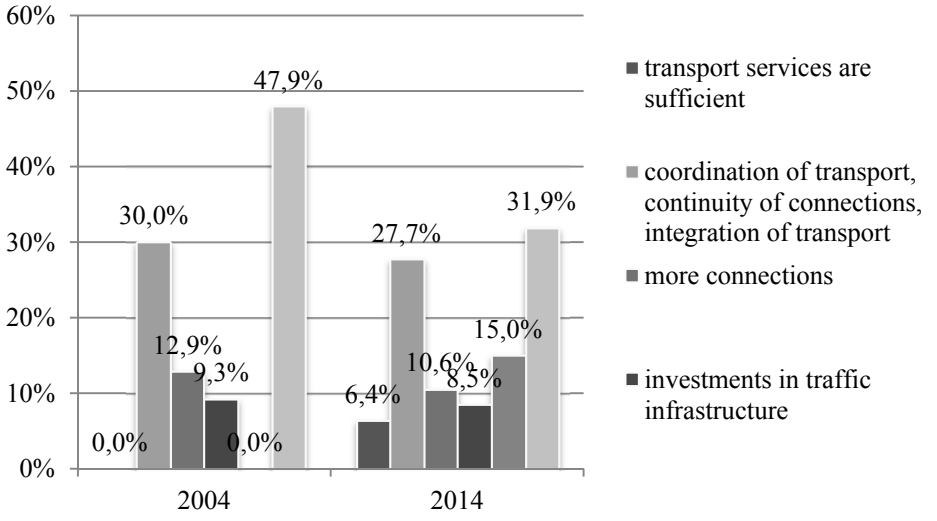
Figure 3 Reasons for satisfaction/dissatisfaction with the way the basic transport services in the South Bohemian Region are financed



Source: Own processing

Only about 40% of municipalities gave particular reasons for their satisfaction or dissatisfaction with financing, other municipalities are not able to assess this area. As the answers were quite fragmented, they were modified and divided in 4 basic categories. The research results from 2014 are almost identical with the results from 2004. A newly emerging category of investments in traffic infrastructure (4.5%) can be pointed out, related to the entry of the Czech Republic into the EU and the possibility to draw financial resources of the EU. Another interesting result is a gradual decrease in the number of municipalities that are not able to assess this area.

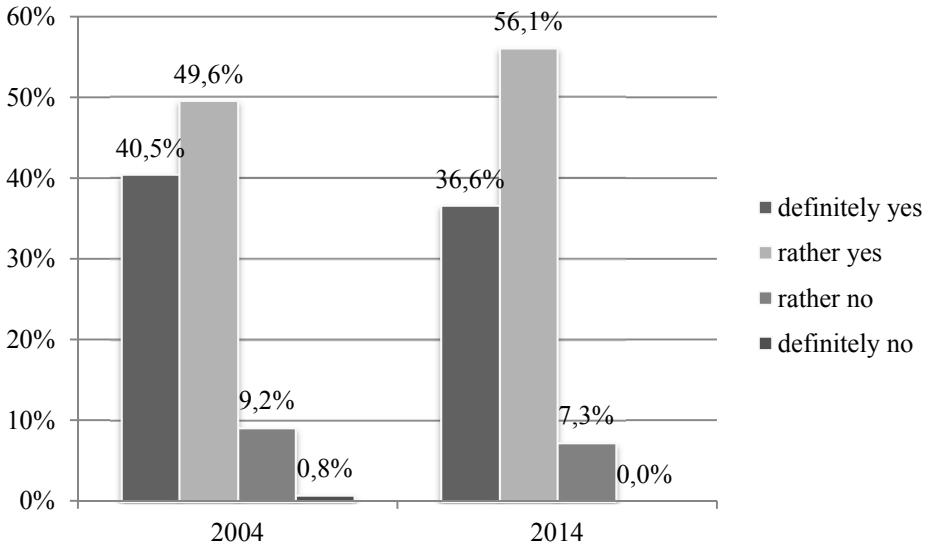
Figure 4 Suggestions on how to improve the quality of transport services



Source: Own processing

If we compare answers from 2004 and 2014, suggestions and recommendations in the area of transport services became more specific by about 15%. Requirements for transport coordination, connecting service and integration of transport, more connections and investments in the area of transport services haven't changed much in the past 10 years and they move around the level of 30% - 10% - 10%. A new thing that appeared in 2014 was 6.4% satisfaction with the existing level of transport services and a category "other" (15%) which includes requirements for investments in vehicle fleet, preference of railway transport or making public transport more attractive. On the basis of the results from the previous years we can point out an unaltered requirement of municipalities for better coordination, connecting service and integration of transport, related to the not yet implemented integration of transport in South Bohemia into a regional integrated public transport system as it is the case in the majority of regions in the Czech Republic (except for the Ústí, Zlín and Vysočina Regions).

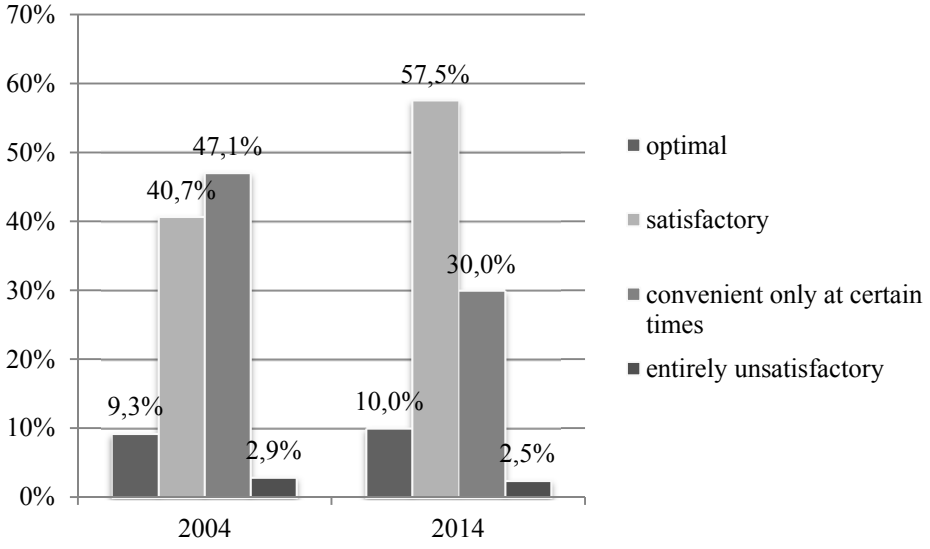
Figure 5 Opinion on building a regional integrated transport system



Source: Own processing

Building a regional integrated transport system is supported by almost 92.7% of municipalities, which means an increase of about 3% compared to 2004. An integrated transport system is supported by at least two thirds in all categories of municipalities; the strongest support is in small and medium-sized municipalities. If we use the pattern "*1*definitely yes+ 0,5*rather yes - 0,5*rather no - 1*definitely no"*, the overall level of satisfaction has changed from 59.92 % to 61.00 % over the past 10 years.

Figure 6 Assessment of the quality of transport services in municipalities



Source: Own processing

In the opinion of municipalities, transport services in the respective municipalities have improved over the past 10 years, which was already implied by the question about the satisfaction with the way of financing. 10% of respondents think that the transport services are "optimal". There has been a significant improvement of approx. 17% in the category "satisfactory" at the expense of the category "convenient only at certain times". The number of respondents who assessed the current quality of transport services in their municipality as "entirely unsatisfactory" is approx. 3%. The opinion of the respondents fully corresponds with the "Plan of transport services in the area for 2012-2016 – the South Bohemian Region" (Jikord, 2011) which evaluates transport services in the South Bohemian Region to be on a good level, with no need to make any major changes in a medium term horizon. Replacing some trains by buses and using low-capacity buses generated savings which the South Bohemian Region is going to use to improve regional transport, mainly in catchment areas with higher frequency and in border regions.

4 Conclusions

As regards public transport services, Marada and Květoň (2011) point out in their analysis "Differences in transport services in Czech rural regions" that there is a vicious circle of public transport in rural areas that can be simply described as follows: small population of municipalities causes low economic efficiency of connections and therefore the necessity of subsidies from public funds; an effort to increase profitability leads to the reduction of connections that are used very little; as a result, the range and quality of transport services decreases and a part of their users start to use a different means of transport (usually a car); the smaller number of users further reduces the profitability of connections (see e.g. Nutley, 1996). This phenomenon has been observed in rural areas abroad (e.g. United Kingdom) and also during the period of transformation in the Czech Republic. The role of traffic accessibility is probably going to be more important as a result of a growing concentration of job opportunities and services of a higher level in bigger settlement centres and an increasing concentration of elementary services (food store, lower primary school, pub) in a seat of a central municipality with multiple municipality parts. The demand for transport services related to the necessity to travel in order to meet everyday needs is probably going to grow in rural areas. However, this demand is very low from the economic point of view, mainly in villages with small population in peripheral regions.

In the South Bohemian Region the research focused on the problems of transport services revealed that the system is functional and in spite of some unpopular measures (e.g. cancellation of regional railway transport on track no. 193 Dívčice – Netolice) municipalities declare a high level of satisfaction with both transport services (67.5%) and their financing (88.6%). The requirement for better transport coordination, connecting service and integration of transport persists. Therefore, the company called JIKORD, a South Bohemian coordinator of transport, was founded in 2010, so that the execution of independent authority in the area of transport services of the region was separated from the execution of public administration in transferred competency. The existence of JIKORD has a positive impact mainly in the implementation and testing of a number of concepts and models (e.g. buses on call in the Milevsko micro-region, using low-capacity buses, a JIKORD Plus tourist ticket valid in the whole region, a pilot project IDS (Integrated Transport System) Jindřichův Hradec, the upcoming integrated transport system in the České Budějovice Region, etc.). Their goal is to make transport services in the region more efficient. Potential savings are then used to improve the quality of transport in the region, mainly in catchment areas with higher transport frequency and in border regions. There has been a trend of continuous increase in financial resources from the budget of the South Bohemian Region, which was on average 2.2% of growth in both regular public bus transport and railway transport. In future, a decline in the budget of the South Bohemian Region will be probably apparent in this area, as suggests the medium-term budget forecast of the South Bohemian Region. In 2016, an integrated transport system (IDS) will be re-introduced in the České Budějovice area and regional elections will take place in autumn. Their result will clearly indicate if there is space and political will for further integration of transport in the regions of South Bohemia. The integration of transport would be a gradual base for a potential creation of an integrated transport system in the whole region, the creation of which is supported by 92.7% of municipalities, as the research shows. Although satisfaction with transport services has positive trends, it is essential to focus on marginalized municipalities, the number of which is low, but stable – 2.5% of municipalities are definitely not satisfied with the way the basic transport services in the South Bohemian Region are financed and realised. The results from 2014 fully correspond with those from 2004 in this case. An interesting trend apparent in all areas is a significant decline in the number of respondents (by up to 20%) who are not able to assess the respective problem and give an answer. Until recently, Perlín, 1999, explained this by ignorance of problems public transport deals with and inability to effectively control real expenditures on transport services. The author says that due to a number of conditions this ignorance factor is being gradually eliminated, which is essential for the transport market to gradually open. This can be expected in the South Bohemian Region after 1 January 2020, when the existing contracts with transport companies in public service obligation will terminate. It will be another important milestone in transport services in South Bohemian municipalities.

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Quest for Sustainable Food Production: Social and Financial Metabolism of a Local Food System

Eva Fraňková

Abstract: *The question of how to feed the global population not only sufficiently, but also sustainably has become a significant problem for both academics and activists all around the world. However, there is not any shared methodology how to assess the sustainability of agricultural production. Local food systems (LFS) are often suggested as a more sustainable alternative to the large-scale mechanized mode of agriculture but there are still many gaps in our knowledge of their social, environmental and economic impacts. This paper introduces the concept of social metabolism as a useful tool for assessing the LFS' sustainability; looking at energy and material stocks and flows of a defined system, it enables one to inspect the functioning of a food system in detail, both on global, national and local scale. Applied to three case studies of Czech and Slovak organic farms, the social metabolism study can provide information on energy and material demands per unit of production, on land-use, labour time and the level of self-sufficiency of the farm system. The data on material and energy flows are suggested to be complemented by a local multiplier, an indicator of local monetary flows related to the farms. Although not providing the final verdict about the farms' sustainability, the concept of social metabolism provides a very useful framework to structure such a debate.*

Key words: Social metabolism · Local Multiplier · Sustainable Food Production · Organic Agriculture

JEL Classification: Q15 · Q18 · Q57 · R11

1 Introduction

Food production is one of the most important fields of human activity, together with energy production one of the unavoidable ones, if we, as human beings, are to sustain our lives on the Earth. During the last century, we have witnessed an unprecedented growth of the volume of food production on a global scale, but also a growing amount of data suggesting that there are many environmental, social, and also economic problems connected to the current industrialized and globalised food production system. In this context, rising academic attention has been devoted, among others, to so-called local food systems (LFS), which are rooted in a broader concept of economic localisation. At the same time, new conceptual frameworks have been developed for studying complex socio-economic systems and their interactions with the environment, including the concepts of social metabolism and the local multiplier (see section 2 for more details).

The issues of food security, food sovereignty and more generally sustainable food production is gaining increasing attention and importance on all levels of the national (MZV ČR, 2011: 6, 10, 15-16), European (EU Focus, 2010) and global (UN, 2010) political agenda. The question of how to feed the global population not only sufficiently, but also sustainably in a long term, has become a significant part of a vivid academic debate (see e.g. Pretty et al., 2006; Ranganathan & Hanson, 2011 or GOS, 2011). Though often perceived as a global problem, sustainable food production has the inevitable local dimension of agricultural, environmental, economic, social, institutional and other context of particular countries, where the food is produced, processed, transported, traded, and consumed or wasted. Hence, understanding of the particular food production practices and their impacts on the local level is crucial for any understanding and change on the higher levels.

The concept of economic localisation can be seen as an attempt to develop a potential alternative trajectory to economic globalisation.[8] There is a wide stream of localisation proponents who consider economic localisation to be

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[8] Economic localisation can be defined as "both the process and the result of moral, political and practical support of as many localised aspects of production and consumption as possible and desirable. More specifically, it includes preferring local factors of production, their local ownership, local capital flows, and orientation primarily on satisfaction of local needs. Other integral aspects include emphasis on and support for sustainability of production and consumption, the development of local communities, democratic decision-making, strengthening local economies and self-reliance, and building relationships to place. Economic localisation does *not* mean (attempts at) absolute autarky or any other type of isolation from the outside world." (Fraňková & Johanisová, 2012)

one of the most important strategies for developing sustainable ways of satisfying human needs (see e.g. Douthwaite, 1996; Shuman, 1998; Hines, 2000). Especially the current system of food production, distribution and consumption has become both a focus of localisation activists' practice, and a distinct subject of academic interest. (Winter 2003; Watts et al., 2005; Maye et al., 2007) According to the proponents of economic localisation (see their analysis by Fraňková & Johanisová, 2012: Table 2), the concept entails, besides others, the following environmental and economic aspects:

- preference for locally sourced factors of production (natural resources, labour and capital);
- the most feasible closed circulation of matter and energy, including management of waste as a resource;
- emphasis on sustainability of production and consumption;
- attempts to shorten distances between production and consumption;
- preference for local ownership of factors of production;
- emphasis on local circulation of money and local financial capital.

By putting these aspects into practice, localised food production is supposed to bring social, environmental and economic benefits such as: lower transport dependence resulting in less consumption of fossil fuels, lower CO_2 emissions, less waste from packaging, higher levels or local recycling, more closed cycles of matter and energy within the production system, and also stronger local economies showing a higher level of local circulation of money, lower dependence on foreign investments, and less dependency on, and more resilience towards fluctuations of the global economy. (Douthwaite 1996; Norberg-Hodge et al., 2002; Desai & Riddlestone, 2002) However, there are still significant gaps in our knowledge of the social, environmental and economic impacts of food system localisation (Martinez et al., 2010) and thus more contextualised material data is needed, critically investigating the potential localisation benefits indicated above.

There are some case studies of particular localisation schemes targeted on the social and community aspects of localisation (e.g. Seyfang, 2007), and a growing body of literature focused on its environmental impacts, mostly on the connections between the local food systems and climate change (e.g. Kramer et al., 1999; Weber & Matthews, 2008; MLFW, 2010 and others, for the literature review see Edwards, 2008 or Brodt, 2007). Some of these studies combine carbon emissions/carbon footprint studies with energy use analyses, often using the life-cycle methodology or input-output analysis (see Carlsson-Kanyama et al., 2003; van Hauvermeiren et al., 2007). However, no study so far seems to have made use of the intellectual framework of social metabolism as introduced below, although they may share much of the methodological background. Besides this, there is a limited number of studies available, trying to measure the economic impact of localised food systems, using mostly the concept of local multiplier (see Martinez et al., 2010).

In spite of the growing body of foreign literature regarding local food systems and the concept of economic localisation, and also a significant mass of literature on the social metabolism and local multiplier methodology, which can be very effectively employed in the study of local food systems (see also further), there are still some crucial missing links. Thus, this papers aims to 1. introduce the concepts of social metabolism and local multiplier (section 2), 2. and demonstrate and discuss their usability for studies of local food systems (section 3) and more broadly for the debate on (more) sustainable forms of agriculture (section 4).

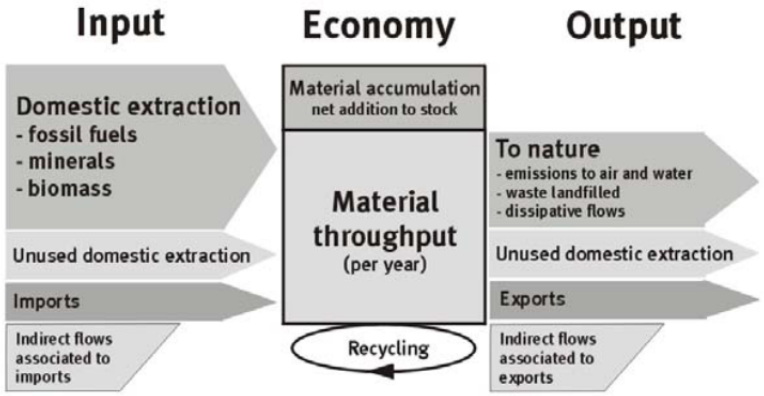
2 Methodological framework

During the last two decades, social metabolism has become a recognized field of research. Rooted in the intellectual background of ecological economics (see Martinez-Alier 2009), its purpose is to study complex socio-economic systems and their interactions with the environment. For the intellectual history and basis of the social metabolism concept see Fischer-Kowalski (1998a; 1998b) and Fischer-Kowalski et al. (1999). The social metabolism approach is "based on the premise that any social system not only reproduces itself culturally but also biophysically through a constant flow of materials and energy with its natural environment as well as with other social systems." (Singh et al, 2010: 5) To study these exchange relations of material and energy flows, the conceptual framework of the Material and Energy Flow Accounting (MEFA) is used (Singh et al, 2010: 6). For its general outline and analytical categories (in terms of the Material Flow Analysis, MFA) see Picture 1.

Most of the social metabolism studies are conducted on a national level. There is a unified methodology approved for the EU countries by Eurostat (EUROSTAT, 2007), and comparable data are already available for the EU countries (e.g. Weisz et al., 2005), and also on a global scale (Dittrich et al., 2012). For the Czech Republic, a comprehensive study of the country's social metabolism and land-use was done by Kušková et al. (2008) for the period between 1830 and 2000. For the regional and local level, there is a limited number of social metabolism studies (for their overview see Hammer et al., 2003). Most are focused either on developing countries or, in industrialised countries, on cities and their

hinterlands. As regards local food system studies, only a few pilot studies conducted in the context or industrialized rural areas are available (Krausmann, 2001; Krausmann et al., 2003; Haberl & Krausmann, 2007; Haas 2002). There thus remains the challenge of piloting another study of social metabolism on a local level focusing on local food systems, and thus contribute to integrating the expertise of the two fields of research, social metabolism and local food system studies.

Figure 1 General scheme for economy-wide material flow accounting and analysis (MFA), excluding water and air flows



Source: EUROSTAT (2001:16)

One of the important features of the localisation concept is its complexity and the interconnectedness of its particular aspects. For this reason, it is important to complement the assessment of environmental impacts studied via the social metabolism concept with economic analysis. Within the localisation studies, the methodology of the local multiplier is suggested to be highly relevant. The multiplier effect was described already by J. M. Keynes, who studied the impacts of government spending on national economies. In the Keynesian sense, a multiplication effect occurs when a change in spending induces a more than proportional cumulative change in demand. In other words, "Increased spending causes firms to hire more workers, those workers go out and consume more, and a virtuous circle ensues." (Mendel, 2012, in prep.) By the same principle, the *local* multiplier can be calculated, expressing the "added value", i.e. the cumulative positive change in demand and related potential of job creation on a local level – the assumed positive outcomes of economic localisation indicated above. The British New Economics Foundation (NEF) has developed a simple tool, the Local Multiplier, to calculate the local multiplication effect for individual actors (be it a government body, local shop, a farm, or other) within a local economy. NEF recommends tracking the spending of the investigated actor up to the third round of circulation of the money within the local economy, and hence they call the tool LM3 (Local Multiplier, 3rd round). LM3 can be interpreted as an indicator of how much the particular actor contributes to the local economy, and also of the strength of the local economy, expressed by the proportion of money staying circulating within the local economy before "leaking" outside. For a more detailed explanation of the logic and interpretation of the LM3 see NEF (2002).

There have been a number of LM3 case studies performed in the UK, mostly for the spending of the public sector and its impacts on local economies (see NEF, 2002). Specifically for the local food sector, a few studies exist using (not only) the local multiplier tool (Magnusson et al., 2010; Matinez et al., 2010). However, the methodology is not settled yet and the results are comparable only to a limited extent. In the Czech Republic, there are a few pilot studies using the LM3 tool also for investigating the effect of local governmental spending and its impacts on local economies (e.g. Ježková, 2009; Novotná, 2011), none, however, have been targeted on local food systems' impacts on local economies.

3 Social metabolism and metabolic transitions in agriculture

Using the approach of social metabolism, particular facts and consequences are revealed which might escape our attention otherwise, if we rely solely on monetary-based indicators. One of the most important of such insights is the energy inefficiency of the industrialized agriculture compared to other forms of cultivation and food production. Despite the different methodologies and thus somewhat limited comparability of the results of particular metabolic studies (see e.g. Pelletier et al. 2011 for their review), it has been made clear that the industrialized forms of agricultural

production typically require more energy inputs than they produce as outputs. Ulčák (2003:74) provides an overview of various forms of agricultural production and their energy efficiency; ranging from the ratio of 65-70:1 (energy output : energy input) of the tropical small-scale production of cassava, 38:1 ratio of non-mechanized rice production in Thailand and 10:1 ratio of pastoralist production of meat and milk in Africa, through 1,3:1 energy ratio of kitchen gardens in the UK, the world average represents already the inverse ratio of 1 energy unit of output to approximately 10 units of input. The mechanized production of strawberries in the US (1:5), the broiler production in the UK (1:10) and the marine fisheries of the Mediterranean region (1:100) then all represents the same trend of more inputs than outputs, typical for the industrial, high-external-input (as characterized by Giampietro et al., 2014:41) agriculture.

If we complement the data on energy return on energy invested (EROI) with other metabolic indicators such as the annual material throughput, number of people working in agriculture and the volume of stocks of man-made artefacts, one can distinguish three general metabolic patterns, so called metabolic regimes (Fisher-Kowalski & Haberl, 2007); whereas the first type, hunter-gatherer society is characterized by an average per capita annual flow of approximately 1t of biomass (food, wood) and < 0,1t of minerals (stones, metals), and the second, agrarian society by an annual average of 4t of biomass (food, fodder, wood) and 0,2-2t minerals (stones, metals), the industrial society's flows represent a magnitude-bigger flows of approximately 20t of materials in total, consisting of 5t of biomass (food, fodder, wood), 5t of fossil fuel energy carriers, 8t of construction minerals and 2t of metals. (Fischer-Kowalski et al. 2011) The historical process of change and transformation from one metabolic pattern to another is then called metabolic transition. (Fischer-Kowalski & Haberl 2007) This transition is highly interconnected with the big-scale processes of industrialization and globalization with significant impacts not only on the whole economies and societies but also on their lower levels.

Thus also the agricultural sector was subject to change; the transition from more subsistence based models of the hunter-gatherer and agrarian societies to the industrial agriculture is characterized above all by diminishing importance of human and animal labour, by growing dependency on fossil fuels and more generally on external inputs, and by higher levels of overall material and energy throughput. Also the Czech (and Czechoslovak) agriculture has undergone such transformation from the agrarian to the industrial model of production during the last two or three centuries, as both qualitatively and quantitatively demonstrated by Kušková et al. (2008) and Grešlová Kušková (2013). Between 1920 and 2000, the number of workers in agriculture dropped from 1 474 000 to 181 000 and the energy use of animal and human labour was dwarfed by energy inputs from fossil energy and industrial fertilizers. (Grešlová Kušková 2013:594,596) Symbolic for this trend is the point when tractors in the Czechoslovak agriculture outnumbered the horses which happened between 1965 and 1970. In accordance with other data on energy efficiency (see above), within the same period (1960-1970) the energy efficiency of Czechoslovak agriculture lowered significantly from 5,1:1 to 2:1; after some fluctuations, very similar result is typical also for the current state – in 2005 the ratio was 2,1:1. (Grešlová Kušková 2013:594,598)

If we are to reverse this trend (growing energy inefficiency and numerous related negative environmental impacts of agriculture), we have to look for models which show better results regarding their metabolic profile. It is very useful to compare the current metabolic parameters with the historical ones, however, we need models viable in current both social, environmental and economic conditions. Exactly for this reason, a project looking at three case studies of Czech and Slovak organic farms takes place;[9] this study of the farms' social metabolism will provide information on energy and material demands per unit of production, on land-use, labour time and the level of self-sufficiency of the farm systems. The analysis is complemented by the local multiplier investigation, as described above. The data will contribute to the debate on sustainability in agriculture, both on the methodological and material level.

4 Discussion and Conclusions

As already noted above, sustainability in agriculture is a complex issue. Ulčák & Pall (2003) formulate three basic areas of its meaning; 1. Sustainability as sufficient food production to feed the world population;[10] 2. Environmental sustainability – preserving ecosystem functions and biodiversity, and minimizing negative impacts of agriculture on biota, and 3. Sustainability of related cultures and human relationships. All these aspects are combined in the term of *food sovereignty* as defined by farmers, social initiatives and NGOs both from the global South and North, together with the democratic right to participate and decide on the conditions and consequences of food production: *"Food sovereignty is the right of peoples, communities, and countries to define their own agricultural, labour, fishing, food*

[9] A project called *Quest for sustainable food production: Social and financial metabolism of selected local food systems* (grant no. 13-38994P) supported by the Czech Science Foundation (GAČR).

[10] It is the meaning of *food security* as defined by FAO (Food and Agriculture Organisation of the UN): *„Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."* (FAO 2006:1)

and land policies, which are ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the true right to food and to produce food, which means that all people have the right to safe, nutritious and culturally appropriate food and to food-producing resources and the ability to sustain themselves and their societies." (Nyéléni 2015). It resonates with the insight of one of the most influential writers on sustainability in agriculture, Wendell Berry, who argues that every truly responsible food consumer is, at least to some extent, also a food producer (Berry 1977).

In this line of thought it is important to remind that not only agriculture as a specialized profession and an economic sector is a source of alimentation. Also subsistence cultivation (as mentioned above) and food production in the form of gardening provides substantial amounts of food, both South, North, East and West. As showed e.g. by Sovová (2015) on the case of allotment gardens in Brno, CZ, the amount of food produced in this area is remarkable and thus deserves, together with other forms of local food production (see e.g. Ulčák 2006 for pork), more research attention. Though far from being framed in terms of sustainability practice or in the food security context by its practitioners (see Smith & Jehlička 2007 for one of the very few studies of this phenomenon), the Czech practice of local subsistence gardening has significant pro-environmental impacts, and many features comparable to the western movements of urban gardening, community gardens, and home-grown food campaigns now gaining ground in the UK and other western countries. The Czech Republic as a post-communist country, still in the process of transformation, is a very interesting area for studies of local food models as it provides a combination of existing "native" food practices partly persisting from the communist and pre-communist times with the concepts such as farmers' markets, organic box-schemes, and community supported agriculture initiatives imported as part of the local food agenda from the West (esp. UK and USA).

Although there has been only little theoretical reflection of these phenomena (see the exceptional study by Smith & Jehlička 2007) the situation is changing and the topic gains more attraction both within practice and academia. This paper tried to contribute to this trend and aimed at enriching the methodological tools available for studying (not only) Czech local food practices and sustainable agricultural initiatives. Thus, this paper introduced the concept of social metabolism as a valuable tool to capture the complexity of issues related to the sustainability debate in food production, possibly complemented by another tool to capture the local economic flows, the local multiplier. Especially on the issue of energy efficiency in agriculture it was shown that social metabolism does provide crucial material insights that are not revealed by prevalent monetary-based indicators. Although not providing the final verdict about the agricultural practices' sustainability, the concept of social metabolism is a very useful framework to structure the necessary debate.

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The Implementation of the Occupational Health and Safety Management at Work and its Influence on the Economic Performance of the Company

Kateřina Halíčková, Marcela Basovníková, Eva Abramuszkinová Pavlíková

Abstract: *The issue of social responsibility is one of the most discussed contemporary topics. It is closely related to the financial management of the company. The social area is one of the three main topics integrated in the concept of corporate social responsibility. In addition to the social interactions of the company and its surroundings, there is also included a wide range of internal relations. The largest group within the rage of internal relations consists of employees. Employees' satisfaction, loyalty, fluctuation, sick leave of employees, as well as accident rate has a direct impact on labour productivity. This has a direct impact on the economic performance of the company.*

In the Czech Republic, the highest number of accidents and the highest number of fatalities are in the construction industry. The summary of duties related to the occupational health and safety of workers at workplace, given the acronym OHS, is based on legislative regulations. OHS is regulated primarily by the Labour Code and Law. 309/2006 Sb. The standard for occupational health and safety management systems is currently OHSAS 18001. When a company is certified, it is demonstrating an occupational health and safety management at high level and its continuous improvement. This article deals with the measurement of economic performance of enterprises in connection with the implementation of OHSAS certificate 18001. Economic performance will be measured by both traditional and modern methods of performance measurement on 50 enterprises operating in the construction sector in the Czech Republic.

Key words: accident rates · construction · corporate social responsibility· economic performance · occupational health and safety · OHSAS 18001

JEL Classification: M14 · L25

1 Introduction

Corporate Social Responsibility (CSR) is a phenomenon of recent years. Implementation of the rules of social responsibility in the company and its impact on economic performance in recent years was a topic of a large number of international authors. The conclusions of these experts are ambiguous. Authors such as Calabrese et al., (2013), Amalendu (2012), and Fauzi Idris (2009), Iqbal et al. (2012) and Tyagi (2012) clearly demonstrate the positive impact of CSR on the economic performance of the company. For others, CSR is not an important variable for the performance.

In the Czech Republic, the implementation of CSR in the form of a certificate SA8000 and its subsequent impact on economic performance was dealt with by Basovníková, Abramuszkinová Pavlikova and Vavřina (2013). The results of this research suggest rather neutral impact on the implementation of the CSR on the economic performance of the company. It also resulted in a fact, that CSR is implemented mainly by financially stable businesses. Other surveys done by Doane (2005) and Reich (2007) confirm, on the contrary, that the investments associated with obtaining a certificate does not guarantee a hundred percent return and these authors are strongly against the introduction of the CSR rules in companies.

One of the three areas of CSR is the internal social business environment, which consists mainly of employees. Any business, respectively business management, has an obligation to workers based both on the employment relationship and partly defined by a law. In the Czech Republic, the principles of corporate social responsibility and related to some statutory obligations, such as the right compliance with occupational safety and health (OHS below[12]).

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[12]The issue of occupational health and safety in the Czech Republic is legislatively regulated by the following laws and regulations: Act no. 262/2006 Coll., The Labor Code, as amended and implementing regulations: Government Regulation no. 495/2001 Coll., Decree of the Ministry of Health no. 288/2003 Coll., And Government Regulation no. 201/2010 Coll.; Act no. 309/2006 Coll., And the implementing regulations: Government Regulation

Implementation and compliance of OHS leads to the reduction of risks and accidents in the workplace. This reduces staff turnover and leads to a decline in the number of days of paid leave. Among the indirect positive effects of OHS we can mention staff loyalty, greater productivity based on the feeling of safety in the workplace and others. As indicated by Hyršlová and Bednaříková (2007), these consequences through labour productivity directly affect the economic performance of a company by the positive rate.

Employers, who consistently prevent accidents at work and occupational diseases through the implementation of OHS and regularly train their employees in this area, obtain long-term benefits such as the increase of the level of motivation, collaboration and staff ethics, reduced or limited possibility of criminal or civil lawsuit (European Agency for Safety and Health at Work, 2008). Veber (2007) ranks OHS management systems into the section of the Health and Safety Management System, which refers to one of the three foundation stones of quality control. Other includes the Quality Management System and the Environmental Management System.

By Branská (2003), the focus on occupational safety and health brings the company not only a competitive advantage, but also increase in economic efficiency. Blašková (2005) adds that the emphasis on occupational health and safety leads to a significant reduction of economic costs associated with accidents and sick leave. Hyršlová and Bednaříková (2007) as the cause of the increase in productivity and a consequence of the introduction of quality management of occupational health and safety report, among others, employee satisfaction by knowing that the employer cares about their safety in the workplace.

The initial implementation of the measures which are necessary for compliance with the standards and rules of safety and health at work is relatively costly activity for a business, especially in certain sectors. The costs associated with compliance with occupational health and safety rules can be reduced by the quality management defined in the standard OHSAS 18001. The basic rules of OHS and the resulting responsibilities of employees and employers are clearly defined in the Labour Code. On this basis OHSAS 18001 is operates, which establishes the procedure for the formation and implementation of OHS management system in the enterprise. The standard provides guidance on enterprise mapping hazards, manage risks and improve its economic performance. Šenk (2012) in his book states, that "OHSAS is the best known way to control occupational health and safety."

OHSAS 18001 provides the company management with guidance, how efficiently and at lower cost to implement in practice the rules set by legislation. Although implementation of the standard itself is not completely free of cost, its long-term use is beneficial to company management, among others also financially. The reduction of financial costs and increased revenue from principal operations, due to increased productivity, lead directly to increased economic performance of the company.

Construction is one of the sectors with the highest injury rate, as confirmed by Milan Pavelčík of Bureu Veritas certification company. As he says: "A construction worker is probably the most endangered profession in our country. In construction, there are also the most fatal injuries because the most fatal accidents are often caused by falls from height." The statistics presented by the Magazine Safety (2015) shows that in 2014, from the total number of 45,358 work injuries with subsequent working disablement in the Czech Republic, there were 7% of accidents in the construction. The number of fatalities was 106 and 20 of them were caused by falling from a height in the construction. Accidents at work are significantly lower than in 2008, but the trend is rather stable. In 2014 in comparison with 2013, there were 950 cases more, as stated by the Czech News Agency (2015). The numbers of fatalities are slightly declining.

Occupational accidents are largely caused by the inattention of employees and failure to comply with the principles of safety in the workplace. A significant percentage of injuries are also caused by the employer's desire to save money on safety measures. The employer intentionally saves on the purchase of personal protective equipment, both in its quantity and quality. This will lead to immediate and significant cost savings only until the moment of the occurrence of occupational injury. The administration associated with the reporting and subsequent disablement of employees or activities related to the need to find immediate replacement, ultimately increases the cost of the employer.

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no. 378/2001 Coll., And Government Regulation no. 11/2002 Coll., And Government Regulation no. 27/2002 Coll., And Government Regulation no. 28/2002 Coll., and Government Regulation no. 168/2002 Coll., and Government Regulation no. 406/2004 Coll., and Government Regulation no. 101/2005 Coll., and Government Regulation no. 362/2005 Coll., and Government Regulation no. 591/2006 Coll., and Government Regulation no. 592/2006 Coll., and Government Regulation no. 361/2007 Coll., and Government Regulation no. 1/2008 Coll., and Government Regulation no. 201/2010 Coll., and Government Regulation no. 272/2011 Coll.; Act no. 258/2000 Coll., And the implementing regulations: Decree of the Ministry of Health no. 490/2000 Coll., Decree no. 432/2003 Coll., Decree of the Ministry of Health no. 137/2004 Coll., Decree of the Ministry of Health no. 537/2006 Coll., Decree no. 238/2011 Coll., Decree no. 306/2012 Coll. Act no. 247/2000 Coll.; Act no. 361/2000 Coll. and implementing regulations: Decree no. 30/2001 Coll., Decree no. 277/2004 Coll.; Czech National Council Act no. 174/1968 Coll. and implementing regulations: Decree ČÚBP no. 50/1978 Coll., Decree ČÚBP no. 85/1978 Coll., Decree ČÚBP no. 18/1979 Coll., Decree ČÚBP no. 19/1979 Coll., Decree Cubo no. 21 / 1979 Sb., Decree ČÚBP no. 48/1982 Coll., Decree ČÚBP no. 91/1993 Coll., Decree no. 73/2010 Coll.; Act no. 350/2011 Coll. and implementing regulations: Decree no. 163/2012 Coll., Decree no. 61/2013 Coll.; Law no. 22/1997 Coll.; Act no. 251/2005 Coll.

2 Methods

The research goal is to quantify the impact of the implementation of OHSAS 18001 on labour productivity in the company from a specified research sample. A partial objective is to evaluate the significance of labour productivity indicators on the economic performance of the company in a defined group. Based on this goal, the following research question is suggested: "Does the ownership of the certificate OHSAS 18001 influence the economic performance of enterprises?" The object of the research is a homogenous group of companies with a legal obligation to comply with occupational health and safety rules, fulfilling the conditions defined in the selection of the research sample. The subject of the research is the evaluation of the economic performance in the construction sector.

The research sample includes companies that meet the following criteria. They are registered in the Czech Republic, their area of business is construction (section F according to the CZ-NACE), they are owners of OHSAS 18001 certificate and they are available in the databases with data about financial statements of the business necessary for the determination of economic performance from 2004 to 2013. A list of companies that own certificate OHSAS 18001 was acquired on ISO.cz. Based on the analysis of secondary data from financial statements of individual companies, we selected 50 of those where financial statements were available including all necessary data for the period 2004 – 2013 under study.

The research sample consists of the following companies: AGC Automotive Czech a.s., Agromeli spol. s.r.o., AKIT s.r.o., APASON s.r.o., ARCADIS Projektmanagement s.r.o., BLÁHA s.r.o., BONATRANS, a. s., BPS-Prastav, s.r.o., Brněnské vodárny a kanalizace, a.s., BS Vsetín, s.r.o., CS CABOT spol. s.r.o., DAICH spol. s.r.o., Dopravní stavby Brno, s.r.o., DOSTA Tábor s.r.o., ELPREMO, spol. s.r.o., FIRESTA-Fišer, rekonstrukce, stavby a.s., FLECK-CS Elektroenginnering spol. s.r.o., GEMO OLOMOUC, spol. s.r.o., HALKO stavební společnost, s.r.o., H-INTES s.r.o., Ing. Bronislav Vala, IP - TRADING, s. r. o., JIHOSPOL jihočeská obchodní a stavební společnost a.s., JIMI CZ, spol. s.r.o., JP GASECO s.r.o., Jurica a.s., LAVIMONT BRNO,a.s., LENIA spol. s.r. o., Leonhard Moll Railway & Tower Systems, s.r.o., MEGA TRUCKING BOHEMIA spol. s.r.o., MERTASTAV s.r.o., METROSTAV a.s., Navláčil stavební firma, s.r.o., PARTR spol. s.r.o., Petr Březina - APB Plzeň, PMP Prostějov, s.r.o., POZEMSTAV Prostějov, a.s., Průmyslové stavitelství Brno a.s., První KEY - STAV, a.s., PSJ, a.s., Společnost T.A.Q. s.r.o., STAFIN a.s., Stavební řemesla - Zeman s.r.o., Strojírny Podzimek s.r.o., Suntel Group, s.r.o., TELE DATA SYSTEM, spol. s.r.o., THERMOSERVIS - TRANSPORT s.r.o., UNIGEO a.s., VW WACHAL a.s., Zlínstav, a.s.

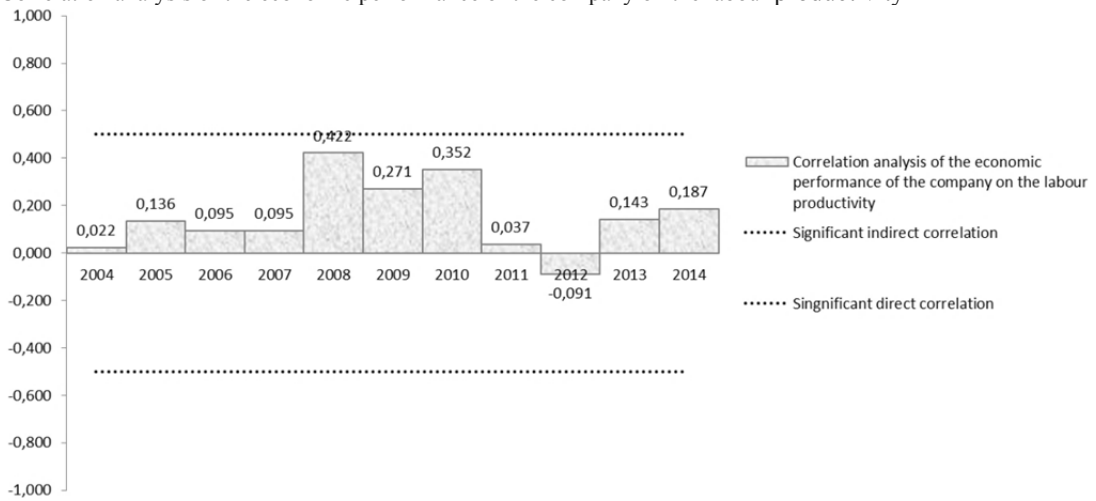
The economic performance of selected companies is represented by the return on equity indicator (ROE below). Return on equity was chosen primarily for its easy access to sector values. Sector values were obtained from benchmarking diagnostic system of financial indicators of the Ministry of Industry and Trade (INFA). Another reason for choosing ROE was superiority of the use of equity in the capital structure of selected companies. Labour productivity is determined by the share of value added and personnel costs. The first step performed was correlation analysis and the relation between the economic performances of companies on labour productivity. Subsequently, a comparison of economic performance and labour productivity of selected companies with sectoral levels was analysed. Higher average values of a specific group of companies than the industry average may indicate that the ownership of OHSAS 18001 certificate is an economic advantage. Furthermore, there were series in time analysed for the entire industry. The results obtained by correlation analysis and binary comparison of ROE and labour productivity were subsequently confronted with specific data of the individual companies financial statements. The cause of extreme values was investigated, with significant annual increase and decrease in monitored indicators with their potential causal connection with other items of financial statements.

3 Research results

To answer the research question, the research process was defined in the methodological part, predicting a causal relationship between labour productivity and economic performance of the company. Surprisingly, the results of the correlation analysis suggest that the measure explaining the labour productivity is not significant for the economic performance of selected companies. As seen in Figure 1, it is evident that the highest degree of correlation is represented by a correlation coefficient in 2008. This value was only about 0,422, not even reaching the level of the lower level of significance, which was established at 0.5. In the given year, from the whole period, the highest degree of correlation was between labour productivity and economic efficiency of enterprises reported from the research sample.

Moreover, a binary comparison of the average values of labour productivity of selected enterprises and the average labour productivity for the entire construction industry was conducted. The results reported in Figure 2 show that in most of the observed period, the value of labour productivity is higher than 1. Due to the nature of the formula, it can be said that for the most of the observed years the added value exceeds of the personal cost. The only exception is 2013, when labour productivity is only reaching the coefficient of 0.98. In the given year, personnel expenses slightly exceed the added value.

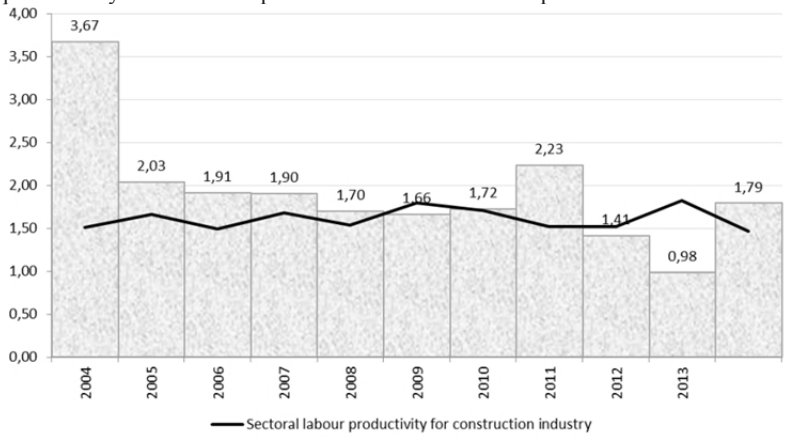
Figure 1 Correlation analysis of the economic performance of the company on the labour productivity



Source: Own source

From Figure 2 it is also clear that in most of the periods under study, the selected group of companies is declaring higher average labour productivity than the average in the sector. Apart from 2004, the difference is not so significant, reaching only 0.4 units. Additionally, in 2009, 2012 and 2013, the average values of sectoral labour productivity were even higher than the average values in the sample of enterprises under study. In 2013, the difference was almost the entire 1 unit.

Figure 2 Average labour productivity values of companies from the research sample



Source: Own source

The table 1 was created to complement the average values. It contains a percentage of the number of enterprises which reached in each of the years under study the values of labour productivity higher than the average in the sector. Table 1 shows that not even a third of companies from the research sample do not declare higher sectoral labour productivity than the average sector productivity. Only in 2006, the productivity was higher in more than in 50% of selected companies. In other years, the labour productivity was lower in more than two-thirds of companies in comparison with construction sector.

Table 1 The percentage of companies which have higher labour productivity than the average in the sector

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Percentage	27.91%	23.81%	52.17%	31.25%	29.63%	26.42%	24.14%	34.48%	25.42%	10.17%	32.56%

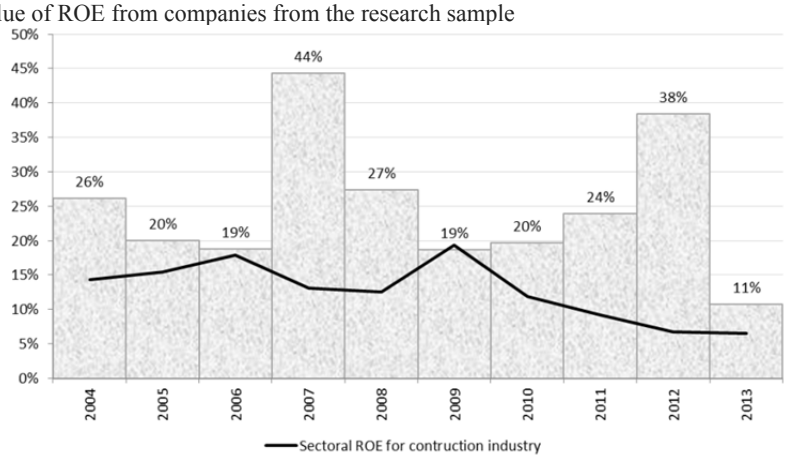
Source: Own source

For the indicator of return on equity, which represents the economic performance of enterprises, the similar binary comparison was conducted, as results display in Figure 3. The average values of ROE in selected businesses achieved positive values. The highest average return on equity from the research sample was between 2007 and 2012; the lowest ROE was in 2013. It can therefore be concluded that both the sectoral values and average value of the selected group of companies achieved a satisfactory level.

The average ROE from the research sample declares higher values than the average sectoral values in almost all cases, excluding only one. In 2004, 2007, 2008, 2011 and 2012 the ROE for selected enterprises was markedly higher than ROE in the sector. The exception in this positive trend is year 2009, when the sectoral value of ROE reaches its peak

in the period. The average value of return on equity was only 18.7% in the research sample; the sectoral value was nearly 19.4%.

Figure 3 The average value of ROE from companies from the research sample



Source: Own source

Furthermore, the values were supplemented by a percentage of the number of enterprises in each of the monitored years to show the values of economic performance which were higher than the average in the sector. Table 2 shows that in five out of the eleven monitored periods, more than 50% of selected companies declare higher ROE values than the average value for the construction industry. In the remaining years, more than a third of companies have a higher economic performance than the sectoral average in a given year.

Table 2 The percentage of companies which declare higher ROE than the average value in the sector

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Percentage	47.73%	42.22%	39.58%	56.25%	59.18%	32.00%	53.85%	50.00%	35.29%	36.00%	52.94%

Source: Own source

4 Conclusions

The first surprising conclusion of the research is insignificant correlation between economic performance and labour productivity in a selected group of companies. Low correlation coefficients are probably caused by the insignificance of personal expenses to the amount of return on equity. It is not possible to replace the added value which was used in the calculation of labour productivity, but the replacement of an indicator of personnel costs for different types of costs would be likely to lead to a greater explanation of the extent of economic performance. For example, we can assume that the costs associated with the human factor in the company are not as important as the costs associated with managing equipment and other tangible assets.

Enterprises which have OHSAS 18001 certificate, achieve higher average labour productivity than the average for the construction sector. This statement can be concluded from the data shown in Figure 2. On the other hand, Table 1 clearly shows that in most of the monitored period, less than the majority of enterprises from the research sample, does not reach the average values for the sector. From the collected data we can therefore conclude that the selected group of companies include companies with significantly higher levels of labour productivity, which significantly affect the average values of labour productivity of the entire research sample.

The labour productivity of companies in the survey sample does not achieve clearly better values than the average values in the construction industry. However, at the beginning of the research it was demonstrated by correlation analysis that the selected indicator of economic performance does not depend on the level of labour productivity. If the research would finish at this point, it would not be possible to determine the impact of the ownership of the certificate OHSAS 18001 on the economic performance of selected companies.

The average return on equity has been greater in the reporting periods than sectoral values in the construction industry, as shown in Figure 3. Again, by supplementing this with Table 2, we conclude that in most of the periods under study it is less than the majority of enterprises of the research sample not even the average values for the sector. On the other hand, the values of economic performance reach higher values the values of indicators of labour productivity.

On the basis of the percentage of companies from defined groups that achieve at selected times higher values of selected indicators than the average value in the construction sector recorded in Tables 1 and 2, an interesting conclusion was obtained. As for economic efficiency and labour productivity it is true, that in the research sample, there is majority of those companies with below average values and only a few companies that are achieving values significantly above average. The companies which are declaring much better economic results can influence average values of the selected group to that extent that the average values seem to look higher than the sectoral values.

In the context of the research question it can be concluded that the ownership of certificate OHSAS 18001 has an influence on the economic performance of the company, which is not very significant but positive. The influence of the OHSAS 18001 standard on the labour productivity in a company is also less important, but still has a positive effect.

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Cooperation and Entry of SMEs into Foreign Markets

Dagmar Bednářová, Jaroslava Pražáková, Petra Kosíková

Abstract: *Entry of Czech SMEs to foreign markets and their success there is more difficult compared to Czech markets. It is important to research and analyse the entry condition for foreign markets regardless the form of access and cooperation. The researches include a territorial survey, business-political survey, consumer research, survey the competition etc. Underestimating the preparatory stage may lead to very high risk that is a cause of a crisis that could lead to business disappearance. That's why they preventive measures to identify risk factors are important. Small enterprises tend to vote for a form of cooperation with foreign partners, mostly based on supplier and customer relations. However, it also depends on many factors, mainly on commercial policy conditions. Also, there are barriers to entry into foreign markets, including language barriers, not finding a suitable partner, distribution difficulties and other.*

Key words: SME · access barriers · foreign markets

JEL Classification: M10 · M11 · M19

1 Introduction

Lorem Entry of an enterprise to a foreign market is often a step influencing further development. An enterprise that is successful in the Czech market may have a more strategic goal to enter foreign markets. Many Czech enterprises have found outlets for their products abroad. Mostly, products are exported to neighbouring countries such as Germany, Slovakia and Austria.

When entering foreign markets, the way the enterprise enters into it, is an important factor. It usually includes export and import operations, the forms requiring little capital investment and capital inputs of businesses into foreign markets. Territorial diversification of action at two or more geographic areas is initially connected with increased risk. If the markets are geographically close and economically dependent, as is the case of Czech and German and Austrian markets, the risk may persist or increase under certain conditions. Small and medium enterprises have both advantages and disadvantages over large companies. The benefits include the flexibility and quicker adaptation to market demands, the ability to create a business climate of the region etc. The disadvantages include limited resources, both financial and personal, difficulties to obtain orders and access to new markets (Bednařová, Škodová Parmová, 2010). One of the ways to expand their markets is to enter foreign markets.

Entry into foreign markets is an important step for an enterprise that can bring the options for its further development. If a survey of the foreign market was poorly conducted, it could cause negative consequences for an enterprise. For a long time, there has been professional interest of the factors that lead a company to enter foreign markets and to encourage them to select these markets. Over the past few years, it includes the paper by Moini, Kalouda, and Tesar (2008), who presents five groups of factors influencing entry into foreign markets. These are: characteristics of the enterprise, motives management, management skills, and knowledge of foreign markets, costs and barriers to entry into foreign markets.

The features of an enterprise that should be considered also include the age of an enterprise (the number of years of its existence). As reported by the research, younger enterprises are more interested in entering foreign markets (George, Wiklund and Zahra, 2005, Bell, Crick and Young 2004).

Other motives for starting export as often reported by the research include unused production capacity (Brooks and Rosson, 1982) or the very competitive environment in the domestic market (Rabino, 1980). The biggest barriers to export were analysed by a U.S. Senate study in 1982. It reported costs and more time-consuming, administrative requirements associated with foreign regulatory measures. Knowledge of the environment and the necessary skills

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related to export procedures, documentation, and government regulations are another major requirement for successful entry of small businesses into foreign markets. The barriers made by banking institutions, payment of documentary credits and the need for further banking operations related to export are also often reported. On the other hand, some studies proved that such barriers are not so significant (Naidu & Rao, 1993, Moini (1991).

Barriers in the area of bureaucracy and a lack of awareness about the possibilities of cooperation were proved to be strong in the research. In small businesses, the personality of the entrepreneur is also important.

The question how an entrepreneur can influence the principle decisions on starting foreign activities and choosing the appropriate countries was discussed in a number of studies. The study mostly discusses generally objective characteristics of entrepreneurs, such as their age, education, or their attitudes to foreign activity in general, regardless a particular country.

However, there is always a form of market research (some authors confuse the terms research and survey; the terminology of the authors is kept in the original version in this part). Foreign market research usually takes place in two stages. The first stage involves collecting basic information, which is used to verify the fact that the market has real potential and it can be entered. The second stage consists of exploratory work in the countries under specific conditions of the country (Černohlávková, Machková et al., 1998).

All types of surveys should clearly answer the following questions:

- Is it correct to enter into the market?
- What is the attractiveness of the market in the short and the long term?
- What is the expected sales volume?
- What is the right strategy for entering and appearances in this market?
- What are the social, economic, political and legal peculiarities that affect the behaviour final customers?
- What is the proper way to distribute in that market?
- What are the right criteria for market segmentation?
- What is the competition in the market and what methods are used?
- What is the correct production, price, communication and distribution policy?
- What are the risk considerations to entering the market? Are they acceptable?
- What are the benefits of final entry into the market?

Based on the output of the research, we can find out if it is profitable to enter into the market (Svatoš, 2009).

The surveys are usually classified by the content and purpose in the following way:

- Territorial survey;
- Commercial and political survey;
- Commodity survey;
- Consumer survey;
- Survey of competition;
- Survey of prices and related factors;
- Survey of business methods;
- Technical survey;
- Survey of infrastructure and resources;
- Survey of contact currencies and payment terms;
- Legal survey;
- Tax survey;
- Survey of social and cultural practices (Svatoš 2009).

In case the enterprises are interested in cooperation, it is also important to consider the differences between the countries in economic conditions and their economic development. It is important for the decision about a possible cooperation. Overall macroeconomic stability of the foreign market is also an important criterion. Stability of currency and financial markets, significant fluctuations in inflation, and a large volume of foreign investments cause that enterprises connect less risk with foreign activities (Hodicová, 2011). It is also important to clarify cultural differences in a country with which the entrepreneur wants to establish cooperation. Intercultural differences are closely related to marketing, management, human resources and consumer behaviour. This factor has currently become more and more important (Šroněk, 2002).

The above mentioned differences may lead to barriers that limit starting cross-border cooperation. As reported by Jeřábek, Dokoupil & Havlíček (2004), the most common barriers include:

- different mentality;
- the lack of mutual exchange of information;
- different legislation and other administrative issues;
- different interests;
- different purchasing power;
- different level of infrastructure;
- missing transport links;
- The language barrier and other.

The language barrier of both partners can lead to misunderstandings. It may not be just a lack of foreign language skills, but also about the different meanings of words.

When an entrepreneur after considering all the above mentioned factors decides for cross-border cooperation, it is necessary to consider possible risk. In export and import these risks are related mainly to the period between the conclusion of the contract and its fulfilment (Machková, Sato, Zamykalová a kol., 2002). Originally planned reduction of the risk through diversification of activities could multiply it. This was recently revealed during the economic crisis which hit more enterprises in the German market.

2 Methods

The aim of the paper is to analyse condition for entering and cooperation of small and middle-sized enterprises into foreign markets and to find out the barriers and risk related to this. The paper concerns both entry conditions into the foreign markets and the barriers that affect this entry. A review of literature related to the issues was performed. The results of the review are reported in the previous part of the paper.

Further, as a part of an analysis of entry conditions, the activities of a sample small enterprise choosing a business partner in Germany was researched. Unfortunately, the permission for publishing the company's name and other details in this paper was not obtained. Due to that, the information is not presented in the paper.

The views of small business to cross-border cooperation and barriers that hinder this cooperation were surveyed as part of the Aktion project called “Use of IT–technologies to support small business in regions of České Budějovice and Freistadt” in cooperation with Kepler University in Linz. This survey also included interviews with representatives of chambers of commerce in Linz and České Budějovice.

The research was surveyed in the regions of Freistadt and České Budějovice. In total, 170 small enterprises were addressed in the sectors of trade, industry and transport. A questionnaire survey among entrepreneurs on both the Czech and Austrian side was done. The personal and telephonic interviews (50:50) were used by 40 interviewers almost from the students. The return rate was around 98%, the high number is caused by selected method of questioning. Both samples (Czech and Austrian) were balanced in the terms of number of interviewed companies, their size, production or business orientation.

The research results are presented in total due to very small differences between Czech and Austrian respondents (in presented part of the question only marginal 0,01 - 0,1 of the mark). Czech and Austrian entrepreneur opinions are almost identical and can be presented as follows. With the exception of the two questions (low readiness of the Czech partner, low readiness of the Austrian partner), that are presented separately.

3 Research results

The paper discusses two most important topics: the factors repelling cross-border cooperation, i.e. barriers to market entry and provides a case study of one of the small businesses, which deals with this issue in practice.

3.1 Conditions of entry into foreign markets - a case study

Conditions of entry into foreign markets and necessary steps were monitored in a small enterprise with less than ten employees. It is an engineering company based in the region of Vimperk. Location of the enterprise is advantageous in terms of transportation of goods to German towns.

The enterprise would not prefer to found a branch in Germany. Such entry would be too expensive and disadvantageous. Founding a branch abroad is more advantageous for middle-sized and large enterprises as it is

an important investment. The enterprise enters the international market in the form of direct export. Therefore, it is crucial to find a suitable partner. In terms of transportation, it is best to be a partner as close as possible in Lower Bavaria. After conducting a thorough survey of all the conditions, enterprises in Lower Bavaria with similar product range offering businesses cooperation on their website are found. There are two possibilities of entering the market. Either it is possible to address some of the enterprises in Lower Bavaria, interested in cooperation, or to contact shops in Lower Bavaria selling supplies to engineering machines and offer the enterprise's products. The cooperation with a suitable partner is chosen. The commodities research showed that machinery and transport equipment are attractive in the German market and the Czech Republic is a major exporter. This brings new opportunities and possibilities for the development of the reporting enterprise. The enterprise also meets the requirements for high quality products.

Consumer research showed that the quality of a product is the factor that motivates a German customer to purchase. The second factor is the price. As the price of the products of the enterprise is lower than the price of German products, the entry into the German market is definitely a right step.

As the Czech Republic is a EU member, the conditions for business are easier. EU Member States form the common internal market governed by the EU legislation.

The German economy is characterized by its great openness to the world market. The Czech Republic is a popular partner and not just because of the advantageous geographical position, but also because of its industrial tradition. Nowadays large but also small and medium-sized enterprises are interested in cooperation, as evidenced by the case of the reporting enterprise. This mainly concerns the area of custom manufacturing and cooperation and subcontracting in manufacturing.

Finally, it can be said that after conducting a survey of all conditions, the enterprise has a great chance to establish cooperation with some of the German enterprises. The results were obtained in the thesis "The conditions for the entry an enterprise into the foreign market" (Kučerová, 2013). The results are supported by interviews, which were carried out in co-operation with workers of IHK Passau and JHK České Budějovice.

3.2 Barriers to the cross-border cooperation

The reason for the small interest in business in foreign enterprise and between the border regions of Upper Austria and South Bohemia is revealed by the discussion about cooperation barriers. The biggest barrier as reported by the entrepreneurs is seen in the language barrier, in the bureaucracy and that they failed to find an appropriate business partner. A lack of information about cooperation, poor readiness to cooperate both by Czech and Austrian partners is also reported by the entrepreneurs. As reported by the entrepreneurs, cultural differences and distance (see Figure 1) would be the lowest barrier. Differences between individual answers are revealed in Figure 1, which summarizes the overall results of the 11 proposed alternatives barriers, which were presented to the survey respondents.

The evaluation was conducted on a scale of 1 to 5, where 1 denotes very strong barrier and almost non-existent barriers were evaluated as number 5 as seen the respondents. The strongest barrier obtained an average mark of 1.88. The least significant was rated as 3.22.

The research also revealed the following results:

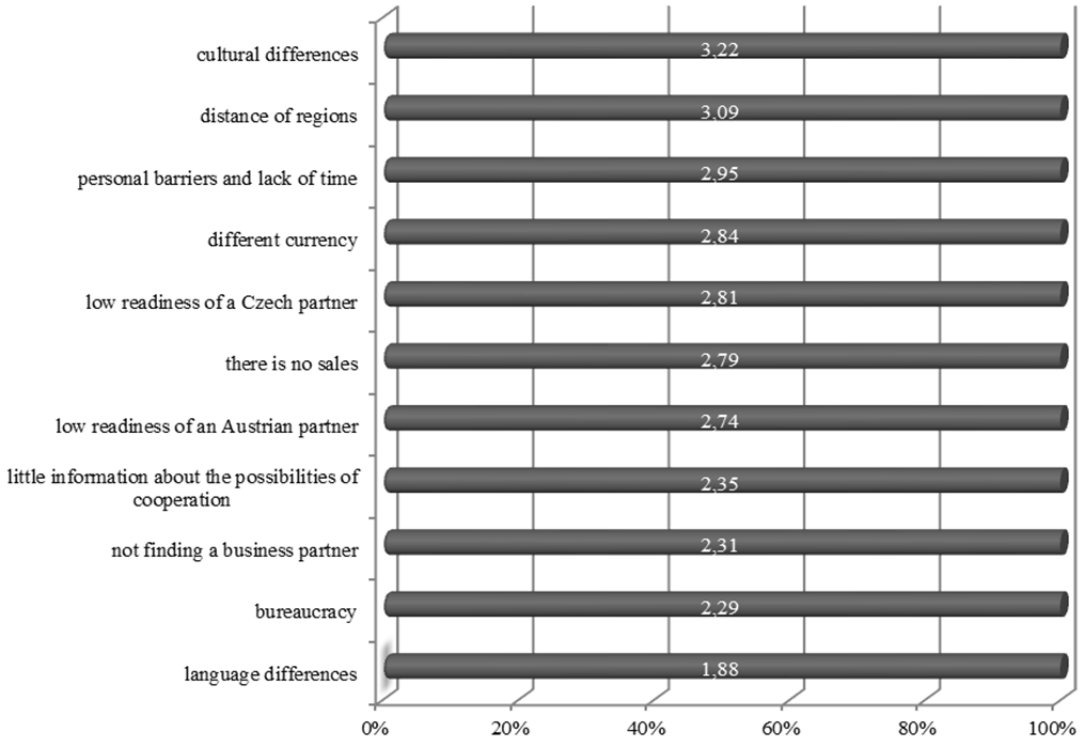
- The fewer employees, the more often a different language is reported as a barrier;
- The fewer employees, the more often bureaucracy and not finding a business partner is reported as a barrier;
- When not finding a business partner is reported a barrier is seen in little information about the possibilities of cooperation and support to the activity.

The decision to cooperate with foreign partners is significantly affected by the barriers to entry into the market, especially for small businesses. Barriers to the cross-border cooperation as seen by the entrepreneurs were researched within the Aktion project, which concerns the Czech - Austrian cooperation. Both areas are considered similar in structure of enterprises by size (comparison was based on data provided by the two chambers of commerce.

The research was surveyed in the regions of Freistadt and České Budějovice. In total, 170 small enterprises were addressed in the sectors of trade, industry and transport. A questionnaire survey among entrepreneurs on both the Czech and Austrian side was done. The interviews with them revealed that the cross-border cooperation is not at a high level. In Austria, 12.0% of entrepreneurs cooperate with a Czech partner and in the Czech Republic, it is 11.8%, mainly in the area of export and import. This kind of cooperation is currently the most viable for Czech entrepreneurs in terms of investments and the least demanding as shown by the survey. But even this kind of cooperation is influenced and often not realized because of the barriers that affect the enterprises. The biggest barrier as reported by the entrepreneurs on both sides of the border is the language barrier. The survey showed that the fewer employees, the more often

a different language is reported as a barrier. Another major obstacle is bureaucracy. The same case of dependency as for language barriers was reported. The fewer employees, the more often bureaucracy and not finding a business partner is reported as a barrier

Figure 1 Barriers to cross-border cooperation of SMEs



Source: authors´survey

In case of not finding a suitable partner, a barrier is seen in little information about cooperation and supports this activity. Another barrier as reported by small enterprises is seen in readiness for cooperation, both on the Czech and Austrian side. The smallest obstacles in terms of business are the cultural differences and the distance. Not all Austrian entrepreneurs see economic potential in South Bohemia. The research showed that the potential is seen by 41% of Austrian entrepreneurs. Benefits are seen particularly in small distances, the possibility of gaining new markets, in low personnel costs and higher profits. The entrepreneurs frequently start cooperation within their own business (57%), using Czech entrepreneurs and personal contacts. Least entrepreneurs used the services of Chambers of Commerce.

The entrepreneurs are afraid of potential risks that may arise in the context of cooperation. It's another barrier that discourages small enterprises from the decision to start cooperation with a foreign partner. Such risk may also occur in trade relations.

This paper focuses on the evaluation of cross-border cooperation between small enterprises in the regions of Freistadt and České Budejovice. The cross-border cooperation within this size category is relatively limited. One of the main reasons for the situation is the small number of employees of such enterprises, which are often fully occupied by operating activities of the enterprise, and there is no capacity left for other development activities. This is why for example the differences appear to be significant for enterprises with fewer employees. The same applies for bureaucracy and fail to find a suitable business partner.

Small and micro enterprises also seek customers among households more easily, thanks to their focus and in most cases even less technological demands of and are not so fixed to B2B cooperation. That is why more often they are based on personal relationships and especially when they are not the only source of income for their owners.

These results were a stimulus for the development of follow-up Aktion project, which will further explore various barriers to cross-border cooperation.

The current political and international situation has provoked controversy about the safety of some foreign markets. Due to the tense situation prevailing for example in the Russian markets, more and more entrepreneurs will seek for

business cooperation with partners from countries where such problems cannot be expected. Probably it would not be too surprising if enterprises tried to replace those problematic markets by some that are geographically closer and much safer. One can assume that the increase incentives to work this time would lead to a greater increase than in previous years.

4 Conclusions

International cooperation is no longer a privilege of large enterprises only. Small and medium enterprises have started to be interested in such cooperation too. For these enterprises, it is particularly important to carry out a comprehensive survey of conditions in the country where they want to start cooperation. A survey of conditions done by an engineering enterprise reported an entry to the German market would be advantageous for the enterprise. The enterprise enters into foreign markets through direct exports. Therefore, it is crucial to find a suitable partner. In case of the cooperation the owner is aware of the potential risks that can occur especially in the since the conclusion of the contract and its fulfilment. The biggest barrier is the language barrier, followed by bureaucracy and the fail to find a suitable partner. The smallest barriers in terms of business are the cultural differences and the distance.

Small and micro enterprises also seek customers among households more easily, thanks to their focus and in most cases even less technological demands of and are not so fixed to B2B cooperation. That is why more often they are based on personal relationships and especially when they are not the only source of income for their owners – very often it is just a part time job.

The current political and international situation has provoked controversy about the safety of some foreign markets. Due to the tense situation prevailing for example in the Russian markets, more and more entrepreneurs will seek for business cooperation with partners from countries where such problems cannot be expected. Probably it would not be too surprising if enterprises tried to replace those problematic markets by some that are geographically closer and much safer. One can assume that the increase incentives to work this time would lead to a greater increase than in previous years.

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Generation Y and the most Attractive Benefit

Jiří Duda

Abstract: *The article presents the partial results of research on the requirements of students, members of the Generation Y, in providing employee benefits. The research was conducted in the period between 1998-2014 among master students of the Faculty of Agronomy and the Faculty of Business and Economics of Mendel University in Brno. The paper compares the frequency of the most preferred benefits (top ten) for the entire period of research and the last 5 years. The results show that the top ten are benefits are basically the same, with the exception of the flexible working hours, which got to the top 10 in the last 5 years. Another benefit that has been more demanded in the last 5 years, are the sick days (a few extra days off). The most desired benefits regardless of the faculty studied include contribution to corporate catering, additional salary (extra wage), and the possibility to use the office car for private purposes. Throughout the whole research period these three benefits held a top-three place in the popularity of benefits. Compared with the results of the last 16 years, the benefit of an additional week of vacation becomes more frequently demanded in the last 5 years. The paper also compared the resulting requirements of students with the benefits provided by employers presented in the surveys of the company Profesia and company NN.*

Key words: Employee benefits · Generation Y · student

JEL Classification: J32 · D22

1 Introduction

The notion of Generation Y first appeared in 1993 in the journal Advertising Age and marked a generation of children born in 1985-1995 (Constantine, 2010). However, we also meet with the resource that gives birth to the years 2000 to 2004 (eg. Clark, 2007; Beekman, 2011, and others). Strauss and Howe (2010) define the border born in the years 1982 - 2004. Alexander & Sysko (2012) even state border born in 1982 - 2009. For Generation Y we can also arise with different names of this generation. These include the Internet and the digital generation, the click generation, echo boomers (Balda, 2011; Kopecký, 2013). Mainly in the USA (eg. Evans, 2011; Jayson, 2006), the Millennials (Children of the millennium) is often used the name of Generation Y. Most of Generation Y is entering to the labor market right now and if the employers want to attract the best talent workers, they have to adapt to their requirements not only for its recruitment policy but also its approach to these young workers. According Kociánová (2012) the people of Generation Y should form the bulk of the working age population till 2025. Young people see modern technology as a normal part of their lives and they want to use them. In addition, they are also flexible and eager to be judged by the results of their work, regardless of when, where and how they execute it. Also Bannon (2011) and Kubatová & Kukelková (2013) are considering Generation Y workers more flexible than previous of workers Generation X.

The authors Stojanová (2015), Hershatter (2010) and Tulgan (2009) point out that the requirements of Generation Y at work the market is very specific, the future employers must take into account potential for it. According to them, this generation values most long-term education, followed by gaining experience in the areas covered by their company. Generation Y emphasizes to the long-term effect, not only at work but also in his personal life, education, investments, prefers the efficiency of time and resources. By Kopecký (2013) the companies should concentrate on the formation of incentive programs, attractive working environment and a comprehensive system of human resource management. Acquisition, motivating and retaining of the best workers it will be important to deal with Generation Y employees alike, as the company treats its customers. The company Hays (2013) conducted a survey, which examined the factors influencing generation Y when choosing their future employer. The results showed that most affect the ability of training and development programs, employee benefits and time flexibility in employment. Important factors are also the possibility of rapid progress in their career and well-defined career path. The opposite opinion has Vysekalová (2011), according her, this generation does not seem to know exactly how their career should look like, but they are much more demanding in their requirements for employers.

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Benefits are by many authors (DeCenzo, 1999; Dulebohn, 2009; Dvořáková, 2007) an essential part of a functioning program, employee motivation, because they have a significant impact on whether the employee will remain in the company. Except the benefits, for attracting of new employees there are the important characteristics of the company - eg. a good working atmosphere, career advancement (Backes-Gellner & Tuor 2010). Benefits also become possible reason to accept a job offer contender. Horská (2009) contends that the benefits considered as hygiene factors Herzberg et al. (2004). According to the author, if the benefit is withdrawn, there leads to demotivation of employee. This view is supported by research Vnoučková (2014). Benefits are also less demanding than the economic exploitation of wages, because many benefits are tax-supported (eg. Hammermann, 2014; Macháček, 2013; Duda, 2011; Grubb and Oyer 2008).

The article presents the partial results of research on the requirements of students, members of the Generation Y, in providing employee benefits. The research was conducted in the period between 1998-2014 among master students of the Faculty of Agronomy and the Faculty of Business and Economics of Mendel University in Brno. The aim of this work is identify and compare the frequency of the most preferred benefits (top ten) for the entire period of research and the last 5 years. The aim is paper also compared the resulting requirements of students with the benefits provided by employers presented mainly in the surveys of the company Profesia and company NN.

2 Methods

Over the years participated in the survey a total of 1,442 students of Faculty of Agronomy and 2,274 students of the Faculty of Business and Economics. Numbers of students in respective years of research were ranged from 175 to 321 students. This corresponds to approx. 70-90% of all students studying the 5th grade of the faculty. Survey was carried in seminars on the subject Management (students of AF) and Human Resource Management (students of FBE). For detecting information was used questionnaire. The students had spontaneously identify up to 5 most important advantages that they requested by their potential employers. These benefits should also indicate the order of importance (1-5 place) provided benefits. During the monitored period, students identified a total of 51 employee benefits. It was selected the ten most preferred benefits for each year of research. In Tables 1 and Tables 2 can be seen in the order of top ten benefits, which was compiled on the basis of the frequency of placement in the top 10, respectively 5 most desirable benefits for each year of the survey. In case of equal number of counts with 10 benefits decided on the order of placement benefit in the five most preferred benefits.

For comparison, the order of preference of employee benefits has been used Spearman's rank correlation coefficient given in Stávková (2004). Coefficients characterized by the value of the Spearman correlation coefficient with the response of students indicate the order of answers of ten most desirable employee benefits. The more the two respectively match the more this ratio approaches 1, the more the two opposite order the more closer to -1. Research is carried out continuously, in the paper are used data from the years 1998 to 2014.

$$r_S = 1 - \frac{6 \cdot \sum_i (a_i - b_i)^2}{n \cdot (n^2 - 1)} \tag{1}$$

where:

r_s

a_i are the serial numbers of students of the Faculty of Business and Economics,

b_i are the serial numbers of students of the Faculty of Agronomy

n the number of benefits

3 Research results

As can be seen on Table 1, students regardless of the faculty studied, usually requiring a trio of identical employee benefits - contribution to corporate catering, additional salary (extra wage), use of company car for private reasons. These three benefits are considered by students of both faculties as are very important, indispensable. Students prefer throughout the whole research almost identical benefits. The top ten ranking benefits differ by only one benefit. Students of FBE to top the assigned benefit "employee professional development," students of FA prefer benefit "share of profits". Among the students preferred the same benefits of both faculties in the top ten include employer cover language courses, extra holiday week, contribution to pension insurance, cellular phone for private use, contribution to recreation, contribution to life insurance. Students assign to benefits almost similar importance. Spearman rank correlation coefficient of benefits throughout the research is among the top ten benefits $r_s = 0.95$.

If we compare the students' demands, representatives of Generation Y, throughout the survey and the last 5 years, we can see that the top ten demands too much does not change, there is only a slight change. In the Table 2 we can see that among the very attractive benefits in the last 5 years there have been included benefits again - contribution to corporate catering, additional salary (extra wage) and use of company car for private reasons. In the forefront, compared with the results of the past 16 years, gets the benefit of the extra week of holiday. In the last 5 years the survey can observed, that the students started to prefer flexible working hours, which are generally getting into the top ten ranking, closely followed of benefit sick days. From the top ten benefits for students FBE dropped out benefit contribution to life insurance, the students FA in the top ten desist from contribution to recreation. Ranking individual benefits was little changed, students of both faculties agreed on eight benefits. Spearman correlation coefficient ranking benefits for the period 2009 - 2014 is $r_s = 0.667$. This number is lower than the observed value of the all research ($r_s = 0.95$), but we can say that students of both faculties have similar views.

Table 1 The order of the frequency of the most desirable employee benefits – 1998 - 2014

Employees benefit	Rank FBE	Rank AF
Contribution to corporate catering	1	1 - 2
Additional salary (extra wage)	2	1 - 2
Use of company car for private reasons	3	3
Extra week holiday	4	6
Employer cover language courses	5	4
Contribution to pension insurance	6	5
Cellular phone for private use	7	7
Contribution to recreation	8	9
Contribution to life insurance	9 - 10	10
Employee professional development	9 - 10	*
Share of profits	*	8

Source: Own processing; * benefit is not in the top ten ranking

The importance of extra week holiday and flexible working hours confirms Kollerová (2014), which compared the development employee benefits provided in Czech Republic processed by Profesia 2007-2012. These benefits are ranked in the top five rankings provided benefits - were in second and third place. These two benefits according to this survey was available to 25% of the respondents. This research was attended by 66 374 respondents. The most provided employee benefit was contribution to corporate catering which has 44 % of respondents. In the top five were still contribution to pension insurance and cellular phone for private use. The use of benefits, that were available to more than 10 % of respondents, include the free drinks at the workplace, employee professional development and notebook for private reasons. Relatively high number of respondents (23%) hasn't any benefit.

Table 2 The order of the frequency of the most desirable employee benefits – 2009 - 2014

Employees benefit	Rank FBE	Rank AF
Contribution to corporate catering	1 - 4	1 - 3
Additional salary (extra wage)	1 - 4	1 - 3
Use of company car for private reasons	1 - 4	4
Extra week holiday	1 - 4	1 - 3
Cellular phone for private use	5	7 - 8
Contribution to pension insurance	6	5
Employer cover language courses	7	6
Contribution to recreation	8 - 9	*
Employee professional development	8 - 9	*
Flexible working hours	10	10
Share of profits	*	7 - 8
Contribution to life insurance	*	9

Source: Own processing; * benefit is not in the top ten ranking

In the Czech Republic the research requirements in the field of employee benefits are not too much. In long time company NN in collaboration with the Confederation of Industry of the Czech Republic (2015) are dealing with this problem. Results are shown in Table 3. Among the most commonly provided benefits include cellular phone for private use, employee´s professional development, medical checks, drinking regime and contribution to corporate catering. Results also showed the following key findings: 99% of companies providing employee benefits and in the average they are providing 12 employee's benefits. Menu is raising less traditional benefits e.g. medical checks, sick days too.

Table 3 Employee benefits – 2010 - 2015

Employees benefit	2010	2011	2012	2013	2014	2015
Cellular phone	80%	84%	75%	87%	89%	88%
Employee professional development	70%	78%	82%	85%	81%	83%
Medical checks	-	-	-	75%	78%	77%
Drinking regime	71%	79%	71%	82%	75%	81%
Contribution to corporate catering	75%	68%	81%	82%	74%	72%
Use of company car for private reasons	75%	80%	75%	76%	74%	73%
Material donations / one-off rewards	57%	64%	64%	71%	71%	66%
Contribution to pension insurance	60%	71%	74%	68%	68%	77%
Contribution to life insurance	39%	54%	43%	53%	49%	60%
Contribution to sport	33%	32%	39%	40%	42%	35%
Additional salary (extra wage)	32%	37%	37%	39%	39%	47%
Contribution to health (vitamins etc.)	24%	31%	35%	36%	39%	36%
Contribution to culture	29%	28%	33%	41%	35%	42%
Employee loans	31%	32%	36%	38%	34%	40%
Vaccination against flu	24%	28%	25%	35%	27%	31%
Contribution to recreation	20%	24%	28%	32%	27%	30%
Sick day	-	-	-	30%	25%	33%

Source: NN (2015)

As can be seen from the foregoing, offer of companies in the provision of benefits is diverse and substantially conform to the requirements of students. Many employers offer contribution to corporate catering, which are among the most popular benefit for students. In a survey conducted by company NN there are not reported employee benefit an extra week of holiday, which is considered to be one of the most important employee benefit for the students. Probably this benefit is not collected by company NN. Significance of employee benefit an extra week holiday confirms the above exploration by company Profesia (Kolerová, 2014). In the offer from the companies there also were other benefits that are required by the students - employee professional development, use of company car for private reasons, contribution to pension insurance. Providing benefits contribution to corporate catering and contribution to pension insurance were confirmed by the survey Sodexo (2005). Contribution to corporate catering provided by this survey 70% of firms, contribution to pension insurance provides 36 % of companies. Employers also respond to new demands of Generation Y in working time flexibility and the benefit to be classified in its range of benefits. Also benefit sick days is more likely to appear in the menu of companies. According to Achieve Global (Lunsford, 2009), which dealt with motivational aspects of Generation Y, among the most important motivational aspects of Generation Y there are included employees' professional growth, allowing self-realization, personal stake in the success of the company and the flexibility of working time.

4 Conclusions

Generation Y is currently increasingly being applied in the labour market. The paper, based on long-term research, identifies the top ten most desired employee benefits. Respondents were students from Mendel University in Brno. Among the most attractive benefits included by students - Contribution to corporate catering; additional salary (extra wage); use of company car for private reasons; extra week holiday; cellular phone for private use; contribution to pension insurance; employer cover language courses; contribution to recreation; employee professional development; flexible working hours; share of profits; contribution to life insurance.

In the Czech Republic research requirements in the field of employee benefits are not too much. In the long term with this problem there are engaged the studies of the company NN and the company Profesia. From the results we can

say that employers provides the more employee benefits required generation Y. The most commonly provided benefits include contribution to corporate catering; cellular phone for private use; contribution to pension insurance; employee professional development. On the benefits provided by employers are beginning to discover the benefits that Generation Y is increasingly prefer - flexible working hours, employee professional development, and sick days. Generation Y is trying to strike a balance between their personal life and work life. Generation Y emphasizes the long-term effect, long-term training. Employers must remember that Generation Y has a little more different requirement in employee benefits than Generation X.

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Employee Training and Development as a Tool for Improving the Competitiveness of Czech Enterprises

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Abstract: *Employee training and development is one of the important tools to increase workers' human capital in order to improve the competitiveness of enterprises. This paper gives key findings on training and development activities in enterprises in the Czech Republic. The findings presented in the paper are based on quantitative analysis derived from European enterprise surveys CVTS 2, CVTS 3 and CVTS4 (Continuing Vocational Training Survey). These surveys give an overview of the companies' training and development policies in the European Union including the Czech Republic. The surveys indicate that enterprise size is a key factor influencing the provision of training to their employees. The amount of enterprises that provided training to their employees and participation in training courses increase with the size of the enterprises. Furthermore, small enterprises spent less on training courses than medium-sized enterprises which spend less than large enterprises. The findings also suggest that enterprises generally preferred to provide training through formal external and internal courses rather than the use other form of training. The main reason for enterprises does not provide any form of training to their employees was that the existing skills and competencies correspond to the current needs of the enterprises. The findings raise a number of important issues that should be considered by enterprises in order to develop their employees' competences and to increase the enterprises' competitiveness.*

Key words: Employee Training · Small and Medium-Sized Enterprises · Large Enterprises · Continuing Vocational Training · Survey

JEL Classification: M12 · M53 · O15

1 Introduction

Small and medium-sized enterprises (SMEs) in the Czech Republic represent a very important part of the Czech economy. The data indicate that the share of small and medium-sized enterprises in the total number of active business entities in 2014 was 99.84 % and the share of SME employees in the total number of business sector employees in the Czech Republic was 59.39 %. In addition, the contribution of value added by small and medium-sized enterprises to the whole of the Czech Republic in 2014 was 53.11 % (Ministry of Industry and Trade, 2015). Accordingly, the economic performance of the SMEs has a significant impact both on national economy and individual regions. Given the significance of SMEs, development of these enterprises and specifically their employees play a significant role. At present, the human resources in any organisation, especially in SMEs are considered as strategic element and one of the key factors of their competitiveness. This is even more important in the knowledge-based economy, where intangible factors are of growing importance and human resources are among the fundamental intangible resource for the organisation (OECD, 2013). It is evident that well-educated and trained employees are a key factor for SMEs to achieve competitive advantage (Zieba, K & Zieba M, 2014). Therefore, the quality of the human resources which includes development of employee knowledge and skills should be considered as a crucial issue for SMEs (Koubek, 2011). This implies that the employee training is becoming an important tool for enterprises seeking to gain an advantage among competitors.

Employee training has been defined variously. In its broadest sense, the employee training is defined as "a systematic acquisition and development of the knowledge, skills, and attitudes required by employees to adequately perform a task or job or to improve performance in the job environment" (Tharenou, Saks & Moore, 2007, p. 252). The employee training narrowly defined is the systematic application of formal processes to acquire knowledge and help employees to gain the skills necessary for them to perform their jobs satisfactorily (Armstrong & Taylor, 2014). For the purpose of the present CVT survey employee training is defined as the training activity that must be the result of a decision in the enterprise. The primary objective must be the acquisition of new competencies or the development and improvement of existing competencies. Furthermore, a training measure or activity should be financed in total or at least partly by the enterprise (directly or indirectly). The employees with apprenticeship or training contract may not be considered. There must be an actual activity or event which can be identified as a specific and separate period of training (Eurostat, 2012).

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According to Zieba, K. & Zieba, M. (2014) SMEs should pay attention to the employee training due to the following factors: they often lack skilled employees, they miss development opportunities due to lack of skills and competencies and they lose competitive advantage due to lack of appropriate knowledge and skills. Through the employee training and development, the enterprises provide not only new knowledge, abilities and skills and also provide opportunities for experience exchange and proactive behaviour. All these finally contribute to employees' employability, personal development and life satisfaction (CEDEFOP, 2014). Furthermore, many studies show that employee training has a positive impact on employee turnover, enterprise performance, enterprise productivity, the survival rate and competitiveness (Hashim & Wok, 2013).

Despite the importance of employee training and development and its benefits to both employers and employees surveys indicate that SMEs are still reluctant to provide their employees with training (Václavková et al., 2007; Doležalová & Holátová, 2015).

Understanding the complexity of provision employee training in enterprises is one of the necessary preconditions for adopting targeted policy measures with the aim to support enterprises and hence promote effective employee training. This paper gives key findings on employee training in enterprises in the Czech Republic, especially in small and medium-sized enterprises.

These findings are based on quantitative analysis derived from European enterprise surveys CVTS 2, CVTS 3 and CVTS4. The primary objective of European Continuing Vocational Training Surveys (CVTS) is to collect key data about the continuing vocational training provided by enterprises for their employees. These surveys are coordinated by the Statistical Office of the European Union (Eurostat). The CVT survey is conducted every five years. The reference period is the calendar year. The first survey (CVTS 1) was carried out in 1994 in the 12 Member States of the European Union. The last survey CVTS4 was carried in 2011. CVTS5 will run in 2016 and first results are expected to be published towards the end of 2017. The Czech Republic participated in CVTS2 for the first time in 2001 as one of the candidate country. For the second time it was in CVTS3 and for the third time it was in CVTS4.

2 Methods

The aim of our analysis is to give insights into training policies and practices in enterprises, especially in SMEs in the Czech Republic. More specifically, the objective is to describe and to compare employee training in SMEs and large enterprises. The analysis was taken from the Continuing Vocational training surveys CVTS2, CVTS3 and CVTS4. Data were obtained from Eurostat's online database and from the Czech Statistical Office. For these surveys common European questionnaires were used.

The surveys covered enterprises with 10 or more employees in specified NACE categories.[16] In table 1 below is a description of the total number of enterprises respective the total number of sampled enterprises in the Czech Republic included in the surveys[17].

Table 1 Number of enterprises

CVTS	Number of enterprises	
	Sample/total number of sampled enterprises	**Sampling frame/total number of enterprises**
CVTS2	7 000	31 529
CVTS3	10 000	45 792
CVTS4	10 000	43 403

Source: CSO (2008, 2013)

The Continuing Vocational Training Surveys have provided a wide range of information concerning enterprise-based training. Therefore, for giving analysis the following quantitative indicators were chosen: incidence, participation and expenditure. Based on these indicators we can identify similarities or differences between SMEs and large enterprise concerning employee training.

Incidence - the elements of this indicator are as follows:

- enterprises providing any type of CVT in all enterprises (%),
- enterprises providing training courses in all enterprises (%),
- enterprises providing any other forms of training in all enterprises (%).

[16] The target population: in CVTS2 the enterprises belonging to the NACE categories C- K + 0 and ISECTORS 11 a12, In CVTS3 the enterprises belonging to the NACE categories C- K + 0 and ISECTORS 11 a12, 13, 141, 142 a 15, in CVTS 4 the enterprises belonging to the NACE categories B-N, R,S and ISECTORS11-13, 141, 142 and 15. The outputs were elaborated on the level of 20sections CZ-NACE (CSO, 2008, 2013)

[17] Detailed instructions for determining the sample structure and target numbers for each CVT survey were given in CVTS Manuals (European Commission, Eurostat, 2000, 2006, 2012).

Participation - the element of this indicator is as follows:

- employees in all enterprises participating in training courses (%).

Expenditure - the elements of this indicator are as follows:

- total cost of training courses per employee,
- total cost of training courses per participant.

Incidence provides data of whether an enterprise provide or not provide formal training and what kind of training provide. Participation indicates data on the workforce participating in employer-provided training. Expenditure refers to the investment of money on employee training from the enterprise resources. Incidence and participation are indicators used by researchers to point out differences in providing training between large and small and medium-sized enterprises (CEDEFOP, 2010).

3 Research results

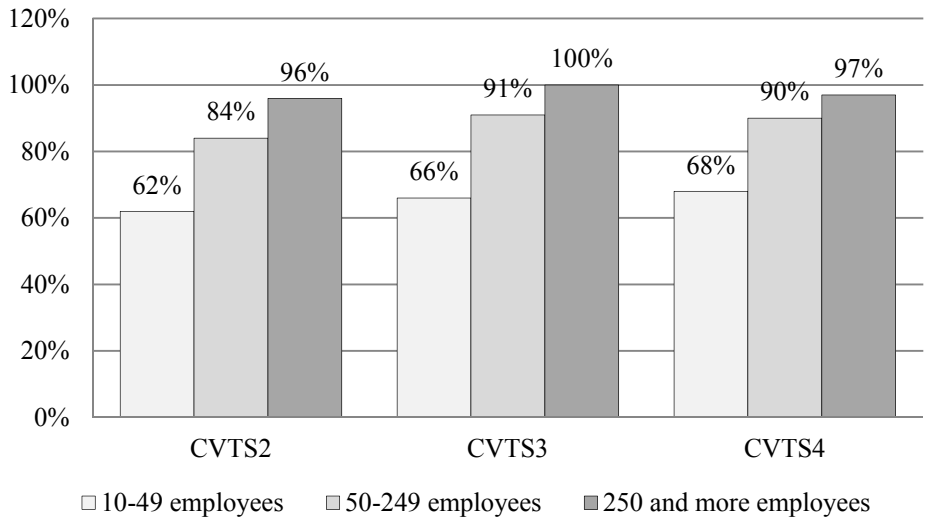
In the following section there are presented the results for the chosen indicators.

3.3 Course incidence

For this indicator we present results in relation to the amount of training undertaken by the enterprises and the types of training.

The findings show that the overall percentage of enterprises with training activity has risen between CVTS2 and CVTS4 in all sized enterprises. On the other hand the results indicate that the proportion of enterprises offering training rises as the size of the enterprise increases. It is lowest in the small enterprises (10 to 49 employees) and the highest in the large enterprises (250 or more). The figures for small enterprises ranged from 62 % to 68 % and in the large enterprises from 96 % to 100 %. To sum up, nearly all large enterprises and most of medium-sized and small enterprises provided some training. This can be reflected as a positive trend in employee training. The following figure 1 summarises these findings by enterprise size.

Figure 1 Enterprises providing any training in all enterprises in %



Source: Own processing based on Eurostat data (2014)

Enterprises and other forms of training

Enterprises can provide employee training in the form of training courses and ‘other’ forms such attending conferences, workshops, lectures and seminars, job rotations and secondments, learning and quality circles, self-learning and training at workplace. Table 2 shows that the proportion of all size enterprises that carried out training courses was greater than the proportion of enterprises with ‘other’ forms of continuing training. It is also evident, that the smaller enterprises have the lowest rate of training courses to compare with large enterprises. The similar situation is in the case of other forms of training. The provision of other forms of training was more frequent in larger enterprises. Overall, we can suggest that the provision of other forms of training in all size enterprises complements the training courses. The positive finding is the fact that the employee training is not limited only to training courses. The following table 2 summarises these findings by enterprise size.

Table 2 Enterprises providing training courses and any other forms of training in all enterprises in %

Size class (number of employees)	Training courses			Any other forms of training		
	CVTS2	CVT3	CVT4	CVTS2	CVTS3	CVTS4
10-49	54%	56%	57%	53%	54%	55%
50-249	79%	64%	83%	73%	76%	77%
250 and more	94%	100%	96%	85%	88%	89%

Source: Own processing based on Eurostat data (2014)

From the analysis of the CVTS data (shown in table 3) among the 'other' forms of training in small and medium-sized enterprises the dominant were attendance of conferences, workshops, etc. On –the –job-training (continuing training in the workplace) was also of the highest importance. Small and medium-sized enterprises also favoured these forms, although at lower usage levels. Job rotation was least common in all enterprises.

Table 3 Enterprises providing the most common and least common forms of training in all enterprises in %

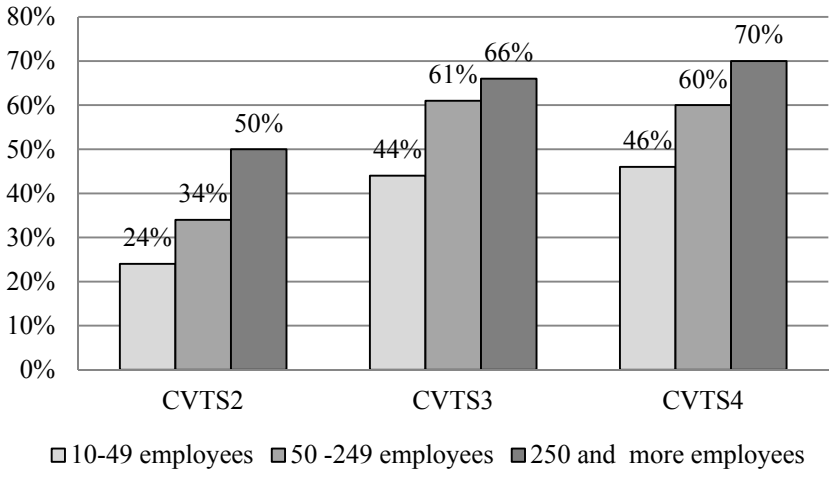
Size class (number of employees)	Conferences, workshops, lectures, trade fairs			On-the-job training			Job rotation		
	CVTS2	CVTS3	CVTS4	CVTS2	CVTS3	CVTS4	CVTS2	CVTS3	CVTS4
10-19	39%	57%	50%	22%	55%	54%	4%	4%	5%
20-49	43%	63%	58%	23%	56%	59%	3%	3%	5%
50 -249	64%	69%	71%	39%	61%	64%	8%	6%	9%

Source: Own processing based on Eurostat data (2014)

3.4 Participation of employees in training courses

Figure 2 shows that in small and large enterprises the percentage of employees participating in training courses increased between CVTS2 and CVTS4, rising from 24 % in CVTS2 to 44 % in CVTS3 and 46 % in CVTS4 in small enterprises and from 50 % to 66 % and 70% in large enterprises. The employee participating in training courses in medium-sized enterprises rise between CVTS2 and CVTS 3 (from 34 % to 61 %) and fell slightly between CVTS3 and CVTS4 (from 61 % to 60 %). It is also evident that participation in training courses clearly increased slightly with enterprise size. Small enterprises have the lowest participation rates in CVT courses across all of the CVT surveys. Large enterprises have the largest rates of participation in all CVT surveys.

Figure 2 Percentage of employees (all enterprises) participating in training courses



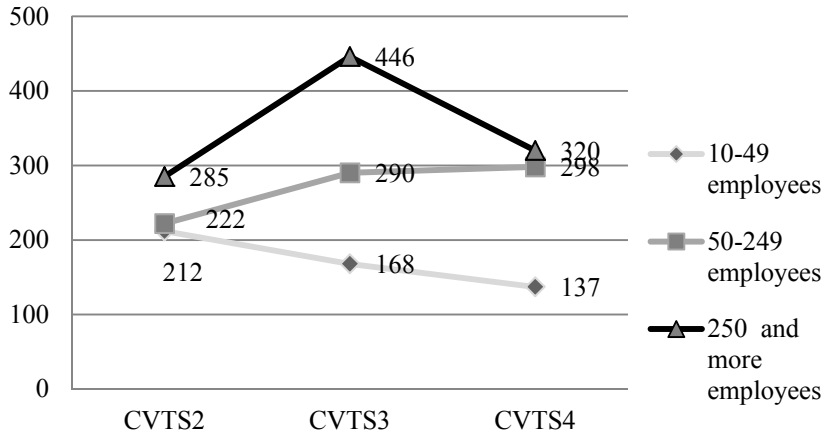
Source: Own processing based on Eurostat data (2014)

3.5 Expenditure

While the first two indicators (incidence and participation) are for all sized enterprises characterized mostly by increasing figures, the third indicator (cost) is demonstrating decreasing figure. The total cost of training courses per employee in CVTS 4 was around 137 EUR in enterprises with between 10 and 49 employees and 320 EUR with 250 or more enterprises. This is lower than in CVTS3 (168 EUR in small enterprises and 446 EUR in large enterprises) and in CVTS2 for small enterprises (212 EUR). The cost of training courses per employee for medium-sized enterprises was

298 EUR in CVTS4 which indicates rise since CVTS3 (when it was 290 EUR) and CVTS2 (222 EUR). Overall, the cost is higher for larger enterprises than for smaller one.

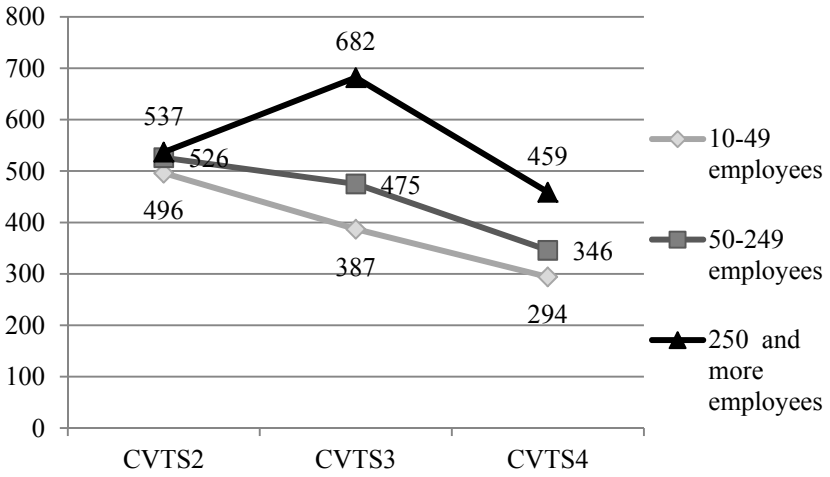
Figure 3 Total costs of training courses per employee (EUR)



Source: Own processing based on Eurostat data (2014)

Figure 4 shows that the total cost of training courses per participant in large enterprises rose from 537 EUR in CVTS2 to 682 EUR in CVTS3, but fell back to 459 EUR in CVTS4. The total cost of courses for participant in small and medium-sized declined between CVTS2 and CVTS4, from 496 EUR in CVTS2 to 387 EUR in CVTS3 and 294 in CVTS4 in small enterprises and from 526 EUR in CVTS2 to 475 EUR in CVTS3 and 346 EUR in CVTS4 in medium-sized enterprises. Overall, the total cost is higher for larger enterprises than for small and medium-sized ones.

Figure 4 Total costs of training courses per participants (EUR)



Source: Own processing based on Eurostat data (2014)

4 Conclusions

The following trends in employee training were indicated. First, the provision of employee training rose between CVTS2 and CVTS4 in all sized enterprises. Second the training courses were the most frequent type of employee training used by enterprises of all sizes. Third, the percentage of employees participating in training courses increased between CVTS2 and CVTS4 in most of the enterprises. The fourth, the costs of training for participants have been reduced in the period between CVTS2 and CVTS4 in all sized enterprises.

On the other hand, it should be noted that size of enterprise is an important factor influencing training and development of the workforce. In almost any analysis of given indicators large enterprises are likely to vary significantly from smaller ones. Larger organisations are more likely to deliver employee training than do small

organisations. It is also evident, that participation in training courses increased slightly with organisation size. Finally, there is a relationship between enterprise size and expenditure on employee training. Small enterprises spent less on training courses than medium-sized enterprises which spend less than large enterprises. These findings are in line with similar surveys. For example, Learning and Development 2015 by CIPD (2015) or Skills Development and Training in SMEs by OECD (2013).

Given the significance of small and medium-sized enterprises, development of these enterprises and mainly their employees is necessary. High quality workforce can give the enterprises the competitiveness needed to successfully operate in the current highly competitive and uncertain business environment. Therefore, providing suitable, regular and high quality employee training has a crucial role.

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Age Management Measures - a Case Study

Lenka Janošová, Božena Buchtová

Abstract: *This article introduces different possibilities for age management measures for working with employees above 50 years old on a specific example of a Norwegian company. Firstly, there is a brief summary of the reasons for the introduction and use of age management in business practice as the implication of demographic changes in the developed countries of Europe, especially the ageing of the population and, therefore, the ageing of the entire workforce in the labour market. Furthermore, the article presents a list of actions implemented in the Norwegian company, AB Ltd., in order to increase the productivity and loyalty of the current employees and also to take advantage of the synergies between different age groups working in teams to solve working tasks. Finally, the article argues for the possibility of the application of these measures to the business environment in the Czech Republic with regard to economic and cultural differences between these two countries, which are a key factor for successful implementation.*

Key words: age management · ageing of the population · employment · employee's benefits

JEL Classification: M54 · M51 · M12

1 Introduction

The employment of people over 50 years old has recently become an increasingly contemplated topic. Expert commissions are being formed on a European, as well as local, level to try to promote the topic among government officials, public administration institutions and private business entities, by organizing courses, financial support programmes or proposals for changes of legislation. One example is the National Action Plan promoting positive aging for the period 2013-2017, prepared by the Ministry of Labour and Social Affairs of the Czech Republic (MLSA CR), the White Paper: An Agenda for Adequate, Safe and Sustainable Pensions, 2013, issued by the European Commission or its publication, 2012 – the European Year for Active Ageing. The reason for the increased interest in this area is the issue of the aging population faced by the entire European Union (EU) –the Czech Republic (CR) not being an exception. Every year there is a reduction in the number of births, which means extending the working life of the population of individual countries (Eurostat, 2015).

Unfortunately, a mere extending of the retirement age does not bring adequate compensation for the lowering number of the economically active population financing the present retirees in the rolling pension financing system. Companies demanding a young generation of workers must still vigorously fight for quality graduates, mostly in technical fields, even though it could often prove to be more effective to make use of more experienced employees or retirees. This trend was confirmed by the testimony of the parties of the largest Engineering Fair in Brno (Právo, 2015).Performing work activities in later life, without any doubt, carries some risks and the need for increased interest from HR, as well as a relevant manager. Older employees must deal with a variety of prejudices and stereotypes, many of them end up at job centres (OECD, 2015), which brings these individuals not only financial problems but also social (loss of contact with society) and mental (the feeling of uselessness) problems. This may lead to a deterioration in their health that, in turn, leads to increased costs in health insurance (Buchtová 2002, Kuchař 2003, Pavelcová 2004).

Age diversity in the workplace can bring the company both positives and negatives. A big role is played by the approach of managing workers to different age groups of employees. This largely depends to what extent they succeed in maximizing the benefits and eliminating the risks. To simplify this task, the Danish researcher, Ilmarinen (2005, 2011), introduced the concept of age management, which means, according to a translation of the Association of Education during Adult Age (2011), "creating conditions that take into account the age, at a political and organizational level, in the management of work processes in the physical and social environment". As the definition shows, not only the age group of people over 50 years is affected, but it is a comprehensive approach to a whole spectrum of age groups represented in a company. It is the effort to adapt their work environment, organizational structure and the range of benefits offered, so as to create an environment enabling the maximum utilization of the potential of each age group - young people up to 30 years old, the generation between 30-50 and persons over 50.Each of the aforementioned generations has different needs and priorities; therefore, it is necessary to take into account age differences. Initially, the issue of the employment of older workers over 50 years of age has started to be researched by

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Scandinavian authors, for which there are several reasons. The most important is the fact that all the Scandinavian countries act as generous "welfare states", the cost of their social policies represents the largest percentage of state budget expenditures, and therefore, the impact of aging is reflected by the countries very quickly. The state budget receives less tax revenue and the need for higher social costs arises, whether they are for pensions or benefits during periods of illness. Specifically, in 2015, 36% of spending (the largest budget item) accounted for the payment of pensions, sick pay or health care, i.e. NOK418.6 billion. (Statensogutgifterinntekter, 2015)

An effort to keep employees on the labour market for a longer time presents itself as the best solution to the situation.

2 Methods

The aim of this case study is to identify the measures of age management intended for a selected age group of 50+ in the Norwegian company AB Inc. Measures targeted at this age group are, in the Norwegian business environment, called a "senior policy" (The Centre for Senior Policy SSP, 2012). Senior policy measures in a work environment are considered to be such measures that are striving to adapt the working environment to the needs of workers aged 50+. However, it does not have to be a measure specifically aimed at this group, the measures may be focused on several age groups at once.

We have chosen this Norwegian company because of the level of the development of age management. We have chosen a production company, where the transfer of know-how from experienced to less-experienced employees is implemented, and human capital is one of the most important competitive advantages here. It can represent a key factor of success on a highly competitive globalized market. A proper functioning of such a system requires the sufficient motivation, capacity and commitment of employees to achieving continuous improvement and development. For these reasons, the main objectives of personnel policy are: 1) to provide all the age groups with the possibility of personal and professional growth in their course of work, 2) to implement specific measures to support the development of essential competencies.

Another criterion was the existence of different age groups in the company. The main guideline for the selection has become the annual award for the company with the best age management system, which is awarded by the Centre for Senior Policy. Out of the nominated companies, only one was interested in working on this case study. To preserve its anonymity, it will be referred to under the name AB. The purpose of this case study is to capture the main instruments used to adapt the work environment to the needs of older employees, aged 50+, including the efforts to quantify the costs of their implementation and reuse.

The history of AB and its predecessors dates back to the 1880s when the first company dealing with electric energy was founded. Over the next 60 years, it slowly developed from a small family business to become a big manufacturing company expanding into related fields. In the 1980s, when there was a huge boom in the oil industry in the North Sea, there was a dramatic increase of capital. As a result of an inflow of new investors, and after mergers with several companies engaged in oil processing and providing related services, the company has existed since 2007 in its current structure. It belongs among the premier providers of services related to the processing of crude oil, natural gas and renewable energy sources. The range of services includes conceptual studies, engineering, procurement, production, assembly, finishing systems, maintenance, operational support and decommissioning.

The management presents the delivery of sustainable solutions as the company’s vision. The key for them is to act as a responsible, visionary, open and flexible company. In their own internal directives, they have committed to performing management that cares about the health and safety of their employees and the protection of the environment. All activities must comply with ethical standards and the principles of social responsibility. An important element for them has become the credibility to all their stakeholders – suppliers, customers, clients, employees, owners and local government. Within its official policy, they are committed to improving the skills of their employees and to an equal recruitment policy.

In addition to Norway, where we can find the majority of their branches of management and production, it operates on the markets of Denmark, Thailand and Singapore. Overall, the company employs more than 6,000 employees. The annual turnover for 2013 amounted to NOK12 billion (approx. CZK 40 billion).

The main method used was the analysis of key documents containing information on the workings of the senior policy of Norwegian Enterprise AB, Inc. These were mainly internal directives and manuals about senior policy in the workplace, as well as wage rules and directives for selected senior policy measures. As these resources contained only partial or general information about the operation, it was necessary to complement these materials with interviews with the Human Resources director of the company and his representatives. Interviews were carried out via standardized or semi-standardized interviews. Following an agreement with the HR Director, a questionnaire survey among employees was not agreed upon; therefore, this plan was abandoned for the time being. However, the questionnaire is not ruled out during further cooperation.

3 Research results

In AB, we identified two groups of age management measures. In the first one belonged measures required by the Norwegian legislature, above all in the Labour Code (Lov om arbeidsmiljø, arbeidstidogstillingsvernmv – LOV-1977-02-04-4) or the ones negotiated with trade unions, for example, Contractual Early Retirement Schemes about a flexible transition to retirement. It is mainly a flexible retirement age, based on new legislation by the Norwegian government to support the employing of older people. An employee is able, at their sole discretion, to choose their retirement age from the offered range of 65-75 years. It is also acceptable to combine employment and a part or full pension from the age of 62. Each employee age group has a set expected life span in retirement. In the time of retiring, the collected pension requirements are divided by the years of the expected length of life for the age group. The result is the annual amount of retirement pension paid. AB Inc. takes part in Contractual Early Retirement Schemes (AFP). This legislation allows for the retirement to be at an age from 62. A necessary condition for early retirement or the combination of work and retirement is, however, a sufficient sum paid into the pension system. The competent authority established a minimum level of income from which it is possible to ask for early retirement. This threshold has to be met at least ten years after reaching the age of 50. Since 2011, the scheme AFP has been a permanent part of the public pension scheme. In the private sector, the law allows the combination of retirement pension, AFP contributions and a job without the necessity to meet the minimum threshold of income in recent years. If there is an agreement between a company and an employee, the employee can postpone their retirement and continue working until 67. In this case, they receive a wage, as well as the pension.

Into the second group of measure belong those based on a voluntary basis. Specifically in this company, it is Milestone Discussion, financial counselling, a course for the preparation for retirement, part-time jobs, extra vacation, unpaid leave without stating a reason, relief from work on shifts, mentoring/coaching and individual career planning.

One of the tools enabling an individual work environment's adaptation is the repeated discussion, the so-called "Milestone Discussion", with an employer, taking place from the reaching of 60 years of age. The goal of the discussion is, above all, the identification of the needs of individual adjustments in an area's working time, work tasks or workload, the range of responsibility or expected work demands during the senior phase of the circle of working life. The discussion takes place yearly between the direct manager of the employee and the employee. Based on the observations and suggestions from all the staff involved, the manager reports the current satisfaction with the present system and possibly proposes changes. The report is passed to a higher manager, who decides further steps. The discussion should take place at the same time as the participation on a company course preparing older employees for retirement does. If suitable, and depending on personal situation changes of the employee, the employee or their direct manager can ask for the start of "Milestone Discussion" from an earlier age (the bottom limit is set at 55). When taking part in the discussion from 55, the main goal is rather finding out about the employee's wishes and preferences concerning their future development in the company in terms of the competence requirements for individual jobs. Not later than at 60 years of age begins, there is the preparation of a specific plan for the development of selected competencies following the agreed-upon measures and a plan of a gradual transition to retirement.

The relationship between a manager and a subordinate is built upon mutual trust, respect and equality in rights. Superiority x subordination is rather a formality printed in the organizational structure. Real people act as if they were at the same level. Employees in Norway do not fear losing their jobs if they admit a problem in a work activity. Whether it is unsatisfactory working conditions, the onset of health problems or family problems. Managers are trying to solve the cause of the problem as quickly as possible. Letting an employee go, especially before reaching the age of retirement, is an extreme option.

The company offers the possibility of consultations and workshops arranged with individual financial consultants for employees born in 1950 or earlier. In the courses, employees learn about the options for financial investment and securing themselves for retirement, about all the risks and benefits associated with particular variants, and the consequences that the choice of each product would bear. This provides a good basis for correct decisions on funds management. For younger employees, this option is offered from reaching 61 years of age.

A retirement preparation course is provided to employees from 60 (when they decide to participate in the "Milestone Discussion", it is possible to take part in the course even sooner, from 55). The programme of the two-day seminar aims at introducing the employees to the conditions of retiring and relevant formalities, forms necessary to be filled in or what applications should be submitted. As a result of the latest pension reform (2011), the content had to be revised to reflect the new law on retiring that began to regulate flexible retirement. Employees do not only find out about the legislative aspects, but a whole senior policy system of AB Inc. is introduced. That way, they gain an overview of the possibilities of working time adjustments, conditions in the workplace or unpaid leave. Although the internal directives provide a whole senior policy overview with all the conditions for using the various measures, in the course everything is explained in an informal way. Employees can ask questions about uncertainties or propose measures and adjustments that would suit them more. At the same time, they are introduced to the people responsible for the implementing of specific measures in the company. Therefore, they can, if needed, contact them later directly. The leader of the course is, partly, an external specialist and, partly, an HR professional.

There are two forms of flexible working hours in a company – reduced working hours and job sharing. AB Inc. prefers full-time work for as long as possible, but provides the option of reduced working hours as well, mostly 60-80% of the standard working time. If suitable, the percent can be lower. This is, however, particularly the case in job sharing between two employees, where the work time is divided equally 50:50. Due to health regulations, the percent of working hours can be reduced below 50. During the implementation, it is necessary to allow for the certain time required to master proper work task assignment according to the extent of the jobs.

An advantage of the measure is seen in that, even though an employee works only for 60-80% of the standard working time, that does not mean the same reduction in work performance. On the contrary, in the company, it has been shown that work time utilization is more effective. The reduction of performance with advancing working hours is not as noticeable as with a common working time. Reducing the working time to 60% was reflected, in the best scenario, by a lowering of performance to 78%, and with an 80% reduction in working time, the work performance was reduced to 89%.

In the case of part-time jobs, we can say that we employ more people than necessary to achieve a required performance. Therefore, our costs rise due to health and social insurance. On the other hand, such employees are more efficient in shorter working hours, and it is necessary to account for the costs of severance if the employees were let go. Its amount increases in Norway, with the years of service. Furthermore, for a certain time before the retirement, an employee cannot be laid off, that is why a part-time work arrangement is an appropriate form for the maximum utilization of the working capacity of older employees.

Employees after the age of 63, working full-time, are provided week long paid leave, in addition to the usual length of leave. A condition for obtaining it is the last 12 months without being on sick leave. After reaching 65, the full-time employees are entitled to another week of paid leave, this time without further conditions. The extra holiday can be taken as a whole week, single days or hours in the following twelve months. The company cannot transfer the time to the next period or reimburse it. From the 67^{th} year of age, there is a calculation of the days of paid leave in relation to the time of retirement. If an agreement on the transition to part-time work is achieved, the right to the paid leave is again proportionally reduced. Extra holiday is supposed to serve the employee to revive their working abilities, which leads to an increase in work performance after the return to work. It plays an important role in the prevention of health disorders. Norwegians spend their leisure time actively, to keep their mental and physical strength in better shape, which also contributes to a reduction in health care costs.

For employees from 63 years of age, the company offers the possibility to take up to 20 days of unpaid leave without the need to state a reason. If the employee is entitled to a contributory AFP pension, 100% of the wage is accounted to their mandatory income, despite not having exercised their performance. The unpaid leave provides a security that, in the case of a need to resolve some private affairs, they have the support of their employee. Then they can solve their problems immediately and then focus on their work performance without further distractions.

Being a mentor for other employees is completely voluntary. The company actively offers this option as a part of the Milestone Discussion. However, the decision is up to each individual employee. If they are interested, they inform the manager, whether it is during the Milestone Discussion or during usual working time. The manager registers the interest and passes the information to Human Resources. Periodically, during six months, the interest in the mentor position is evaluated in relation to the current needs. Based on this selection, the potential mentors are approached, and the company organises a workshop for them. There they learn how to approach young workers, what their specifics are and what the best methods of skill transfer are, etc. The content of the technical scope of the transmitted knowledge depends solely on the appointed mentor and the manager. Mentoring is performed by the employee in their regular working hours as their new working task, if required. Older employees feel useful in the role of a mentor, they are happy to share the experience acquired and see it being passed to the younger generation. At the same time, young people can give them vigour, confidence and a zest for life. That improves their well being, increasing their ability to work (according to the Working Ability Index – WAI) and decreases health problems in employees. In such a case, a similar age of mentor and novice is advantageous, they understand the problems of their age and are able to estimate the best possible way of skill transfer. The mentor receives no additional salary; only their job description is changed. The course for mentors is organised by the HR department of the company and attended by former and current mentors so that they are able to share their knowledge with others.

When alternating shifts cycles (morning, afternoon, night), an employee from 60 is entitled to omit whole cycles and work only in morning shifts at a standard length. They do not have to participate in extended shift cycles (12-hour shifts).

Individual career planning is a part of the corporate concept of human resources planning. Based on the “Milestone Discussion”, an HR worker, alternatively a manager, tries to estimate the further needs of new employees. They also plan such steps to strengthen motivation, improve the expert knowledge and health status to ensure an older employee is able to perform their job just as well as in the past and feels comfortable and satisfied in the process. This approach allows the spending of personal costs effectively and within a pre-set plan.

4 Conclusions

To sum it up, we can divide age management measures to two groups. In the first one belonged measures required by the Norwegian legislature, above all in the Labour Code, it is mainly a flexible retirement age. Into the second group of measure belong those based on a voluntary basis. Particularly in this company, it is Milestone Discussion, financial counselling, a course for the preparation for retirement, part-time jobs, extra vacation, unpaid leave without stating a reason, relief from work on shifts, mentoring/coaching and individual career planning. The main goal of all measures implemented in the Norwegian company, AB Ltd., was to increase the productivity and loyalty of the current employees and also to take advantage of the synergies between different age groups working in teams to solve working tasks.

The example of the Nordic model of the age management system pointed out a completely different approach to employee care in Norway than we experienced during our two case studies in technically oriented companies in the Czech Republic. Norwegian managers prefer long-term goal orientation. Therefore, current performance and productivity are not crucial to them. They are rather interested in how long they can keep the current level of productivity and how the company can contribute to its sustenance. They are not thinking purely in terms of directly incurred costs but see the long-term benefit of senior policy. As proved in the case of the observation of leading managers in a Norway company, including older employees into work teams led to an increase in opinion and experience diversity. The reduction of the time necessary for a decision-making process occurred (accelerated by 20%) and, furthermore, the solutions were easier to implement and more efficient than with more homogenous teams. This is possible due to a confrontation in creativity and moderation, enthusiasm and experience, verve and detachment. Another result is also the positive effect on employee satisfaction with the work environment. They are willing to work longer (the age of retirement increased, on average, by one year), to act as a mentor to younger employees in the workplace, while not demanding a raising of wages. The work fulfils and entertains them to such an extent that they stay even after reaching 67, the retirement age. For the company, it means cost savings in the areas of employee acquisition and learning. Actions supporting a healthy lifestyle, the possibilities of reliefs within the shift system of work or the bonus leave of absence caused a drop in sick leave of almost a third. That supports the implementing of similar measures in Czech companies that could also, through this, improve the work ability of their employees (WAI).

A difference also lies in the approach of the employees themselves. Czech employees are, as a result of historical development, used to more directive management, to a manager focusing on achieving a maximal performance for a minimal possible wage. New measures, implemented to support employees, could seem untrustworthy to them as a trust in company's intentions is missing. On the other hand, it is not very common to discuss things with responsible managers and to try to find a solution out of fear of losing your job. The approach of managers towards older employees will have to change, if only under the pressure of an aging population. Dwelling in prejudice and praising the "cult of youth" cannot last forever if the number of children born keeps declining and the retirement age keeps rising. If others prefer employing young, perspective and creative graduates, a company could focus in a different direction that is employing older people (naturally in combination with other age groups). According to the experience from Norway, this does not incur great financial costs in most cases; rather it is necessary to devote a manager's time to surveying the situation, the exploration of employee needs and solution proposals. An endeavour to improve the situation of employing people over 50 is dealt within current European Union politics. Therefore, as well, it is possible to expect the release of financial resources into relevant European funds during the upcoming programme period. A company then would not even have to pay entry costs, for example, on acquiring ergonomic aids to equip the workplace or for the labour cost of an external consultant for seniors. Moreover, it could label itself as socially responsible because it supports employing a risk group on the labour market.

Apart from increasing the diversity of a team and the acceleration of correct decision making, an experienced employee also brings other advantages of a long-term character. For example, it reduces employee fluctuation, because older employees, according to our survey, prefer stability rather than constant changes. We can see another benefit in the upbringing of loyal and reliable employees with a network of social contacts and diverse interests that, in the time of crisis, can become a pillar of the company, as their solidarity with the company manifests, for example, in their willingness to reduce their salary, retreat from some benefits, move to another position or to obtain a new contract. An important advantage is also the possibility of obtaining a contribution for the salary costs from the Labour Office when acquiring a long-term applicant or tax relief. When creating a socially beneficial job, the contribution could reach CZK24,000 for the wage and financing the requalification of the applicant with the company.

Another advantage is, according to Norwegian experience, easing the transfer of "tacit knowledge" through mentoring to new employees. The company saves on external training, as well as on the time needed for training and, at the same time, it uses the working hours of a current employee, enriching their job content.

In the Norwegian experience, there is an improvement in the transfer of "tacit knowledge" through mentoring and diversified teams. These teams make faster and more reliable decisions than homogenous teams. At the same time, there was no sharp increase in personnel costs, since the application of most of the measures is implemented by the employees of the company during their work time. Only in exceptional cases (external financial counselling lecturers

and the preparation of a retirement course), a one-time increase in funds release occurred. On the basis of the analysis performed, it came to light that the company also implements optional measures of age management if they result from discussions with employees, as needed to maintain their working ability. Continuously, a verification of functionality and compliance of the current state runs with the individual needs of the employees, being it through "Milestone Discussion" or on the basis of a manager's recommendation.

The main purpose of all the above-mentioned measures is to increase competitiveness by keeping the experienced workers and securing the transfer of their knowledge and experience to the younger employees. That is why some of the measures do not have an immediate positive economic impact. They are rather focused on the long-term rise of employee satisfaction, increasing their loyalty towards the company or establishing trust between them and managers, who are then able to, after the early recognition of a problem connected to a higher age (for example, the need of a different kind of education when implementing a new technology), forgo the problem. As a result of the below-mentioned measures, the company managed to increase the average retirement age by one year, which means that they are about to make use of the experiences of their employees for a longer time and do not have to go through the new employee acquisition process that often.

Measures to support the employing of people over 50 are met with incentives from the Norwegian government, as well as from non-profit organizations. It could even be said that the main initiative comes from the public sector that is trying to motivate companies to become a part of these endeavours. Implementation into the Czech environment could be problematic, with respect to the different way of communication between the private, public and non-profit sector. That is, in the Czech Republic, built on a more formal and mandatory basis, in comparison with Norwegian reality, which is based more on long-term informal relations and an effort to forgo problems altogether.

The European Union, as well as the Czech Republic, has developed plans to support the integration of the 50+ age group into the workforce. A part of the project, there is a possibility of co-financing the implementation of the measures in companies with the goal of ensuring better working conditions for older employees and their retention in an employable state up until a late age. Therefore, it is a good time for companies to try to implement, or, at least, to get acquainted with, the principles of Age management. Only a few companies have yet appreciated the employment of people over 50, so there is still a range of high-quality candidates with industry know-how, whose acceptance into the company could improve its competitiveness. Sooner or later, as a result of population development, the cult of youth will have to be abandoned and then the early adopters of senior policies will have a head start.

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How to Develop and Manage a Participative Organization in Social Services with Children and Youth?

Pavel Navrátil

Abstract: *The idea that children and adolescents can and should participate in decision-making in the context of social services management for youth and children started to be discussed relatively recently in the Czech Republic (Nosál & Čechová, 2014). Earlier views on participation focused mainly on adults, and at the same time the area of services for children and teenagers was based on the assumption that by involving adults (parents, teachers and social workers) the best interests of the child would automatically be represented. McNeish and Newman (2002) note that currently there is no longer a debate about whether to include children and young people in the decision-making process, but rather ways are being sought to find different approaches to participation which apply in different conditions and situations. In the Czech environment, however, it still seems that the involvement of children and teenagers in decision-making in the context of social service management is not routine. The text is very first of the outputs of the Czech-Swiss project, whose research and the practical aim is to analyze and transfer experience from children and teenagers participation in the Swiss social services. The goal of the essay is to review the academic and professional literature on the topic of participation of children and adolescents, especially from the domestic and Anglo-Saxon environment to establish conceptual framework and knowledge base for empirical research (which we do not present here).*

Key words: children · participation · youth · involvement · social services · development of organization

JEL Classification: D23 · L32 · L23

1 Introduction

Current debates about involvement and marginalization dominate the agenda of many European political debates. There is a growing concern about the stability and sustainability of social cohesion and an increasing number of groups of people who are seen as being at risk of being socially excluded. In today's discussions, welfare services (understood in a broad sense) have a central position. There are strong expectations that welfare services can limit marginalization and support participation (Matthies & Uggerhøj, 2014).

Also, all children have a fundamental right to participate (Grugel, 2013). Several provisions of the Convention on the Rights of the Child refer children's right to participation (The United Nations 1989). Participation is one of the fundamental principles of the Convention, as well as one of its core challenges. The Article 12 of the Convention on the Rights of the Child declares that children have the right to engage in decision-making processes that may be related to their lives and to influence decisions taken in their regard (within the family, the school, the community, and social services). This right is especially relevant for children in the child protection system (e.g. children in risk). However, participation is not a simple process and can be easily misunderstood. The literature presents an array of ideas about involvement, and the meanings of the participation concepts are often presented very contradictorily or even vaguely. We suppose that clear understanding of surrounding concepts is necessary to be possible to use them meaningfully. Therefore, we decided to dedicate the essay to clarification of the concepts.

2 Methods

This study is the grounds laying output of the Czech-Swiss project, whose aim is to transfer practical experience about children and teenagers participation in the Swiss social services to the Czech ones. On the base of this project, a series of theoretical and empirical studies should arise. In the text, we focus on the conceptualization of the issue of participation and elaborate the concept of participation, which we need for following empirical studies (mainly case studies). The principal method we use at this stage of research is the desk research (Huberman & Miles, 2002). In this article, we review the academic and professional literature on the topic of participation of children and teenagers, especially from the domestic and Anglo-Saxon environment to establish conceptual framework and knowledge base for next stages of empirical research. We focused on the articles published in peer-reviewed academic journals or monographs which focus on the topic children, youth, participation, social service/ social work. As well we relate to some international and national documents.

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3 Desk research results

The idea of participation currently brings very significant suggestions with regards to the innovation of social services in the field of social work with children, teenagers and their families (Nolan, 2007). It should, however, be noted that participation is not a simple and readily applicable concept. Besides, in the literature, there are various meanings of participation, and each of them brings a specific point of view or a way of understanding participation and also a particular concept for the participatory processes. Therefore, it is necessary to define different approaches and explain our understanding of participation.

3.1 Participation of youth and children in development and management social services

According to the Academic dictionary, the term participation can be defined as attendance, involvement or interest (Kraus, 2009).

Boyden and Ennew (1997) however, explain that there are at least two basic concepts of participation. According to the first, the term participation is a synonym for the simple attendance or the presence at a place or activity. The second approach seeks the essence of participation in the sharing of power, and it understands participation as a form of empowerment that allows all parties actually to participate in decision-making. Although we prefer the understanding of participation as a form of empowerment that allows a real contribution to decision-making, we recognize that this requires a much more sophisticated approach than is described in the first concept of simple participation, which appears to be relatively easy to reach.

The participatory approach to children and teenagers is based on discussions of participation, which were originally carried out in the context of adult members of society, i.e. citizens with voting rights. The authors Sherry Arnstein (1969), Brager and Specht (1973) who are now considered classical, published reflections on the participation of adults which is still influential to this day. Arnstein (p. 216), for example, in her notion of participation emphasized the idea of sharing resources in a democratic society and she understood participation to be a means of fundamental social reform: „…citizen participation is a categorical term for citizen power. It is the redistribution of power that enables the have-not citizens, presently excluded from the political and economic processes, to be deliberately included in the future.

The visionary work of Arnstein (1969), Brager and Specht (1973) has been intensely elaborated upon in the last three decades in the context of participation of children and teenagers. For example, Czech author Kaplánek (2012) in understands participation as a tool for the education of a democratic citizen, i.e. an individual who is capable of "everyday democracy" and is prepared for the maximum involvement in the decisions that concern them. According to him, it is already necessary to experience participation from childhood, and in all socialization systems: in the primary (family) and the secondary (kindergartens, all levels of schools, educational establishments, alternative care facilities). It is, therefore, essential that children in social care also enter into the participatory processes because these children are particularly vulnerable and for them the participatory experience is a means of strengthening and empowerment.

In general, it seems that regarding the participation of children and teenagers the same principles can apply as those relating to the participation of adults. However, it is necessary to take into account some specifics, which are relevant to childhood and the young age of the subjects. McNeish and Newman (2002) point out that the following factors should we consider the participation of children and youth. Social interpretations of childhood in a given culture; legal and social competence; continuity and speed of development; a different perception of time by adults and by children. We are now going to outline the basic reasons on which participatory thinking is based when working with children.

3.2 Reasons for involving children in management of social services

Are there any reasons for participatory practice in researched literature? There are many good arguments for involving children in decision-making. The range is very diverse and among them, we can find ethical, political, legal, pragmatic, religious and philosophical motives (Thomas, 2012). Some of them we will now present and outline.

One group of arguments refers in particular to the need for enforcement and implementation of children's rights. In principle, it points to the fact that children are citizens and service users and share the same basic rights to attend and participate like everyone else. They (the rights) should not be denied. Another group of arguments relates to the development of the rights of customers and users. Different groups of customers and users of social services express their wish to participate in the development of the services. Their interest in and specific pressure are increasing (even in the target group of children and teenagers) as they want to influence the goals and the form of services that are provided either by state or non-state organizations. The participation can also be viewed as a simple legal obligation. The children's right to participation is contained in a series of legal documents, particularly in the UN Convention on the Rights of the Child (specifically Article 12), in the Law on Social Protection of Children 359/1999 Coll. (and, of course, others). Participation can also be understood as a tool to improve the services provided. The consultation with children enables an improvement of the provided services and their adaptation to the changing needs. The children can help define them. Participation, therefore, leads to more accurate, more appropriate decisions that are better informed, and thanks to the participation the likelihood that the jointly made decisions will be implemented and will be more

efficient increases. Benefits of children participation for groups and organizations summarizes Ministry of social development (Involving children: A guide to engaging children in decision-making, 2003):

- It is an opportunity to understand children better.
- Children bring new perspectives and knowledge.
- You can develop more effective policies, services, programs by including children's perspectives in their design, planning, and delivery/implementation.
- You can build a more positive, democratic organization.
- You can decide where to use your resources (like money, people, and time) more effectively.
- You can promote positive attitudes towards children.

Participation gives children a certain level of influence and an element of choice and can help them understand their wishes and needs. Another set of arguments emphasizes that participation leads to a strengthening of the democratic processes. Through participation, children become better prepared for life in a democratic society and, therefore, can become active members of their community. At present, the question of the development of "civic-mindedness" has also become highly attractive and political. Children as the future citizens (with voting rights) must be able to learn "somewhere" how to be active members of their community and state, how to participate in their management (governance). For promoting participation experience also shows that participation improves the protection of children. Participation is proving to be an important element in the protection of children. Repeatedly it has been confirmed that it was the failure to listen to children, which in specific cases contributed to their abuse. Other arguments then point out that participation helps to develop important life skills, mainly: communication, negotiation, prioritization skills, and decision-making. This set of arguments is followed by another, according to which participation does not only support individual skills but also encourages the development of the whole personality. Effective participation, in fact, may contribute to the development of confidence in their abilities, to increase their self-confidence and to help clarify their identity. Many authors see participation as a comprehensive process, which is also associated with the transcendence of our being. A man becomes a man precisely because they participate in the divine dignity, in their environment, in society, in the context of culture. Participation is presented here as something fundamental and innately human, without which a man cannot be a man-.

Based on the above arguments, participation could be seen as a panacea that will eliminate all the difficulties and problems of society and individuals. Such a simplified understanding would certainly be naive and incorrect. Participatory discourse brings the significant focus on democratic values, which brings the interaction of man with his social environment into focus. Such an object of interest is perfectly in line with the core values and focus of social work. At the same time, it is to be noted that the practical implementation of participation has some ideological and practical limits. As Healy pointed out (Healy, 1998), participation is a process that must be seen in context. However, to rigorously analyze the circumstances that influence participation, one must first clearly define the areas in which the participatory processes occur. Each area is undoubtedly restricted to different contexts that define the specific conditions which either limit or support participation, its potential, and necessary forms

3.3 Basics for children and youth participation

Matthies and Uggerhoj (2014) define participation as an involvement of people into the decision-making process, management and administration. The same authors, however, in addition to political participation also refers to participation in the economic and social spheres. According to them, the context of economic participation is especially about a co-decision in the areas of work and the job market. Social participation by Matthies and Uggerhøj then relates to the affiliation of a citizen to social groups and possible voluntary memberships in clubs, associations, and other organizations.

However, there are also other typologies of areas, which describe the application of participation from another standpoint. When working with children and teenagers participation may be implemented in five areas according to McNeish and Newman (2002): 1 / individual decision-making; 2 / the development of services; 3 / involvement in the community; 4 / politics; and 5 / research. The first area of participation is, therefore, an area of individual decision making and relates to the decisions about all aspects of a young person's life. Therefore, in this sphere, the point is to allow children to be involved in decisions about themselves. The participatory law applies not only to ordinary family life but also especially to situations, where there is a crisis, and the child enters the system of social (as well as health) services. For example, when a family and marriage disintegrate, in situations of child neglect, in foster care, when in need of medical treatment, etc. It does not mean, however, that the participatory rights should only be limited to a crisis. To the contrary, participatory thinking must permeate an everyday approach to child care, it is a component of individual social work. In crisis situations, however, the assurance of participatory rights is essential. How can we support the increase in the quality of services in individual decision making?

McNeish and Newman (2002, p. 195) provide a list of essential conditions that need to be complied with and possibly developed, to support young people during their individual decision-making process:

Figure 1 Key factors supporting individual decision-making

Informing children	Children should be adequately informed so that they can make informed decisions.
Time and explanation	Children should be provided with sufficient time and adequate explanation so that they could understand.
Ongoing consultation	The decision-making process must be set up as a continuous process.
Non-judgmental support	The support must be available and above all non-judgmental.
Place and conditions	It is also necessary to prepare a suitable location that is sufficiently comfortable and private.
Time for preparation	The child must be prepared for such a situation, and the situation must also be re-evaluated with the child.
Impartiality	A worker who facilitates the participation process must be capable of an unbiased attitude.
Priorities of the children	For the child to feel that they are a partner in the process, it is necessary to take into account their priorities.
Child's "advocate."	In many situations, it is preferable that an advocate represents the view of the child.
Needs of children	The involvement of a child in the decision-making requires specific sensitivity to all their needs.
Feedback	It is necessary to discuss and examine the resulting situation with the children.

Adapted according to McNeish and Newman (2002, p. 195)

The second area concerns the participation in the development of services. In this area, the children and young people as service users can participate in the planning, delivery, and evaluation. The involvement of children and young people in this area can help an adequate shaping of services that can then better meet the needs of the target group. It should be noted that while the involvement of children and young people in all stages of service development is in recent years relatively common, the young people engagement in this context is still quite taboo in the Czech Republic. There are many forms of participation of children and young people in service development (see Fig. 2). Some of the common forms of participation of children and teenagers in the development of services abroad (Switzerland) are mainly consulting, but also more active forms of participation, where young people cooperate on a long-term basis with project managers. Some agencies, for example, engage young people in the advisory, or directly in the governing bodies. In most of these bodies, the young people cooperate with adults, but there are also cases where these bodies are composed entirely of young people. Other forms of participation of children and teenagers also include participation in tenders for representatives of a service or project, collaboration in shaping the principles and standards of a service or project and a presentation of a project. Recently, an increasing effort has been made not only to engage young people in designing new projects but also in their evaluation.

Figure 2 Overview of forms of service innovation by engaging children and teenagers in Switzerland

One-off consultation with children from the target population (in/out of care)
Active (long-term) cooperation with managers
Establishment of advisory bodies • Committees • These bodies can be composed only of young people, combined
The involvement of former service users • Evaluation of services • Training of workers • Provision of services to children and teenagers

Source: author

Experience with the involvement of children and teenagers was first made in the private non-profit sector, but it is also increasingly imported into the public service (Omeni, Barnes, MacDonald, Crawford, & Rose, 2014).

Another (third) area of children and teenager participation is in the community sphere. This area of participation opens up new opportunities for children and young people to participate in community development. The community here might be a local community, but also interest groups that do not respect common geographical location. The fourth area of participation is the area of politics and public opinion. New ways are being investigated which would encourage children and teenagers to be involved in influencing public opinion and politics. Often it is done through the involvement of young people in the media and public campaigns or their participation in public discussions, etc. The last (fifth) area of participation can also be the area of research. Young people can participate in research in various roles, as consultants, interviewers, they may participate in the formulation of research questions or the questionnaire and, of course, they may enter into the next phases or activities of the research.

3.4 Levels of participation

Literature recognizes not only the areas of participation but also the levels and forms. By the form of participation we understand ways of how to learn it, implement it and raise its level, while the level of participation on the other hand rather assesses the degree and quality of participation. Sinclair (2000) compares the concept of forms and levels of participation by various authors:

Figure 3 Forms and levels of participation

Arnstein (1969)	**Thoburn, Lewis Shemmings (1995)**	**Hart (1992, 1997)**		**Shier (2000)**
Civil proceedings	Delegated power Involvement in the development of services	Decisions initiated by children shared with adults (*self-management*)	**Actual p.**	Children share power and responsibility for decision-making
Delegated power		Decisions initiated and implemented by children		
Partnership	Partnership Participation	Decisions initiated by adults shared with adults		Children are involved in decision-making
Reassurance	Involvement Consultations	Consultation and information		Children's views are taken into account
Consultations	Full awareness/information	Decisions implemented by adults, children are informed		Children are encouraged to express their opinions
---	---	Tokenism	**False p.**	Children are listened to
Therapy	Reassurance	Decorating		
Manipulation	Manipulation	Manipulation		

Source: Sinclair (2000, p. 2)

Figure 3 presents a typology of forms and levels of participation by various authors, who base it on the general (political) concept of Sherry Arnstein (1969) and adapt her model to the situation of children and teenagers. Perhaps the most famous models of the level of participation of children and teenagers include Hart's model (1992; 1997). He distinguishes between types of participation regarding the degree of power that is shared with the children. As we consider his classification to be representative and especially usable in practice, we will pursue it in more detail in the text below. How can the Hart's typology help us? It can help on the one hand to distinguish what can be considered actual participation, but it also, on the other hand, supports our thinking about the level of participation which is reasonable in a given situation.

The area called false participation, represents different forms of child participation where such involvement of children is seen only as instrumental concerning the interests of the adults. Adults through "the involvement of children" reach their own goals. Children are subordinate to adults in their powerlessness, and their engagement is not authentic. It does not express their essential interests, views, feelings though the adults may think it does or they may pretend so. In contrast, the area of actual participation includes such forms of involvement of children in which children gain an opportunity for authentic expression while the level of implementation of their interests varies according to the type of participation. While the children are seen to be rather passive recipients of the adults' notification, in the context of self-management they are becoming autonomous entities, fully implementing the power over their projects.

In the researched literature, there is a discussion about whether it is necessary and desirable always to strive for the highest level of participation. Many authors believe that the participation level must be carefully assessed with regards to the relevant circumstances of the child or children involved. For example, according to Treseder (2004), the idea that it is always necessary to achieve the highest participation level is quite misleading for it is necessary to choose such a level of participation that best meets the interests of the child. The purpose of participation is to benefit the children, rather than to expose them to undue burdens or responsibilities. Participation, therefore, should be accepted as one of the tools supporting efforts in promoting the child's best interests, not as mechanically applied device.

4 Conclusions

The right for children to participate in decisions affecting their lives was established in Articles 12 and 13 of the United Nations Convention on the Rights of the Child, ratified in 1989. Since then, children's and young people's participation in child welfare and protection services has been the focus of research, policy development and legislation. The Convention determines that children must be heard and that their views have to be taken into account by age and maturity (Vis & Thomas, 2009). International research community first focused on whether children and young people had a say in decisions about their lives. It was accompanied by a growing knowledge of the benefits of children's participation in such decisions, an awareness that has been increasingly transformed into legislation. Many studies have emphasized the importance of participation in the development of children, especially children in care. For example, participation in decisions about their lives helps children feel connected and committed to the decisions that are taken (Woolfson, Heffernan, Paul, & Brown, 2010); it may lead to an increase in self-esteem (Vis, Strandbu, Holtan, & Thomas, 2011) and personal mastery. Additionally, by taking children's views, wishes and expectations into account, management of interventions might be more responsive and, therefore, more effective (McNeish & Newman, 2002). Although there is a general agreement about children's and young people's participation, it is difficult to put into practice.

The goal of the essay was to review the academic and professional literature on the topic of participation of children and teenagers, especially from the domestic and Anglo-Saxon environment to establish conceptual framework and knowledge base for empirical research. First, we briefly outlined the basis for participation of children, next we discussed the meaning of the topic of participation of children and teenagers, we also described the areas of participation of children and young people and lastly we considered the levels and forms of participation. Based on these concepts and knowledge we finally described pre-requisites for the involvement of children and teenagers in the development and improvement of the quality of social services, and we proposed a model for the implementation of the participatory practice.

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Life Coaching as a Means to Build the Identity of Young People

Jitka Navrátilová

Abstract: *There are many approaches and methods to that facilitate the achievement of intended goals for their users. The question of selected method is always crucial, because the kind of method you select largely influences the form of the result achieved. In this paper, I consider and argue the use of life coaching when working with young people as a method of facilitating the management of risks that arise from countless offers and options, to which the young are exposed (Giddens, 1994). Despite the great possibilities open to young people, we encounter significant failures, and often the criminal activity of young people, whose brutality is sometimes startling. It turns out that adolescence has never been as difficult as it is today (Giant, 2015). This work builds on the assumption that if young people are to be able to face social risks and challenges, they need to cultivate such skills and abilities in themselves that will allow them to not only survive, but primarily organize a life in which they benefit not only themselves, but also contribute to the proper functioning of society. I followed from authors who emphasize the need to develop and cultivate the identity and potential of individuals, which are the source of improved well-being, despite difficult situations (Masten, 1990; Ferguson, 2001; Seligman, 2004; Anderson, 2004; Saleebey, 2006; Lopez and Louis, 2009; Giant; 2015). The aim is to discuss whether life coaching can be regarded as a method for supporting young people in discovering their identity and carrying out safe life projects.*

Key words: identity · life coaching · young people · postmodernity · potentiality · reflexive project

JEL Classification: A14

1 Introduction

Almost limitless possibilities and opportunities are nowadays open to young people, from which they can choose and shape their own lives. But being able to choose correctly may not be easy, and for many, it is the requirement of a choice so difficult that they eventually avoid it altogether (Ludwig, 2013). For young people, the situation may be even more difficult, as they cannot rely on their experience when deciding, for they do not have any yet; and on top of that, they can be far more influenced by fashionable trends, which may overwhelm them more easily. This may lead to the fact that young people take on identities and create life biographies that bring them no benefits. It is alarming that the number of young people who commit crimes is increasing, their brutality increasing, more and more of those suffering from depression; and those who are flirting with the idea of death or voluntarily choosing to end their lives growing in numbers. These are very serious matters that lead to the need for a greater understanding of the fact that young people find themselves face to face with great opportunities offered by the postmodern era, what it means for them, and how to support them in order for them to seek life projects that are not dangerous for them, nor for their surroundings. I consider the extent to which the life coaching method can help young people uncover the meaning of their lives and identity, through which they can realize their full potential.

2 Research material and methodology

The main purpose of this paper is to reflect on the ways, in which we can help and encourage young people in their effort to find their way in life and to succeed, despite the uncertainty of today's postmodern era.

Firmly embedded identity versus identity as a reflexive project

The issues of searching for identity have a specific form in the context of the postmodern era. One of the most striking characteristics that characterizes the postmodern era is the process of individualization, which changes the firmly embedded identity of traditional societies into identity shaped as a reflexive project. As long as identity had been handed down from generation to generation as an unquestionable fate, the issues related to personal identity were essentially impossible (comp. Navrátil, Navrátilová, 2008). According to Bauman (1995), questions about identity rises from existential insecurity, uncertainty and non-definiteness of all its forms. Personal identity becomes problematic when gaping social bonds provide freedom, and at that very moment, the need to model one's own identity. In this context, Giddens (1991) speaks about the project of the reflexive self, which he understood as an emerging identity that

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is socially constructed. Our self, human identity, is shaped and molded by life experience, which we gain during the course of our lives. Identity is not a fixed entity, but it has a fluid character. Man continuously integrates the events of the outside world and thus creates his own life biography, his own story about himself. In essence, the existence of reflexive self means that each individual creates their own identity, a biographical project as an individual project, where they themselves are principally responsible for the result of the self-creative process. As Zygmunt Bauman (1995: 125) metaphorically expresses *"... and we now know or feel that there are no other ways than those characterized by our own steps in the soil at the moment we go over it…"*. According to Bauman (1995), the fact that nowadays we no longer live and breathe a project, but projects, is characteristic in the process of creating our own biography. The design of our own identity is a reflexive project to the effect that individual people constitute and negotiate their identities through critical reflection and under the influence of a constant flow of new information. This reflection is continuous in nature and may at any time change the trajectory of our life.

According to Giddens (1992), the realization of identity as a reflexive project primarily means that questions arise in an entirely new form: "Who am I?" "What is the purpose of my life?" "What goals are worthy?" "Who should I be?" "What work should I choose?" "How should I live?" "What values should I profess?" "What kind of life should I choose?" Existential psychologist Viktor Emanuel Frankl (1996) points out that these questions in principle cannot be circumvented or permanently suppressed. Every adult must answer them in some form, and they also inevitably assume final responsibility for the answers (comp. Frankl, 1996). As postmodern individuals, we take responsibility for the answers to these questions.

The increasing quantity and variability of information places the postmodern person before the constant requirement to make decisions and choose. This requirement places demands on individuals to acquire new skills, which will help them make decisions and plan their own lives. Ferguson (2001, 2003b, 2004) understands this need for the active shaping of personal life projects as a key parameter in defining postmodern society. It is therefore not at all surprising that popular topics related to issues of lifestyle, nutrition, personal development, etc., which characterize the effort to personally seek acceptable and valued ways of life, are massively popular. As noted by Navrátil and Navrátilová (2008), these actions can be interpreted as a search for an alternative of a lost life meta-goal, social norms providing instructions for life. The importance of these topics is also emphasized by the fact that the most important research topics that occur in sociology include those related to the quality of the life being lived (Hamplová, 2006). The effort to ensure that clients choose their own solutions and use their own resources to solve their problems is behind discussions on the use of strength-based perspectives in the helping professions, such as social work, social pedagogy, special pedagogy, adult education, and so on. (Salebeey, 2006).The issues of finding personal development and success are, in disciplines such as management, human resource management, human resources and so on, presented with a great interest in leadership, coaching and other development methods.

3 Results

Young people and the creation of life projects

The need to actively build our life biography is not only the privilege of adults. Although Frankl (1996) talks about the fact that every adult individual bears the responsibility for how they will respond to the questions related to their existence, the primordial questions about our identity arise before us much earlier than in adulthood. A number of opportunities and challenges, which are a feature of the postmodern era, is one of the reasons for the early confrontation of young people with issues related to finding their life projects and the need to choose among a number of potential life biographies.

Many authors point out that the combination of the amount of options, which a postmodern man is exposed to, and the lack of a socially structured social life and individual identity, create the pressure of uncertainty on an individual, resulting in the increased occurrence of new hazards (e.g. Bauman, 1995; Ferguson 2001, 2003b, 2004, 2003c; Frankl, 1997).The amount of young people who fail in their life journeys reveals the vulnerability of youth to this pressure of opportunities. The endless ocean of possibilities that opens up before our young can become dangerous waters, waves that can easily drown the young. Long-time youth counsellor Nick Giant points out, in this context, that:*"*"*...Many children growing up in today's world are richer than any previous generation. Millions of children have mobile phones, brand clothes, video game consoles and many other 21st century achievements. They have access to more information. The world is the largest library for them, which they have it at their fingertips. They are generally more educated than their parents and grandparents. According to this, children should be the happiest, healthiest and most successful people on Earth. And yet, there are incomprehensible stories of youth bullying, depression, suicide, theft and many other problems that plague our children. It seems that adolescence has never been harder than today!"* (2014, p. 19).

Possibilities and the associated uncertainties among youth have accelerated in connection with the expansion of social networks, which are currently the most visible place for creating identities, the confrontation with them, and a place creating false identities that can have very negative consequences if accepted by young people. The postmodern era creates many opportunities for the creation of false identities becoming the image of a social atmosphere, which creates pressure to a conformist acceptance of a certain identity - the life project. For example, Ivo Možný[21] points out that the social atmosphere of consumerism, in which young people live, leads to the fact that they do not start families. A social climate that creates a feeling of lacking money forces them to earn more and more money, although the money they already have is enough to start their own family. The life project associated with parenthood is very easily replaced by the project aiming to earn as much money as possible. Frankl (1997) sees the escape towards the conformism of consumerism as the consequence of the fact that man no longer has instincts that previously told him what he must do and what he should do. Their absence leads to the fact that many people do not know what they want and even what they should want.

Conformism has many forms among the young. The typical display of youth, for example, means that young people listen to the same music, go to the same movies, admire the same heroes and wear the same clothes. Punová (2015:74), referring to Klainová (2005, p. 68), states: "*Clothing businesswoman Elise Decoteau said about her teenage customers: 'They live in packs. When you sell something to one, you sell it to the rest of their class, and then the whole school'."* We would certainly find many similar examples. The uniformity of thought also contains the danger that this could, in an avalanche-like manner, become fashionable behaviour that may lead to catastrophic consequences, and in extreme cases death, for a young person. Creating a cult of super slim models may leave behind legions of young people suffering from anorexia, or those who do not have a good relationship with their body. The acceptance of violence as a way of solving problems may, with young people, give a false impression that shooting a gun solves, for instance, their problems at school. An example might be a 15 year old boy from Estonia, who shot his German teacher, or a student two years older, also from Estonia, confiding the planned shooting to one of his classmates the day before, that he would solve all his problems at school with a gun the next day. The problematic and criminal behaviour of young people is gaining new connotations in the context of virtual reality, which has become a natural environment for young people. If Matoušek with Kroftová (1998), at the end of the second millennium, pointed out the research surveys of Centerwaala (1992), that watching violence in movies increased violent crime within an interval of ten to fifteen years, then the Internet accelerates this process significantly. The 17 year old boy from Estonia who wanted to solve his school problems with a gun had posted pictures of wars and weapons on his FB profile a few days before the planned event, and wrote:"You have inspired the serial killer in me"[22]. This is one of the sad cases where a young person, who was considered a good student by his teachers and classmates, developed a problematic identity - he identified with the life project that has dangerous consequences both for himself and his surroundings. These and many other cases filling the pages of newspapers and other media point out, over the mantle of tragic stories, the difficulty of discovering one's own sense of life and identity.

I believe that young people more than ever need to have a helping hand in "the uncertain waters" of today, which will assist them in discovering their own identity and the creation of life projects that would contribute to their well-being. Although this aid can be seen at multiple levels, I see it in this work as an accompaniment in the development and cultivation of skills of young people, which can help them safely choose from the number of options and opportunities they are daily exposed to, in order to create their safe identities.

The development of young people's potential as an approach to shaping their identity

As previously mentioned, a large number of opportunities can pose a risk for young people, which can negatively affect their life trajectory. In the postmodern context, however, the risk is perceived positively as well. For example, Giddens (1994) sees risk as a challenge that can inspire our life vision and plans. Although young people need support so that they do not lose themselves among various opportunities, it is not desirable to focus purely on the elimination of such risks. Many authors (Giants, 2015; Munford and Sanders, 2015) suggest a helping hand in the form of cooperation, which would provide an opportunity for young people to realize what they want to achieve in life, to discover the meaning of their lives, to discover their own identity and to learn how to make decisions and how to choose. This cooperation is based on the premise that young people have sufficient potential and ability to handle all of this. Working with young people's potential has become the core direction and the lens, through which we can assess the way they handle the risks that surround them. The cooperation between young people and those who assist them in achieving their plans, therefore, involves the discovery, cultivation and development of this potential. Focusing on the potential instead of the deficiencies brought a new view of individuals, who face their own problems, as well as a new view

[21] http://echo24.cz/a/wMFWf/mladi-si-zvykli-na-vyssi-komfort-na-zalozeni-rodiny-nemaji-penize

[22] http://zpravy.aktualne.cz/zahranici/strelba-v-esotnske-skole-zak-zastrelil-ucitelku-nemciny/r~940d431c5ded11e4b6d20025900fea04/

of professional work methods. According to Weick et al. (1989) the consequence of the deficiency approach is a belief that individuals alone are not able to cope with their situation. By contrast, focusing on the potential is based on the idea that every individual has the capacity and resources to manage their situation (Salebeey, 2006). Concentrating on the potential opens a door to the discovery of one‘s own unsuspected possibilities and to the creative use of these possibilities in forming one‘s own life projects.

Youth is one of the most important periods in person’s life. During this period, young people are intensively preparing for their future in terms of both work and private lives. Professionals working with young people therefore face a crucial question: how should we cultivate and develop the potential of young people so that they are able to build safe life projects and identities for themselves? There are different approaches to shaping young people's identities. In this work I have drawn on Giddens' (1992) concept based on the social construction of identity, which is sensitive to different social and physical environments, in which young people live (Thomas and Holland, 2010). Within this concept the identity is then understood as a dynamic search for the person’s own meaning and social status in different contexts, e.g. a family, school, peers, etc. (Munford and Sanders, 2015). Young people then, based on the values encountered in these contexts, create their own reflexive self, which has a major impact on shaping and designing their personal identity. Punová (2015) in agreement with Sharland (2006) points out that: "*... although there are a number of risks, which may threaten the teenagers, we should not forget the fact that young people themselves are shaping their lives and that their life trajectory depends on the context of their social, material, cultural and relational world. "* (2015, p. 76) .Munford and Sanders (2015) point out that, given this approach to identity formation, young people need help with discovering and exploiting new opportunities through which they could actively build and promote their own identity. According to Punová, (2014) one of the prerequisites for strengthening a person‘s identity is the development of resilience skills that enable young people to cope with "adversity.

Schools represent one of the most distinctive contexts, within which we can work with the potential of young people and in doing so shape their identity. Chip Anderson (2004: 1) argues in relation to the development of young people’s potential within the educational process that *"... this concept of education involves teachers who deliberately and systematically seek discovery, development and application of their own abilities and potential in order to improve their teaching methods, which would enable them as part of the educational process to help students to discover their talents and potential, to develop their thinking and ability to solve problems and achieve an optimal level of personal excellence., "*The basic fact that we work with, when considering young people in the education process, is the acknowledgment that each of them has potential. The duty of the educators is then to help students to become aware of it and to actively assist in its cultivation and development (Lopez and Louis, 2009).

The work on the development of young people’s potential, as seen by many authors, lies in supporting their creativity, in developing their personal talents and cultivating their minds. Focusing on these characteristics seems essential in terms of achieving their personal excellence and in helping to build their future success (Peterson and Seligman, 2004; Seligman, 2003; Saleebey, 2006; Lopez and Louis, 2009; Giant, 2015). A search for personal excellence becomes a search for one‘s own meaningful life projects that form the identity of the young.

Life coaching as a tool for discovering the identity of the young

There are a number of development methods that help to cultivate the potential of individuals. I focus my attention on life coaching, which I see as an appropriate method that enables young people to consider their life biography and to reveal their identity in order to achieve success and happiness in life. Timothy Gallwey (1974) and John Whitmore (1992), who formulated and developed the method of coaching, considered the cultivation of thinking to be an essential prerequisite for success in life and for the development of one‘s potential. In the early 70s Gallwey began to publish texts (1974) that formulated coaching as a new method suitable for the development of personal and professional excellence achievable by everyone. His professional work and experience led him to the realization that the our state of mind has the most fundamental impact on our performance. Therefore, it is necessary to pay attention to our minds and to reveal our inner game. His "Inner Game" not only brought knowledge about the importance of working with our mind, but it also showed the direction in which to focus our attention in order to win (Gallwey, 1974, 2004). Becoming aware of the sort of inner game each of us plays helps to reveal our inner fears and insecurities that are common obstacles to the achievement of our goals. According to Gallwey (2004), reflecting on our own "Inner Game" helps us not only to improve our own performance, but also to realize that we do not play in order to win, but to learn something, to use our own potential.

Coaching is based on fundamental principles that include the following: trust, awareness and responsibility. A good coach always encourages the coachee to believe in themselves, to believe they can achieve their goals, to become aware of and to understand the situation, in which they find themselves, and finally, to take responsibility for their lives.

The basic premise is that we alone are responsible for the kind of lives we live, and also, for the choices we make in life (cf. Gallwey, 2004; Haberleitner et al., 2009; Whitmore, 2013). In this respect, coaching is fully compatible with the Giddens reflexive self concept that assumes personal responsibility for the continuous reflection on living circumstances and for the creation of one‘s own life projects. Coaching allows the coachee to explore their own reality and, in doing so, to find new ways of thinking and interpreting and to discover their own world of possibilities and challenges that they would like to actualize. The whole method is based on the premise that the coach approaches the coachee in terms of their potential. Having an optimistic view on the hidden and untapped potential of all people, he or she considers different ways of harnessing that potential in the client‘s favour (Whitmore, 2013).

Life coaching is one of the various types of coaching. It has common roots with the business and leadership coaching model. What contributed to its development was the new knowledge about the interconnectedness between work and private life, which had a major impact on the performance of employees. The tools and strategies applied by business coaches started to be used outside of work and enabled the creation of life coaching (Giant, 2015). Life coaching is a tool that develops the potential of a coachee and helps them to achieve their own goals and visions. These are achieved by the cultivation of the thought process, through which we discover ourselves; we realize which paths we would like to follow in life and what results we would like to achieve. All this leads to the recognition of one‘s own identity and to the choice of one’s own life trajectory.

With regard to the specifics of youth and the basic assumptions that underpin coaching, Giant (2015) pointed out that life coaching helps young people to:

- Better understand themselves including the mechanism that triggers their negative emotions;
- Identify positive and negative effects
- Build relationships with others;
- Develop a positive and healthy self-image;
- Discover and build their own identity;
- Identify and achieve their goals;
- Improve self- confidence and self-esteem;
- Build resilience skills and coping mechanisms.

It is evident that thanks to life coaching young people can seriously focus on themselves and on their development; they can also find answers to the existential questions regarding the meaning of their lives and finding their own identity. The coachee learns to believe in themselves thanks to the emphasis that the coach places on believing in them and their abilities. This is essential throughout the whole coaching process. Many people do not achieve success in life not because they do not know what they want to achieve, but because they do not believe that they are able to achieve it. With regard to their young age and the frequently present insecurity that young people experience, it is important to work with them in a way that enhances their self esteem and confidence. This will help them when considering and determining their personal goals regardless of any fashion trends. Life coaching inherently holds a great potential for the support of the young. Through this, the young can find themselves and discover the meaning of their own lives.

4 Conclusion

The main purpose of this paper is to reflect on the ways, in which we can help and encourage young people in their effort to find their way in life and to succeed, despite the uncertainty of today's postmodern era. In this paper, I have explored the idea of using life coaching as an instrument to help young people to find their life projects and to discover their own identity. On the bases of Giddens' reflexive self concept I have shown how the risks that young people are exposed to, thanks to the countless opportunities, can be utilized in their favour. I base my work on the fact that, if young people are to cope with the difficulties associated with finding their place in life, they need some support from adults. I believe that this help should not be viewed primarily as a solution to a problem, but it should be focused on the development and the potential of young people. Above all, it should be focused on the development of such qualities and skills that would enable them to actively shape their lives despite circumstances. I considered the development of these skills via life coaching. I thought about the main possibilities of this method and considered how they can affect the ability of young people to create their own life projects. Based on theoretical evidence I found that life coaching, which was originally intended for workers, can be very useful for young people too. One of the reasons is that young people today, more than ever, like to choose their own way of life. I thensee life coaching as a method that helps young people to make such a choice that would help them to succeed in life and to live their lives based on their own choices. Figuratively speaking, it is about them meeting with their "destinies", which reflect their identities. It turns out that life coaching has a great potential in this respect.

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Part-time Work in SME in the Moravian-Silesian Region

Ivana Němcová

Abstract: *The purpose of this paper is to summarize the basic findings of the research, which deals with employing and with managing of part-time workers. Partial aim is to compare the attitudes of employers and representatives of small and medium enterprises in the Moravian-Silesian region to part-time work. To achieve the goal of this work were used method of description, comparison and statistical methods. It was found that the use of part-time employment is dependent on the size of an enterprise and is independent on the owner of the enterprise. It was also found the differences among the respondents in the opinions about effectiveness of part-time employees for the company.*

Key words: part-time work · part-time employment · Moravian-Silesian region

JEL Classification: E24 · J22 · O15

1 Introduction

Higher labour market flexibility is nowadays considered an inseparable part of labour markets that face with unemployment and decrease in jobs. The labour market climate is also disturbed by economic crisis, after which it takes a long time for the labour market to return back to "normal". Today, the labour market is conditioned by many changes that have an impact on further development of human resources management and the employer-employee relationship (Brožová2003, Dušková 2005, Keller, 2012):

- increased employment in services,
- growth of the strategic importance of human capital,
- risks and uncertainty associated with constant changes,
- new forms of communication and information technology,
- creation of competitive advantage in markets based on creativity, learning, adaptation, and the ability of transformation of knowledge into technical and technological innovations,
- transformation of economy in the financial sector,
- growth in the volume of inferior forms of employment (such as uncertain, temporary, or badly paid jobs),
- growth in the volume of well paid jobs based on knowledge,
- work flexibility.

Work flexibility has become one of the characteristic features of work nowadays. By flexibility we mean the ability to adapt to changing conditions and the ability to react quickly and flexibly (Podnar, Golob, 2010). Also, work flexibility can be used to fight unemployment as one of the causes of unemployment is the rigidity of the labour market. However, some (for example Keller 2012,p. 23) point out that "inferior forms of work contribute to the fact that employment becomes more uncertain, makes employees less resistant to market fluctuations, and still less allows employees to face social uncertainty".

From the point of view of economic theory, we can divide work flexibility into several types. Already Atkinson (1984) divided flexibility into the so-called numerical, functional, and wage flexibility. Another classification includes positive and negative flexibility (Jepsen, 2006) or offensive and defensive flexibility (Vielle, Walthery 2003).

Given the focus of this paper, we consider it appropriate to deal also with time flexibility (also working-time flexibility; it takes into account the time aspect of working time) and work flexibility (called also flexible forms of employment; it connects various forms of employment relationships and working conditions), which are, compared to the above mentioned flexibilities, focused directly on the definition of various forms of flexible forms of employment and flexible forms of work and working time (Accornero, 2005; VÚPSV 2004).

According to this typology, we can divide time flexibility into **classical forms** of working time (which have been used since the 1990s) – for example barter, night shifts or overtime work. Among **new forms** of working time (which have been used in recent years) we count working time account, staggered hours, compressed work week, flexible working time, work in working teams, **part-time work**, job-sharing, term-time working, sabbatical, career breaks, educational leave, part-time retirement.

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Also, flexible forms of employment can be divided into classical and new forms. Classical forms of flexible employment, which are, at the same time, the most popular and most used, are self-employment and temporary forms of employment. New flexible forms of employment include home-working, on-call work, working on the move, teleworking, subcontracting (VÚPSV 2004;Gilarová 2004).

Nowadays, one of the most desirable types of flexible employment, especially in western countries, is part-time job (shorter working time, § 80 in the Czech Labour Code). In Czech Republic work part-time just about 6 % of all employed person, but the number of employees on part-time arrangement slightly rises. That is why this paper is dedicated to this topic. The purpose of this paper is to summarize the basic findings of the research, which deals with employing and with managing of part-time workers. Partial aim is to compare the attitudes of employers and representatives of small and medium enterprises in the Moravian-Silesian region to part-time work.

2 Theoretical basis of Part-time Work

Part-time employment refers to work that takes place for less than a standard number of hours per week. In Czech Republic, part-time workers are those who work fewer than 40 hours per week. From the legislative point of view, we can say that our labour law is neutral towards part-time employment - it neither promotes nor restricts it in any way (Kotíková, Kotrusová, Vychová 2013). The Czech Labour Code, says if "employee taking care of a child who is under 15 years of age or a pregnant female employee, or an employee who proves that he or she, mostly on his or her own, takes long-term care of a person who, is considered as a person being dependent on another individual's assistance and such dependency is classified by grade II (dependency of medium seriousness), grade III (serious dependency) or grade IV (full dependency), and this employee requests to work only part-time or requests some other suitable adjustment to her or his weekly working hours, the employer is obliged to satisfy with such request unless this is prevented by serious operational reasons." (Law no. 262/2006 Coll., "Labour code" as amended).

Part-time employment gradually increased in majority of developed countries, especially in recent decades. Part-time jobs are mainly used by women and it is the most feminized alternative form of work. (McDonald, Bradley, Brown, 2009; Cuesta, Ramos Martín 2009)

But only few authors in this field specializes on human resource management, or, more precisely, on the management and leadership of employees with part-time jobs. Yet, such publications do exist. For example, Lynda Macdonald (2009) characterizes in a part of her book dedicated to part-time jobs their advantages and disadvantages, reveals the differences between part-time and full-time employment, and deals with the management of part-time employees in the area of remuneration. Between the most mentioned advantages of part-time work for employers belongs an option to harmonize personal and working life. Disadvantages for employees are the lower salary (according to amount of arrangement) and the lower option to employee training. On the other side, the advantages for employers can be higher flexibility, and higher firm productivity. They surveyed, that 10% increase in the part-time share is associated with 4.8% higher productivity (Nelen, de Grip 2013). As the biggest disadvantages are mentioned higher administration costs, and difficulties with managing and leading of workers.

Giannikis andMihail (2011) discovered that part-time employment is associated with higher turnover and a higher risk of dismissal, a reduction in non-financial rewards. It was also found that there are many reasons why employees with part-time have lower educational opportunities (because of the training costs and return on investment; working irregular shifts; working background; low enthusiasm of part-time employees; high turnover of part-time employees; lack of resources, knowledge, and suitable training provision) (Sobaih 2011).

Vinopal (2011) dealt with research of importance of selected factors of work quality for employees and their satisfaction with these factors. His results show that for employees are very important job retention, relationship with colleagues and behaviour of managers, nonfinancial rewarding and time for family. But employees' satisfaction is depended on the working time. Part-time workers are more satisfied with remaining time, than full-timers. The satisfaction with relationships with colleagues and behaviour of managers doesn't depend on working arrangement. On the other hand, part-time workers are more unsatisfied with nonfinancial rewarding and with job retention.

Václavková (2007) says, that small and medium-sized enterprises offer a relatively large job security to their employees, because they offer a temporary job much less often than open-ended employment contract. But simultaneously small and medium-sized enterprises offer part-time work much less, than large enterprises.

3 Methodology of the research

This article is part of a student project focusing on employment and leadership of people with part-time jobs in enterprises in the Moravian-Silesian Region (hereafter abbreviated the MSR). The aim of this research is, besides

other things, to find out how the institute of part-time employment is used in the MSR, a region of long-term, widespread unemployment where part-time employment could help improve the situation. Attention was paid also to the ways of managing employees with part-time jobs and to the comparison of employees with part-time and full-time jobs.

It was used a method of inquiry (questionnaire consisting of 27 questions, which were divided into the following groups: identification questions, questions concerning the possibilities of part-time employment, and questions on leading and managing of people with part-time jobs).

The data collection was performed through electronically sent questionnaires due to lower costs and time savings. The basic sample comprised enterprises and organizations in the MSR totalling 16681. In order for the survey to be representative, we needed to collect at least 376 correctly filled in questionnaires (Raosoft, 2015). Weapproached11 000companies; 149 emails with request to fill in the questionnaire were not delivered (July – September2015). 410 respondents filled in the questionnaires, which guarantee the representativeness of the research. The questionnaire was distributed via the portal survio.com, which allows that the respondent cannot reply twice. In this way, the uniqueness of each questionnaire was guaranteed. The overall return of the questionnaires was thus 3.78 %.

Table 1 Characteristic of the population size and sample size

	Population size = 16680	**Sample size = 410**
1-49 employees	15 502	305
50 – 249 employees	948	75
250 and more employees	230	30

Source: Own processing

For this paper are used the data only from small and medium sized enterprises, overall 380 enterprises, which still guarantee the representativeness of the research. Was formulated the following hypotheses with respect to the stated goal:

H1: *More than a half of researched subjects use part-time work*. This hypothesis was based on the preliminary research and on the results of Václavková (2007) and on current knowledge gained from others researches which claim that up to 60% of companies use part-time jobs (Confederation of Industry of the Czech republic 2009; Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic 2010).

H2: The larger enterprises use the part-time work more. This hypothesis was divided into statistical hypothesis:

$H2_0$: The use of part-time employment is independent of the size of an enterprise.

$H2_A$: The use of part-time employment is dependent on the size of an enterprise.

We assumed that the use of part-time employment would be dependent on the size of the enterprise, because, quite logically, the more employees the company has, the more part-time jobs it can offer.

H3: Foreign enterprises use part-time work more frequently, than domestic enterprises.

$H3_0$: The use of part-time employment is independent of the owner of an enterprise.

$H3_A$: The use of part-time employment is dependent on the owner of an enterprise.

4 Research results

The number of people in part-time employment amounts to 316 thousand; the share of part-time in total employment is thus 6.6% (2014 data from the Czech Statistical Office). The standardized Eurostat data, however, show a value of 5.5% for the Czech Republic for 2014. Compared to the average of the EU-28 countries, where the share of part-time to total employment was 19.6% in the last year, this number is very low. Because part-time work helps to coordinate working and personal life, there is a supposition that mothers with little children usually work part-time. In fact 5,3% mothers with child in age 2-3 years can work part-time and just 11,6% women with children in age 3-6 years have part-time work. But according to Formánková, Dudová, Vohlídalová, (2011) almost 40 % mothers with little children in age 3-6 and about 11 % mothers with children in age 2-3 would like to work part-time. There we see potential for future.

The primary research has shown that employers enable part-time employment in 68 percent of cases (altogether 257 firms). The characteristics of firms providing part-time employment can be found in Table 2. This question also confirmed the hypothesis H1. *More than a half of researched subjects use part-time work.* The research showed that 70% of the surveyed companies use part-time employment.

According to Confederation of Industry of the Czech republic (2009), employs part-time work 50% of enterprises, according to the Association of Small and Medium-Sized Enterprises and Crafts of the Czech Republic (2010) 58% of companies employs part-time jobs. We assume that we have reached such a high number, because companies, which do not use the part-time job, omitted the questionnaire because of lack of interest, even though it was said in the instructions that the views of companies that do not use part-time work are valuable.

Table 2 Using of part-time

	Total		**Use part-time work**	
	Abs.	**In %**	**Abs.**	**In %** (from total)
Small enterprise (1 - 49 employees)	305	80.26%	199	52.37%
Medium enterprise (50 – 249 employees)	75	19.74%	58	15.26%
Total	380	100%	257	**67.63**%
Domestic enterprises (private sector)	253	66.58%	157	41.32%
Branch of foreign enterprise	17	4.47%	10	2.63%
Public sector	110	28.95%	90	23.68%
Total	380	100%	257	**67.63**%

Source: Own processing

However, we need to say that only 42,12% of the all 380 companies carried out a survey among their employees or job applicants to find out whether they would be actually interested in part-time jobs. Yet, when asked about the barriers to the establishment of part-time jobs, 20% of the respondents who reported to have never surveyed the interest of their employees in part-time jobs, reported that the employees' lack of interest in part-time jobs is a very strong or strong barrier to their establishment. We can, therefore, assume that it is the unwillingness of the management and medium management and lack of interest in this alternative form of employment that are responsible for such attitudes of the firms.

Next, we focused on what relation exists between the size of an enterprise and the use of part-time employment. The calculation was conducted in the SPSS using the Chi-squared distribution. The output is viewed in Figure 1. The Pearson 2-sided Asym. Sig. value from chi-square test is 0,045. Chosen level of significance is $\alpha = 0{,}05$. According to this values, we reject $H2_0$: *"The use of part-time employment is independent of the size of an enterprise*."

Figure 1 SPSS results (dependent of using part-time work on the size of enterprise)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
PearsonChi-Square	4,02[a]	1	,045
Likelihood Ratio	4,22	1	,040
Linear-by-LinearAssociation	4,01	1	,045
N ofValidCases	380		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 24,28.

Source: Own processing

Next, we focused on what relation exists between the owner (domestic/foreign) of an enterprise and the use of part-time employment. We used chi-sqaure in SPSS again. The result shows Figure 2. According to values, we cannot reject $H3_0$: *"The use of part-time employment is independent of the owner of an enterprise."*

Most often, employers use part-time employment for operational reasons (56%); also, a relatively high number of employers have a helpful attitude towards their employees (44%). From this we can presume that if firms use part-time employment mainly for operational reasons, there is a possibility that people working in these positions work part-time involuntarily. According to Eurostat data (2015), there were 21 percent of involuntary part-time employments in the Czech Republic in 2014. Compared to the EU average (29,6%), this number is lower; nonetheless, we believe it is important to emphasize that the share of involuntary part-time employments has risen rather substantially since 2001 (from 14% to today's 21%). In contrast, quite surprisingly, the least reported reason for not using part-time employment is the effort to save money during the economic crisis (15%).

Figure 2 SPSS results (dependent of using part-time work on the owner of enterprise)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
PearsonChi-Square	,63[a]	1	,427
Likelihood Ratio	,61	1	,436
Linear-by-LinearAssociation	,63	1	,428
N ofValidCases	380		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 6,53.

Source: Own processing

Our attention was paid to dis/advantages of using and managing part-time. In these questions respondents could mark more than one option. 49 % of all respondents are inclined to the view that there are no disadvantages associated with employment of part-time employees. There is no difference in results by the size of enterprise.

The greatest disadvantage for the small enterprises is limited communication with part-time employee (29%). The same number of respondents see problem in shorter presence of part-time employee. For middle sized enterprises are the greatest difficulties shorter presence of part-timers (38 %) and the need to occupy working place by two part-timers (17 %).For both group of enterprises the organizational difficulties aren't big disadvantage (for 14% small and 17% medium sized enterprises). This is surprisingly interesting information, especially when we compare this result with another result. According Confederation of Industry of the Czech Republic (2009) almost 50 % of respondents fear of changes, which introduction of part-time work brings.

From the other side, according to employers the biggest advantage is higher flexibility (for 38 % of small enterprises and for 30 % medium enterprises) and higher productivity of employees (for 26 % small firms and 17 % of medium-sized enterprises). Almost 45 % of all respondents, which use part-time work, checked the option "no advantages". It is interesting, that 25,67% of these respondents checked the option "no disadvantages" and currently they marked the option "no advantages"in next question. This means, that 66 of 257 respondents don't see any negative or positive aspects of part-time job. We can suppose that these companies maybe don't pay enough attention to part-timers.

In this last part of questionnaire we asked the respondents on whether part-time employees could be beneficial for the firm (its productivity, the loyalty of employees, financial savings in the form of lower wages for part-time employees, redundancy payment (if there is not 1 position with 2 part-time employees, but 1 part-time position), higher flexibility of the firm with respect to demand fluctuations, subsidies for part-time jobs provided by employment offices) (according to Nelen, de Grip 2013;Kotíková, Kotrusová, Vychová 2013, McDonald 2009).

Almost half of all 380 respondents (46,58%) are inclined to think that it is possible for a firm that employees part-time employees to have the above mentioned features, but they are not able to judge it. This stems from the fact that a larger number of the respondents employ only few part-time employees, and they thus do not give much attention to these employees as they are not in direct contact with them, gaining information about their productivity indirectly. Another explanation is that this question was answered also by those respondents who do not use part-time employment in their enterprises (for example due to the character of the firm's activities or because the managers do not support this form of employment sufficiently), but they are convinced that part-time employment has positive effects.

Table 3 Opinions on the positive effects of part-time employees according to whether enterprises use part-time employment or not

	Use part-time work		Don't use part-time work	
	Small enterprises	Middle enterprises	Small enterprises	Middle enterprises
I agree	17,59%	20,69%	4,72%	5,88%
I think it is possible	41,21%	32,76%	63,21%	52,94%
I think it is not possible	34,17%	41,38%	20,75%	29,41%
I disagree	5,03%	3,45%	10,38%	5,88%
Own answer	2,01%	1,72%	0,94%	5,88%

Source: Own processing

When we focused on the differences in answers, depending on whether an enterprise uses part-time employment or not, we found that there was a difference between these two groups of respondents – the enterprises using part-time employment are more sceptical towards these opinions. It is interesting that a less than 5 percent of the respondents who currently do not use part-time employment agree with the opinion that part-time employment can be beneficial for the firm. This indicates that these enterprises used part-time work in the past, and these opinions proved to be true for them. There is, however, also a quite big group of respondents who do not use part-time employment, but they believe that the firm could profit from its usage.

5 Conclusions

The article is devoted to the topic of using part-time work in Moravian-Silesian region (MSK). MSK is the region with high unemployment and part-time work can contribute to her reduction.

It was found that part-time work use almost 70% of enterprises. But total part-time employment is only about 6%. Though companies use part-time work, the proportion of people who do this work are very low (eg. compared to the EU average, which is almost 20%). The use of part-time depends on the size of the business, but is independent on the owner. As the largest advantage of using part-time employers perceive flexibility and improved productivity. Disadvantages of using part-time work are limited connection with part-time employees and shorter presence at workplace, but this is impossible to eliminate.

Based on the results of this questionnaire, we are going to carry out depth interviews with selected enterprises which will be interested in a qualitative survey. Attention will be paid to factors of managing and leading of people working part-time.

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Typical Crises in Selected SMEs in the Czech Republic

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Abstract: *This article deals with identification of typical crises in selected SMEs in the Czech Republic. Individual crises were recorded by our research team based on guided interviews with owners or managers of 183 SMEs. The most frequently occurring crises are related to customers (15.1%), and employees (14.5%). This article also brings a description of the typology of crises in SMEs suggested by the research team.*

Key words: Crises · Crisis typology · Emergency management · SME · management

JEL Classification: M15 · M11 ·M12

1 Introduction

According to Zuzák and Königová (2009), a crisis represents a breaking period when, within a subject affected, it is being decided whether further development will lead to the subject's disappearance or recovery to the level before the outbreak of the crisis. The effects of every crisis have negative impacts not only on the subject affected by the crisis, but also on its surroundings. This leads to the crisis-affected subjects trying hard to eliminate its consequences and bringing the affected subject to the level where it was operating before the rise of the crisis. It is mostly the effort to stop the negative development and to channel the downward development curves; at first to a stable position and then to the upward direction".

According to Crandall, Parnell and Spillan (2009) a crisis is usually an event which is characterized by ambiguity of causes and a significant impact on the overall health of the organization.

Crises in enterprises, respectively their causes, can be found inside or outside a company. Among typical crises that may arise inside an enterprise belong material and raw material crises, financial crises, human resources crises etc. In the outer environment of a company can be seen e.g. sales crises in the surroundings of the company, quick and significant changes in price policies of suppliers, legislation, etc. (Smejkal & Rais, 2013).

The ICM (Institute of Crisis Management) suggests that there can be defined the following types of crises: unexpected events (e.g. earthquakes, storms), mechanical-based problems (material fatigue), human mistakes, managerial decisions (or no decisions at all). According to ICM the latter ones occure most frequently. The reason is frequent lack of managerial reaction to information signalling a potential outbreak of a crisis (Königová, 2007). Another typology (Hammerich & Lewis, 2013) lists the following crises: natural disaster, technological crises, confrontation, malevolence, organizational misdeeds, workplace violence, rumours, terrorist attacks/man-made disasters.

Crises may arise either suddenly, unexpectedly, or as a consequence of a long-term problematic operating. Crisis occurrence, and especially its course, represents a process which is possible to divide into individual stages. They mostly differ in character as well as in time span (Zuzák & Königová, 2009). Bělohlávek, Košťan a Šuleř (2006) list among these:

1. Potential stage: Crisis has not taken shape yet. Nevertheless, causes of its future occurrence start to cumulate.
2. Latent stage: At this point we can already recognize the symptoms of individual critical phenomena that begin to act, it is as well possible to take some action to prevent the outbreak of the crisis.
3. Immediate stage: The crisis is spreading further. However, it is a short-term deployment of critical phenomena that threaten the operation of the company.
4. Chronical stage: At this stage critical features still persist, or we can see their downturn and then their continuous deployment. Their course depends in particular on the management's reaction.
5. The final stage reflects the effectivity of critical management. The crisis can be either overcome, or the organization may be considerably weakened. The worst scenario is the company would perish.

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2 Methods

The article describes a process of research while identifying typical crises, their outbreak, course, impact, intensity, including possible solutions focused on selected SMEs. Evaluation of frequency of typical crises was conducted in the text with regards to the area of coverage of SMEs in compliance with the OECD typology.

Crises identification was conducted through a series of guided interviews on 183 SMEs selected all around the Czech Republic. These guided interviews were based on an interview structure designed by the research team including the designed crises typology. The material was consequently consulted with representatives of the SMEs.

The guided interviews consisted of two parts – the basic description of the company (strategy, level of processes, size of the company, etc.), as well as description of crises that had been solved by the management in the past (e.g. intensity, impact, ways of solving, duration). The interviewees were managers or SMEs´ owners. Our research was conducted from 2014 to 2015. Altogether there were identified 753 crises in 19 areas.

3 Research results

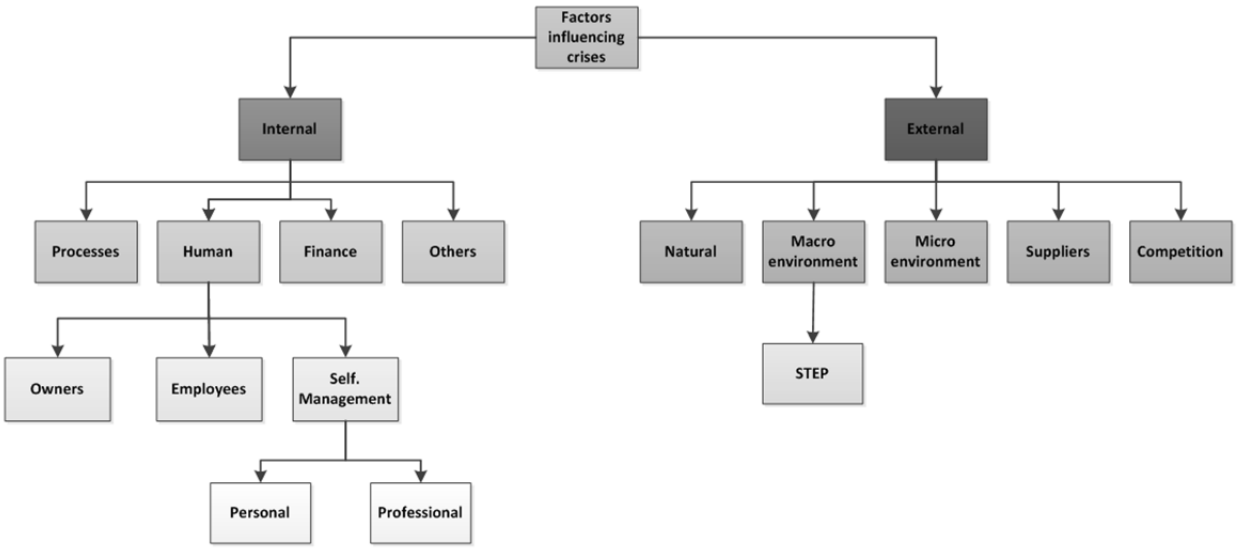
Research focused on revealing typical crises in SMEs followed the steps below:

1. Draft of crises typology
2. Preparation of supporting material for guided interviews
3. Data collection and result processing
4. Selection of critical areas and their frequency

Ad 1) Draft of crises typology

At this stage of our research based on professional literature we selected the main categories of presumed crises that were enlarged by the research team using techniques of generating ideas (mind maps) and then specified during consultations with SMEs representatives. Closer specification of crises in comparison with crises listed in foreign professional literature (Hammerich & Lewis, 2013) was necessary especially due to a different external environment typical for the Czech Republic. Survey of the suggested types of crises can be seen in figure 1.

Figure 1 Factors influencing crises



Source: Own processing

Ad2) Preparation of supporting material for guided interviews

Each guided interview was recorded in the pre-prepared supporting material which consisted of two parts. During the introduction phase of the interview we focused on the entrepreneur's or manager's satisfaction with the current state of doing business which then changed into the company's characteristics (e.g. number of employees, area of business, policy, result indicators, processes, legal form of business). The second part of the interview focused on occurrence

of critical situations from the company's "survival" point of view. Crises were enumerated and described. The respondents also gave the time line of crisis occurrence; signals that led to crisis recognition, way of solution and its possible alternatives, impact and intensity.

Ad3) Data collecting and result processing

Data were recorded into pre-prepared forms that were consequently digitalized by means of google documents, after that they were exported to SPSS where basic statistical analyses were conducted (categorization of data and basic relations). Afterwards the summarized figures were discussed by a professional team and divided into individual categories.

Ad4) Selection of critical areas and their frequency

The selection of critical areas was mostly based on pre-prepared methodology which was only slightly adjusted – the individual categories were more varied to comply with the perception of the respondents. In total 753 crises were divided into 19 categories out of which the most numerous are crises related to suppliers, employees, bureaucracy, inputs, competition, maturity and prices. Other areas like e.g. capacity, personal crises, capital, thefts, form of company, obsolescence of the product, natural influence and others – these represent occurrence lower than 5% as can be seen in table 1.

Table 1 Categories of crises

Type of crisis	Number	%
Capacity	28	3,7%
Collecting bills	49	6,5%
Competition	49	6,5%
Customers, demands	114	15,1%
Employees	110	14,6%
Entrepreneur - personal crisis	17	2,3%
Financial capital	36	4,8%
Inputs, Supplies	55	7,3%
Legal form of business	8	1,1%
Natural disasters	31	4,1%
Outdated product	3	0,4%
Owners	37	4,9%
Placement of business	19	2,5%
Processes	22	2,9%
Quality of production	18	2,4%
Regulations, bureaucracy	74	9,8%
Selling prices	39	5,2%
Technical breakdowns	28	3,7%
Thefts	16	2,1%

Source: Own processing

4 Conclusions

The research team in cooperation with SMEs representatives have suggested a typology of crises which complies with professional literature (Smejkal and Rais, 2013). Furthermore, there had been prepared material for guided interviews that were consequently conducted with managers and owners of SMEs. The suggested typology of crises was especially important for guidance of these interviews. Based on the gathered data, the individual categories were specified and extended.

Crises connected with customers and their demands occur most often in SMEs (15.1%), next come crises of employees (14.6%), and followed by bureaucracy impact (9.8%) and problems with suppliers (7.3%).

The recorded data are going to be further analysed in detail and consequently made available for SMEs representatives.

Acknowledgement

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Strengths and Weaknesses of Human Resources Management in SMEs

Petr Řehoř

Abstract: *The SWOT analysis is a core of strategic management. A part of this analysis is analysed in this paper. It comprehensively analyzes the external and internal environment of human resource management in small and medium-sized enterprises (SMEs) in South Bohemia and support them in choosing a suitable personnel strategy. This analysis should not analyze past development only as the ability of managers to predict future developments and adapt to changes has been more and more important for strategic management. Communication processes and employee training has been considered by managers the greatest weaknesses and strengths.*

Key words: Human resource · Management · SWOT analysis · Communication · SMEs

JEL Classification: L10 · M10

1 Introduction

The quality of functioning of the human factor is one of the most important factors influencing the success or failure of enterprises in a competitive environment (Armstrong, 2002). Akhtar, Ding and Ge (2008) surveyed general managers and HRM directors in 456 Chinese companies on product/service performance and financial performance of their companies and a range of SHRM practices. They found that a set of HR practices (training, participation, reoriented appraisals, and internal career opportunities) affected both product/service performance and financial performance. HR practices influence an organization's social climate, which in turn, shapes knowledge exchange and combination and leads to better organization performance (Collins & Smith, 2006). Richard and Johnson (2001) found that HRM effectiveness significantly reduces turnover, which in turn increases overall market performance assessment.

Nikandrou and Papalexandris (2007) examined HRM practices that distinguish top-performing firms from others regarding management of people in mergers. They noted that for economic synergies to be realized, human synergies must be achieved first and HRM has a vital role to play in the process. The researchers found that successful companies had increased HR involvement in strategic decisions, formalized HR practices, built organizational capability through training and development activities, devolved HR activities to line managers, and emphasized internal labor market opportunities. Macky and Boxall (2008) found that HR practices have an additive, positive relationship with the employee work attitudes of job satisfaction, trust in management, psychological identification with their organizations, and intention to remain employed with their organizations.

Management approaches and the status and nature of human resources work in the organization has been changing with increasing demands on human resources (Bohlander, 2004). Many researchers agree that the human resource function is one of the most crucial elements in an organisation's success (Dolan & Jackson, 2002). Armstrong (2002) defines Human Resources Management as a strategic and coherent approach to the management of an organization's most valued assets – the people working there who individually and collectively contribute to the achievement of its objectives (Armstrong, 2002). Kleibl et al. (2001) define the goal of human resources management, more specifically, as securing the quantitative aspects of human resources (number, age and occupational structure and formal qualifications) and also qualitative aspects (performance, creativity, motivation and identification with the goals of an enterprise).

The concept of human resources as the key factors of strategic importance for the success of an organization contributes to emphasize the strategic approach and long-term aspect of Human Resource Management (Koubek, 2002). HRM is clearly being renewed in organisations and gradually affirming its strategic role (Pinto & Prescott, 1988).

De Pablos (2005) argued that to create a sustainable competitive advantage, organizational flexibility (both resource and coordination) and fit (both internal and external) must be achieved simultaneously to create a firm that renews itself and can respond quickly to environmental demands. Recent studies have continued to examine the relationship between HRM and competitive performance. Foot and Hook (2002) recommend a strategic approach to human resources

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management. The employee development should be a part of the strategic plan of an organization and clearly relates to corporate objectives. Strategic human resources development should contribute to the implementation of corporate strategies through policy and practice of human resource development (Hroník, 2007). As Trainer (2004) reports, the organization analysis through the SWOT analysis gives a systematic way of evaluating internal and external forces of the environment and thus is a part of strategic planning.

The SWOT analysis is a classification method that enables a summary evaluation of social and economic analysis (Řehoř, 2007). It is suitable for the formation of a future strategy (Johnson, Scholes & Whittington, 2012). Its task is to detect information (strengths and weaknesses) and to enable the designated authorities identify on the one hand, the possibilities for development of a municipality, on the other hand to point out potential problems (risks) and specify the necessary steps for their removal - to formulate a strategy (Janečková & Vaštíková 1999). Its outcome is defining a strategy that seeks to use the strengths and opportunities and to eliminate weaknesses and threats (Tyll, 2014).

2 Methods

The aim of the paper is to assess the human resources management in small and medium-sized enterprises and to define the strengths and weaknesses of this important management function.

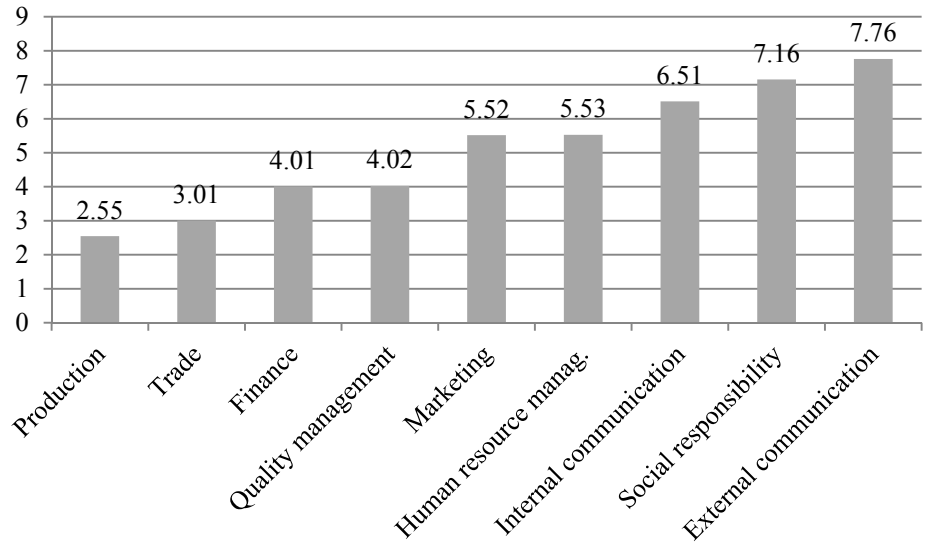
Primary data was obtained using quantitative methods questionnaire. The research sample was selected using non-probabilistic method of random selection, because of the difficult conditions of data collection. Research sample therefore contains 300 small and medium sized enterprises from the South Bohemia region. The questionnaire survey had the character of the scale (within the evaluation questionnaire were determined intervals from 0 to 20% poor, 21 to 40% below average, 41-60% average, 61-80% satisfactory, 81 - 100% perfect). These intervals are applied in the evaluation of the operation of individual processes. Within the SWOT analysis, first of all, the managers of SMBs were supposed to specify what their strengths and weaknesses in human resources management were.

3 Research results

3.1 Rating a process of internal communication by their importance for an enterprise

This question was dealing with rating nine important processes in an enterprise. The managers of SMEs were supposed to rate the processes by their importance for the organization. The average rating is reported in figure 1. The production process was reported as the most important (average rating of 2.6) followed by trade, finance and quality control. The process of internal communication was reported at the seventh position (rating of 6.5); preceded by the process of human resources management (rating of 5.5). The managers did not see the area of communication (both internal and external which was rated as the least important) so vitally important for the management of an organization.

Figure 1 Rating a process of internal communication in SMEs by their importance

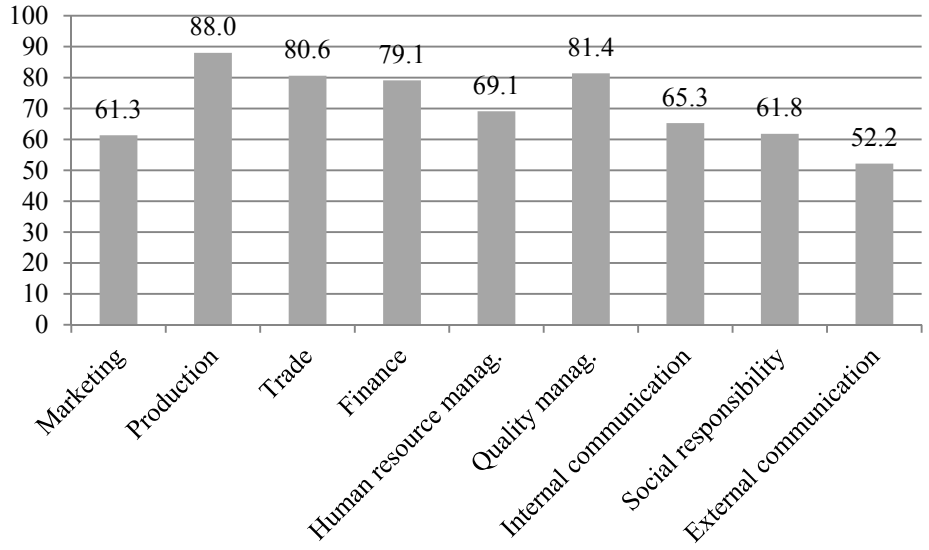


Source: Own processing

3.2 Rating a process of internal communication by its functioning

The SMEs managers in South Bohemia also rated functions of the processes. The rating was performed in % (0% - does not work 100% - maximum satisfaction with the functioning). As reported in figure 2, the best results were reported for the production process (88%). The Quality management and trade were rated by more than 80%. Internal communication was reported at the 6th place (65%). External communication was seen as the worst process of this rating (52%). Again, this result clearly indicates that the area of communications is not fully implemented and that there are a number of ways to make this process more efficient as the managers would appreciate.

Figure 2 Rating a process of internal communication by its functioning in %



Source: Own processing

3.3 SWOT analysis

Strengths

Through the SWOT analysis, the managers of SMEs should determine their strengths in the field of human resources management at first. Most of them (nearly 9%) considers the development and training of employees a very strong area. This is further followed by the following aspects (see Table 1): communication (8%) and remuneration; attitude and behaviour of employees and their stability in the organization (all around 6%).

Table 1 Strengths of SMEs in HRM

	n	%
Development and Education	19	8.72
Communication	17	7.80
Remuneration	13	5.96
Attitude and behaviour	13	5.96
Stability of employees	13	5.96
Team work	11	5.05
Market position	9	4.13
Working environment	9	4.13
Qualification	8	3.67
Expertise	8	3.67

Source: Own processing

The following were also reported as strengths: flexibility, motivation, corporate culture, hiring and recruitment, work organization, experience, tradition and reputation, evaluation and satisfaction.

Weaknesses

The area of communication with employees was reported as the most important weakness by more than 11% of SMEs followed by development and training of employees (nearly 11%) and remuneration (approximately 9%) – see Table 2.

Table 2 Weaknesses of SMEs in HRM

	n	%
Communication	21	11.23
Development and Education	20	10.70
Remuneration	16	8.56
Remuneration	11	5.88
HRM	11	5.88
Recruitment	10	5.35
Evaluation	8	4.28
Fluctuation	8	4.28
Organization of work	7	3.74
Behaviour of employees	6	3.21

Source: Own processing

The following were also reported as weaknesses: employee motivation, time, finance, experience, management skills, overloading of employees, social policy and seasonality.

4 Conclusions

SMEs in the market environment of the 21st century are exposed to conditions that are changing literally overnight due to rapid globalization and highly turbulent environment. Competition gains a whole new dimension forcing enterprises to rapid responses to emerging threats. Activities of enterprises have been expanding. Thanks to innovations, discoveries and progress of modern science new products are created and together with opportunities as other products become obsolete and decline. Product life cycles is shortening and forcing enterprises to be more flexible. Methods and procedures in the management of organizations and human resources have been changing too. More than ever before, it is difficult to attract and retain quality employees in particular.

SMEs may enjoy greater flexibility because of the simplicity of their internal organization, being faster at adapting and responding to changes. This new situation reveals the need to suggest or find more efficient management processes so that SMEs can apply strategies that allow them to achieve a better performance. The most important process for SMBs in South Bohemian Region is the realm of manufacturing – production (2,6), which is followed by trade, finance and quality management. Process of internal communication ranks behind human resources management (5,5) and it occupies the seventh place (6,5). Managers should pay more attention to these processes. The role and importance of human resources in the company is constantly growing and people have become one of the most important resources of enterprise in recent years

The area of communication and human resource development and education are mostly reported by the SMEs as their biggest strengths or weaknesses. SMEs must eliminate weaknesses and improve communication with employees and enable them to develop their skills. Development and training of human resources should provide opportunities for learning, development and training to improve the performance of individuals, teams and organizations. Investment in the training and education of employees manifestly would enhance organizationally specific knowledge, particularly where this has a broad perspective that includes helping employees to learn a wide range of skills, rather than equipping them simply to complete a restricted job.

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Logistic Tasks and their Assurance in Different Industries

Petr Válek, Drahoš Vaněček

Abstract: *The purpose of this article was to find out who organizes and manages logistic activities in the enterprise. Starting in 2015, this pilot project is followed by detailed investigation concerning management of supply chains. The article is based on a questionnaire surveys of 63 enterprises from different branches of national economy: engineering, food processing industry, production of goods for households and building industry.*

The survey indicated that in engineering enterprises logistic activities are first of all the task of logistic formations, in other enterprises this is solved differently, without any substantial tendency. Management of logistic activities by means of a specialized logistic formation makes possible for management of the enterprise to concentrate more on strategic tasks instead of solving operational tasks.

Key words: Logistic operations · logistic formation · management · industry

JEL Classification: O33 · L23

1 Introduction

Enterprises have to solve new tasks constantly, in the last two decades especially new issues concerning waste management and relation with the environment. In fulfilling these tasks also logistics has its role. Logistics is represented in greater enterprises by independent logistic unit (department), in smaller enterprises only by one employee in charge of these activities.

Until the seventh decade of the past century it has been demanded that logistics should do mainly a certain service for marketing, that is to deliver necessary quantity of materials (products) in demanded quality, time and price to the demanded place (Schick, 2009). This task remains also in present, but the key role of logistics shifts to the strategic area, where logistics should participate on important decisions of enterprises, concerning for example finding suitable location for newly constructed stores, production halls, using outsourcing etc. (Lambert, 2000; Slack, 2000). Logistics is further demanded to take actions related to the environment (decrease the quantity of emissions or management of reverse logistic flows etc. – see Waters, 2009; Christopher, 2011; Koutný, 2014). To fulfil these tasks, logistics must be appropriately integrated into organisational structures and according to the size of the firm it must have also necessary number of employees.

2 Methodology

The department of management at the University of South Bohemia, Faculty of Economics, made an inquiry in 2013 by means of students in 63 enterprises. Students received the task to ask managers in different enterprises to answer questions in paper questionnaire. Following industry categories were investigated: 1. Engineering (28 enterprises), 2. Food processing industry (17), 3. Production of goods for households (11), 4. Construction industry (7). The aim was to receive more detailed information about the activity of these enterprises in supply chains (SC). Attention was given mainly to management of selected logistic activities. Received data were processed on the basis of relative frequency.

Management of logistic activities is assigned to a specialized logistic department in bigger enterprises, in smaller enterprises there can be only a single employee, who is in charge of these tasks. But it is also possible to transfer logistic activities to other departments in the enterprise, as business, marketing, or top management. Seven different logistic structures were investigated, but only the following four existed in the investigated enterprises.

1. Logistic department (or one employee in charge) manages all necessary logistic activities.
2. Logistic department (or one employee in charge) does not exist in the enterprise, necessary activities are assured by other departments in the enterprise.

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3. A smaller logistic formation (or only one charged employee) guarantees one part of logistic activities, the other part is transferred to other departments.
4. A smaller logistic formation (or only one charged employee) guarantees one part of logistic activities, the other part is transferred to other firm by means of outsourcing.

Other alternatives occurred only rarely in the investigated enterprises, and they are not going to be further examined.

3 Results

Logistic formations in enterprises (see Table 1)

In all four groups of investigated enterprises the structure Nr. 1 prevails, when logistic department or only one charged employee manages necessary logistic activities (35.7-42.9 %). Slightly smaller representation has the structure Nr. 3, when some logistic activities performs a smaller logistic formation, the other are shifted into competency of other departments (29.4-36.4 %).

Also the structure Nr. 2 is not negligible, where there does not exist a specific logistic unit, and necessary activities are performed by other departments in the enterprise (14.3-23.5 %). Between individual groups of enterprises there does not exist significant difference in representation of different firm's structures.

Table1 Organisational structure of logistic formations in enterprises (%)

Structure	Engineering	Food processing industry	Industry of goods for households	Construction industry
Structure Nr. 1	35.7	41.2	36.4	42.9
Structure Nr. 2	14.3	23.5	18.2	14.3
Structure Nr.3	32.1	29.4	36.4	28.6
Other structures	17.9	5.9	9.0	14.2
Total	100.0	100.0	100.0	100.0

Source: authors

Involvement into supply chains (see Table 2)

Involvement only in one or in two supply chains is low, higher percentage in the Construction industry can be caused by a small number of respondents in the sample. Most often enterprises are involved in more SC, first of all in Engineering (71.4 %). Interesting also is the share of enterprises outside the SC, which exist in all four groups, much of them are in Industry of goods for households (36.3 %) and in Food processing industry (29.4 %). If the firm is involved in more SC, then the relations with upstream and downstream links are not so stable.

Table 2 Involvement of enterprises into supply chains (SC) in %

Involvement	Engineering	Food processing industry	Industry of goods for households	Construction industry
In one SC only	7.1	11.8	9.1	28.6
In two SC	0.0	5.9	9.1	28.6
In more SC	71.4	47.0	45.5	28.6
In none of SC	17.9	29.4	36.3	14.2
No answer	3.6	5.9	0.0	0.0
Total	100.0	100.0	100.0	100.0

Source: authors

Key link in the supply chain (see Table 3)

At about one half of all enterprises consider themselves as the key link in the supply chain, they probably produce final products. Especially distinctively it is in the Construction industry, where this percentage raises to almost 86 %. In connection with the previous table it represents more complex management, if the key link has to manage relations with links in more supply chains.

Table 3 Key or dependent link (%)

Form of the link	**Engineering**	**Food processing industry**	**Industry of goods for households**	**Construction industry**
A) Key link	50.0	47.0	54.5	85.7
B) Dependent link	39.3	41.2	18.2	14.3
C) No answer	10.7	11.8	27.3	0.0
Total	100.0	100.0	100.0	100.0

Source: authors

Material and information flow (see Table 4)

Most often management of information and material flow are assigned to top management, what seems good, first of all in small enterprises. In engineering this activity is equally divided between logistic formation (probably in bigger firms) and top management.

Table 4 Management of information flow (%)

Management by	**Engineering**	**Food processing industry**	**Industry of goods for households**	**Construction industry**
1. Logistic formation or a special employee	35.7	11.8	13.6	14.3
2. Other formation in the enterprise	10.7	35.3	13.6	28.6
3. management of the firm	35.7	35.3	54.6	57.1
4. According to the situation	14.3	11.8	9.1	0.0
No answer	3.6	5.8	9.1	0.0
Total	100.0	100.0	100.0	100.0

Source: authors

Order receipt and tracing of its fulfilment (see Table 5)

In Engineering and Production of goods for households, order receipt and tracing of its fulfilment is the task of logistic formation in about 50 % of the cases. It is a bit surprising, as far as it could have been expected that this will be the task for another formation (business). In the Construction industry this issue is shared by the same percentage between a special logistic formation and top management. The reason might be a higher financial volume, about which subordinate departments cannot decide.

Table 5 Order receipt and tracing of its fulfilment (%)

Formation	**Engineering**	**Food processing industry**	**Industry of goods for households**	**Construction industry**
1. Logistic formation or only one employee	50.0	32.4	54.5	42.9
2. Another formation in the firm	25.0	32.3	18.2	14.2
3. Top management	10.7	23.5	18.2	42.9
4. According to the situation	10.7	11.8	9.1	0.0
No answer	3.6	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0

Source: authors

Material management (see Table 6)

Material management belongs with more than 50 % in Engineering and Production of goods for households to a logistic formation. It is interesting that in Food processing industry and Construction industry these problems are dealt with by another unit in the firm or top management. Especially incomprehensible it is in the Construction industry, where material management is mostly the issue of top management (42.8 %). The reason can be a big financial amount fixed here.

Table 6 Material management (ordering, storing, control) - %

Formation	Engineering	Food processing industry	Industry of goods for households	Construction industry
1. Logistic formation or only one employee	58.9	38.2	54.5	28.6
2. Another formation in the firm	21.4	35.3	18.2	14.3
3. Top management	8.9	26.5	18.2	42.8
4. According to the situation	10.8	0.0	9.1	14.3
Total	100.0	100.0	100.0	100.0

Source: authors

Reverse logistic and waste management (see Table 7)

Reverse logistics and waste management are most often managed by a special logistic formation (in Engineering 48.2 % and in Building industry 42.8 %). At Food processing industry it is in similar percentage another formation (41.2 %). It is rather surprising that also in Engineering deals with these problems through another formation of the enterprise (30.4 %).

Table 7 Reverse logistic and waste management (%)

Formation	Engineering	Food processing industry	Industry of goods for households	Construction industry
1. Logistic formation or only one employee	48.2	23.5	22.7	42.8
2. Another formation in the firm	30.4	41.1	27.3	0.0
3. Top management	3.6	11.8	13.6	28.6
4. According to the situation	10.7	11.8	18.2	14.3
5. No answer	7.1	11.8	18.2	14.3
Total	100.0	100.0	100.0	100.0

Source: authors

Logistic and environment (see Table 8)

The relatively new problems of logistics and environment do not have stabilized position in businesses, and they are assigned to different formations. In Engineering this is the top management (71.4 %), at Food processing industry it is evenly divided between logistic formation and top management, at Production of goods for households these problems are dealt with by other than logistic formation, alternatively top management, and in the Construction industry it is first of all the top management.

Table 8 Logistics and environment (wastes) %

Formation	Engineering	Food processing industry	Industry of goods for households	Construction industry
1. Logistic formation or only one employee	14.3	26.5	9.1	28.6
2. Another formation in the firm	3.6	29.4	36.4	0.0
3. Top management	71.4	38.2	36.4	42.8
4. According to the situation	3.6	5.9	0.0	14.3
5. No answer	7.1	0.0	18.1	14.3
Total	100.0	100.0	100.0	100.0

Source: authors

4 Conclusion

At contemporary time logistics has to solve new tasks, connected with involving firms into supply chains and with protection of environment against harmful emissions and other impacts, caused mainly by transport. Logistics also has to deal with reverse flows. For successful solving of these tasks it is necessary to have a suitable organisational structure in a firm, and defined, delimited tasks for logistics. Our investigation showed certain difference in solving these problems among four groups of enterprises. In this area we will continue in a larger investigation of a larger set of firms.

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Session 4

Mathematical-statistic Modelling and Optimization in Practise

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Factors Influencing Customer Repeated Purchase Behavior in the E-commerce Context

Ladislav Beránek, Václav Nýdl, Radim Remeš

Abstract: *Predicting customer purchase behavior in the e-commerce activities is an important task. However, this effort requires fulfillment of a lot of problems. Recommendation systems have become a common way how to help peo-ple when they have to decide in complex selections. But they are not able to perform predictive tasks in this context satisfactorily. In this paper, we deal with a design of a predictive framework for customer purchase behavior in e-commerce context. The aim is to understand customer behavior for online shopping. It means this research seeks to explain the relationship between Internet shopping and customer's behavior, i.e., to identify the determinants of the relationship between online shopping and business customers based model which includes factors, for example perceived value, satisfaction, and behavior (purchase intent). Experiments performed on a real dataset show that these factors play a key role in the decision-making process.*

Key words: E-commerce· Predictive model· Purchase Behavior· Customer Perceived Value

JEL Classification: D83

1 Introduction

With the rapid development of the global information and communicationstechnology (ICT) and the widespread usage of Internet various types of networkconnecting devices such as smartphones and tablets are becoming more and morecommon. Wireless coverage rate is growing in an explosive manner and Gartnereven predicts it will even reach 90% by 2015 (Garg, et al., 2013).Consequently, people will be able to access all resources, especially e-commerce, in the Internet at anytimefrom anywhere by then.

One of the key features of e-commerce based on Internet infrastructure is that it has low barriers to entry. It is therefore evident that there are a number of similar e-commerce activities with similar content. They offer similar product or services. If one service is created then a number of equivalent alternative web service follow after a very short time. However, this leads also to a high switching rate between those e-commerce web sites by users. There are also various websites aimed at comparing of prices and product features, including recommendations and references from users. Customers can then choose e-shop according to their preferences.

Due to these experience, it is obvious that great competitive advantage for e-shop or other e-commerce web site is if it has loyal customers who return and perform repeatedly purchases on a respective e-shop. This means that the identification of determinants of intention to perform repeated purchase is crucial for e shops and other e-commerce activities.Loyal customers will recommend the company to relatives or friends and may be willing to pay higher price. Word of mouth advertising is often very effective and can save shoppers from wasting time searching for the best deal

Considerable attention is given to understand to customer behavior in connection with online shopping at the present time, for example (Ltifi and Gharbi, 2012; Hernández et al. 2011) and other. The current research is trying to explain the relationship between Internet shopping and customers behavior using models that include factors such as perceived value, satisfaction, and behavior (purchase intention) and others. However, little attention is paid to the study of the conditions that lead to repeated shopping. The content of this paper is focused on the study of factors that influence this loyal customer behavior.

The rest of the paper is divided into six sections. The following paragraph contains a theoretical basis, an overview of previous research and definition of relevant hypotheses. Chapter 3 describes briefly the research methodology and

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Chapter 4 data analysis and experimental results. The paper concludes with a discussion of the results (Chapter 5) and conclusion (Chapter 6).

2 Theoretical background and hypothesis development

Different studies use some well-known theory to explain the behavior of online shopping. Research studies showed that there are many factors that influence the behavior of online consumers. The complete coverage of all potential factors in one of the research model is almost impossible. Most studies have focused on several key factors. For example Koufaris (2002) tested the factors that come from the information systems (technology acceptance model) marketing (Consumer Behavior) and psychology (Flow and environmental psychology) in one model. Pavlou and Fygenson (2006) examined consumer acceptance of e-commerce with an extended theory of planned behavior (Ajzen, 1991). In their research model, consumer behavior has been studied separately in terms of getting information behavior and shopping behavior, both of which were affected by the trust and perceived risk, consumer attitude, social influence, personal online skills and technology-oriented factors, including the perceived usefulness, perceived ease of use and functionality of websites. Most studies use basically two theories, namely the Technology Acceptance Model and the Task-Technology Fit. These theories are important for understanding how people use technology in connection of e-commerce activities (Chen, 2009).

Customers can easily compare prices of products on Internet. If the e-commerce company will be unable to establish a stable relationship it will have to participate in fierce price competition. The question is how to entice customers to buy from the same e-commerce website, how to create customers' loyalty.

Rational behavior theory and The theory of planned behavior (Ajzen, 1991)suggest that the behavior of intent can be used to predict actual behavior. Some customers are firmly convinced of constantly performing transactions with the same company. Using customer loyalty to measure the possibility of future purchases is consistent with Assael's(2000) definition of customer loyalty. Partiality towards a certain brand influences the consistency of purchasing behavior. However, some researchers argue that continually making actual purchases measure customer loyalty (Zeithaml, 1996).

This study focuses on people's behavior regarding to repeated purchase behavior in the e-commerce context. Disciplines, such as psychology, are dedicated to understanding, explanation and prediction of human behavior. From these areas, two theories which are suitable for this study have been found. The theory of planned behavior and social cognitive theory were chosen to predict and explain human behavior in the respective research. In addition, customer satisfaction, switching barriers and structural assurance are variables that could explain some of exploredconsumers' behavior, i.e. intention to repeat purchase.

2.1 Customersatisfaction

Customer satisfaction is generally defined in the marketing literature as the discrepancy between a customer's expectations and perceptions. In this viewpoint, customer satisfaction is delineated as the consumer's evaluation that products or services meet or fall to meet the customer's expectations. Moreover, satisfaction is a judgment that a product or service feature, or the product or service itself, provided (or is providing) a pleasurable level of consumption-related fulfillment, including levels of under or over-fulfillment.

Satisfaction is defined as a feeling fulfillment when certain needs, desires or goals are met and when they shop for enjoyment (Florence, et al., 2006). Customers compare what they paid for some product or service. By this they judge whether or not they feel satisfied (Fornell, 1992). Satisfaction can be measured by following parameters: 1 The experience and quality of shopping from this company; 2. The accuracy of the advertised material; 3 The enjoyment of shopping with one specific company compared to another; 4. The satisfaction of pricing compared to service; 5. A general overall feeling of satisfaction. Past research indicates that company-provided customer service training can effectively increase the probability of a customer making future purchases and increases the marketing share at the same time (Tse and Wilton, 1998).

Customer satisfaction has a great impact on repeated purchase behavior of customers.We propose therefore two following hypotheses:

H1. Customer satisfaction is positively associated with repurchase intention.

H2 - Customer satisfaction is positively associated with switching barriers

2.2 Switching Barriers

Switching barriers are factors that make it difficult or costly for a customer to change service providers. These factors include three types of switching barriers: strong interpersonal relationships (the strength of the personal bonds that may develop between the employees of a supplier and the customer), high switching costs (the customers perception

of the time, money and effort associated with changing supplier) and attractiveness of alternatives, which refers to whether viable alternatives exist in the market.

Author of the paper (Kuisma, 2007) classified switching barriers into three factors: alternative attractiveness, switching cost, investment in a relationship. He also described switching barriers include search costs, transaction costs, learning costs, loss of loyal customer discounts, loss of established habits and relationships, and risk of the unknown. Switching costs are not only economic in nature, but also can be psychological and emotional.

We assume that switching barriers will have a positive effect on repeated purchase of customer. Hence, the following hypothesis is proposed:

H3 - Switching barriers is positively associated with repurchase intentions

2.3 Structural Assurance

Structural assurance indicates the web environment. Environment is very important for predictions concerning a website. Structural assurance reduces internet risk by employing some security technologies. Accordingly, lack of structural assurance suggests the environment is relatively risky or dangerous. The lack of security technologies would cause users to question the motive or ability of a website.

Social learning theory (Mearns, J., 2009) holds that behavior predictions are a result of interaction between the environment and internal factors. Thus, environment is very important for predictions concerning a website. Structural assurance reduces internet risk by employing some security technologies (Grazioli 2004). Accordingly, lack of structural assurance suggests the environment is relatively risky or dangerous. The lack of security technologies would cause users to question the motive or ability of a website. Two possible reasons are inferred, either because of the website's incapability to evolve the technology, or because of the website intentionally failing to follow privacy and security policies. Therefore, we hypothesize:

H4 - Structural assurance is positively associated with repurchase intentions

2.4 Intention to repeat purchase

We examine online intention instead of studying the online consumers' actual behavior. Behavior is decided by individual intention.

Customer repurchase intention is defined as the individual's judgment about buying a service again, the decision to engage in future activity with a service provider and what form this activity will take.

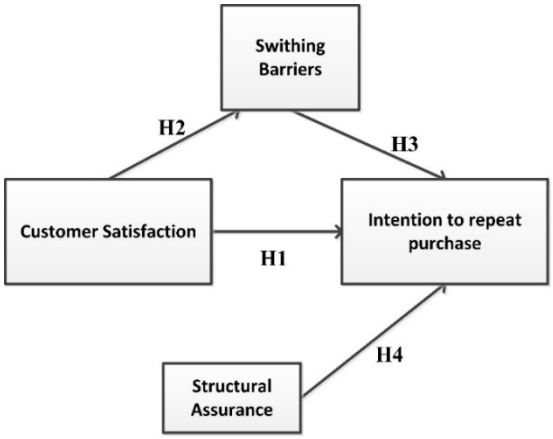
Researchers have focused on different aspects of repurchase intention. For example, regarding the underlying logic of the ECT model as described by Bhattacherjee (2001a, 2001b), the model posits that confirmation and satisfaction are the primary determinants of the intention to repurchase. Jones (1998) considered that switching barriers directly affect repurchase Intention. Customers' repurchase intention depends on the value obtained in their previous transactions (Wathne et al., 2001) such as: appropriate performance criteria (benefits), competition, and cost considerations.

3 Research methodology

The partial least squares (PLS) technique of structural equation modeling, which uses a principle component-based estimation, was used for the analysis. The approach is suitable for validating predictive models, particularly those with small size samples (Chin, 1998). The primary research question of this study is: what are the factors that cause unsatisfactory results of implementation of information security awareness program? To help answer this research question, a conceptual model combining the theory of planned behavior, self-efficacy, and perceived certainty and severity of sanction was created. This model appears in Figure 1.

This study examines the relationships between the three possible determinants concerning online shopping. To determine the consumer satisfaction, original constructs described for example by Jaronski (2004), Florence et al. (2006), Fornell (1992), Tse and Wilton (1988) were modified. Original items and five point scales were adapted for adherence to the principles of intention repeat purchase. Switching barriers use measures adapted from Burnham et al. (2003), Khalifa and Liu (2007) and Mouakket (2009). The construct structural assurance was measured using four misuse scenarios. Scenarios were chosen because they are considered to be the best way to respond to sensitive issues (Nagin and Pogarsky, 2001). These scenarios were adapted from Harrington (1996) and Paradice (1990).

Figure 1 Research model



Source: authors

4 Data analysis and results

Data for this study was obtained through questionnaires, which we have posed to students of part time study. We addressed 22 respondents. The age of respondents was 25-44 years. Students were from different backgrounds with different levels of experience. Approximately half of the respondents worked in the field of IT in various positions. Also the organization to which they belonged, were different. They were business organizations as well as government organizations. Respondents were evenly divided by gender, represented different ages, and various years of the use of computers. They all believed that they had good knowledge of the use of computers. Respondents had an average of4.7 years of experience in both small and large companies from various industries branches and government organizations.

The specific tool that was used was SmartPLS 2.0 (PLS-SEM. 2014). PLS supports two measurement models: (a) the assessment of the measurement model and (b) the assessment of the structural model. The structural model presents information about the pathsignificance of hypothesised relationships using the path coefficients (β) and R squared (R^2). An examination of the structural model indicates that the model explains approximately 70 percent of the variability in behavior intention ($R^2 = 0.69$) and 40 percent of the variability in behavior ($R^2 = 0.37$). These results are based upon 22 responses from students, participant of part time studies. Chin (1998) notes that R^2 values of 0.69 and 0.40 for the percentage of variance in a model are substantial and moderate, respectively. The R^2 shows the percentage of variance in the model to give an indication of its predictive power.

Further, an assessment of the measurement model of the three main constructs was estimated using: internal consistency, convergent validity, and discriminant validity. Hair et al. (1998) suggested that item loadings of 0.5 are adequate for these indicators. The composite reliability for each of the study's constructs was above the recommended level of 0.70, indicating the internal consistency of the data. Fornell and Larcker (1981) recommended that the average variance extracted (AVE) criterion be used to assess convergent validity. These researchers suggested that an AVE value of 0.50 is acceptable, as it indicates that a latent variable is able to explain more than half of the variance of its indicators, on average. Convergent validity was examined using the average variance extracted measure. Customer Satisfaction and Structural Assurance cleared suggested 0.5 benchmark with scores of 0.61and 0.54, respectively. Unfortunately, one construct fell short: Switching Barriers generated an AVE score of 0.44.

In addition, each of the four hypotheses was examined using t-tests (21 degrees of freedom). This is an indication of path significance levels. Two of the hypotheses were supported, while two were not. H1 is supported at the 0.01 level (t-value = 3.15, β = 0.398), suggesting that Customer Satisfaction does influence Intention to repeat purchase. H4 is supported at the 0.01 level (t-value = 3.80, β = 0.560), suggesting that Structural Assurance does influence Intention to repeat purchase. H2, and H3 were not supported, suggesting that, in this situation, Customer Satisfaction do not influence Switching Barriers (t-value = 0.046, β = 0.004) and Switching Barriers do not influence Intention to repeat purchase (t-value = 0.109, β = 0.034).

5 Discussion

The aim of this research was to find out why people decide to repeat purchases in online shopping. The results of this study suggest that customer satisfaction and structural assurance and contribute to improvement of adoption principles of desirablebehavior in the area of online shopping, while the switching barriersnot.

Customer satisfaction (H1) is an important factor influencing intentions to return. This result is consistent with previous study in information system continuance intention and usage research (Limayem and Hirt, 2007). Accordingly, we can infer and suggest online website managers need to develop an interesting and fancy interface design, which can increase online users' tendency to use the website again. Satisfied customers are a less expensive and more effective advertising channel than mass media. For example, Crego and Schiffrin(1995) mentioned that a 5% increase in customer retention reduces 18% of operating costs.

Factor Structural assurance (H4) indicates that perceptions of website malevolence and incompetence have a strong effect on a user's distrust of the website. A user has negative expectations of an incompetent website, because it does not have the ability to do for the user what s/he needs done. A website of malicious intention towards users may cause financial loss, steal private information, induce the purchase of unwanted goods, etc. Users will not allow themselves to become vulnerable to such a website to prevent negative outcomes. Therefore, as the review of distrust literature suggested, certain attributes of a website, namely malevolence and incompetence are two main antecedents of distrust in the website.

Our study has found that Switching Barriers (H3) is not an important determinant of repeated usage intention. The lack of a significant relationship between the factor Switching barriers and Intention to repeat purchase for online shopping is rather surprising. The plausible explanation is that, according to our data survey, 76% of participants are online shopping experienced users. Thus, experienced users may have different perspectives about e-commerce systems and their continuing use. Consequently, intentions to return may be high regardless of user perceptions of barriers and ease of use. Future research is needed to investigate this topic.

Therefore, website designers and administrators should consider factors customer satisfaction and especially structural assurance that affect user's intentions to repeat purchase.

Limitation and Future Study

There are several limitations for our research. First, this study may have limited generalizability, because of the small number of interviewees. Second, limitednumber of factors are taken into account. We want to include factors in future study. Third, an online survey was used as the method to collect data. One often cited disadvantage of self-reported surveys is the threat of common method bias (Malhotra et al. 2006). In future, other methods should be employed to broaden this research.

6 Conclusion

This research examines the model designed to explain why user intent to repeat purchase in online shopping sites. Model, while imperfect, explains almost 70 percent of the variance in intention to repeat purchase. However, many questions remain to be examined. For example, the sample consisted only of students of part time study in university. The sample will be extended by a more representative cross-section of individuals. Other variables that could affect the intention to repeat purchase on online shopping sites should be explored, for example factors as price, perceivedease of use, ways of communication or some other social factors. These issues will be addressed in future research.

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Spatial statistics: Recognition of Spatial Relationships of Companies

Ilona Berková, Tomáš Mrkvička

Abstract: *The paper solves the methodology for recognition of spatial relationships of bankruptcy and creditability indicators in Zapadocesky, Jihocesky and Vysocina regions. The main aim of our research is revealing whether companies are spatially dependent (behaviour of indices is same or different) or whether companies are spatially independent. Spatial statistics will be focused on relationships within the sector as well as between sectors. The classification model IN 95 is used in the analysis and it will be modelled by marked point process. The main tool will be the analysis of Ripley's K-function or other second order characteristics. Sectors and company sizes will be used as marks of points and they will be incorporated in the studied characteristics. For introduction of the methodology we applied these methods on a sample of trees location in Redwood.*

Key words: IN 95 · spatial statistics · bankruptcy and credibility models · market point proces · Ripley´s K-function

JEL Classification: C31

1 Introduction

Point process statistics analyses geometrical structures of patterns formed by objects which are randomly distributed in space and can be used for classification and identification of structural changes. Objects are represented by points or marks where points describe their locations and marks provide additional information, thus characterising the objects further, e.g. size, shape, type and so on. Point pattern is a collection of points in an area or set and is interpreted as a sample from a point process. Point processes are denoted by N and it means a random set of points x_1, x_2,…, i.e. $N=\{x_1,x_2, \ldots\}$. The set N can be finite or infinite. The main aim of point process statistics is to understand and describe interactions among points that explain the mutual positions of points. Spatial statistics is applied in economy where you can reveal economical interactions which typically lead to clustering and repulsion among points (Illian et al., 2008).

It is possible to apply statistical models on point patterns´ data. These models can be used for data summarization and making predictions. Also they can be simulated, it means, random pattern can be generated by model. The importance of statistical modelling can be identified as the best and the most effective form of data analysis. An analysis without statistical modelling leads to less informative results. Statistical model of point pattern is denoted as point process (Baddaley, 2010).

Lots of empirical studies have tried to develop suitable indices and statistical tests which can measure the degree of spatial behaviour of points. The measurement can be performed by traditional methods by indices, for example by Aggregation Clark-Evens index (Dixon, 2002). However, more popular are distance methods (J-function, D-function and g-function) and nearest neighbours methods (L-function and K-function). These methods identify interaction of points through summary characteristics of point pattern (Illian et al., 2008). An important issue of point process statistic is simulation of point processes, where recent research of Myllymäki et al. (2015) introduced new methods for comparing a summary characteristics estimated from data and estimations from its simulations.

Data collection methods depend on objects which are represented by the points, the objectives of the study and the available resources. During data collection methods it is important to optimise unbiasedness, representativeness and control sampling errors. Among points it is possible to observe three main interaction, i.e. clustering, repulsion and random interactions. For exact qualification and distinction in particular types of spatial behaviour it is necessary to choose suitable statistical methods which provide detailed information about spatial structures. Each method view random sets from different angle.

The main aim of the paper is to introduce statistical methodology, which can be applied to point pattern of corporations. Results will be used for monitoring of aggregated behaviour of companies, i.e. if companies make clusters or not.

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Spatial concentration of companies is studied in long term with many authors and is solved especially by K-function and its modifications. As important authors in the field of application of spatial statistics on company data may be consider for example Giusseppe Arbia, Giuseppe Espa a Diefo Giuliani, who applied K-function to find spatial interaction of companies in Italy in the important article "*Clusters of firms in an inhomogeneous space: The high-tech industries in Milan"* (Arbia et al., 2012). Authors modified K-function by extension of time in the article "*Detecting the existence of space-time clustering of firms"* (Arbia et. al, 2010).

2 Methods

The research will focus on spatial dependences of corporations settled in Zapadocesky, Jihocesky and Vysocina region. These regions were chosen because of comparatively homogeny conditions of regions and their position makes the suitable observation window. It contains more than 11 000 companies. As we haven´t collected data of corporations yet, we will introduce basic principles of spatial analysis by using data which describe a location of seedlings of trees in Redwood.

The most popular tradition method of spatial statistic is the Aggregation Clark-Evens Index (CE index). The CE index is based on summary characteristics which compares mean of nearest-neighbour distance. Values of the CE index greater than 1 indicate that the pattern has a tendency towards regularity, while the CE<1 indicates clustering. The advantage of this index is its easy application. On the other hand it leads to losing of information through reflection of point processes as simple statistics.

Ripley´s K-function is a tool to analyse complete data of spatial point processes. In the analysis there is considered two dimensional space. Data contain locations of each point in defined observation window. This function can be used to summary point patterns, test hypotheses, estimate parameters and fit model. K-function provides more information and more sensitive analysis than traditional methods. Sometimes this function is considered as the second order moment cumulative function which is related to second order intensity function reference. Ripley´s K function is the mean number of points other than the typical point in a ball of radius r centred at the typical point. The aim is testing deviations from complete spatial randomness (CSR). Ripley´s K-function is defined as:

$$K(h) = \frac{1}{\lambda} E(N_h),$$

Let N_h be the number of points within distance h of random window and λ be intensity of process. For more information see Illian et al. (2008) page 215.

The function has a simple form in the Poisson process case (CSR): $K(h)=\pi h^2$, for $h \geq 0$. Usually L-function is defined instead

$$L(h) = \sqrt{\frac{K(h)}{\pi}},$$

in CSR $L(h)=h$. Sometimes L-function is called Ripley´s L-function because it is just standardized version of Ripley´s K-function. If $K(h)>\pi h^2$ or $L(h)>h$ for small h, in the pattern there are clusters. If we can define $K(h)<\pi h^2$ or $L(h)<h$ for small h, points in the pattern are regular. Results of L-function are more conclusive due to better interpretation.

For a comparison of empirical functions and their counterpart, which is simulated from zero hypothesis, should be applied Envelope tests. Myllymäki et al. (2015) introduced new global Envelope tests which provide graphic illustration and exact p-value. Tests present distances where behaviour of function leads to rejection or confirmation of zero hypothesis. It is used for better understanding and suggestion more suitable models. Especially Rank Envelope test is based on Envelope test and it is recommended in case of high number of simulations. In our research it is considered 2 499 simulations. The value of significance level is 5 %.

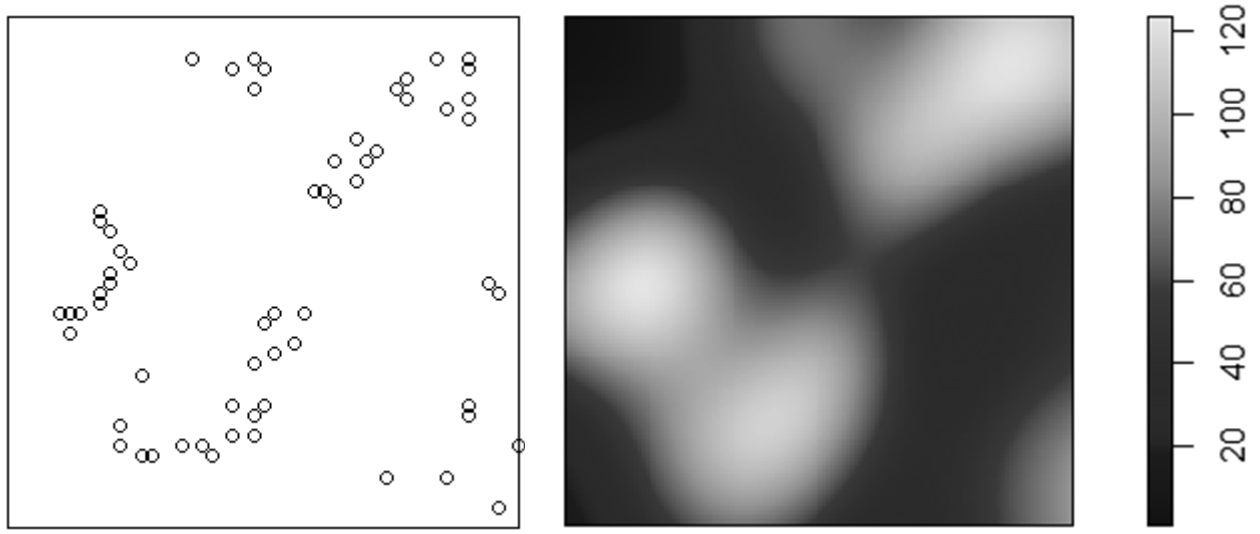
3 Research results

In the research there were observed 62 seedlings of tree in Redwood. The observed window is square with 1 m^2 area. The average intensity is 62 seedlings of tree per m^2. Location of seedlings is displayed in the Figure 1.

In the Figure 1 we can see that seedlings tend to formation of clusters. For objective evaluation statistics methods must be used to confirm the statement.

The CE index is considered as the most exploited tradition method. The test statistics of the CE index is R=0.6187. It is ratio of average neighbour distance in observed window (W) to expected distance for CSR. The alternative hypothesis is clustering. P-value of Bootstrap test that the CE index is equal to 1 is 4×10^{-4}. Thus data generate clusters.

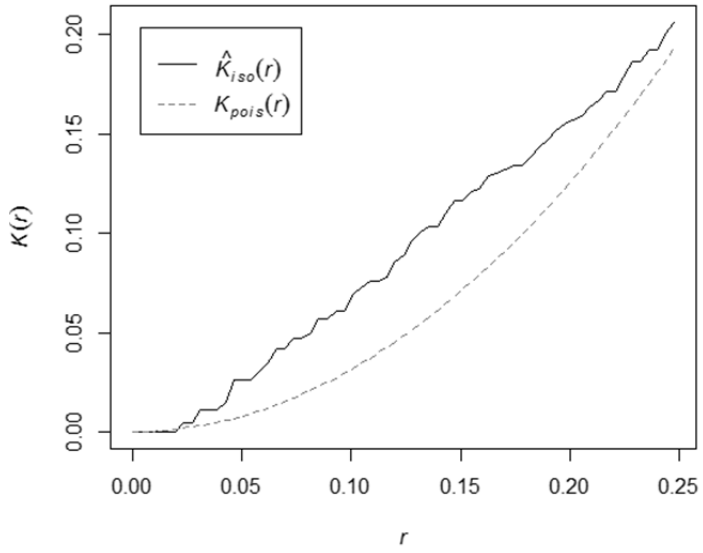
Figure 1 Map of seedlings of tree in Redwood



Source: Authors

The main tool for point processes analysis is Ripley´s K-function which is illustrated in Figure 2. The Figure shows that empirical K-function (solid line) is different from expected theoretical value (dashed line), which shows value of CSR and responds πh^2 for distance.

Figure2 Ripley´s K-function for Redwood data

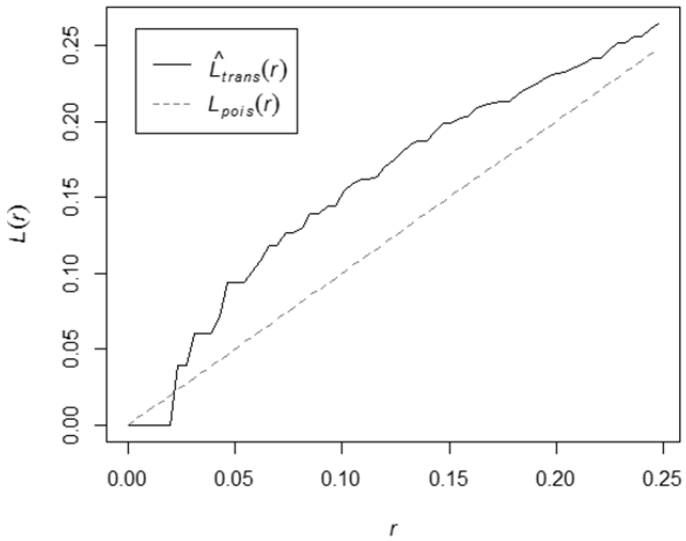


Source: Authors

In the similar way it is possible to construct L-function which can be seen in the Figure 3. L-function was used due to its linear behaviour in case of Poisson model and its better interpretation.

It is obvious that estimations of $\widehat{K}(h)$ and $\hat{L}(h)$ are above the CSR curve. It means that the pattern generates clusters. It is necessary to find out if clustering is significant. This significance is identified by simulation of global envelope. Global envelope for clusters of these functions are illustrated in Figures 4. In this case we considered 2 499 simulations. L-function is often adjusted to horizontal graphic illustration for better understanding. We used this adjusting for another modelling of function too.

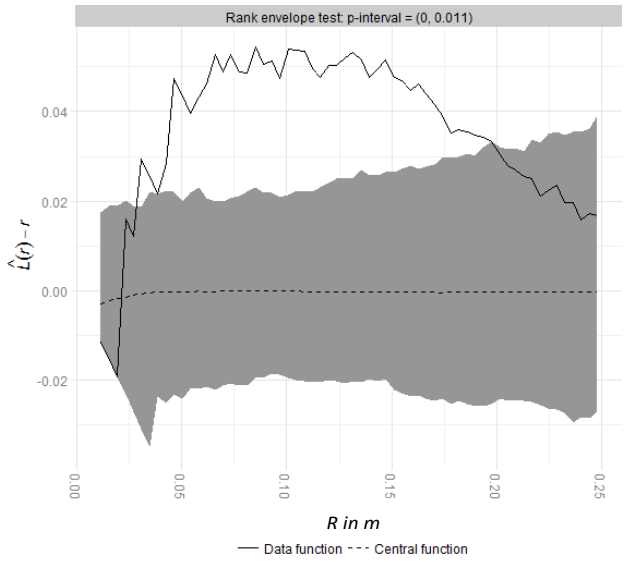
Graf 3 L-function for Redwood data



Source: Authors

The CE index, K-function and L-function refer that dates tend to generating clusters. In first case it was considered homogenous Poisson process so the dates were tested for CSR. Rank Envelope test for this model is illustrated in the Figure 4. From the results mentioned above it is necessary to reject hypothesis which consider that the pattern is Poisson model on base of L-function. The graphical illustration is supported by p-value which is in interval from 0 to 0.011, so we can reject the zero hypotheses of CSR.

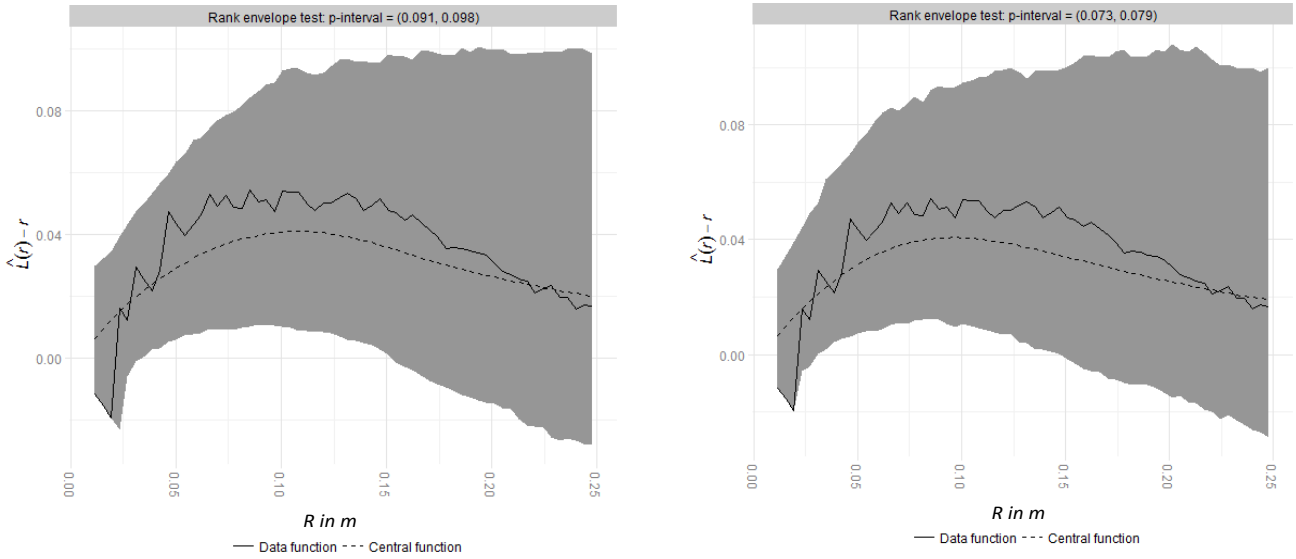
Figure 4 Rank envelope test of Poisson process



Source: Authors

The results in Figure 4 show that point pattern tends to generate clusters in distance of points from 0.04 metres to 0.20 metres. The statement can be confirmed by application of Cox processes which represent clustering processes. Neyman-Scott process is particular Poisson cluster process which considers that parents of clusters follow Poisson process and daughters are spread around parents with dispersion density function. The most famous Neyman-Scott process is Modified Thomas process and Matérn cluster process. In the first we considered Modified Thomas process which testing is illustrated in the Figure 5 (on the left side) and then we considered Matérn cluster process which testing is illustrated in the Figure 5 (on the right side).

Figure 5 Rank envelope test modified Thomas process (left) a Matérn cluster process (right)



Source: Authors

Modified Thomas process is the specific version of Neyman-Scott process where distribution of daughter point around points of parents has symmetric standard distribution. In Matérn cluster process, which is type of Neyman-Scott process, there are points spread uniformly and independently in the circle with ratio r around the centre of clusters (Illian, J. et al., 2008).

Result shows that pattern follows clustering models and we cannot reject hypothesis which claims that pattern is Neyman-Scott process on base of L-function. The result is confirmed by p-value which is in interval from 0.091 to 0.093 for Modified Thomas process and in interval from 0.073 to 0.079 for Matérn cluster process. The hypothesis of generation of clusters is confirmed, so it is not necessary to model Gibbs processes which are used in case of mutual repulsion of points.

4 Conclusions

The aim of this paper was to introduce basic principles of spatial statistics, chosen methods and their application. These principles will be used for deeper monitoring of spatial relation of companies. In the analysis of point processes there were found out that seedlings of tree in Redwood generate clusters. It was found out due to modelling of processes on base of L-function. First of all there was modelled Poisson process which shows deviation from complete spatial randomness and showed clusters generation. Then there were used cluster processes as Modified Thomas process and Matérn cluster process which confirmed the hypothesis about clustering.

This issue will be applied in next research which main aim will be identification if companies are spatial independent or if there exists some spatial dependence. In case that companies will be spatially dependent we will solve if this dependency is the same (it means if companies develop in same way) or if dependency is different (it means if companies develop in different way). Analysis in this paper could help with deeper recognition of spatial relations of corporations where marks describing the health of companies will be added to the point process.

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Accounting Data of ERP Systems and Spatial Dependence of Economic Activity

Petr Hanzal

Abstract: *This paper is seen as a contribution to the field of enterprise resource planning systems (ERP) and their application in spatial statistics. The main objective is to demonstrate the possibility of using accounting data of enterprise information systems for regional statistics, identifying spatial dependence of economic activities, through a set of accounting data obtained from enterprises. The theoretical framework provides a theoretical basis for the definition spatial statistics evaluation and indicators of economic activity. Interpretation of statistical methods are then used in the practical part, derived from accounting data of enterprise resource planning systems, 30 randomly selected enterprises with nationwide coverage in ČR, regardless of the branch structure.*

Key words: ERP - Enterprise Resource Planning Systems · Regional economic activities · Accounting data · Spatial statistics

JEL Classification: C02 · E03 · C88

1 Introduction

Accounting data represents an inevitable element of any enterprise information system. Accounting data is the bearer of the recorded facts relating to the enterprise activities and is also able to be transferred, interpreted and processed. It includes complete knowledge of micro- and macro-environment of the organisation, such as the recorded data on economic facts and other factors influencing the corporate value production chain (Sodomka, 2010).

The basic function of bookkeeping is to provide all its users reliable information about the financial standing of the respective enterprise. Bookkeeping is required to particularly provide information about the property and financial situation in the form of the Balance Sheet, and performance information in the form of the Profit and Loss Account, for the respective period of time. In doing this, not only the evaluation how the corporate management increased the value of the entrusted assets for the expired period is made, but we witness ever higher interest in prognosticating the financial situation, i.e. whether the enterprise is able to achieve good financial results in the future and in what amount. The accounting information is intended both for managers and various external users interested in the enterprise for various reasons. (Kovanicová, 2005).

Based on the aforementioned, we can distinguish two basic groups of accounting information users (Kovanicová, 2005):

- Entities directly participating in financing the enterprise (enterprise owners and creditors – for example debenture holders, banks, contractors);
- Entities interested to a certain extent in the financial result of the respective enterprise (tax authorities, state administration authorities, employees, competing enterprises, potential investors, the public).

In addition to its information function, bookkeeping have many other functions (Kovanicová, 2007):

- Maintaining records on the corporate events, i.e. the registration function;
- Bookkeeping is used as an evidence in disputes, particularly in protection and acknowledgement of rights resulting from creditor–debtor relationships;
- Bookkeeping is a basis for assessing the tax liabilities;
- Bookkeeping is a mean, based on which managers are responsible to the enterprise owners;
- Bookkeeping provides information for the business decision-making processes and internal decision making processes of various types and time horizons.

When financial accounting is kept, the general accounting principles should always be observed. The basic legal framework of the Czech accounting system consists of the Act on Accounting, regulations to implement it and

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the Czech accounting standards. The financial and tax accounting systems are mutually interconnected in Europe and in our country. Moreover, tax rules and laws have a considerable impact on the accounting principals of financial bookkeeping, which may be considerably misrepresented by them in certain cases (Šteker, 2010).

Financial accounting data is formed by facts in the field of proprietary relationships, receivables from customers, payables to suppliers, and it also monitors the revenues and expenses from the accounting unit's standpoint in its entirety. This data records all business transactions in the area of purchase and sales of goods, materials, enterprise's own products and services, including master data of suppliers and customers (Hanzal, 2009).

2 Methods

The statistical quantities that allow measuring spatial dependence of regions may include the autocorrelation degree, which takes into account the spatial arrangement of regions and their mutual locations. In general, the spatial autocorrelation principal may be understood as an existence of certain dependence between probability of occurrence of a certain phenomenon in the spatial unit and probability of occurrence of the phenomenon in units j, which are in spatial proximity. Therefore the spatial autocorrelation equation can be presented as follows (Spurná, 2008):

$$p_i(y) = f\,(\Sigma i\, w_{ij} p_j(y)) \tag{1}$$

where p_i(y) is the probability of occurrence of the phenomenon in the unit i, w_{ij} for i ≠ j is the weight selected.

The idea of spatial autocorrelation may be therefore verbally defined as a similarity of regions, which are researched in regards to their mutual location and spatial continuity of a certain phenomenon. If high values of the monitored variable tend to create clusters in certain monitored locations, while the low values do so in other monitored locations, it is apparent that the monitored phenomenon shows a positive spatial autocorrelation.

If the analysed data shows a positive spatial autocorrelation, such data simultaneously creates clusters of units with similar values of the monitored phenomenon. If high values tend to be very close to low values and vice versa, it is a negative spatial autocorrelation. If the data is spread so that no relationship between close values exists, we speak of zero spatial autocorrelation. However almost every spatial data shows a certain type of positive spatial autocorrelation. The question is whether the respective degree is significant or not, this means if it expresses a real spatial dependence of the respective quantity in the monitored locations – see Table 1.

Table 1 Moran's diagram and example of Moran's I display

Weighed variable value in proximity units

Low – High Negative Spatial Correlation	High – High Positive Spatial Correlation
Low – Low Positive Spatial Correlation	High – Low Negative Spatial Correlation

Variable value in a spatial unit

Spatial autocorrelation can be measured by several spatial autocorrelation statistics describing similarity of proximity observations depending on the fact, if it is a discrete or a coherent variable. In general, any statistics of spatial autocorrelation create a dependence between attribute similarity c_{ij} and distance proximity w_{ij} of spatial units i and j in the simplest expression:

$$\Sigma i \Sigma j\; c_{ij} w_{ij} \tag{2}$$

This means that all autocorrelation statistics depend on a certain definition of spatial weighing, which attempts to quantify the proximity concepts (which are often subjective) and differ from one another by expressing the attribute similarity c_{ij}.

The following methods are applied to evaluate the autocorrelation degree (Anselin, 2008):

- Moran's I criterion;
- Geary's C criterion;
- LISA analysis;
- General G statistics;
- Local G statistics.

The most frequently applied indicator to measure spatial autocorrelation of quantitative data is Moran's I criterion. Moran's I criterion can be presented in a generalised form as follows (Spurná, 2008):

$$I_k = \frac{n * \sum_{i=1}^{n} \sum_{j=1}^{n} w_{ij}^{(k)} * (z_i - \bar{z}) * (z_j - \bar{z})}{\left(\sum_{i=1}^{n} (z_i - \bar{z})^2 \right) * \left(\sum_{i \neq j} \sum w_{ij}^{(k)} \right)} \quad (3)$$

$w_{ij}(k)$ is indication of mutual distance between regions i and j for step k;

z_i is the researched quantity in location i, $\bar{z}$ represents arithmetic average;

n is the number of the analysed units.

If the spatial autocorrelation is positive, then the Moran's criterion is positive; if the spatial autocorrelation is negative, then the Moran's criterion is negative. If the variable shows no statistical spatial dependence, the Moran's criterion is close to zero. As weights w_{ij} are not standardised for interval <0,1>, standardisation must be performed by aggregating them in the denominator.

Before the spatial autocorrelation analysis itself is made, the spatial weighing schemes must be created, which considerably affect the resulting values of the autocorrelation statistics from the methodological standpoint.

There are many variants of this method, which differ from one another in the neighbourhood definition methods and setup of w_{ij} weights. It is recommended to describe the neighbourhood and the weight values by weight matrix W with dimensions n x n, where n is the number of regions. Weight w_{ij} between two regions can be expressed according to Table 2.

Table 2 Weight between two regions

Variant	Weight definition	Weight definition description
1	$w_{ij}= 1$	If the region's centroid j is one of the closest centroids to region i
	$w_{ij}= 0$	In other cases
2	$w_{ij}= 1$	If the region's centroid j is within a certain distance δ from region i
	$w_{ij}= 0$	In other cases
3	$w_{ij}= d\gamma_{ij}$	If the distance d_{ij} between the regional centroids i and j is lower than certain distance δ from region i ($\gamma < 0$ expresses steepness of the distance impact)
	$w_{ij}= 0$	In other cases
4	$w_{ij}= 1$	If region j shares a common border with region i
	$w_{ij}= 0$	In other cases
5	$w_{ij}= l_{ij}/l_i$	Where l_{ij} is the length of the shared border between regions i and j; respectively, li is the region's circumference
6	$w_{ij}= d_{ij}$	Where d_{ij} is Euclidean distance of centroids of the neighbouring regions

Resource: Spurná (2008)

The methods allowing local autocorrelation analysis include so-called LISA – Local Spatial Autocorrelation Analysis, which is based on the local Moran's statistics and allows measuring spatial dependence for each individual location (Anselin, 2005). It exists in univariate or multivariate version. It is based on the same principles as Moran's I, nevertheless it is localised, and the inputs necessary for LISA statistics are the same as those for the global autocorrelation statistics.

Indicator of intensity of economic relationships.

The administrative unit LAU1 – districts was the smallest monitored location during the spatial autocorrelation research. The intensity of economic relationships was calculated for each unit based on business transactions of enterprises, and then these units have been subject to a research by statistical methods, whose aim was to identity the spatial dependences.

In order to define economic agglomerations in the Czech Republic, a set of indicators has been chosen to characterise the situation in the individual regions from the point of view of sales of merchandise, own products and services in the monitored regions of the respective territory, from a sample of 30 randomly selected enterprises with nationwide coverage.

Indicators of intensity of economic relationships on the basis of business transactions of enterprises

The definition itself, calculation and definition of data of the individual partial intensities are shown in Table 3 with the following meaning of the respective variables:

Y_i – the number of employees of the enterprise i, where i=1…n.

Z_r – population of the region r where sales are performed, or from which purchases are performed, where r=1… the number of regions (in our case the number of LAU1 – districts).

n – the number of enterprises (in our case 30).

Table 3 – Definition, calculation and sources of data of the individual components.

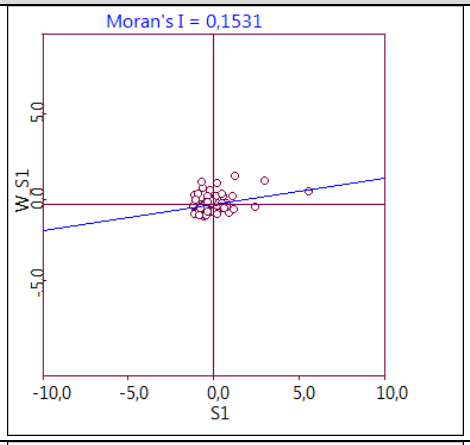
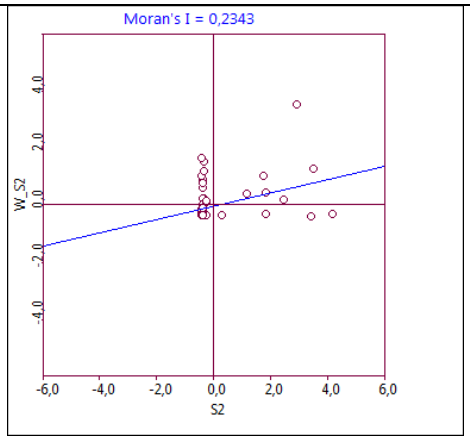
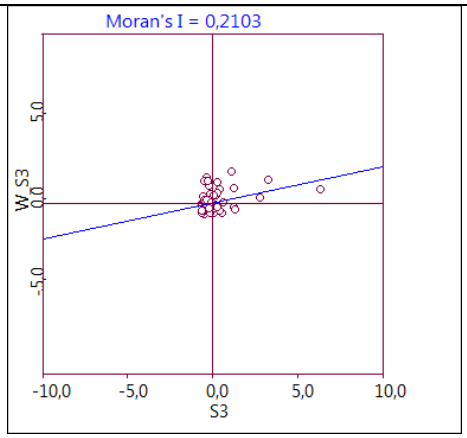
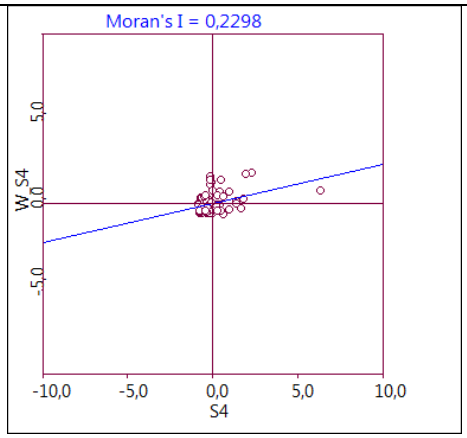
Partial intensity	Mathematic definition	Description of variables	Data filter criterion	Data source
I_{hpz_r} Partial intensity of values of sales of merchandise and own products	$\frac{\sum_{i=1}^{n} \frac{B_{ri}}{Y_i}}{Z_r}$	B_{ri} – Total amount of all sales of merchandise and own products to the target region r by the enterprise i	Synthetic account 604 for merchandise 601 for own products	Author's calculation
I_{ppz_r} Partial intensity of the number of sales of merchandise and own products	$\frac{\sum_{i=1}^{n} \frac{C_{ri}}{Y_i}}{Z_r}$	C_{ri} - Total number of all sales of merchandise and own products to the target region r by the enterprise i	Synthetic account 604 for merchandise 601 for own products	Author's calculation
I_{hps_r} Partial intensity of values of sales of services	$\frac{\sum_{i=1}^{n} \frac{D_{ri}}{Y_i}}{Z_r}$	D_{ri} - Total amount of all sales of services to the target region r by the enterprise i	Synthetic account 602 for services	Author's calculation
I_{pps_r} Partial intensity of the number of sales of services	$\frac{\sum_{i=1}^{n} \frac{E_{ri}}{Y_i}}{Z_r}$	E_{ri} – Total number of all sales of services to the target region r by the enterprise i	Synthetic account 602 for services	Author's calculation

Source: author's own

3 Research outcomes

Moran's I criterion was used for analysis of spatial autocorrelation; all calculations were made using OpenGeoDa software. Partial constituents of the indicator of intensity of economic relationships were analysed based on business transactions of the enterprises defined in Chapter 2. The weight matrix calculation method was defined according to variant 6, Table 2, Chapter 2. Table 4 shows the values of spatial dependence between LAU1 regions for various types of business transactions.

Table 4 Values of spatial dependence between regions for various types of business transactions

Spatial dependence type	Moran's diagram of spatial dependence
Spatial dependence in the area of intensity of values of sales of merchandise and own products I_{hpz_r}	
Spatial dependence in the area of intensity of the number of sales of merchandise and own products I_{ppz_r}	
Spatial dependence in the area of intensity of values of sales of services I_{hps_r}	
Spatial dependence in the area of the number of sales of services I_{pps_r}	

Source: author's own

4 Conclusions

The performed analysis of spatial autocorrelation of the selected variables based on calculation of Moran's I criterion confirmed the hypothesis, that spatial data is characteristic by its spatial dependence, because in all cases, positive spatial autocorrelation has been confirmed. The degree of Moran's I criterion reached the values 0.1194–0.2411. We may deduce from the aforementioned that the cluster interconnection from the point of view of business operations of 30 randomly selected enterprises is demonstrable, however not very high.

The increasing mutual dependence is a characteristic feature of the global economy development. These phenomena may be described both by economic & statistic indicators acquired on the basis of statistical research, and on the basis of data from business information systems, which are providers of a large volume of information important for regional economy and development. The business information systems provide many instruments for effective procurement of information.

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The Comparison of Stochastic and Deterministic DEA Models

Michal Houda, Jana Klicnarová

Abstract: *The idea of deterministic data envelopment analysis (DEA) models is well-known. If we start to study the stochastic DEA models, it seems at first glance, that the ideas of these two models are totally different. The aim of this paper is to explain that there is a really nice connection between the ideas of stochastic and deterministic models.*

Key words: Data Envelopment Analysis · Deterministic DEA · Stochastic DEA · Efficiency

JEL Classification: C44 · C61

1 Introduction

The idea of the piecewise-linear convex hull as a frontier estimation for effective units goes back to Farrell (1957) and it was consider by a few authors in following years. The main attention received this topic when Charnes, Cooper and Rhodes (1978) presented their paper, where the Data Envelopment Analysis (DEA) was introduced. Since then there were published a large number of papers and books which extended these results and DEA methodology – see for example Coelli (2009).

The basic idea of DEA is the comparison of some units which are characterized by several inputs and outputs. The main aim of this analysis is to identify so-called efficient units. More precisely, the aim is to estimate frontier function and to measure the efficiencies of units relative to this estimated frontier. The other possible point of view at this problem comes from the decision making theory. In fact, we have some units and we know there evaluation according to several criteria, some of them are cost type, some of them are benefit type. Our aim is to find such units (alternatives in the terms of multiple attribute decision making), which are not dominated and which are Pareto efficient. The solving of DEA problems leads to the problem of mathematical programming, in case of deterministic models to linear programming, in case of stochastic model to non-linear programming problems.

The paper is organized as follows. In the section 2 we introduce the basic notation necessary for the setting of these problems. Section 3 introduces the deterministic DEA models and the stochastic DEA models are given in section 4. To show the connection between deterministic and stochastic models, we present the deterministic models in non-classical way. We do not use a formulation based on the idea of optimization of efficiency – which is widely used for deterministic models, but we use a dual approach – an approach of dominated alternatives. This allows us to show a close connection between deterministic and stochastic formulation of the problem.

2 Methods

To set up the models, let us introduce the following notation. By DMU_k, we denote a k-th decision making unit, where $k = 1, \dots, K$ and K is a number of units in question. Then, we write $X := (x_{ik}) \in \mathbb{R}^{m \times K}$ for input matrix where each column $x_{\cdot k} = (x_{1k}, \dots, x_{mk})^T$ represents the input vector of k-th decision unit. On the other hand, the rows of the matrix X represent the values of individual inputs, that is, $x_{i\cdot} = (x_{i1}, \dots, x_{iK})^T$ gives the values for the i-th input of all units. In the same way, we use $Y := (y_{jk}) \in \mathbb{R}^{n \times K}$ as the output matrix, and $y_{\cdot k}$, $y_{j\cdot}$ the corresponding output vectors (column and row vectors).

The key object in our investigation represents the *production possibility set*, denoted PPS in short. It is the set of all possible/allowed combination of inputs and outputs. This set is given by the data, it varies from analysis to analysis. It is also important to remark that – as mentioned above – matrices X and Y are not variables (as usual in optimization models) but they represent the data (i.e., inputs and outputs of analyzed units).

The analysis of the efficiency of a unit is closely related to the definition of the dominance property. As we will see, its definition varies depending upon the production possibility set chosen. As a consequence, the efficiency of the unit

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in question will be defined individually for each model considered and cannot be seen as a "universal" property of the unit.

The unit which is considered for efficiency, will be denoted DMU_0 through the paper.

3 Discrete and Continuous Production Possibility Sets

In this section, we describe traditional deterministic DEA models appearing in the literature. Apart from the usual economical formulations (based on comparing the input/output ratio), we concentrate on the characterization of these models based on production possibility sets, which later facilitates the transition to their stochastic versions.

3.1 Discrete Production Possibility Set – Additive Model

We start our investigation with the production possibility set composed from only the actually observed units, that is

$$PPS_I := \{(x_{\cdot 1}, y_{\cdot 1}), \dots, (x_{\cdot K}, y_{\cdot K})\}. \tag{1}$$

To characterize the efficiency of the units with respect to PPS_I, we perform a simple pairwise comparison between units using the following definition of efficiency dominance.

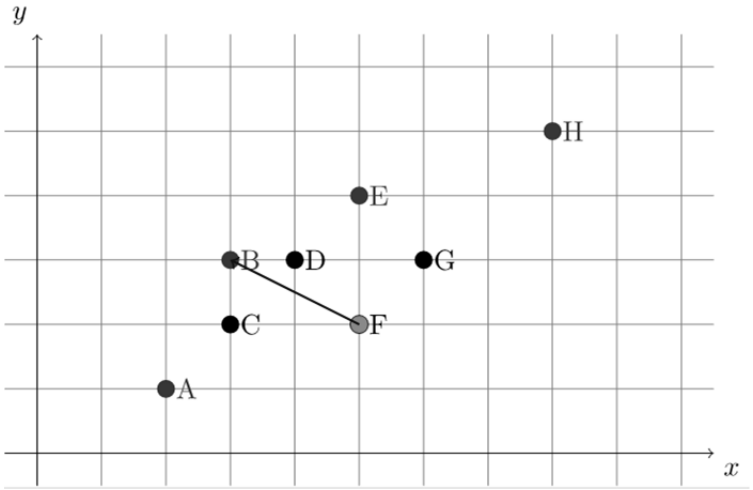
Definition 1 (Cooper, Huang, Li, 2004) We say that DMU_1 *dominates* DMU_2 with respect to PPS_I if $x_{\cdot 1} \leq x_{\cdot 2}$ and $y_{\cdot 1} \geq y_{\cdot 2}$ with strict inequality holding for at least one of the components in the input or output vector. We say that DMU_0 is *efficient* with respect to PPS_I if there is no unit dominating DMU_0 with respect to PPS_I.

Bowlin et al. (1984) formulated a so-called additive model with binary constraints as follows:

$$\begin{gathered} \text{maximize } \left(\sum_i s_i^- + \sum_j s_j^+\right) \text{ subject to} \\ \sum_k x_{ik}\lambda_k + s_i^- = x_{i0} \text{ for all inputs } i = 1, \dots, m, \\ \sum_k y_{jk}\lambda_k - s_j^+ = y_{j0} \text{ for all outputs } j = 1, \dots, n, \\ \sum_k \lambda_k = 1,\ \lambda_k \in \{0,1\}^K,\ s_i^-, s_j^+ \geq 0. \end{gathered} \tag{2}$$

The decision variables s_i^-, s_j^+ are the slack and surplus variables, respectively, for the inequalities $X\lambda \leq x_{\cdot 0}$, $Y\lambda \geq y_{\cdot 0}$. (We will generally refer to them as slacks in the rest of the paper.) As there can be only one element of he binary variables equal to one (say k-th, that is $\lambda_k = 1$), this element identifies the unit (namely DMU_k) for pairwise comparison with DMU_0, at each solution (iteration). Maximizing slacks ensures that, at an optimal solution, DMU_k is the "most dominant" unit, with respect to DMU_0. At optimum, if all slacks are zero, then DMU_k does not dominate DMU_0 in sense of Definition 1, hence there is no unit dominating DMU_0, henceforth DMU_0 is efficient. Figure 1 illustrates the procedure: the most dominating unit for F is the unit B. As the slacks and surpluses are nonzero in this case, F is not efficient. The units A, B, E, and H do not have dominating units in sense of Definition 1, hence they are efficient.

Figure 1 Example of the additive DEA model



Source: Own processing of the data from Table 1.1 in Cooper, Seiford, Tone (2007)

Due to the presence of integrality constraints, this optimization problem unfortunately does not have its dual form, that is, with objective in a traditional input/output ratio form. Its continuous relaxation leads to the model which is described in the following section.

3.2 Continuous (Convex) Production Possibility Set – BCC Model

A continuous relaxation of (2), given originally by Banker, Cooper, Charnes (1984) and known as BCC model, supposes the production possibility set to be the convex hull of observed units. That is,

$$PPS_C = \{(x,y) | x = X\lambda, y = Y\lambda, \lambda = (\lambda_1, \lambda_2, \dots, \lambda_k)^T,\ \textstyle\sum_{k=1}^{K} \lambda_k = 1, \lambda \geq 0\}. \tag{3}$$

To characterize the efficiency of the units with respect to PPS_C, we easily extend Definition 1 to deal with the newly defined production possibility set.

Definition 2 (Cooper, Huang, Li, 2004) Let $(x_{.1}, y_{.1}), (x_{.2}, y_{.2}) \in PPS_C$ be two input-output pairs from the production possibility set PPS_C. We say that $(x_{.1}, y_{.1})$ *dominates* $(x_{.2}, y_{.2})$ with respect to PPS_C if $x_{.1} \leq x_{.2}$ and $y_{.1} \geq y_{.2}$ with strict inequality holding for at least one of the components in the input or output vector. We say that DMU_0 is *efficient* with respect to PPS_C if there is no pair $(x, y) \in PPS_C$ dominating DMU_0 with respect to PPS_C.

The *output oriented BCC* optimization *model* (Banker, Cooper, Charnes, 1978) is formulated as follows:

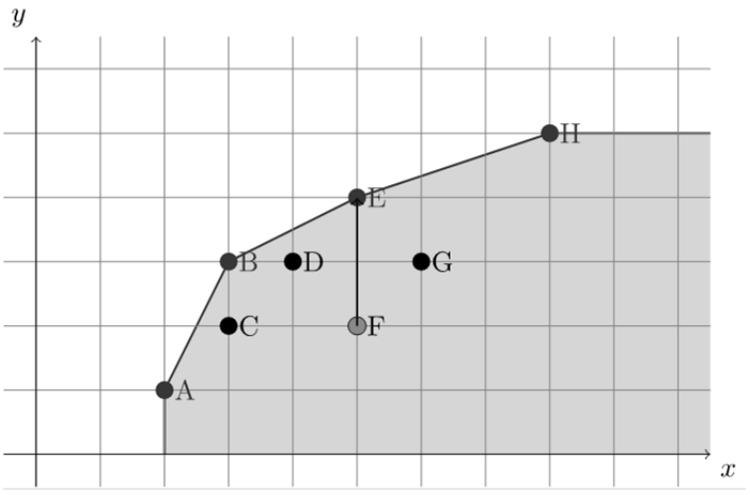
$$\begin{gathered} \text{maximize } \phi + \epsilon\left(\textstyle\sum_i s_i^- + \sum_j s_j^+\right) \text{ subject to} \\ \textstyle\sum_k x_{ik}\lambda_k + s_i^- = x_{i0} \text{ for all inputs } i = 1, \dots, m, \\ \textstyle\sum_k y_{jk}\lambda_k - s_j^+ = \phi y_{j0} \text{ for all outputs } j = 1, \dots, n, \\ \textstyle\sum_k \lambda_k = 1, \lambda_k \geq 0,\ s_i^-, s_j^+ \geq 0, \phi \text{ unconstrained,} \end{gathered} \tag{4}$$

where ϵ is a non-Archimedean infinitesimal (a positive number smaller than any other positive number) . The decision variables s_i^-, s_j^+ are again the slack and surplus variables for the inequalities $X\lambda \leq x_{.0}$, $Y\lambda \geq \phi y_{.0}$. The additional decision variable ϕ represent the inefficiency factor of outputs of DMU_0. If $\phi = 1$, then DMU_0 with $(x_{.0}, y_{.0})$ is sometimes called *weakly efficient* unit. Indeed, there could be more optimal solutions with $\phi = 1$ if we set $\epsilon = 0$; including the sum of slacks/surpluses into the objective, we select the "most dominant" among these solutions (c. f. the additive model), that is, with all slacks equal to zero. Non-Archimedean infinitesimal ensures that this sum of slacks and surpluses does not hurt the value of the objective function. We arrive at sufficient optimality conditions:

Proposition 1 (Cooper, Huang, Li, 2004) If (a) $\phi^* = 1$, and (b) $s^{-*} = s^{+*} = 0$, where * represents the optimum of (4), then DMU_0 is (fully) efficient with respect to PPS_C.

Figure 2 demonstrates this situation: PPS_C is represented by the shaded region, its frontier is piecewise-linear line connecting units H, B, E, and H. Points lying on the right-most part of the frontier (to the right of H) are solutions of (4) having $\phi = 1$, but the maximal slacks are not zero for these point—there is a point (namely H) which has the same value of the output but with smaller inputs, that is, dominating our considered points in sense of Definition 2.

Figure 2 Example of the convex output oriented (BCC) DEA model



Source: Own processing of the data from Table 1.1 in Cooper, Seiford, Tone (2007)

For any inefficient unit, the non-zero elements of the variable λ identify a point on the efficient frontier found as a convex combination of so-called peer units. Point F on Figure 2 is not efficient (with $\phi < 1$): it is its only peer unit E which has the optimal outputs with the same level of inputs.

The dual form of (4) is formulated by

$$\begin{gathered}\text{minimize } \sum_i u_i x_{i0} + q \text{ subject to} \\ \sum_i u_i x_{ik} + q \geq \sum_j v_j y_{jk} \text{ for all units } k = 1, \dots, K, \\ \sum_j v_j y_{jk} = 1 \text{ (dual constraint for } \phi), \\ u_i, v_j \geq \epsilon, \, q \text{ unconstrained,}\end{gathered} \tag{5}$$

which is the traditional formulation of BCC model (minimizing the input/output ratio). Non-Archimedean infinitesimal ε ensures that all inputs and outputs are considered in the analysis. The variable q, dual for the convexity constraint $\sum_k \lambda_k = 1$, is known as the variable return to scale factor.

3.3 Continuous (Linear) Production Possibility Set – CCR Model

Further relaxation of (4), removing the convexity constraint $\sum_k \lambda_k = 1$, results in the model given originally by Charnes, Cooper, Rhodes (1978) and known as CCR model. The production possibility set in this case is the convex cone containing observed units:

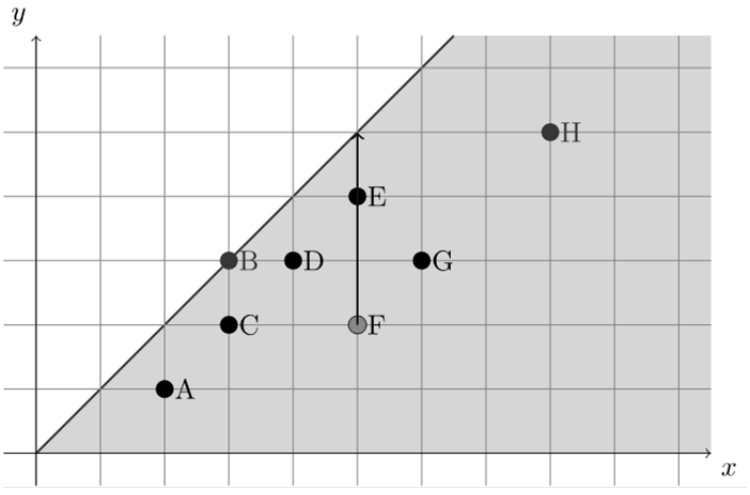
$$PPS_L = \{(x, y) | x = X\lambda, y = Y\lambda, \lambda = (\lambda_1, \lambda_2, \dots, \lambda_k)^T, \lambda \geq 0\}. \tag{6}$$

To characterize the efficiency of the units with respect to PPS_L, we can use Definition 2, just replacing PPS_C with PPS_L. The *output oriented CCR* optimization *model* (Charnes, Cooper, Rhodes, 1984) is formulated as follows:

$$\begin{gathered}\text{maximize } \phi + \epsilon\left(\sum_i s_i^- + \sum_j s_j^+\right) \text{ subject to} \\ \sum_k x_{ik}\lambda_k + s_i^- = x_{i0} \text{ for all inputs } i = 1, \dots, m, \\ \sum_k y_{jk}\lambda_k - s_j^+ = \phi y_{j0} \text{ for all outputs } j = 1, \dots, n, \\ \lambda_k \geq 0, \; s_i^-, s_j^+ \geq 0, \, \phi \text{ unconstrained,}\end{gathered} \tag{7}$$

The interpretations of the model and optimality conditions are analogous to the convex case. The situation is demonstrated on Figure 3; you can notice the production possibility set in conic form.

Figure 3 Example of the linear output-oriented CCR DEA model



Source: Own processing of the data from Table 1.1 in Cooper, Seiford, Tone (2007)

The dual form of (7) is formulated by

$$\begin{gathered}\text{minimize } \sum_i u_i x_{i0} \text{ subject to} \\ \sum_i u_i x_{ik} \geq \sum_j v_j y_{jk} \text{ for all units } k = 1, \dots, K, \\ \sum_j v_j y_{jk} = 1 \text{ (dual constraint for } \phi), \\ u_i, v_j \geq \epsilon.\end{gathered} \tag{8}$$

The missing variable q (i. e., $q = 0$) is manifestation of the property of constant return to scale.

4 Stochastic Extensions to Production Possibility Sets

The data represented by the matrices X, Y are usually not deterministic. We will now consider the inputs and outputs to be random variables. Hence, the matrices X, Y and corresponding PPS are also random. To deal with resulting random constraints, we also define a (sufficiently small) *tolerance* or *risk level* $\alpha \in (0; 1)$. It is worth to note here that the notion of stochastic efficiency is not uniquely determined but adapted to a particular situation.

4.1 Stochastic additive model

In the case of discrete production possibility set defined by (1).

Definition 3 (Cooper et al., 1988) We say that DMU_0 is *not stochastically dominates* with respect to PPS_I if for each $\lambda_k \in \{0, 1\}^K$, $\sum_k \lambda_k = 1$ we have

$$\mathbb{P}\{X\lambda \leq x_{.0}, Y\lambda \geq y_{.0}\} \leq \alpha. \tag{9}$$

The stochastic extension of the additive 0–1 model reads simply as

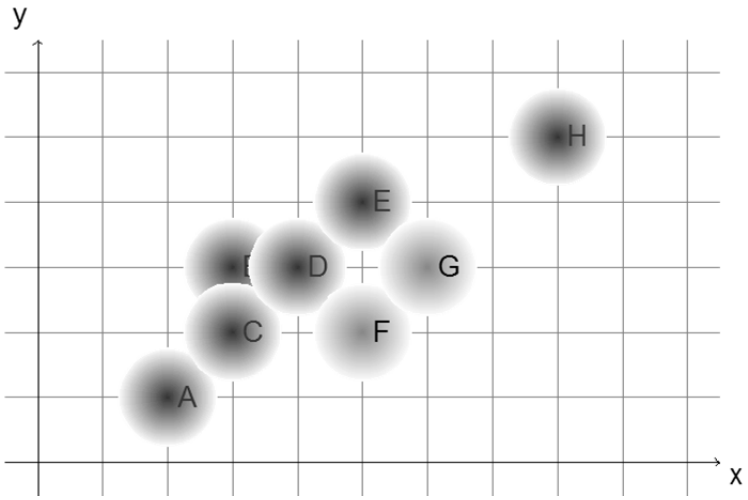
$$\beta^* := \max \mathbb{P}\{X\lambda \leq x_{.0}, Y\lambda \geq y_{.0}\}. \tag{10}$$

It is now easy to see the optimality condition for stochastic efficiency in this case:

Proposition 2 (Cooper, Huang, Li, 2004) DMU_0 is α-stochastically efficient with respect to PPS_I if and only if $\beta^* > \alpha$.

The concept of stochastic efficiency is illustrated on Figure 4. Conclusions about efficiency must be made with respect to uncertain position of the input-output points: for example, units B and C can exchange their positions so that C is dominating B for a particular instance. In stochastic terms, both B and C must be indicated as efficient if the probability of such event is sufficiently high. The only remaining non-efficient points are the units F and G for which this probability is small.

Figure 4 Example of the stochastic additive DEA model



Source: Own processing of the data from Table 1.1 in Cooper, Seiford, Tone (2007)

4.2 Stochastic continuous model

Continuous extension to additive stochastic dominance is straightforward:

Definition 4 (Cooper et al., 1988) We say that DMU_0 is α-*stochastically efficient* with respect to PPS_C if for each $\lambda \geq 0$ with $\sum_k \lambda_k = 1$ we have

$$\mathbb{P}\{X\lambda \leq x_{.0}, Y\lambda \geq y_{.0}\} \leq \alpha. \tag{11}$$

Applying necessary and sufficient conditions for stochastic dominance (see Cooper et al., 1988), the stochastic extension to BCC takes the following form known as *almost 100% confidence chance-constrained problem*

$$\begin{gathered}\beta^* := \max \mathbb{P}\{\textstyle\sum_i s_i^- + \sum_j s_j^+ < 0\} \text{ subject to} \\ \mathbb{P}\{\textstyle\sum_k x_{ik}\lambda_k + s_i^- < x_{i0}\} \geq 1-\epsilon \text{ for all inputs } i = 1, \dots, m, \\ \mathbb{P}\{\textstyle\sum_k y_{jk}\lambda_k - s_j^+ > y_{j0}\} \geq 1-\epsilon \text{ for all outputs } j = 1, \dots, n, \\ \textstyle\sum_k \lambda_k = 1, \lambda_k \geq 0,\ s_i^-, s_j^+ \geq 0.\end{gathered} \tag{12}$$

Proposition 3 (Cooper et al., 1988) If DMU_0 is α-stochastically efficient, then $\beta^* \leq \alpha$. If $\beta^* > \alpha$ then DMU_0 is not α-stochastically efficient.

4.3 Marginal chance-constrained model

Relaxing the almost 100% (namely $1-\epsilon$) confidence, Cooper et al. (2002, 2003) introduced *a marginal chance-constrained optimization model* for BCC of the form

$$\begin{gathered}\text{maximize } \phi \text{ subject to} \\ \mathbb{P}\{\textstyle\sum_k x_{ik}\lambda_k + s_i^- = x_{i0}\} \geq 1-\alpha \text{ for all inputs } i = 1, \dots, m, \\ \mathbb{P}\{\textstyle\sum_k y_{jk}\lambda_k - s_j^+ = y_{j0}\} \geq 1-\alpha \text{ for all outputs } j = 1, \dots, n, \\ \textstyle\sum_k \lambda_k = 1, \lambda_k \geq 0,\ s_i^-, s_j^+ \geq 0.\end{gathered} \tag{13}$$

Problem (13) implies the following definition of marginal stochastic efficiency:

Definition 5 (Cooper et al., 2002) We say that DMU_0 is *marginally α-stochastically efficient* if (a) $\phi^* = 1$, and (b) $s^{-*} = s^{+*}$ for all (alternate) optimal solutions, where * represents the optimum of (13).

Problem (13) is a special case of the standard individual chance-constrained problem. If the constraint rows follow normal distribution, (13) reduces to a quadratic optimization problem (involving normal quantiles $\Phi^{-1}(\alpha)$). We refer to Prékopa (2003) to a survey of solution methods for such problems; see also Cheng, Houda, Lisser (2015) for a recent contribution (involving dependency properties and second-order cone programming methods).

5 Conclusions

In the paper, we presented several types of deterministic and stochastic models. The non-classical way of the construction of deterministic models – based on domination of units – allows us to show a close connection between deterministic and stochastic models. We also presented that these deterministic models coincide with classical ones, because they are in fact their dual forms.

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On the Computation of B-Spline Basis Function Values $B_{Q,r}(t)$

Miloš Kaňka

Abstract: *In the article we describe the construction of B-spline basis functions* $\boldsymbol{B_{Q,r}}$ *with the help of divided differences and determinants. The so-called Vandermonde determinant plays a fundamental role in expression for the particular determinants in our case. The computation of the value of* $\boldsymbol{B_{Q,r}(t)}$ *at a given point* $\boldsymbol{t} \in \mathbb{R}$ *can be realized through three formulas, the first of which has a general scope and the other two are its simplifications.*

Key words: B-spline basis functions · de Boor formula · Vandermonde determinant

JEL Classification: C63 · C65

1 B-spline basis functions

By the symbol $(t)_+$ we denote the real-valued function

$$(t)_+ = \begin{cases} t, & \text{if } t > 0, \\ 0, & \text{if } t \leq 0. \end{cases}$$

A B-spline function $B_{Q,r} = B_{Q,r}(t)$ is defined for $Q \geq 1$ and r integers, and $Q+2$ knots $T_{r-Q-1} < T_{r-Q} < \cdots < T_r$ as a normalized $(Q+1)$-th divided difference of the function $g(T) = [(T-t)_+]^Q$ of real variable T. Thus, $g(T)$ is, for a given T, function of the real variable t, which we will denote as $(T-t)_+^Q$. Hence,

$$B_{Q,r} = (T_r - T_{r-Q-1})[T_{r-Q-1}, T_{r-Q}, \dots, T_r]g. \tag{1}$$

(Divided differences can be found e.g. in (Schrutka, 1945), for spline-related topics we refer to the other literature listed at the end of the work.)

For example, for $Q = 1$ we have, according to (1),

$$\begin{aligned} B_{1,r} &= (T_r - T_{r-2}) \cdot [T_{r-2}, T_{r-1}, T_r]g = (T_r - T_{r-2}) \frac{[T_r, T_{r-1}]g - [T_{r-1}, T_{r-2}]g}{T_r - T_{r-2}} = \\ &= [T_r, T_{r-1}]g - [T_{r-1}, T_{r-2}]g = \frac{g(T_r) - g(T_{r-1})}{T_r - T_{r-1}} - \frac{g(T_{r-1}) - g(T_{r-2})}{T_{r-1} - T_{r-2}} = \\ &= \frac{(T_r - t)_+^1 - (T_{r-1} - t)_+^1}{T_r - T_{r-1}} + \frac{(T_{r-2} - t)_+^1 - (T_{r-1} - t)_+^1}{T_{r-1} - T_{r-2}}, \end{aligned}$$

that is,

$$B_{1,r}(t) = \frac{T_r - t}{T_r - T_{r-1}} \qquad \text{for } T_{r-1} \leq t \leq T_r, \tag{2}$$

$$B_{1,r}(t) = \frac{t - T_{r-2}}{T_{r-1} - T_{r-2}} \qquad \text{for } T_{r-2} \leq t \leq T_{r-1}; \tag{3}$$

everywhere else $B_{1,r}(t)$ takes the value zero.

2 General expression of divided differences through determinants

In (1), the following expression incorporating determinants holds for $[T_{r-Q-1}, T_{r-Q}, \dots, T_r]g$ (see (Schrutka, 1945), for example):

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$$[T_{r-Q-1}, T_{r-Q}, \dots, T_r]g = \frac{\begin{vmatrix} g(T_{r-Q-1}) & g(T_{r-Q}) & \cdots & g(T_r) \\ T_{r-Q-1}^{Q} & T_{r-Q}^{Q} & \cdots & T_r^{Q} \\ \vdots & \vdots & \ddots & \vdots \\ T_{r-Q-1} & T_{r-Q} & \dots & T_r \\ 1 & 1 & \dots & 1 \end{vmatrix}}{\begin{vmatrix} T_{r-Q-1}^{Q+1} & T_{r-Q}^{Q+1} & \cdots & T_r^{Q+1} \\ T_{r-Q-1}^{Q} & T_{r-Q}^{Q} & \cdots & T_r^{Q} \\ \vdots & \vdots & \ddots & \vdots \\ T_{r-Q-1} & T_{r-Q} & \dots & T_r \\ 1 & 1 & \dots & 1 \end{vmatrix}}, \tag{4}$$

where both determinants are of order $Q+2$, and the determinant in the denominator of this fraction is a Vandermonde determinant

$$V_{Q+2}(T_{r-Q-1}, T_{r-Q}, \dots, T_r) = (-1)^{\sigma} \prod_{0 \le q \le Q} \prod_{1 \le s \le Q+1-q} (T_{r-q} - T_{r-q-s}), \tag{5}$$

where $\sigma = \lfloor Q/2 \rfloor + 1$ ($\lfloor x \rfloor$ denotes the whole part of the real number x).

For example, for $Q = 1$ it follows from (1), (4) that

$$B_{1,r} = \frac{(T_r - T_{r-2})}{V_3(T_{r-2}, T_{r-1}, T_r)} \begin{vmatrix} (T_{r-2} - t)_+^1 & (T_{r-1} - t)_+^1 & (T_r - t)_+^1 \\ T_{r-2} & T_{r-1} & T_r \\ 1 & 1 & 1 \end{vmatrix},$$

whereas by expanding the determinant in the numerator of this fraction we get that

$$B_{1,r} = \frac{(T_r - T_{r-2})}{V_3(T_{r-2}, T_{r-1}, T_r)} \left((T_{r-2} - t)_+^1 V_2(T_{r-1}, T_r) - (T_{r-1} - t)_+^1 V_2(T_{r-2}, T_r) + (T_r - t)_+^1 V_2(T_{r-2}, T_{r-1}) \right). \tag{6}$$

For $T_{r-1} \le t \le T_r$, it follows from (6) that

$$B_{1,r} = (T_r - T_{r-2}) \frac{V_2(T_{r-1}, T_r)}{V_3(T_{r-2}, T_{r-1}, T_r)} (T_r - t)_+^1 ,$$

where, according to (5),

$$V_3(T_{r-2}, T_{r-1}, T_r) = (-1)^{\lfloor 0.5 \rfloor + 1} (T_r - T_{r-1})(T_r - T_{r-2})(T_{r-1} - T_{r-2}),$$

and according to the same formula, if we substitute Q by $Q-1$ and r by $r-1$, we arrive to (again for $Q = 1$) the expression $V_2(T_{r-2}, T_{r-1}) = (-1)^{\lfloor 0 \rfloor + 1} (T_{r-1} - T_{r-2})$. And hence

$$B_{1,r} = (T_r - T_{r-2}) \frac{-(T_{r-1} - T_{r-2})}{-(T_r - T_{r-1})(T_r - T_{r-2})(T_{r-1} - T_{r-2})} (T_r - t) = \frac{T_r - t}{T_r - T_{r-1}},$$

for $T_{r-1} \le t \le T_r$, which is the same result as (2). Analogously, we may prove the validity of (3) for $T_{r-2} \le t \le T_{r-1}$.

The minors related to the elements of the first row in the numerator determinant of (4), which is of order $Q+2$, are Vandermonde determinants of order $Q+1$. Also the denominator determinant in the fraction (4) is a Vandermonde determinant of order $Q+2$. In general, after a short calculation, the B-spline values $B_{Q,r}(t)$, $t \in \mathbb{R}$, are equal to

$$B_{Q,r}(t) = (T_r - T_{r-Q-1}) \sum_{q=0}^{Q+1} \left\{ (T_{r-q} - t)_+^Q \Big/ \prod_{\substack{0 \le s \le Q+1 \\ s \ne q}} (T_{r-q} - T_{r-s}) \right\}. \tag{7}$$

For $Q = 1$, (6) follows easily from (7).

Example 1. For $Q = 2$, $r = 5$ and knots $T_2 = 2$, $T_3 = 4$, $T_4 = 6$, $T_5 = 10$ there is, according to (7),

$$B_{2,5}(t) = 8 \left\{ \frac{(10-t)_+^2}{(10-6)(10-4)(10-2)} + \frac{(6-t)_+^2}{(6-10)(6-4)(6-2)} + \frac{(4-t)_+^2}{(4-10)(4-6)(4-2)} + \frac{(2-t)_+^2}{(2-10)(2-6)(2-4)} \right\} =$$
$$= 8 \left\{ \frac{(10-t)_+^2}{192} + \frac{(6-t)_+^2}{-32} + \frac{(4-t)_+^2}{24} + \frac{(2-t)_+^2}{-64} \right\},$$

recall that $(T-t)_+^2 = [(T-t)_+]^2$. For example, for $t = 5 \in \langle 4, 6\rangle = \langle T_3, T_4\rangle$ it follows that

$$B_{2,5}(5) = 8\left\{\frac{25}{192} - \frac{1}{32}\right\} = \frac{19}{24} = 0.7917.$$

3 Specifying the obtained expression for the computation of B-spline values

It is well known that B-spline basis functions $B_{Q,r}$ possess many interesting properties, see (Meloun & Militký, 1994) for example. We state four of them.

a) They are positive only in the intervals $T_{r-Q-1} < t < T_r$ and are zero everywhere else.

b) They are normalized, that is, for $k \geq 1$

$$\sum_{r=1}^{k+Q+1} B_{Q,r}(t) = 1 \tag{8}$$

in $\langle T_0, T_{k+1}\rangle$; for a complete definition of B-splines in the sum (13) we need to set on every side of that interval another Q so-called complementary knots

$$T_{-Q} < T_{-Q+1} < \cdots < T_{-1} < T_0, \quad T_{k+1} < T_{k+2} < \cdots < T_{k+Q+1},$$

in the simplest case they merge with T_0 and T_{k+1} on the left and right side. We call $T_1 < T_2 < \cdots < T_k$, where $T_0 < T_1$ and $T_k < T_{k+1}$, the main knots.

c) In every interval $\langle T_{p-1}, T_p\rangle, p = 1, 2, \ldots, k+1$, exactly $B_{Q,p}, B_{Q,p+1}, \ldots, B_{Q,p+Q}$ are non-zero, altogether $Q+1$ in number.

d) $B_{Q,r}$ is in $\langle T_{r-Q-1}, T_r\rangle$ a polynomial spline of order Q with knots $T_{r-Q-1} < T_{r-Q} < \cdots < T_r$, that is, in every closed interval defined by two neighboring points $B_{Q,r}$ is a polynomial of order Q that belongs to the class $C^{Q-1}(T_{r-Q-1}, T_r)$.

As an example, for $Q = 1$, $k = 2$ and main knots $T_1 = 1$, $T_2 = 3$ with complementary knots $T_{-1} = -1$, $T_0 = 0$ and $T_3 = 6$, $T_4 = 9$, we give below the B-spline basis functions for $r = 1, 2, 3, 4 = k + Q + 1$ (we used (2) and (3) for their derivation):

$$\begin{aligned}
B_{1,1}(t) &= \begin{cases} t+1 & \text{for } -1 \leq t \leq 0, \\ 1-t & \text{for } 0 \leq t \leq 1, \\ 0 & \text{otherwise,} \end{cases} \\
B_{1,2}(t) &= \begin{cases} t & \text{for } 0 \leq t \leq 1, \\ -\frac{1}{2}(t-3) & \text{for } 1 \leq t \leq 3, \\ 0 & \text{otherwise,} \end{cases} \\
B_{1,3}(t) &= \begin{cases} \frac{1}{2}(t-1) & \text{for } 1 \leq t \leq 3, \\ -\frac{1}{3}(t-6) & \text{for } 3 \leq t \leq 6, \\ 0 & \text{otherwise,} \end{cases} \\
B_{1,4}(t) &= \begin{cases} \frac{1}{3}(t-3) & \text{for } 3 \leq t \leq 6, \\ -\frac{1}{3}(t-9) & \text{for } 6 \leq t \leq 9, \\ 0 & \text{otherwise.} \end{cases}
\end{aligned} \tag{9}$$

We easily verify that the aforementioned properties a), b), c) and d) hold.

Example 2. For $Q = 2$, $k = 2$ and main knots $T_1 = 1$, $T_2 = 3$ with complementary knots $T_{-2} = -2$, $T_{-1} = 1$, $T_0 = 0$, and $T_3 = 6$, $T_4 = 9$, $T_5 = 12$ (the number of knots is equal to $k + 2(Q+1) = 8$), we may, through the de Boor formula, see (de Boor, 1972),

$$B_{Q+1,r} = \frac{t - T_{r-Q-2}}{T_{r-1} - T_{r-Q-2}} B_{Q,r-1} + \frac{T_r - t}{T_r - T_{r-Q-1}} B_{Q,r}, \tag{10}$$

get the explicit expression, e.g., for $B_{2,4}$ together with the help of the results (9) (note that in (10) we put $Q = 1$):

$$B_{2,4}(t)=\begin{cases}\dfrac{t-1}{5}\dfrac{t-1}{2}+\dfrac{9-t}{6}0=\dfrac{1}{10}(t^2-2t+1) & \text{for } 1\le t\le 3,\\ \dfrac{t-1}{5}\dfrac{6-t}{3}+\dfrac{9-t}{6}\dfrac{t-3}{3}=-\dfrac{1}{90}(11t^2-102t+171) & \text{for } 3\le t\le 6,\\ \dfrac{t-1}{5}0+\dfrac{9-t}{6}\dfrac{9-t}{3}=\dfrac{1}{18}(t^2-18t+81) & \text{for } 6\le t\le 9,\\ 0 & \text{otherwise.}\end{cases}$$

For example, for $t=5\in\langle 3,6\rangle=\langle T_2,T_3\rangle$ there is $B_{2,4}(5)=0.7111$.

According to the aforementioned property c), in the interval $\langle T_{p-1},T_p\rangle$, $p=1,2,\dots,k+1$, are the only non-zero functions $B_{Q,p},B_{Q,p+1},\dots,B_{Q,p+Q}$. Using this fact, for $\rho=0,1,\dots,Q$, it follows from (7) through an easy computation that

$$B_{Q,p+\rho}(t)=\left(T_{p+\rho}-T_{p+\rho-Q-1}\right)\sum_{q=0}^{\rho}\left\{\left(T_{p+\rho}-t\right)_+^Q\Big/\prod_{\substack{0\le s\le Q+1\\ s\ne q}}\left(T_{p+\rho-q}-T_{p+\rho-s}\right)\right\},\tag{11}$$

for $t\in\langle T_{p-1},T_p\rangle$.

For example, for $Q=2$, $k=2$ and the increasing sequence of knots from Example 2, it follows from (11) that, for $p=3$, $\rho=1$,

$$\begin{aligned}B_{2,4}(t) &= (T_4-T_1)\sum_{q=0}^{1}\left\{\left(T_{4-q}-t\right)_+^2\Big/\prod_{\substack{0\le s\le 3\\ s\ne q}}\left(T_{4-q}-T_{4-s}\right)\right\}=\\ &=8\left\{\frac{(9-t)_+^2}{(9-6)(9-3)(9-1)}+\frac{(6-t)_+^2}{(6-9)(6-3)(6-1)}\right\}=\\ &=8\left\{\frac{(9-t)_+^2}{144}-\frac{(6-t)_+^2}{45}\right\}=8\frac{5\cdot(9-t)_+^2-16\cdot(6-t)_+^2}{720},\end{aligned}$$

for $t\in\langle T_{p-1},T_p\rangle=\langle T_2,T_3\rangle=\langle 3,6\rangle$. For example, for $t=5\in\langle 3,6\rangle$, there is

$$B_{2,4}(5)=8\frac{80-16}{720}=\frac{32}{45}=0.7111,$$

which is in agreement with the result of Example 2.

Example 3. For $Q=3$, $k=1$, main knots $T_1=1$, $T_0=0$ with complementary knots $T_{-3}=-4$, $T_{-2}=-2$, $T_{-1}=1$, $T_0=0$, and $T_2=3$, $T_3=6$, $T_4=9$, $T_5=12$ (the number of knots is equal to $k+2(Q+1)=9$), there is for $p=2$, $\rho=3$, and $t\in\langle T_{p-1},T_p\rangle=\langle T_1,T_2\rangle=\langle 1,3\rangle$, according to (11),

$$\begin{aligned}B_{3,5}(t) &= (T_5-T_1)\sum_{q=0}^{3}\left\{\left(T_{5-q}-t\right)_+^3\Big/\prod_{\substack{0\le s\le 4\\ s\ne q}}\left(T_{5-q}-T_{4-s}\right)\right\}=11\left\{\frac{(12-t)_+^3}{(12-9)(12-6)(12-3)(12-1)}+\right.\\ &\left.+\frac{(9-t)_+^3}{(9-12)(9-6)(9-3)(9-1)}+\frac{(6-t)_+^3}{(6-12)(6-9)(6-3)(6-1)}+\frac{(3-t)_+^3}{(3-12)(3-9)(3-6)(3-1)}\right\}=\\ &=11\left\{\frac{(12-t)_+^3}{1782}+\frac{(9-t)_+^3}{-432}+\frac{(6-t)_+^3}{270}+\frac{(3-t)_+^3}{324}\right\}=\\ &=11\frac{40\cdot(12-t)_+^3-165\cdot(9-t)_+^3+264\cdot(6-t)_+^3-220\cdot(3-t)_+^3}{71280}.\end{aligned}$$

For example, for $t=2\in\langle 1,3\rangle$ there is

$$B_{3,5}(2)=11\frac{40\ \cdot 1000-165\cdot 343+264\cdot 64-220\cdot 1}{71280}=\frac{891}{71280}=0.0125.$$

In the relation (11) one might set $p+\rho=r$, that is, $\rho=r-p$, while $0\le\rho=r-p\le Q$, which means that

$$p\le r\le Q+p.\tag{12}$$

In this way we get the following expression:

$$B_{Q,r}(t) = \left(T_r - T_{r-Q-1}\right) \sum_{q=0}^{r-p} \left\{ \left(T_{r-q} - t\right)_+^Q \Big/ \prod_{\substack{0 \le s \le Q+1 \\ s \ne q}} \left(T_{r-q} - T_{r-s}\right) \right\}, \tag{13}$$

for $t \in \langle T_{p-1}, T_p \rangle$.

Example 4. Let $Q = 4$, $k = 6$, let the main knots be $T_i = 3(i+1)$ for $i = 1, 2, \dots, 6$, and the complementary knots then $T_{-5+j} = 3(j-4)$ for $j = 1, 2, \dots, 5$ and $T_{6+l} = 3(7+l)$ for $l = 1, 2, \dots, 5$. The increasing sequence of knots

$$T_{-4} = -9 < -6 = T_{-3} < T_{-2} = -3 < \cdots < T_0 = 3 < 6 = T_1 < T_2 = 9 < \cdots < T_{10} = 33 < 36 = T_{11}$$

consists of $k + 2(Q+1) = 16$ elements. For example, for $r = 10$, $r = 7$, there will be, according to (13), in the interval $\langle T_{p-1}, T_p \rangle = \langle T_6, T_7 \rangle = \langle 21, 24 \rangle$ (note that condition (12) is satisfied, as $7 \le 10 \le 11$)

$$\begin{aligned} B_{4,10}(t) &= (T_{10} - T_5) \sum_{q=0}^{3} \left\{ \left(T_{10-q} - t\right)_+^4 \Big/ \prod_{\substack{0 \le s \le 5 \\ s \ne q}} \left(T_{10-q} - T_{10-s}\right) \right\} = \\ &= 15 \left\{ \frac{(33-t)_+^4}{3 \cdot 6 \cdot 9 \cdot 12 \cdot 15} + \frac{(30-t)_+^4}{(-3) \cdot 3 \cdot 6 \cdot 9 \cdot 12} + \frac{(27-t)_+^4}{(-6) \cdot (-3) \cdot 3 \cdot 6 \cdot 9} + \frac{(24-t)_+^4}{(-9) \cdot (-6) \cdot (-3) \cdot 3 \cdot 6} \right\} = \\ &= \frac{1}{1944} \{ (33-t)_+^4 - 5 \cdot (30-t)_+^4 + 10 \cdot (27-t)_+^4 - 10 \cdot (24-t)_+^4 \}. \end{aligned}$$

For example, for $t = 23 \in \langle 24, 27 \rangle$ there will be

$$B_{4,10}(23) = \frac{1}{1944} \{ 10^4 - 5 \cdot 7^4 + 10 \cdot 4^4 - 10 \cdot 1^4 \} = \frac{545}{1944} = 0.2803.$$

4 Conclusion

The first one of the three formulas (7), (11), (13) for the computation of B-spline basis function values $B_{Q,r}(t)$ at given point $t \in \mathbb{R}$ has general validity, while the other two are its simplifications when taking into account the property c) of basis functions, see p. 3 of this work. The author of this article developed a computer program for the evaluation of the values $B_{Q,r}(t)$, as the computation of these by hand would have obviously been too laborious.

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Impact of Terms-of-Trade on Slovak Business Cycles

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Abstract: *Terms-of-trade is intuitively significant source of business cycles and it causes shifts in trade balance. However different theoretical and empirical studies lead to different results. Different theories suggest positive as well as negative relation between the terms-of-trade and trade balance. Empirical studies do not support statistically significant impact of terms-of-trade on output in developing countries. This result can support theoretical business cycle models considering non-tradable goods. Using structural vector auto-regression analysis of the terms-of-trade, trade balance, output, consumption and investment cyclical components we show that the terms-of-trade to trade-balance relationship is negative and that terms-of-trade shocks explain only small fraction of business cycles in the Slovak economy. We use quarterly data in constant prices with the range of years 1997-2014. The results are in line with theoretical and empirical studies in the contemporary world economic literature. Data exhibit Obstfeld-Svensson-Razin effect of the terms-of-trade on the trade balance and suggest considering non-tradable goods in the theoretical models.*

Key words: Terms of Trade · Business Cycle · Slovak Economy · Trade Balance

JEL Classification: C32 · E32 · F14

1 Introduction

Terms-of-trade is theoretically significant source of business cycles and it causes shifts in trade balance. However different theoretical and empirical studies lead to different results of the short-run terms-of-trade impact on output and on trade balance. There are two theoretical effects of terms-of-trade impact on trade balance. Harberger (1950) and Laursen and Metzler (1950) used traditional Keynesian model to show that trade balance grows with terms-of-trade. On the contrary, dynamic optimizing models of Obstfeld (1982) and Svensson and Razin (1983) leads to a conclusion that positive effect of terms-of-trade on the trade balance is weaker the more persistent is a terms-of-trade shock. Uribe and Schmitt-Grohé (2015) showed that in small open economy real business cycle model (or dynamic stochastic general equilibrium model) with capital costs sufficiently permanent terms-of-trade shocks have negative impact on the trade balance. Empirical studies of Aguirre (2011), Broda (2004) and Uribe and Schmitt-Grohé (2015) surprisingly do not support statistically significant impact of term-of-trade on output in poor and emerging countries. In general authors can confirm an intuition that the more open the economy is the higher effect of terms-on-trade on trade balance is. This result may be achieved in theoretical general equilibrium models only if non-tradable goods are considered. Uribe and Schmitt-Grohé developed so called TNT model (endowment economy model with tradable and non-tradable goods) to show that an existence of non-tradable goods "reduce the importance of terms-of-trade shocks."

We verify an impact of terms-of-trade on the Slovak business cycle and on the trade balance. We provide an empirical measure based on structural vector auto-regression (SVAR) econometric specification similar to one presented by Uribe and Schmitt-Grohé using Slovak quarterly data since 1997 to 2014. We compute responses on terms-of-trade impulse and variance decompositions of terms-of-trade shocks. In result we will show that a terms-of-trade shock leads to the immediate decrease in trade balance and has no impact on aggregate output.

2 Methods

We used vector autoregressive (VAR) models for our analysis. It is well known that in VAR models every endogenous variable is a function of all lagged endogenous variables in the system. See Lütkepohl (2005) for more details about VAR models.

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The mathematical representation of the unrestricted VAR model of order p is:

$$\mathbf{y}_t = \mathbf{A}_1\mathbf{y}_{t-1} + \mathbf{A}_2\mathbf{y}_{t-2} + \ldots + \mathbf{A}_p\mathbf{y}_{t-p} + \mathbf{e}_t \tag{1}$$

where $\mathbf{y}_t$ is a k vector of endogenous variables; $\mathbf{A}_1$, $\mathbf{A}_2$, …, $\mathbf{A}_p$ are matrices of coefficients to be estimated; and $\mathbf{e}_t$ is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values.

The VAR model (1) can be interpreted as a reduced form model. A structural vector autoregressive (SVAR) model is structural form of VAR model and is defined as:

$$\mathbf{A}\mathbf{y}_t = \mathbf{B}_1\mathbf{y}_{t-1} + \mathbf{B}_2\mathbf{y}_{t-2} + \ldots + \mathbf{B}_p\mathbf{y}_{t-p} + \mathbf{B}\mathbf{u}_t \tag{2}$$

It is assumed that the structural errors, $\mathbf{u}_t$ are white noise and the coefficient matrices $\mathbf{B}_1$, $\mathbf{B}_2$, …, $\mathbf{B}_p$ are structural coefficients that in general differ from their reduced form counterparts and $\mathbf{B}$ is matrix of restrictions on $\mathbf{u}_t$.

A SVAR model can be used to identify shocks and trace these out by employing impulse response analysis and forecast error variance decomposition through imposing restrictions on used matrices. Uribe and Schmitt-Grohé proposed a specification of the SVAR, through which we can determine responses on terms-of-trade impulse:

$$\mathbf{A}\begin{pmatrix} tot_t \\ tb_t \\ y_t \\ c_t \\ i_t \end{pmatrix} = \mathbf{B}_1\begin{pmatrix} tot_{t-1} \\ tb_{t-1} \\ y_{t-1} \\ c_{t-1} \\ i_{t-1} \end{pmatrix} + \mathbf{B}\begin{pmatrix} u_t^{tot} \\ u_t^{tb} \\ u_t^{y} \\ u_t^{c} \\ u_t^{i} \end{pmatrix} \tag{3}$$

where:

tot	relative cyclical component of the terms of trade
tb	relative cyclical component of the trade balance to output ratio
y	relative cyclical component of output
c	relative cyclical component of consumption
i	relative cyclical component of investment

The u_t^{tb}, u_t^{tot}, u_t^{y},u_t^{c} and u_t^{i} are structural shocks of given variables. We estimated the parameters of the SVAR specification (3) using Amisano and Giannini (1997) approach. The class of commonly used models may be written as:

$$\mathbf{A}\mathbf{e}_t = \mathbf{B}\mathbf{u}_t \tag{4}$$

The structural innovations $\mathbf{u}_t$ are assumed to be orthonormal, i.e. its covariance matrix is an identity matrix $\mathbf{\Sigma}_u = \mathbf{I}$. The assumption of orthonormal innovations imposes the following identifying restrictions on $\mathbf{A}$ and $\mathbf{B}$:

$$\mathbf{A}\mathbf{\Sigma}_e\mathbf{A}^T = \mathbf{B}\mathbf{B}^T \tag{5}$$

Noting that the expressions on both sides of (5) are symmetric, this imposes $k(k+1)/2 = 15$ restrictions on the $2k^2 = 50$ unknown elements in $\mathbf{A}$ and $\mathbf{B}$. Therefore, in order to identify $\mathbf{A}$ and $\mathbf{B}$, we need to impose $(3k^2 - k)/2 = 35$ additional restrictions. The matrix $\mathbf{A}$ of unrestricted specification is a lower triangular matrix with unit diagonal (10 zero and 5 unity restrictions) and matrix $\mathbf{B}$ is a diagonal matrix (20 zero restrictions) in this just-identified specification. Other tested restrictions are imposed on elements of matrix $\mathbf{A}$ (matrix of contemporary effects between endogenous variables), which means that our specification becomes over-identified and also testable.

The selected lag of model (3) is validated by sequential modified likelihood ratio test statistic and information criteria and by the LM test for autocorrelations. We can see them in the Table 1 and 2. Significant values of serial correlation for lower lags could be a reason to increase the lag order of an unrestricted VAR, but this is not our case. We verified the stability of a VAR model (i.e. whether all roots have modulus less than one and lie inside the unit circle). The result of this computation is in the Table 3. We estimated the parameters of restricted and unrestricted specifications. Using the logarithm of the maximum likelihood functions of both specifications we calculated the likelihood ratio statistics and verified the significance of restrictions in the Table 4. All tests are explained in Greene (2003) for example.

Using matrix polynomial in lag operator $\mathbf{A}(L) = \mathbf{B}_1L + \mathbf{B}_2L^2 + \ldots + \mathbf{B}_pL^p$ we can rewrite (2) as SMA representation:

$$\mathbf{y}_t = \left[\mathbf{A} - \mathbf{A}(L)\right]^{-1}\mathbf{B}\mathbf{u}_t = \mathbf{C}(L)\mathbf{u}_t = \mathbf{C}(0)\mathbf{u}_t + \mathbf{C}(1)\mathbf{u}_{t-1} + \mathbf{C}(2)\mathbf{u}_{t-2} + \ldots + \mathbf{C}(h)\mathbf{u}_{t-h} + \ldots \tag{6}$$

Hence, $\mathbf{C}(0)$ is the coefficient matrix on impact, $\mathbf{C}(1)$ at a one period lag, $\mathbf{C}(2)$ at a two period lag, and so on. Generally, $\mathbf{C}_{ij}(h)$ element is the impulse response of variable i to shock j at horizon h. The forecast error of $\mathbf{y}$ at horizon s is:

$$\mathbf{y}_{t+h} - \hat{\mathbf{y}}_{t+h} = \mathbf{C}(0)\mathbf{u}_{t+h} + \mathbf{C}(1)\mathbf{u}_{t+h-1} + \mathbf{C}(2)\mathbf{u}_{t+h-2} + \ldots + \mathbf{C}(h)\mathbf{u}_{t} \quad (7)$$

Variance of the forecast error (assuming orthogonality) is expressed as sum of the individual variances of shocks:

$$\mathrm{var}\left(\mathbf{y}_{t+h} - \hat{\mathbf{y}}_{t+h}\right) = \mathbf{C}(0)\mathbf{I}\mathbf{C}(0)^{\mathrm{T}} + \mathbf{C}(1)\mathbf{I}\mathbf{C}(1)^{\mathrm{T}} + \mathbf{C}(2)\mathbf{I}\mathbf{C}(2)^{\mathrm{T}} + \ldots + \mathbf{C}(h)\mathbf{I}\mathbf{C}(h)^{\mathrm{T}} \quad (8)$$

The fraction of the forecast error variance of variable *i* due to shock *j* at horizon *h*, is then the (*i*,*j*) element of expression (8) divided by the total forecast error variance and is expressed as a percentage. We calculated the impulse response functions and realized variance decomposition to quantify the short-term impact of shocks. Generally, the impulse response function traces the effect of a one-time shock in one of the innovations on current and future values of the endogenous variables and variance decomposition is a way to quantify how important each shock is in explaining the variation of each of the variables in the system.

Table 1 VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	849.7127	NA	7.70e-18	-25.21530	-25.05077	-25.15020
1	940.1206	164.6234*	1.10e-18*	-27.16778*	-26.18060*	-26.77715*
2	958.0665	29.99913	1.37e-18	-26.95721	-25.14739	-26.24106
3	978.6379	31.31768	1.61e-18	-26.82501	-24.19254	-25.78334
4	1003.496	34.13345	1.73e-18	-26.82077	-23.36566	-25.45358
5	1023.302	24.24063	2.24e-18	-26.66574	-22.38798	-24.97302

Source: Own processing

Table 1 shows the VAR lag order selection criteria. All criteria: sequential modified likelihood ratio test statistic (LR), Akaike information criterion (AIC), Schwarz information criterion (SC) and Hannan-Quinn information criterion (HQ) confirmed lag order 1 (asterisk nearby extreme value).

Table 2 VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	37.42832	0.0525
2	25.41611	0.4393
3	20.92892	0.6966
4	28.83195	0.2710
5	30.50831	0.2058
6	31.12115	0.1850
7	30.88250	0.1929
8	33.16054	0.1271
Probs from chi-square with 25 df.		

Source: Own processing

We realized the autocorrelation test in order to eliminate possible wrong VAR lag order decision. Table 2 shows the results of the tests. The LM tests for autocorrelations did not reject the null hypothesis of any residual autocorrelations up to lag *h*.

Table 3 VAR Stability Condition Check

Root	Modulus
0.681944	0.681944
0.539852 - 0.256891i	0.597857
0.539852 + 0.256891i	0.597857
0.270690	0.270690
-0.121938	0.121938
No root lies outside the unit circle. VAR satisfies the stability condition.	

Source: Own processing

Table 3 shows the verification of the stability of a VAR model. All roots have modulus less than one and lie inside the unit circle. The VAR satisfies the stability condition.

Table 4 Test of Over-Identification Restrictions

Log likelihood	959.5133		
LR test for over-identification:			
Chi-square(3)	4.807380	Probability	0.1865

Source: Own processing

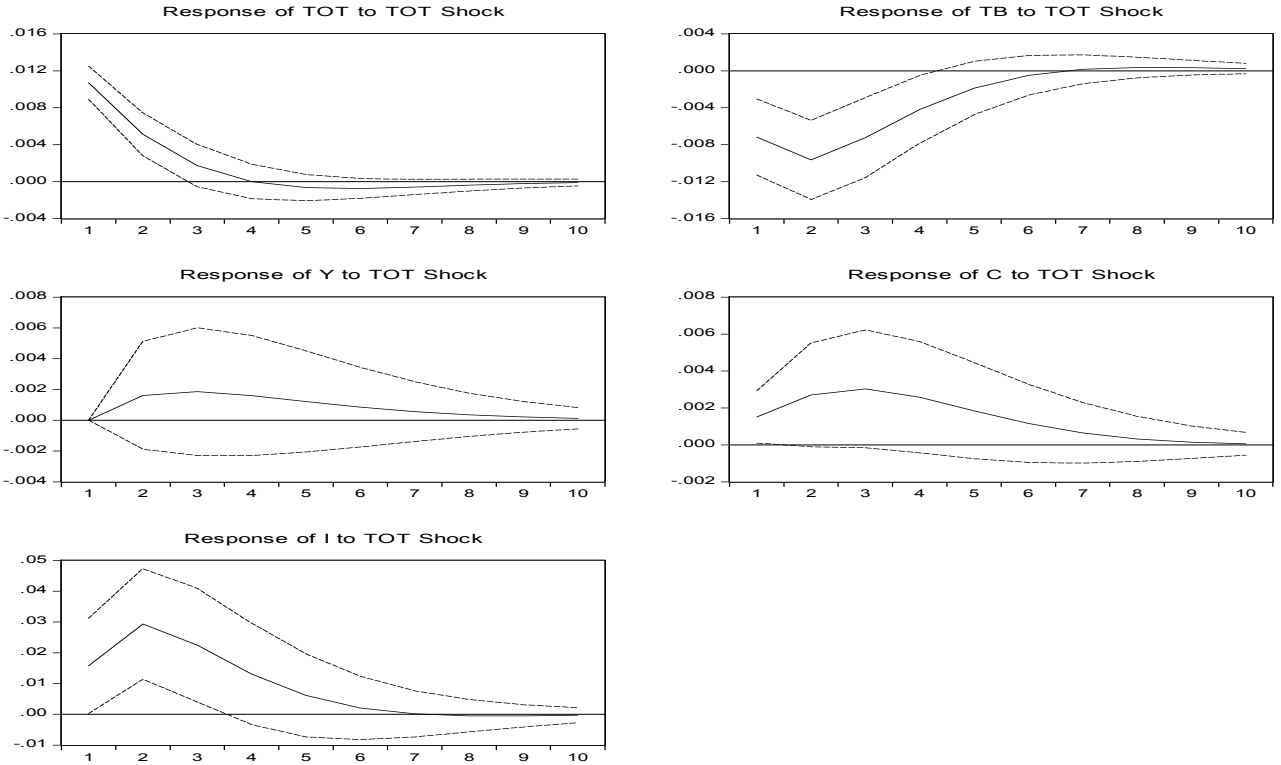
The final specification of structural VAR model is over-identified, so we can test it using likelihood ratio statistics. The logarithm of the maximum likelihood function of unrestricted SVAR model is 961.917. We did not reject the null

hypothesis, likelihood test ratio equals to 4.8074 is less than critical value $\chi^2(3) = 7.8147$. The tested over-identifying restrictions are valid.

3 Research results

The responses to the terms-of-trade shock are in the Figure 1. As output shock elasticity coefficient is not statistically significant, the improvement in terms-of-trade has no impact on the aggregate activity and the one-quarter delayed output expansion is statistically insignificant. Investment displays a somewhat larger expansion, albeit with a one-quarter delay. Consumption expansion is slightly over the limit of statistical significance. The 10 % increase in the terms-of-trade causes an increase of 1.41 % in consumption. On the other hand, the impact of the terms-of-trade shock on trade balance is clearly statistically significant. The 10 % increase in the terms of trade causes a decrease of 6.7 % in trade balance. Furthermore a huger contraction is delayed by one quarter. The result suggests confirmation of Obstfeld-Svensson-Razin effect rather than Harberger-Laursen-Metzler effect of the terms-of-trade.

Figure 1 Impulse Response Functions to Terms-of-Trade (TOT) Shock



Source: Own processing

To gauge the importance of the terms-of-trade shock we compute the fraction of the variance of all indicators of interest explained by terms-of-trade, i.e. the variance decomposition. In the Table 5 are computed these fractions. In the first row fractions of the variance are computed immediately after the term-of-trade shock realisation. In the second row these fractions are computed 40 lags (10 years) after terms-of-trade shock realisation, when responses are stable.

Table 5 Share of Variance Explained by Terms-of-Trade Shocks in Slovakia

	tot	*tb*	*y*	*c*	*i*
immediate	100	15.7	0	1.2	3.3
after 40 lags	83.5	37.8	1.9	8.2	14.9

Source: Own processing

Results in the Table 5 are in line with the papers of Aguirre (2011), Broda (2004) and Uribe and Grohé-Schmitt (2015). The terms-of-trade shocks explain a very little fraction of the output variance in Slovakia as well as in poor and emerging countries.

4 Conclusions

The terms-of-trade has significant impact on the trade balance in Slovakia. Negative correlation of the terms-of-trade with the trade balance supports Obstfeld-Svensson-Razin effect rather than Harberger-Laursen-Metzler effect. As Uribe and Grohé-Schmitt (2015) shoved this correlation is in average positive in the developing countries over the world. Our result suggests that terms-of-trade shocks are relatively highly persistent in Slovakia. Our result confirm the evidence of Aguirre (2011), Broda (2004) and Uribe and Grohé-Schmitt (2015) that terms-of-trade shocks explain a very little fraction of the output variance in emerging countries including Slovakia. This evidence can be theoretically explained by an existence of non-tradable goods. A challenge is to form and calibrate theoretical dynamic stochastic general equilibrium model with non-tradable goods explaining a contribution of the trade balance on short-run macroeconomic performance.

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Macroeconomic Shocks and the Government Debt Dynamics: An Updated Czech Experience

Aleš Melecký

Abstract: *This paper studies how macroeconomic shocks affect the government debt dynamics in a small and highly open economy of the Czech Republic. Applying this modeling approach to the Czech data ranging from 2000 to 2014, the author derive some implications for fiscal policy. The modeling framework includes structural vector autoregression (SVAR) model with debt feedback, estimated using short-term identification restrictions, and non-linear specification of the government debt dynamics. The considered model variables are GDP, inflation, the effective interest rate on government debt, government revenues and expenditures, the exchange rate and government debt. The model estimation is carried out using the Bayesian approach. According to the results, allowing for a non-linear dynamics in the government debt to GDP ratio could imply stronger persistence and higher volatility in the responses of government indebtedness to macroeconomic shocks. Further, the fiscal stance of the Czech Republic seems to be most vulnerable to unexpected depreciation of the Czech crown, discretionary pro-cyclical increases in government expenditures and decrease in government revenues.*

Key words: Government debt dynamics · Non-linear specification · Macroeconomic shocks · SVAR model · Bayesian estimation · Czech Republic

JEL Classification: E62 · H68 · E37

1 Introduction

The global financial and economic crisis and its impact on the fiscal area have highlighted the importance of regular monitoring and evaluation of fiscal risks and weaknesses of the fiscal system, including the sustainability of government debt, particularly in "normal times." Sensitivity analysis of government debt to macroeconomic shocks contribute significantly to the understanding of the risk associated with future development of government debt and help to identify the most likely causes of possible adverse development. Findings from such an analysis allow the authorities to carry out an analysis of adverse (critical) scenarios, develop and prepare plans for emergencies that can be effectively implemented, and ensure the sustainability of government debt through timely adopted economic policy measures. The ratio of government debt to GDP and its dynamics, including understanding of potential threats arising from unexpected shocks are important for management of government debt portfolio.

Bayesian approach for the estimation of the macroeconomic effects of fiscal policy is used e.g. in Afonso and Sousa (2009), who examined the economies of the USA, the UK, Germany and Italy. The influence of fiscal measures on GDP and government budgets with the use of SVAR model examine e.g. Breuer and Buettner (2010). Central and Eastern Europe (including the Czech Republic) is investigated e. g. in Stoian and Campeanu (2010). Beynet and Paviot (2012) focused on the sensitivity of the Hungarian government debt to macroeconomic shocks. On the basis of a simplified version of stochastic debt sustainability analysis and the adopted assumptions they conclude that for the sustainability of the government debt in Hungary the greatest risks in 5-year horizon comes from shocks to nominal GDP growth which volatility is particularly high in Hungary.

There is a number of articles dealing with the developed European economies, but in the case of the "new" EU member states the issue of government debt dynamics is much less studied. Favero and Giavazzi (2007) and Favero and Giavazzi (2009) investigated the effects of expenditure and revenue shocks on growth and highlight the need to include the equation for debt feedback effect into the model. This work is based on the model applied in Melecký and Melecký (2012) and models the Czech macroeconomy using a linear SVAR model, while allowing the government debt dynamics to behave nonlinearly (given the specification of government debt) and have an active impact on the real economy. A similar model was used in Cherif and Hasanov (2012) for the United States. The authors study the effects of the primary balance shocks, inflation shocks and GDP shocks on public debt dynamics. Cherif and Hasanov (2012) argue that incorporating debt feedback effect into the model is needed for stability of prediction of the future debt and due to persistence of impulse responses..

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2 Methods

The Czech economy is modeled with the use of vector autoregression (VAR) structure, similarly as in Favero and Giavazzi (2007), which includes nonlinear specification of government debt to GDP ratio. The structural VAR model is used to identify structural shocks using a short-term restrictions given by the ordering of the endogenous variables. The model can be written as follows:

$$\mathbf{A}\mathbf{y}_t = \sum_{i=1}^{k} \mathbf{B}_i \mathbf{y}_{t-i} + \sum_{i=1}^{k} \boldsymbol{\delta}_i \mathbf{d}_{t-i} + \boldsymbol{\varepsilon}_t \,, \qquad \text{where } \mathbf{y}_t = \begin{bmatrix} g_t \\ t_t \\ y_t \\ \Delta p_t \\ i_t \\ s_t \end{bmatrix}, \tag{1}$$

where $\mathbf{y}_t$ is the vector of endogenous variables with linear dynamics, including the logarithm of government expenditures (g_t), logarithm of government revenues (t_t), logarithm of real GDP (y_t), annualized percentage change in the consumer price index (Δp_t), the effective interest rate on government debt (i_t), and the annualized quarterly change in real effective exchange rate (s_t). Government debt to GDP ratio is denoted $\mathbf{d}_t$ and $\boldsymbol{\varepsilon}_t$ is a vector of structural shocks. **A** is a lower triangular matrix of estimated coefficients for the current endogenous variables, **B** a matrix of the estimated coefficients for the lagged endogenous variables, and $\boldsymbol{\delta}$ is a vector of estimated coefficients for the lagged government debt to GDP ratio.

Reduced form of the SVAR model can be written as follows:

$$\mathbf{y}_t = \sum_{i=1}^{k} \mathbf{C}_i \mathbf{y}_{t-i} + \sum_{i=1}^{k} \boldsymbol{\gamma}_i \mathbf{d}_{t-i} + \mathbf{u}_t \,, \tag{2}$$

where $\mathbf{C} = \mathbf{A}^{-1}\mathbf{B}$, $\boldsymbol{\gamma} = \mathbf{A}^{-1}\boldsymbol{\delta}$, $\mathbf{u_t}$ is reduce form shock and:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & 1 \end{bmatrix} \begin{bmatrix} u_t^g \\ u_t^t \\ u_t^y \\ u_t^p \\ u_t^r \\ u_t^s \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 & 0 \\ 0 & 0 & 0 & 0 & b_{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & b_{66} \end{bmatrix} \begin{bmatrix} e_t^g \\ e_t^t \\ e_t^y \\ e_t^p \\ e_t^r \\ e_t^s \end{bmatrix}. \tag{3}$$

The model used in this chapter is structured vector autoregression model with one period lag SVAR (1), as suggested by Schwartz and HQ information criterion, see table 2 in appendix for details. For the chosen model structure it is easy to calculate the probability function and combined it with the a priori distribution of the parameters in order to obtain the posterior distribution. Specifically, there are given a priori assumptions concerning the probability distribution $p(\boldsymbol{\theta})$, where $\boldsymbol{\theta}$ is the vector containing the model parameters. Posterior distribution $p(\boldsymbol{\theta}/\mathbf{y})$ is therefore proportional outcome of probability function of the solved model and a priori assumptions:

$$p(\boldsymbol{\theta}/\mathbf{y}) \propto L(\boldsymbol{\theta}/\mathbf{y})\, p(\boldsymbol{\theta}) \tag{6}$$

where $L(\boldsymbol{\theta}/\mathbf{y})$ is the probability function dependent on the data **y**. A priori assumptions are mutually independent, $p(\boldsymbol{\theta})$ is therefore constructed based on individual a priori assumptions about the structural parameters indicated in the second column of table 3 presented in appendix.

3 Data

Detail description of the data series used in the analysis, i.e. government expenditures, government revenues, real GDP, inflation, interest rate, exchange rate and government debt to GDP ratio are provided in table 1. Primary data sources are the Czech National Bank's system ARAD and the database of the Czech Statistical office. Prior to the estimation, the data are demeaned.

Table 1 Description of model variables and their sources

Variable	Description
Government expenditures	According to ESA 2010 methodology, adjusted for the effect of population growth, seasonally adjusted using Census X-13; CSO bill. CZK, in logarithms
Government revenues	According to ESA 2010 methodology, adjusted for the effect of population growth, seasonally adjusted using Census X-13; CSO bill. CZK, in logarithms
Real GDP	Seasonally adjusted gross domestic product (GDP) at constant market prices with adjustments for the effect of population growth; ARAD, CNB. bil. CZK, in logarithms
CPI inflation	The percentage change in the consumer price index in local currency (year 2005 = 100, average of the period), compared to the previous year, seasonally adjusted using Census X-13; CSO
Interest rate	The effective interest rate on government debt i.e. Interest payments (D41) at time t, with respect to the quarterly government debt at time t-1, annualized, seasonally adjusted using Census X-13; CSO, ARAD
Exchange rate	Percentage change in the real effective exchange rate converted to a direct quotation, annualized, seasonally adjusted using Census X-13; ARAD, CNB
Debt to GDP	Consolidated quarterly government debt, based on quarterly data for the general government sector (S.13 CSO) relative to nominal GDP, seasonally adjusted using Census X-13; ARAD, CNB

Source: Own processing based on information from CSO and CNB

4 Discussion of results

Preliminary results gained from the solution of reduced form of the model with debt feedback effect shows high inertia of the debt to GDP ratio. Therefore, all macro shocks are expected to have long run effects on government debt to GDP ratio.

The impact of indebtedness on the Czech macroeconomy can be summarized as follows. First, the increased government debt to GDP ratio operate via a standard crowding out effect. The higher need for financing government debt leads to an increase of supply of government bonds and cause increase in the interest rates. Increased funding costs lead to lower project profitability and a decline in private investment.

Second, higher level of debt also decrease the willingness of businesses to finance government services and budgets and because of the reduced tax discipline the tax revenues declines. Third, the estimated negative impact of the debt to GDP ratio on the size of government expenditures is probably the result of the implementation of austerity measures which are adopted at higher levels of government debt in order to increase effort to consolidate government finances. Finally, the effects of the debt to GDP ratio on inflation, interest rates and the exchange rate are not statistically significant.

The results of the sensitivity analysis of the government debt to GDP ratio on macroeconomic shocks suggest that nonlinear specification of government debt dynamics may lead to increased inertia and long run deviations from the steady state after macroeconomic shocks. The fiscal position of the Czech Republic is the most vulnerable to the unexpected depreciation of the domestic currency. However, the depreciation of the Czech Crown creates more "revenues" because of higher income effect than "costs" connected with balance sheet effect and shouldn't therefore increase the cost of servicing government debt.

Second source of risk for the Czech fiscal position are strong pro-cyclical discretionary increases in government expenditures, which leads to an increase in government indebtedness. Third source of risk arises from the reduction in government revenues that could significantly affect government debt. Implementation of adequate fiscal rules may help to improve the situation even in this area. The planned establishment of an independent National Budgetary Board (called Národní rozpočtová rada státu) could also help.

5 Conclusions

This paper studied how macroeconomic shocks affect the government debt dynamics in a small and highly open economy of the Czech Republic. The modeling framework included structural vector auto-regression (SVAR) model with debt feedback effect on the real economy, estimated using short-term identification restrictions, and non-linear specification of the government debt dynamics.

The results supports the findings of Cherif and Hasanov (2012), that there is a need to include debt feedback into the model. Based on the estimation results and sensitivity analysis, the considered macro shocks have long run effects on the debt to GDP ratio.

Three main sources of potential risk for the Czech fiscal position are unexpected depreciation of the currency, which seem to be not too dangerous for the Czech fiscal position due to higher income effect than balance sheet effect. However, CNB policy aimed at smoothing exchange rates is important and should continue in the future. The highest risk comes therefore from two other sides, i.e. increase in government expenditures and decrease in government revenues, with similar size of the effects on debt to GDP ratio.

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Appendix

Table 2 VAR model lag length selection

Endogenous variables: debt/GDP, government expenditures, government revenues, inflation, interest rate, exchange rate, GDP
Data sample: 2000Q2 –2014Q4
Number of observations: 55

Lag	SC	HQ
0	-21.888	-22.1566
1	-26.13829*	-27.21269*
2	-25.30933	-27.18952
3	-23.77222	-26.45822
4	-23.43048	-26.92228

SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion
**indicates lag order selected by the criterion
Source: Own calculations

Table 3 VAR model – Priors and estimation results

Parameters	Priors	Posterior mode	Posterior mean	90% Posterior Bayesian confidence interval
a_21	N (0.064; 0.042)	0.0027	0.0103	[-0.0536; 0.0741]
a_31	N (-0.004; 0.009)	-0.0067	-0.0061	[-0.0201; 0.0097]
a_32	N (0.018; 0.015)	-0.0055	-0.0022	[-0.0165; 0.0153]
a_41	N (-0.021; 0.037)	0.002	-0.0236	[-0.0638; 0.0151]
a_42	N (0.016; 0.059)	-0.0108	0.0068	[-0.0628; 0.0843]
a_43	N (0.552; 0.214)	0.3053	0.3368	[0.2049; 0.4469]

a_51	N (0.053; 0.017)	0.0387	0.0406	[0.0172; 0.0617]
a_52	N (0.120; 0.038)	0.0477	0.0461	[0.0076; 0.0893]
a_53	N (-0.021; 0.194)	0.0007	-0.0328	[-0.152; 0.0967]
a_54	N (0.262; 0.076)	0.1411	0.1403	[0.0499; 0.2229]
a_61	N (0.046; 0.076)	0.0448	0.0752	[0.0081; 0.1384]
a_62	N (0.079; 0.099)	0.0326	0.0259	[-0.1279; 0.1822]
a_63	N (1.084; 0.560)	0.2244	0.3737	[-0.1443; 0.8137]
a_64	N (0.221; 0.230)	0.2775	0.2607	[0.0177; 0.4894]
a_65	N (0.156; 0.519)	0.3937	0.569	[0.1409; 1.0523]
b_11	N (0.132; 0.090)	0.1047	0.0892	[-0.0239; 0.2041]
b_12	N (-0.062; 0.157)	-0.2045	-0.2319	[-0.3602; -0.0797]
b_13	N (1.913; 0.269)	1.0628	1.127	[0.9682; 1.2656]
b_14	N (-0.171; 0.184)	-0.3641	-0.3602	[-0.5827; -0.1262]
b_15	N (-0.247; 0.329)	-0.5718	-0.5412	[-0.8717; -0.1954]
b_16	N (-0.013; 0.142)	0.043	0.0435	[-0.0853; 0.1674]
b_21	N (-0.026; 0.079)	-0.0742	-0.0673	[-0.1639; 0.0212]
b_22	N (0.168; 0.086)	0.1492	0.162	[0.0749; 0.2553]
b_23	N (1.16; 0.171)	0.942	0.9258	[0.7922; 1.0629]
b_24	N (-0.086; 0.125)	-0.1512	-0.1126	[-0.2717; 0.0678]
b_25	N (0.224;0.223)	0.0374	0.097	[-0.2086; 0.3931]
b_26	N (0.095; 0.059)	0.0988	0.1061	[0.0465; 0.174]
b_31	N (0.013; 0.011)	0.0088	0.0109	[-0.0007; 0.0222]
b_32	N (0.026; 0.017)	0.0262	0.0243	[0.007; 0.0412]
b_33	N (0.929; 0.026)	0.9421	0.943	[0.9166; 0.9719]
b_34	N (-0.026; 0.029)	-0.0184	-0.0193	[-0.0557; 0.0184]
b_35	N (0.015; 0.044)	-0.0046	0.0142	[-0.0297; 0.0744]
b_36	N (0.025; 0.021)	-0.0122	-0.0075	[-0.021; 0.0079]
b_41	N (0.035; 0.039)	0.0274	-0.005	[-0.0391; 0.0296]
b_42	N (0.094; 0.082)	0.0603	0.0882	[0.0103; 0.1670]
b_43	N (0.145; 0.134)	0.1854	0.2165	[0.1123; 0.3447]
b_44	N (0.774; 0.084)	0.7163	0.6632	[0.5800; 0.7415]
b_45	N (0.182; 0.191)	0.2192	0.1871	[-0.0473; 0.4174]
b_46	N (-0.018; 0.056)	-0.0098	-0.0056	[-0.0581; 0.0464]
b_51	N (0.035; 0.037)	0.0013	-0.0026	[-0.0361; 0.0330]
b_52	N (0.074; 0.044)	-0.0016	0.0091	[-0.0258; 0.0464]
b_53	N (0.032; 0.082)	0.0454	0.0068	[-0.0708; 0.0836]
b_54	N (0.211; 0.056)	0.1565	0.1844	[0.1277; 0.2425]
b_55	N (0.383; 0.112)	0.2958	0.2385	[0.1105; 0.3677]
b_56	N (0.008; 0.044)	0.0205	0.0241	[-0.0093; 0.0566]
b_61	N (0.061; 0.110)	0.0941	0.0829	[-0.0241; 0.1952]
b_62	N (-0.068; 0.106)	-0.0516	-0.0099	[-0.1504; 0.1129]
b_63	N (0.177; 0.203)	0.2981	0.4286	[0.1705; 0.6881]
b_64	N (0.397; 0.139)	0.3264	0.3372	[0.2051; 0.4774]
b_65	N (0.198; 0.322)	0.0983	0.1211	[-0.3234; 0.5995]
b_66	N (0.156; 0.140)	0.1613	0.0922	[-0.0569; 0.2514]
δ_1	N (-0.006; 0.003)	-0.0054	-0.0046	[-0.0088; -0.0003]
δ_2	N (-0.005; 0.003)	-0.003	-0.0034	[-0.007; -0.0002]
δ_3	N (-0.002; 0.001)	-0.0014	-0.0019	[-0.0033;-0.0004]
δ_4	N (-0.001; 0.002)	-0.0004	-0.0005	[-0.0031; 0.0026]
δ_5	N (0.001; 0.001)	0.0011	0.0009	[-0.0003; 0.0021]
δ_6	N (-0.001; 0.002)	-0.0011	-0.0005	[-0.0024; 0.0016]
e_gg	IG(0.037; 0.500)	0.0575	0.0612	[0.0504; 0.0707]
e_tt	IG(0.021; 0.500)	0.0507	0.0534	[0.0444; 0.0619]
e_yy	IG(0.004; 0.500)	0.0099	0.0104	[0.0088; 0.0118]
e_pi	IG(0.167; 1.000)	0.0281	0.0289	[0.0247; 0.0332]
e_rr	IG(0.104; 1.000)	0.0138	0.0148	[0.0125; 0.0169]
e_ss	IG(0.445; 1.000)	0.0984	0.1029	[0.0883; 0.1179]
e_dd	IG(0.060; 1.000)	0.0277	0.052	[0.0135; 0.0933]

Where a_21 to a_65 are the elements of matrix A, b_11 to b_66 are the elements of matrix B and δ_1 to δ_6 the elements of vector δ in equation (1). Ordering of the model variables is as follows: government expenditures, government revenues, GDP, inflation, interest rate and exchange rate. N (*x*; *y*) denotes normal distribution with mean *x* and standard error *y*. IG (*a, b)* denotes inverse gama distribution with *a* and *b* parameters.

Source: Own calculations

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Comparison Metaheuristic Methods by Solving Travelling Salesman Problem

Ondřej Míča

Abstract: *Travelling salesman problem (TSP) belongs in basic problems of operations research. It is a NP-hard problem. The number of possible solutions of this problem is very high – it increases with the factorial of the number of the nodes at the graph. So even with nowadays computers it takes very large amount of time to solve TSP with exact methods. Therefore TSP is now usually solved with a heuristic (or metaheuristic) techniques, which provides a satisfactory solution in real-time.*

This paper focuses on four classical metaheuristic methods: tabu search, simulated annealing, genetic algorithm and ant colony optimization algorithm, and compares all algorithms using difference between best given solution and optimal solution as evaluation criterion. Computational results on several standard instances of TSP show efficiency of all scrutinized methods.

Key words: Travelling salesman problem · Metaheuristic optimization · Tabu search · Simulated annealing · Genetic algorithm · Ant colony optimization algorithm

JEL Classification: C61 · C63

1 Introduction

Travelling salesman problem is very well known and popular optimization problem. The main issue in TSP is to find Hamiltonian cycle (called after the Irish mathematician William Rowan Hamilton, who is considered to formulate TSP in 19th century). It means to visit all nodes (cities) of the graph exactly once with the possible shortest route and return to the origin node. (Cenek, Jánošíková, 2008)

This seeking the Hamiltonian cycle is situated on a transportation network which can be described as graph G = (**N, E**), where **N** is set of *n* nodes (cities) and **E** is set of *m* edges (paths) between these nodes and each edge has its own length. The network is very often a complete graph (i.e. each pair of nodes is connected by an edge). Or when the graph is not complete, fictive edge between two unconnected nodes with infinite length can be added without affecting the optimal solution. (Volek, 2008)

TSP in general can be represented with following mathematical model:

$$min \sum_{i=1}^{n} \sum_{\substack{j=1 \\ j \neq i}}^{n} d_{ij} x_{ij} \tag{1}$$

$$\sum_{\substack{i=1 \\ i \neq j}}^{n} x_{ij} = 1 \text{ for } j = 1 \dots n \qquad \sum_{\substack{j=1 \\ j \neq i}}^{n} x_{ij} = 1 \text{ for } i = 1 \dots n \tag{2}$$

$$y_i - y_j + n x_{ij} \leq n - 1 \text{ for } 2 \leq i \neq j \leq n \tag{3}$$

$$x_{ij} \in \{0,1\} \text{ for } i, j = 1 \dots n \qquad y_i \in \mathbb{N}_0 \text{ for } 2 = 1 \dots n \tag{4}$$

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where:

n number of nodes,

d_{ij} distance between nodes i and j,

x_{ij} variable, which is 1 when the edge between nodes i and j belongs to the Hamiltonian cycle, otherwise it is 0.

The equalities (2) provide that each node can be entered and left only once. The constraint (3) provides that Hamiltonian cycle is only one tour, not a number of smaller cycles. (Miller, Tucker, Zemlin, 1960)

There are several cases of TSP (not all are mentioned):

- Symmetric: distance between nodes i and j is the same as distance between j and i.
- Asymmetric: distance between nodes i and j is not the same as distance between j and i.
- With time windows: each node can be visited only in given amount of time.
- Sequential Ordering Problem: nodes can be visited only in given order.
- Etc.

Further in this paper is considered only a symmetric travelling salesman problem.

Since TSP is NP-hard problem – the number of possible solutions for graph with n nodes is $(n\text{-}1)!/2$ – the exact algorithm can be used only for small number of nodes. Therefore only heuristics or metaheuristics are used for solving large TSP. (Applegate, 2006)

2 Methods

2.1 Tabu search

Tabu search optimization method was designed by Fred Glover in late 1980's (Glover, 1986). It uses neighborhood search with best admissible selection of improved solution. To prevent sticking in local suboptimal solution tabu list is implemented. The tabu list is a short term memory structure which defines a set of solution explored in previous k iterations of the algorithm where k is parameter of the method also called the tabu tenure. The algorithm runs until some stopping criterion has been satisfied (amount of time, number of iterations without improving best solution, etc.) (Glover, 1990)

2.2 Simulated annealing

The inspiration for this algorithm is from metallurgy. The algorithm was described for first time by IBM research team (Kirkpatrick, Gelatt Jr, Vecchi, 1983). As tabu search algorithm, this approach also uses neighborhood search. The possible move is made with probability (5).

$$p(x, x', T) = \begin{cases} e^{\left(-\left(f(x')-f(x)\right)\right)/T} & \text{when } f(x') \geq f(x) \\ 1 & \text{when } f(x') < f(x) \end{cases} \tag{5}$$

where:

$f(x)$ objective function of solution x,

T the parameter of the algorithm called temperature.

Each run of the algorithm stars with T set to high value and temperature is decreased with each next iteration of algorithm. The simulated annealing can be extended with heating – rising of the temperature. The algorithm stops when some stopping criterion is met (amount of time, number of iterations without improving best solution, etc.). (Kirkpatrick, Gelatt Jr, Vecchi, 1983)

2.3 Genetic algorithm

Genetic algorithm belongs to nature-based algorithms. The inspiration of this algorithm is a process of natural selection and evolution. This method was first designed by John Holland in the early 1970's. The goal of the genetic algorithm is

to breed new population of candidate solutions from old population, as it goes in the nature. The population size k is the parameter of the method.

At the beginning of each iteration candidates for breeding are stochastically selected from old generation according to their fitness (usually objective function). Next generation of solution is generated from selected individuals using combination of genetic operators: crossover and mutation. The stopping conditions for genetic algorithm can be time, number of generated population, etc. (Gendreau, Potvin, 2010)

2.4 Ant colony optimization algorithm

This method is based on examining ant colonies and studying cooperation and communication of ants when they are searching for food. It was first presented by Marco Dorigo in his doctoral thesis. (Dorigo, 1992)

Ants communicate with each other using pheromone trails. The pheromones are chemical substances used by ants to mark their paths. Ants leave pheromone trails on a ground and other ants can scent the direction and intensity of those pheromones. Each ant which uses a marked path renews a pheromone trail because it evaporates during a time (loses its attractive strength). When the path is not used for some time, the pheromone trail slowly disappears.

At the beginning of the algorithm the m ants are placed into randomly selected nodes of the graph. At each step they move to the new node with probability given by the random proportional rule defined as

$$p_{ij} = \frac{(\tau_{ij})^{\alpha}(\eta_{ij})^{\beta}}{\sum_{l \in N_k}(\tau_{il})^{\alpha}(\eta_{il})^{\beta}} \tag{6}$$

where:

τ_{ij} amount of pheromone on the edge between nodes i and j,

η_{ij} attractiveness of edge from i to j calculated as 1 divided by length of the edge,

α, β parameters of the method used to weigh the relative influence of the pheromone and the attractiveness of the edge,

N_k is set of unvisited nodes for k^{th} ant.

After visiting all nodes (the set of unvisited nodes is empty) the ants returns to their original nodes and the amount of pheromone on each edge is updated according to the following formula

$$\tau_{ij} = (1-\rho)\tau_{ij} + \sum_{k=1}^{m} \Delta\tau_{ij}^{k} \tag{7}$$

where:

ρ evaporation parameter,

$\Delta\tau_{ij}^{k}$ is defined as

$$\Delta\tau_{ij}^{k} = \begin{cases} \frac{Q}{L_k} & \text{if } k^{th} \text{ant uses edge } (i,j) \text{in its Hamiltonian cycle} \\ 0 & \text{otherwise} \end{cases} \tag{8}$$

where:

Q constant chosen before the run of the algorithm,

L_k length of found Hamiltonian cycle of k^{th} ant. (Dorigo, Gambardella, Vecchi, 1997)

3 Research results

Each of the listed metaheuristics was implemented in Java language. For benchmarking and testing examples was used TSPLIB (TSPLIB, 2001). It is a library of sample instances for the travelling salesman problem from various sources and of various types. This library nowadays contains 112 instances of symmetric TSPs with its optimal solutions. For this paper was chosen 8 instances of TSP with different numbers of nodes (51, 76, 96, 130, 159, 198, 225 and 262 nodes).

For each tested instance of TSP was made 500 runs of described methods, and each run was limited to 500 iterations. So together 16 000 runs of TSP were made for testing.

For each tested combination the best given solution was taken and this best solution was compared with the optimal solution of instance taken from (TSPLIB, 2001) and was determined the difference between the best and optimal solution.

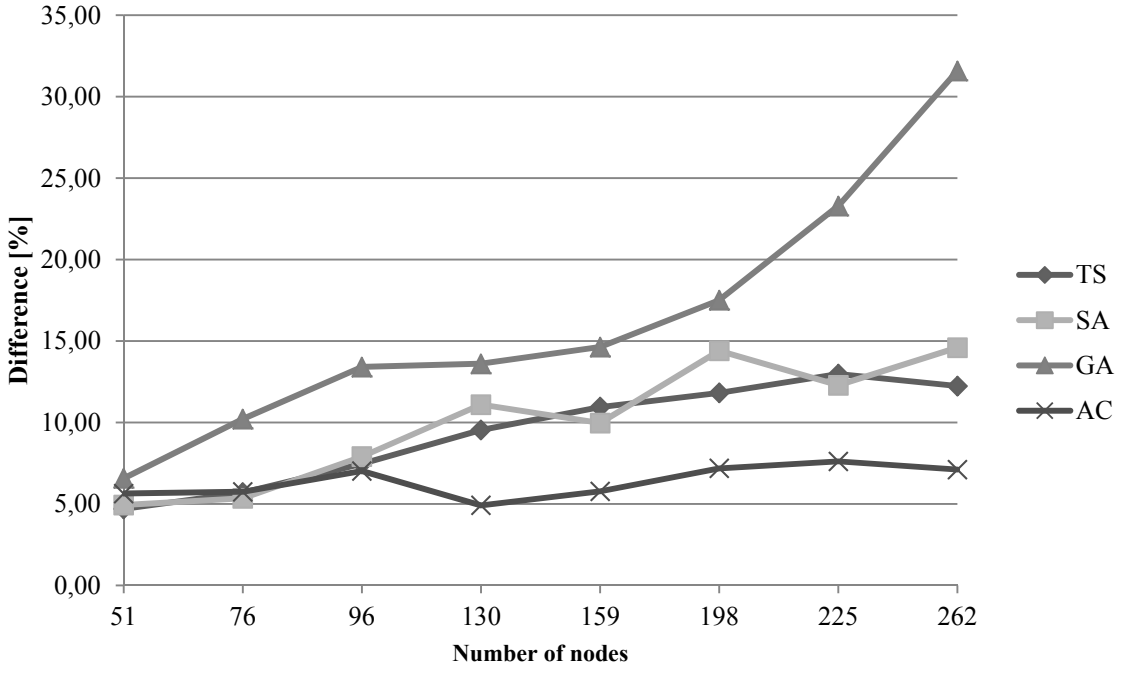
The gained results are shown in table 1 and figure 1.

Table 1 Difference between the best and optimal solution for each tested combination [%]

	Algorithm				
Number of nodes		TS	SA	GA	ACO
	51	4.69	4.93	6.57	5.63
	76	5.70	5.34	10.21	5.74
	96	7.46	7.91	13.40	7.02
	130	9.54	11.10	13.60	4.91
	159	10.94	9.97	14.63	5.77
	198	11.82	14.40	17.51	7.18
	225	12.97	12.28	23.29	7.61
	262	12.24	14.59	31.58	7.11

Source: Own processing

Figure 1 Difference between average and optimal solution



Source: Own processing

4 Conclusions

For TSP instance with fewer nodes all used methods gives solution with similar differences. But with rising number of nodes, the genetic algorithm becomes more and more inaccurate. Tabu search and simulated annealing methods give solution with very similar differences. A best result in almost all cases gives the ant colony optimization algorithm.

So the best result of solving travelling salesman problem from all compared methods gives Ant colony optimization. The disadvantage of this method is higher difficulty of implementing this algorithm. It is also important to say, that all methods are very sensitive to parameters setting. So with different setting they can give better or much worse results.

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Predicting Bonity of Clients through Two Recursive Partitioning Methods

Michael Rost, Renata Klufová

Abstract: *The aim of the paper is to show and compare some classical classification approach with not so classical and typical classification method for identification of the factors influencing the credit scoring of some bank customers. For this purpose, we used statistical methodology like classification and regression trees (CART) and recursive partitioning method called PARTy. These classification methods are both not parametric methods and their application is not restricted by a strong normality assumption like LDA. Our approach is demonstrated on segment of the data coming from bank institution. Data pre-processing and the numerical computation were carried out in the programming language R.*

Key words: classification· credit scoring · CART · PARTY

JEL Classification: C38

1 Introduction

In these days every bank institution evaluates their customers – applicant – for bank loan. For this purpose they gathered and sore gigabytes of information about their customers. Consequently they construct predictive models with aim to uncover a potential risk linked with particular loan applicant. For this purpose bank institution usually use data mining methods like CART (Breiman, Friedman, Olshen, & Stone, 1998), ANN (Hastie, Tibshirani, & Friedman, 2001), and random forest (Hastie, Tibshirani, & Friedman, 2001) or some form of SVM (Vapnik, 2000) or their combinations see commercial software K-XEN.

Some of these methods provide insight into "structure" of such scoring process. From this point of view is very convenient methodology of classification trees which provide „simple" rules and decision tree providing deeper insight into the own decision process. In this paper we implement two classification methods, more concretely classification and regression trees methodology (CART) and more novel approach called recursive partitioning (PARTy).

2 Data and methods

All data, used in this paper, are collected from one bank institution in Czech Republic during the 2013 - 2014. Data could be characterized as random sample from bank internal database. This data set contains information from 2455 credit applicants. Initially there are nine different variables in this data set: Age (A), Income (I), Gender (G), Marital (Ma), Number of kids (Nk), Number of cards (Nc), Mortgage (Mo), Number of loans (L) and Risk for bank (R). In the table 1 there are provided basic descriptive statistics for these variables.

At this point we have to say that we apply discretization during the pre-processing of data set of following variables: age, income, number of kids, number of cards and number of loans. The detailed categories of particular variables is as follows: age with categories: a = [0,26), b = [26,51) measured in years; income with categories: a = (0,20], b = c = (20,40], d = (40,60] measured in thousand CZK; gender with categories: F – female, M –male; marital status with categories: divorced-separated; widowed; married and single; number of kids in family with categories: a = [0,1); b = [1,3); c = [3,5); number of debt or credit cards with categories: a= [0,1), b = [1,3) and c = [3,7); mortgage with categories: no, yes; loans with categories: a = [0,1), b = [1,4) and finally risk for bank with categories: bad loss; bad profit; good risk given by bank risk managers of bank institution.

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Table 1 Descriptive characteristic for used explanatory variables – before transformation

Numerical variables	Descriptive characteristics						
Name	Min.	The first quartile	Median	Mean	The third quartile	Max.	
Age (A)	18	23	31	31.89	41	50	
Income (I)*	15.018	20.559	23.620	25. 653	27. 618	59. 944	
Categorical variables	Categories and numbers of observation						
Gender	Female: 1228			Male: 1227			
Marital	Married: 1214		Single:711		Divorced or separated, widowed: 530		
Number of kids	0: 587	1: 789	2: 934	3: 150	4: 31		
Number of cards	0:325	1:651	2:661	3:367	4:121	5: 172	6:158
Mortgage	No: 546			Yes: 1909			
Risk for bank	Bad loss: 559		Bad profit: 1475		Good risk: 421		

Source: Own processing *Income is provided in thousands of CZK

2.2 Methods

With aim to uncover classification rules we used two methods based on "recursive partitioning" of the space. These methods could be briefly described as follows. During the building the set of classification rules by CART methodology, e.g. tree growing, we usually employ the following phases (Breiman, Friedman, Olshen, & Stone, 1998) or (Hastie, Tibshirani, & Friedman, 2001):

- The split criterion for each node of growing tree is chosen. This problem is usually solved by impurity measure. As an impurity measure, we chose the Gini index. Other possibilities are for example Misclassification error, Cross-entropy or deviance. For more technical details see (Breiman, Friedman, Olshen, & Stone, 1998) or (Therneau, &Atkinson, 2011)).
- To decide which node becomes a leaf (terminal node of tree) is an essential problem solved in the second stage. Usually pruning of tree is used. After building T_{max} tree (each leave contains the objects only from one class, or the number of classifying objects in each leave is smaller than the prescribed value) is this tree pruned to tree T_{optim}. The new tree T_{optim} is the subset of $_{Tmax}$. This pruning of tree T_{max} to tree T_{optim} minimize estimation of relative error of classification.
- The third phase is the simplest part of the tree growing process. Each of the classes is assigned to one of the leaves. The idea is following: to assign correctly the specific class to leaves is to assign the value, that minimizing the estimate of the misclassification error. More information about CART methodology can be found in (Breiman, Friedman, Olshen, & Stone, 1998) or in (Hastie, Tibshirani, & Friedman, 2001). As we can see, the major advantage of the recursive binary tree is its nice interpretability. The whole feature space partition is fully described by one tree.

The algorithm of Hothorn et al. (2006b) for binary recursive partitioning can be described in three steps:

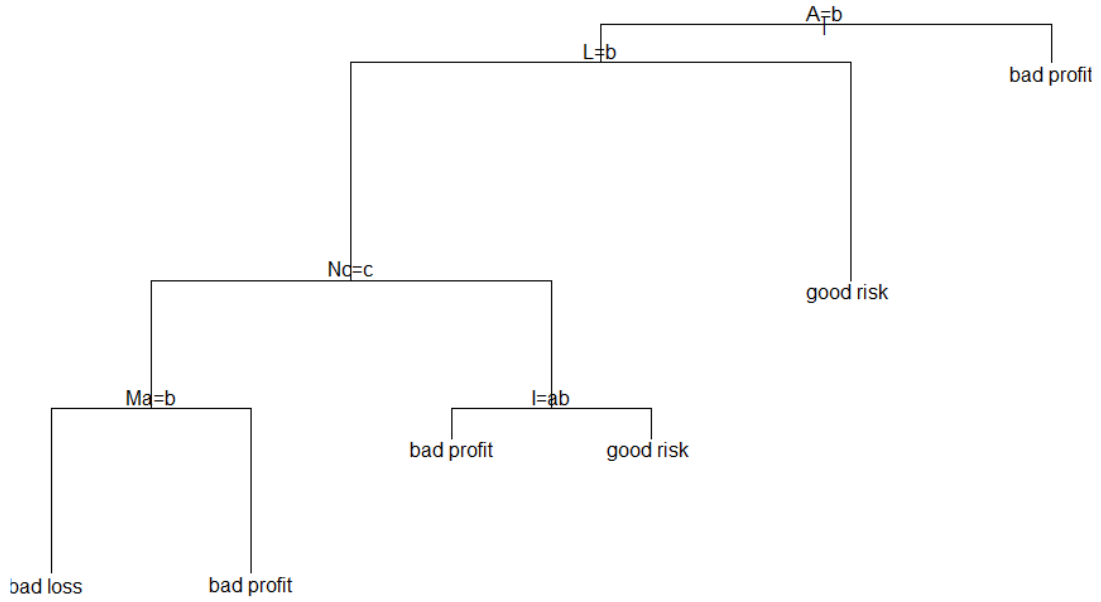
- Firstly, beginning with the whole sample, the global null hypothesis that there is no relationship between any of the covariates and the response variable is evaluated. If no violation of the null hypothesis is detected, the procedure stops. If, however, a significant association is discovered, the variable with the largest association is chosen for the split.
- Secondly, the best cutpoint in this variable is determined and used to split the sample into two groups according to values of the selected covariate.
- Then the algorithm recursively repeats the first two steps in the subsamples until there is no further violation of the null hypothesis, or a minimum number of observations per node is reached.

For more technical details about algorithm see (Hothorn, Torsten, Hornik, & Zeileis, 2006b). Data pre-processing and the numerical computation were carried out in the programming language R (R package, 2011).

3 Research results

At the beginning of the building classification rules, the sufficiently branched tree T_{max} was created. To manage the growing process, the complexity parameter *cp* was specified by zero value because the low value of the complexity parameter made the tree sufficiently branched. Visualization of this tree is proposed on picture 1.

Figure 1 Unpruned classification tree obtained by CART algorithm with setting complexity parameter *cp* = 0.



Source: Own processing

Age (A), Income (I), Marital (Ma), Number of cards (Nc), Mortgage (Mo), Number of loans (L).

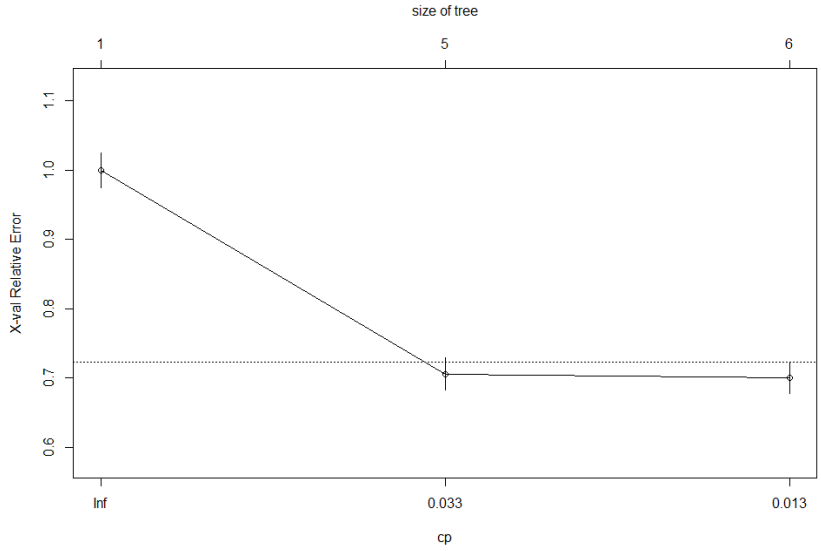
For decision where to stop the growing process and to prune the tree, we used 1-*SE* rule, see table 2 for more details and characteristics. These characteristics are also provided in graphical form on graph 2.

Table 2 Complexity table

Root node error: 980/2455 =0,39919					
	cp	Number of splits	Relative error	X-error	X-std
1	0.062755	0	1.00000	1.0000	0.024760
2	0.017347	4	0.70612	0.70612	0.022747
3	0.010000	5	0.68878	0.68878	0.022574

Source: Own processing

Figure 2 Graphical visualization of the relative error vs. size of tree and complexity parameter

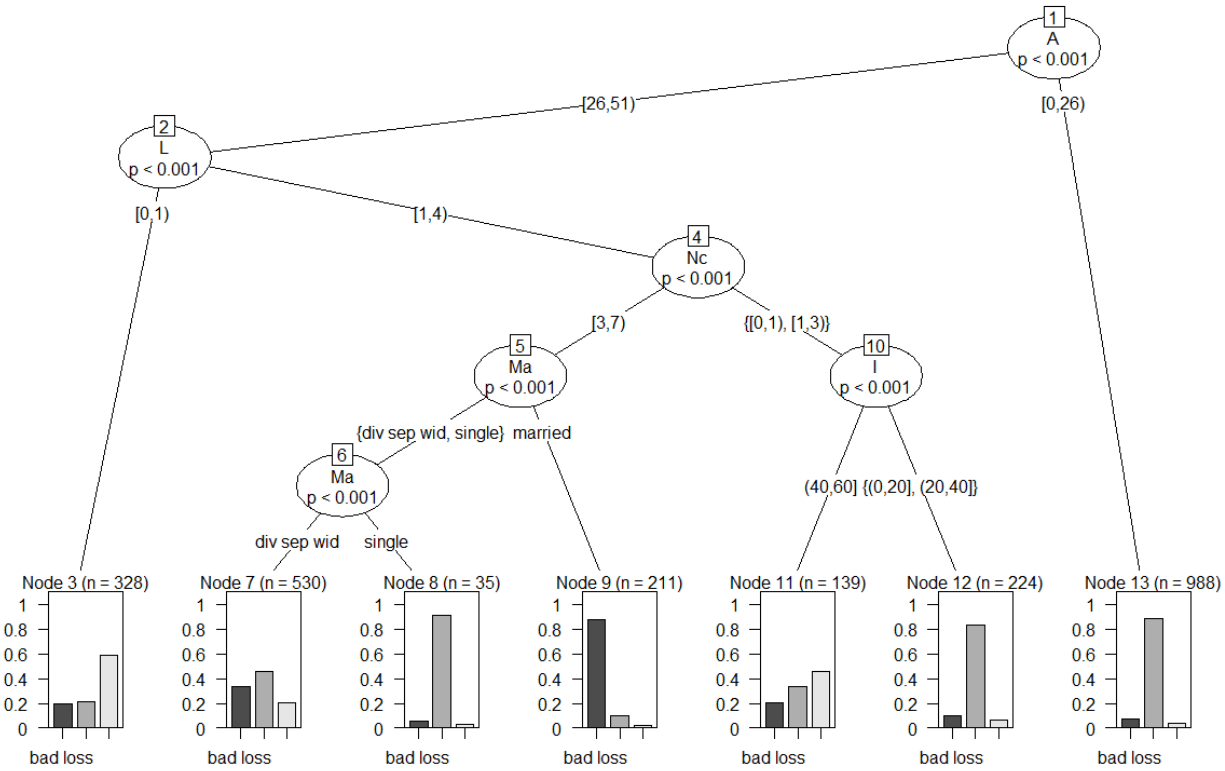


Source: Own processing

From this is clearly evident that if we apply 1-*SE* rule we cannot prune T_{max} classification tree. So the final classification tree obtained by CART methodology is T_{max} tree, e.g. tree with five splits and six terminal nodes.

It is evident that "driving" variables discovered by CART methodology are: age (A), number of loans (L), number of cards, marital (Ma) and income (I). On picture 3 is provided final classification tree obtained by PARTy methodology. We can see that this tree has seven terminal nodes. From this picture is obvious that classification rules are based only on following variables: age (A), loans (L), number of cards (Nc), marital (Ma) and income (I). So the same variables as identified in the previous tree. So we can say that partitioning of the sample space is stable from this point of view.

Figure 3 Resulting classification tree obtained by PARTy algorithm



Source: Own processing

The efficiency of the two mentioned classification approaches is evaluated on training data set. The results are presented in error table in table 3. In the case of classical approach (CART methodology) we reached classification efficiency of 72.50 % for training data. The classification efficiency for PARTy approach reached exactly the same value for test data. For more details see table 3.

Table 3 Error classification table for two methodologies applied on training and test data

Truth	**Prediction**			**Sum**
	Applicant is classified as: "bad loss"	Applicant is classified as: "bad profit"	Applicant is classified as: "good risk"	
Applicant is "bad loss"	Training data set: **186**[a] ; **186**[b]	Training data set: **280**[a]; **280**[b]	Training data set: **93**[a] ; **93**[b]	559; 559
Applicant is "bad profit"	Training data set: **21**[a] ; **21**[b]	Training data set: **1337**[a] ; **1337**[b]	Training data set: **117**[a] ; **117**[b]	1475; 1475
Applicant is "good risk"	Training data set: **4**[a]; **4**[b]	Training data set: **160**[a]; **160**[b]	Training data set: **257**[a] ; **257**[b]	421; 421
Sum	211; 211	1777; 1777	467; 467	2455

[a]Results for classical approach through CART methodology; [b]Results for PARTy methodology

4 Conclusions

Using the above mentioned methodology, we identified some essential factors influencing the classification of customers. From the both classification methodology we identified the same influencing variables. More concretely we identified following variables: Age, Income, Marital, Number of cards (Nc), Mortgage (Mo), Number of loans (L).

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The Annual Percentage Rate - Complexness and Ambiguity

Pavel Tlustý, Tomáš Mrkvička, Marek Šulista

Abstract: *The annual percentage rate should enable consumers to better evaluate the favourability of a loan and indicates the percentage of the loan which has to be redeemed within one year, considering instalments, maintenance and other charges that go with the loan. In addition, loan providers are obliged, according to the Czech law, to present this rate with their consumer credit offers. This paper outlines the calculation of the annual percentage rate and points out its ambiguity illustrated with concrete examples which depict its weakness and inconsistencies which may cause a dispute between consumers, loan providers and state inspection authorities. All the presented deficiencies lead to the conclusion that the annual percentage rate is not a suitable tool which should be used by financial institutions to help consumers to evaluate the favourability of a loan.*

Key words: annual percentage rate · loan

JEL Classification: G23

1 Introduction

The annual percentage rate (APR) should enable consumers to better evaluate the favourability of a loan and indicates the percentage of the loan which has to be redeemed within one year, considering instalments, maintenance and other charges that go with the loan. In addition, loan providers are obliged, according to law, to present this rate with their loan offers. Recently, we could witness some disputes about APR calculation between the Czech Trade Inspection Authority and a non-bank financial institution offering consumer loans using APR calculation methods.

2 Material and methods

The main aim of the paper is to illustrate with concrete examples the weaknesses and inconsistencies of the APR which may cause disputes between consumers, loan providers and state inspection authorities. The concrete examples are calculated in accordance with the formula presented in the Act No. 145/2010 Col. about consumer loans.

2.1 The annual percentage rate definition

In the European Union, the focus of APR standardization is heavily on transparency and consumer rights: "a comprehensible set of information to be given to consumers in good time before the contract is concluded and also as part of the credit agreement [...] every creditor has to use this form when marketing a consumer credit in any member state". So marketing different figures is not allowed. The EU regulations were reinforced with directives 2008/48/EC and 2011/90/EU (www.ec.europa.eu), fully in force in all member states since 2013.

In the Czech Republic, the APR is, according to Act No. 145/2010 Col. about consumer loans (hereafter the Act), calculated as follows (http://www.zakonyprolidi.cz):

$$\sum_{k=1}^{m} C_k \cdot (1+X)^{-t_k} = \sum_{l=1}^{m'} D_l \cdot (1+X)^{-s_l}$$

where

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- X is the APR,
- m is the number of the last draw ,
- k is the number of the draw ($1 \leq k \leq m$),
- C_k is the amount of the draw k,
- t_k is an interval expressed in years and fractions of a year between the date of the first draw and the dates of the following draws ($t_1 = 0$),
- m' is the number of the last instalment or charge,
- l is the number of a draw of an instalment,
- D_l is the amount of the instalments or charges,
- s_l is an interval expressed in years and fractions of a year between the date of the first draw and the date of the following instalments or charges.

2.2 The unequivocality of the annual percentage rate

If the APR should enable us to compare loans with different parameters, it must have the following attributes:

- The APR must exist for every loan.
- The value of the APR must be unequivocally defined; there must be exactly one solution of the APR equation.
- The calculation of the time periods should reflect common conventions.
- The rule for rounding must be defined unequivocally.

It should be mentioned that the calculation of the roots of the given equation is not trivial and it is possible, in most cases, only with the use of a computer. It is important to keep in mind that if any of the above mentioned attributes are not met, the APR cannot fulfil to its purpose.

3 Results

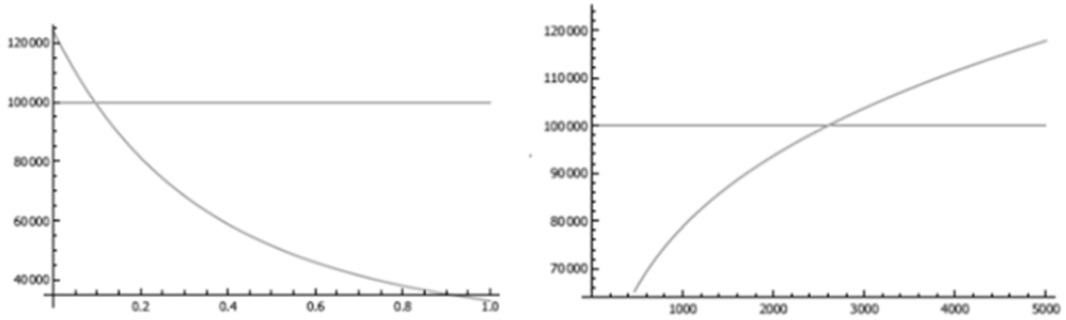
It is not a problem to make an example of a loan for which there is no value or more than one value of the APR calculated in accordance with the Act – see the examples below. Generally speaking, we may say that the given definition (equation) may have up to n different roots (solutions), where n is the number of periods where there is a cash-flow. This is a fact which has not been considered properly and which does not correspond with the nature of the Act. Moreover, some roots may even be negative and the negative APR has no economic interpretation.

Example 1: We ask a bank for a loan of 100,000 CZK. First, we have to pay a single approval charge of 14,000 CZK, and after 3 months, we get the loan which is redeemable by the amount of 110,000 CZK in 3 years later.

The corresponding APR is calculated as follows:

$$100000 \cdot (1+X)^0 = 14000 \cdot (1+X)^{\frac{3}{12}} + 110000 \cdot (1+X)^{-\frac{33}{12}}$$

Figure 1 Graphical solutions of Example 1



Source: authors

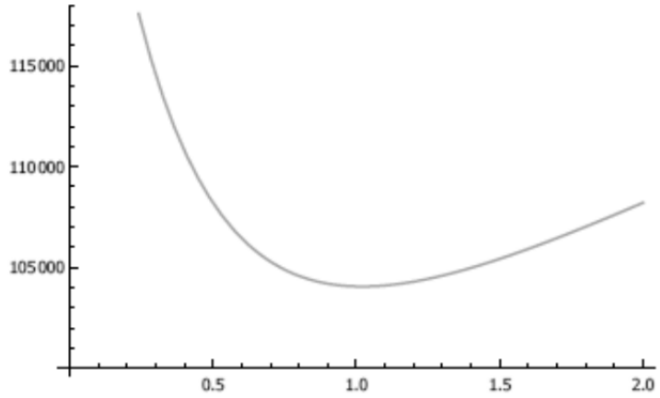
As is possible to observe from Fig. 1, there are two solutions $X_1 = 0.0951$ and $X_2 = 2602$, i. e. the corresponding APRs are 9.51% and 260.200%. There is no doubt that the second value of the ARP is nonsense.

Example 2: We ask a bank for a loan of 100,000 CZK. First, we have to pay a single approval charge of 80,000 CZK, and after 3 months, we get the loan which is redeemable by the amount of 60,000 CZK in 3 years later.

The corresponding APR is calculated as follows:

$$100000 \cdot (1+X)^0 = 80000 \cdot (1+X)^{\frac{3}{12}} + 60000 \cdot (1+X)^{-\frac{33}{12}}$$

Figure 2 Graphical solution of Example 1



Source: authors

As it is possible to observe from Fig. 2, there is no solution and therefore there is no corresponding APR.

A problem may be identified with the length of the interest period. In banking and financial mathematics, there are three basic and standard methods of calculation the interest period – the European standard($\frac{30E}{360}$), banker's interest ($\frac{ACT}{360}$), and exact interest ($\frac{ACT}{ACT}$). The European standard considers every month to have exactly 30 days, the banker's and the exact interests consider months with different lengths. However, the Act calculates the length of every month to have $\frac{365}{12}$ days, even when the year is a leap year. It may cause problems when various financial products use different methods of interest period calculation.

Appendix 5d) of the Act says that "the root of the equation X has to be rounded to at least one decimal place. If the digit on the following decimal place is equal to or bigger than 5, the digit at the given decimal place is raised by 1." It means that, for example, for $X = 0.2315$ after rounding we get 0.2, i. e. the ARP = 20%. However, for both $X = 0.051$ and $X = 0.149$ we get after rounding the same ARP = 10%. This is obviously nonsense and it may be considered as deceiving of consumers.

Some financial institutions offer loans to their customers only if they pay a kind of loan insurance on the ability to repay the given loan. This causes another problem, because then the insurance premium is an obligatory charge going with the loan. However, the consumers do not pay back in their instalments only the loan principle, the interest and other charges but they pay for an extra service – the insurance. Should or should not the insurance be included in the APR? Unfortunately, this fact is not treated by the Act.

We can also encounter a case when a non-bank financial company offers a consumer a product and arranges the loan itself with a third party for the consumer. The mediation charge could be seen again as a kind of service and again, there is the question of whether the charge should be included in the APR calculation, as the Act considers only two parties. This situation is illustrated by Examples 3 and 4.

Example 3: A non-banking financial company offers a product worth 100,000 CZK. The loan of 100,000 CZK is provided by a bank of the same financial group and there is a mediation charge of 8,000 CZK. The total principal (the loan and the mediation charge) is redeemed with 84 monthly instalments of 2,464 CZK.

The client has to repay the total amount of 108,000 CZK with monthly instalments of 2,464 CZK for 84 months. The appropriate APR is 26.7%.

Example 4: A non-banking financial company offers a product worth 60,000 CZK. The loan of 60,000 CZK is provided by a bank of the same financial group and there is a mediation charge of 48,000 CZK. The total principal (the loan and the mediation charge) is redeemed with 84 monthly instalments of 2,464 CZK.

The client has to repay the total amount of 108,000 CZK with monthly instalments of 2,464 CZK for 84 months. The appropriate APR is 51.3%.

As we can see, even though the client repays, in both cases, the same instalment for the same time period, the APRs differ. Another problem can be encountered when a bank requires, for example in the case of a mortgage, that the client has to effect mortgage indemnity insurance which is included in monthly instalments. Then, again, it is an extra service and it is disputable if to include this extra service in the APR calculation or not.

4 Conclusion

The aim of this paper was to outline the complexity of the APR calculation, discuss its characteristics embedded in the Act and to point out a certain ambiguity which may cause a dispute between consumers, loan providers and state inspection authorities. When considering all the mentioned deficiencies, it seems that the APR is not a suitable tool which should be used by financial institutions to help consumers to evaluate the favourability of a consumer credit. The evaluation of credit offers should be considered as a problem of great complexity and to compare various credit offers using only one aspect seems to be rather defective.

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Session 5

Consumer Protection and Legal Aspects of the Land Alteration

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Alternative Dispute Resolution before Czech Trade Inspection

Zuzana Frantíková

Abstract: *The paper focuses on the changes in the area of alternative dispute resolution in consumer protection brought by the almost approved amendment published under No. 445/0 of Act No. 634/1992 Coll., on consumer protection, as amended. The current regulation despite the commission recommendations 98/257/EC of 30 March 1998 of the European Commission does not show any satisfactorily progress in the area of alternative dispute resolution. Within the Czech Republic some consumer disputes are ruled by administrative offices such as the Czech telecommunication office, the Energy regulatory office or the Financial arbitrator. Proceedings led by these offices are regulated in Act No. 500/2004 Coll., Administrative procedure code except the proceeding before the Financial arbitrator which is regulated by Act No. 229/2002 Coll., on financial arbitrator. In accordance with Art. 36 of the Charter of Basic Human Rights and Freedoms all rulings issued of administrative offices are object of judicial review. The above mentioned amendment of Act on consumer protection establishes Czech trade inspection as the residual entity of ADR, which may sometime result in breaching mandatory professional rules in case of commercial practices provided by some professions.*

Key words: Alternative Dispute Resolution · Consumer Disputes ·Consumer Protection · Czech Trade Inspection

JEL Classification: K1 · K13

1 Introduction

Directive 2013/11/EU of the European parliament and of the Council of 21 May 2013 on alternative dispute resolution for consumer disputes and amending Regulation (EC) No 2006/2004 and Directive 2009/22/EC (Directive on consumer ADR) was published in the Official Journal of the European Union on 18 June 2013 and should be implemented by the member states by 9 July 2015. The directive on consumer ADR should not apply to non-economic services of general interests and should not apply to health care services. The aim of the direction is to eliminate any obstacles to the functioning of the internal market and to ensure access to simple, efficient, fast and low-cost ways of resolving domestic and cross-border disputes arising from sales or service contracts. The tasks assigned by the EU to the Czech Republic are following: to implement Directive on consumer ADR and to adopt Regulation EU No 524/2013 of the European parliament and of the Council of 21 May 2013 on online dispute resolution.[38] From April 2008 to 2010 the Ministry of trade and industry of the Czech Republic had tried to launch alternative dispute resolution (ADR). First two years of this project were considered piloting. At the end, the involving parties agreed that it would be convenient to have such an alternative entity. However, it has not been realized so far. At the moment, alternative dispute resolution (except arbitration and mediation) do not exist in the Czech Republic, but on the other hand there are specialized state offices ruling consumer cases in administrative proceeding which in fact fulfil the requirements of directive on consumer ADR.[39] The ADR Directive ensures that consumers have access to ADR for resolving their contractual disputes with traders. Access to ADR is ensured no matter what product or service they purchased (only disputes regarding health and higher education are excluded), whether the product or service was purchased online or offline and whether the trader is established in the consumer's Member State or in another Member State. Member States will establish national lists of bodies offering ADR procedures (ADR bodies). All ADR bodies included in those lists will have to comply with binding quality requirements. Except ADR there is also an ODR regulation. Under the ODR Regulation, the European Commission will establish a European Online Dispute Resolution platform (ODR platform). The ODR platform is a web-based platform that is specifically designed to help consumers

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[38] In relation to the Regulation, the Czech Republic should create an on-line platform for solution of domestic consumer disputes and be able to be involved in on-line European platform in all languages of European union enabling consumers to file their complaints via the complaint form located in the website (in this case European Consumer centre will be responsible for the assistance in case consumers will have some problem with submitting their complaints.

[39] Official webpage of the Ministry of Industry and Trade of the Czech Republic. (on-line). 2015-1105 [cid. 2015-05-11]. Available at: http://ec.europa.eu/consumers/solving_consumer_disputes/non-judicial_redress/adr-odr/index_en.htm

who have bought goods or services online and subsequently have a problem with that online purchase. It allows consumers to submit their contractual dispute and conduct the ADR procedure online and in any of the 23 official languages of the European Union. The ODR platform transmits disputes only to ADR bodies who are included in the national lists of ADR bodies that comply with the binding quality requirements established by the ADR Directive. It will be accessible to consumers and traders as of 15 of February 2016[40].

2 Methods

In this paper there is an emphasis put on analytical method of logical deduction and on method of legal comparison. The purpose of this paper is to achieve by means of interpretation and scientific methods reliable description of current legal regulation of ADR in consumer disputes with respect to a new amendment prepared and proposed by ruling government of the Czech Republic.

3 Current situation and novelties brought by the new regulation

Nowadays in the Czech Republic there are two forms of ADR regulated, namely arbitration and mediation. Arbitration is regulated in Act No. 216/1994 Coll., on arbitration and execution of arbitration judgments and mediation in the Act No. 202/2012 Coll., on mediation. However, these forms of ADR are not suitable for the solution of consumer disputes. Some specialized cases of consumer disputes are solved before state offices such as Czech telecommunication office, Energy regulatory office and Financial arbitrator.

Pursuant to Section 127 of Act No. 127/2005 Coll., on electronic communications, the Czech telecommunication office can rule consumer disputes relating to billing. The consumer can file objections within at the Czech telecommunication office, against the ruling there is an appeal that shall be filed within 15 days at the president of the council. The Energy regulatory office is according to Act No. 458/2000 of 28 November 2000, on the conditions of business and state administration in energy industries and changes to certain laws (the Energy Act) as amended, responsible for regulation in the energy sector. Pursuant to Section 17 art. 7 letter e) of Energy Act the Energy regulatory office is authorized to solve consumer disputes relating to gas, heat and electricity. Consumer disputes stemming from contracts providing financial services are ruled by a financial arbitrator in two-round proceeding. The financial arbitrator is a part of a net called FIN-NET founded in 2001 by the European Commission in order to share knowledge gained from financial disputes and also to help to solve the cross-border financial disputes within the EU. However, there is another net which is meant for out-of-union financial disputes and this net was created in 2007 and was called INFO Network[41]. The proceedings before the above-mentioned state officials are regulated in the provisions of Act No. 500/2004 Coll., Administrative procedure code.

Rulings issued by all the above mentioned ADR entities are objects of the judicial revision in a civil proceeding according to Act No. 99/1963 Coll., the Civil Procedure Code.

4 Conciliation before the Czech trade inspection

With respect to the new directive on consumer ADR a residual ADR entity had to be established – Czech trade inspection, which will solve all the residual consumer cases which do not belong to the authority of the above-mentioned state offices. The conciliation shows to be most suitable for these kinds of consumer disputes. The outcome of the proceeding before the Czech trade inspection will be a private agreement. The participation of a businessman in the conciliation will be mandatory unlike the participation of a consumer who is able to terminate its participation at any time without giving any reason. In case parties will not act voluntarily according to the settlement, a court action can be brought before civil courts. Nevertheless, the agreement will not be executable, which is a big disadvantage of this kind of proceedings. Taking into account that the proceeding will last 90 days and then the agreement concluded and signed by both parties will not be executable and that the parties will have to bring an action before a court in civil proceedings, the whole procedure can be very demanding for a consumer. The distinction between the mediation and conciliation can be quite hard. Unlike the mediation the conciliation represents a more formal procedure when a conciliator is more active and intends by legal advices to reach an out-of-court settlement in the presence of both parties. The proposal can be submitted only by a consumer who has not been successful with his previous complaint at the businessman but only within one-year period from the first submission of the consumer´s complaint. The proposal

[40] Official webpage of the Ministry of Industry and Trade of the Czech Republic (on-line). 2015-11-05 [cid. 2015-05-11]. Available at: http://www.mpo.cz/dokument42173.html

[41] Official webpage of the Financial Arbitror (on-line). 2015-11-05 (cit. 2015-05-11). Available at: http://www.finarbitr.cz/cs/financni-arbitr/zakladni-informace.html

can be submitted via a form available at the Czech trade inspection website, but also it can be sent by mail or submitted personally. The system of ADR at the Czech trade inspection will be released on February 1, 2016. The cross-border disputes in online disputes resolution will be supported by the European consumer centre partly run by the Czech trade inspection. As such procedures are an alternative to resolving disputes before a court they are called Alternative Dispute Resolution (ADR). When they are carried out online, they are called Online Dispute Resolution (ODR). Resolving disputes through ADR/ODR, in general, is easier, faster and less expensive than resolving disputes before a court.

With respect to what was said before there are new duties relating to traders such as they have to adjust their general terms and conditions or other contractual documents, and their websites in case they have them according to the Section 14 of the Act on Consumer Protection in order to inform the consumers on their rights to settle their problem in an out-of-court settlement and of course on which entity is in this case responsible to solve it with all the needed information[42]; traders have to participate in a conciliation in case it is started by a consumer and cannot stop their participation there unlike consumers, also they have to provide Czech trade inspection with information that later on can be used in their disfavour when imposing them with a fine as a most common manner of the resolution of the administrative proceedings. The businessman itself cannot solve the problem at the ADR entity. During the proceedings before the Czech trade inspection the prescription period does not run, the consumer can bring an action to the court until the agreement is concluded, there is no *lis pendens* obstacle.

5 Relation to the free professions

The legal regulation implemented by the above-mentioned proposal does also relate to so called free professions realized either by natural or legal persons executing free professions, it means professions realized on the basis of various acts[43] regulating specific professions such as attorneys, doctors or architects. This meaning was confirmed by a decision of the European court of justice published under the reference number C-421/121.[44] This regulation means that every businessman providing services based either on the Trade Licensing Act or other acts shall provide their services in accordance with the law, which brings many duties. Since 28 of December, 2015 the businessmen are obliged to indicate the price at the beginning in the commercial communication otherwise it could be considered unfair commercial practice and to provide a receipt on provided services with the date of their provision and in case of complaint proceedings the receipt containing the day of exercising a complaint, which claims has been chosen by the consumer and what is the content of the complaint. The Act on the legal professions governs the conditions under which legal services may be provided. ADR is valid also for consumer contracts on providing legal services. According to this fact the businessmen should inform their consumers on the information relating to the alternative dispute resolution. Nevertheless, ADR entity represented by the Czech trade inspection would signify a great danger with respect to the duty of professional secrecy (non-disclosure) because the participation in out-of-court settlement is obligatory in case of a businessman. Pursuant to Section 21 of the Act on the legal profession a lawyer's duty of professional secrecy (non-disclosure) may be waived only by his client, and, after the client's death or termination of existence, his successor; should there be more than one legal successor the consent of all legal successors shall be necessary to waive the duty of professional secrecy (non-disclosure). Nevertheless, the Czech Bar Association chamber has already asked the Ministry of Industry to be the ADR entity for the disputes stemming from the providing of legal services according to Section 20f of the Act on consumer protection.[45]

[42]The Ministry of Industry and Business has to prepare a list of these ADR entities containg all the information stated in Section 20e of the Act on Consumer Protection.

[43] e.g. Act No. 85/1996 Coll, on the Legal Profession, as amended

[44] Judgment of the Court of 10 July 2014. European Commission v Belgium Kingdom. By the application, the European Commission asks the Court to declare that: „by excluding members of a profession and dentists and physiotherapists from the scope of the Law of 14 July 1991 on commercial practices, consumer information and consumer protection (*Moniteur belge* of 29 August 1991, p. 18712), as amended by the Law of 5 June 2007 (*Moniteur belge* of 21 June 2007, p. 34272) ('the Law of 14 July 1991') transposing Directive 2005/29/EC of the European Parliament and of the Council of 11 May 2005 concerning unfair business-to-consumer commercial practices in the internal market and amending Council Directive 84/450/EEC, Directives 97/7/EC, 98/27/EC and 2002/65/EC of the European Parliament and of the Council and Regulation (EC) No 2006/2004 of the European Parliament and of the Council ('the Unfair Commercial Practices Directive') (OJ 2005 L 149, p. 22), the Kingdom of Belgium has failed to fulfil its obligations under Article 3 of that directive, read in conjunction with Article 2(b) and (d) thereof (…)."

[45] Official webpage of the Czech Bar Association (on-line). 2015-12-29 [cit. 2015-29-12]. Available at: http://www.cak.cz/scripts/detail.php?id=15379

6 Conclusions

The above-mentioned new regulation could bring certain reduction of workload to first-instance courts as the first-instance courts are covered in cases after the amendment of Civil procedure code. Administrative proceeding/ADR is easier than the court proceeding, in general it is quicker and based on written submissions so no physically presence of involving parties is needed. The administrative proceeding/ADR is low-cost or free-of-charge. The amendment of Act on consumer protection says that there will be no fee, at least in case of proceeding before the Czech trade inspection. Except many pros brought by the new amendment there is a certain negative fact and that is that consumer disputes belong to private law. By locating them before administrative offices the protection of private rights is transferred to state offices causing slightly imbalance in powers – executive power represented by state offices ruling private consumer disputes originally belonging into the judicial competence. Other negative fact may be considered that providing services by so called free professions is a very specific business area. On the other hand, there is hardly to be imagined that some cases will arise.

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Goverment amendment proposal published under No. 445/0 of Act No. 634/1992 Coll., on consumer protection, as amended

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Act No. 500/1994 Coll., Administrative procedure code, as amended

Act No 2/1993 Coll., Charter of Fundamental Rights and Freedoms, as amended

Act No 229/2002 Coll., on financial arbitrator

Act No. 85/1996 Coll, on the legal profession, as amended

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Judgment of the Court (Third Chamber) of 10 July 2014. European Commission v Kingdom of Belgium. Case C-421/12.

Failure of a Member State to fulfil obligations - Consumer protection - Unfair commercial practices - Directive 2005/29/EC - Complete harmonisation - Exclusion of the professions, dentists and physiotherapists - Restriction or prohibition of certain types of itinerant trading activities.

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Financial literacy in the Condition of the Transition Economy

Liběna Kantnerová

Abstract: *Research conducted by the author was based on a questionnaire survey. The questionnaire contained some questions used by the Ministry of Finance of the Czech Republic in very short version. Furthermore, respondents were questioned on their information sources on managing money.*

Research was based on a survey of 496 students of Economic Faculty of the University of South Bohemia in Ceske Budejovice during four semestres. Statistical methods were used for its evaluation.

Financial literacy can be divided into basic financial literacy and special, advanced financial literacy. Basic financial literacy is a set of knowledge and skills, which should be useable by all people, as it allows ordinary and necessary guidance in ensuring basic financial liabilities and assets of each individual within the nation. Advanced financial literacy is a very broad concept. This includes the potential abilities of different age and professional groups at different levels of action, and use of financial services. These include the need to develop skills, responsibility and ethics of those who professionally manage finances of others, or provide them with financial services too. Currently, due to the growing sophistication of trade unions and deregulation of financial markets, many experts have narrowly specialised. Universities and colleges of economics and finance have a great creative potential, as well as methodological, organisational, professional and scientific experience, to be in the process of increasing irreplaceable financial literacy.

Key words: Financial Literacy · Education Youth · Questionnaire

JEL Classification: B21 · E44 · E50, F60 · G02 · G2 · I25

1 Introduction

The author should say, time is changing and the behaviour of people and their professional skills are too. In the Czech Republic there can be seen poor legislation, agressive advertising and behaviours, low professionalism, and fraud on one side and debts and problems on the other. The decline of morality can be seen anywhere in the world and it was one of the reasons for the financial crisis in 2008, according to Roubini &Mihm (2011).

There are many new products, new rules, new trends (Lucas, Goodman & Fabozzi, 2007), non-professionalism and fraud. To find the right way in this jungle it needs skilled and clever and educated people.

The current financial crisis has highlighted the need for financial education, education focused on practical life skills associated with administration of personal or family budgets, which are a prerequisite for the financial security of citizens and families. Various forms of investment and return on investment require a certain measure of determination and education. The willingness to take risks requires detailed mapping of the product to know before the signing of any agreement ways of calculation and estimation of possible difficulties. This situation creates the need to teach and raise a new generation by more sophisticated and practical methods. It is necessary to give lectures on practical topics, and their connection with practice, and not only on the theory about the function of something. It is necessary to say to students how to avoid problems, and what is necessary where people are who able to help them in some situations, what should be done in case of debts if they are not able to pay instalments when they are unemployed, and to know their rights in such situations, etc.

The situation in recent years in developed and emerging countries and economies is that there is increasing concern about the level of financial literacy of their citizens. This has stemmed in particular from shrinking public and private support systems, shifting demographic profiles, including the ageing of the population, and wide-ranging developments in the financial marketplace. Concern was also heightened by the financial crisis, with the recognition that lack of financial literacy was one of the factors contributing to ill-informed financial decisions and that these decisions could, in turn, have tremendous negative spill-over effects (OECD, 2009). As a result, financial literacy is now globally acknowledged as an important element of economic and financial stability and development (INFE, 2009).

Financial markets have become more complex and individuals are faced with a proliferation of new investment products, many of which are new and often fairly complex. Investment opportunities have expanded beyond national borders, permitting individuals to invest in a broad range of assets and currencies (Kantnerová, 2014).

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But how well equipped are individuals to make financial decisions, and how much individuals know about economics and finance depends on a lot of factors. Renaud (2009) emphasizes that for the first time in the world‘s history more people live in urban areas than in rural areas. As a result, the financial system connected with housing becomes a more and more important part of the whole economy. Housing loans will increase, because urban expansion is intensifying (Kantnerová, 2013). This cannot be covered by government expenditures solely. On the other hand, we can notice that the traditional role of a bank as a lending institution is declining.

On the other hand, macroeconomic consequences are reflected mainly in the reduction of financial exclusion and excessive indebtedness as well as in the restriction of efforts aimed at evening out existing disproportions in household incomes (Kantnerová, 2015).

Some researchers have reported in the past that poor financial decisions hurt productivity in work (e.g. Kim & Garman, 2004). surveyd corporate benefit administrators who cited basic personal finance as an important area in which employee knowledge is deficient and recommended financial lessons for them.

Aside from the “crisis effect”, a series of tangible trends underpin the rising global interest in financial literacy as a key life skill. These can be summarised as follows: risks shift, individual responsibility, increased supply and demand of a wide range of financial products and services (PISA, 2012). There are a lot of risks associated with longevity, credits, financial markets, and out-of-pocket healthcare. The number of financial decisions that individuals have to make is increasing as a consequence of changes in the market and the economy. And a new problem is coming in our society - consumers must confront complicated financial decisions at a young age in today's demanding financial environment, and financial mistakes made early in life can be costly. It is good to arrange steps for the family´s wealth, if the buyer of stocks or bonds can evaluate the risk connected with such deals.

According to Zamrazilová (2011), financial literacy means the basic knowledge of people not only of finance, but in law and economics. People need to use information from any media and what is very important, they need to adopt the main value standard of their money, budget and property – wealth. Czech society, according to the survey of ING bank, has more than 70 % of its citizens with only basic or not so good financial knowledge (Allen, 2007). It is third place from the end in the scale of World nations.

Our past system of education was not enough, but it is changing nowadays, slowly, but it starts to work. There is a new Strategy of Ministry of Education, Youth and Sport, support from the central bank and Ministry of Finance and finally work of special department on the Ministry of the Interior starts too (Kantnerová, 2015).

2 Methods

The results of this current study are based on a questionnaire survey. The questionnaire is very simple, because there was no grant or fund. People are sometimes disturbed by so many questions and refuse to answer them. So the first condition was to have the questionnaire short, but covering the major sides of financial literacy.

The list of main questions:

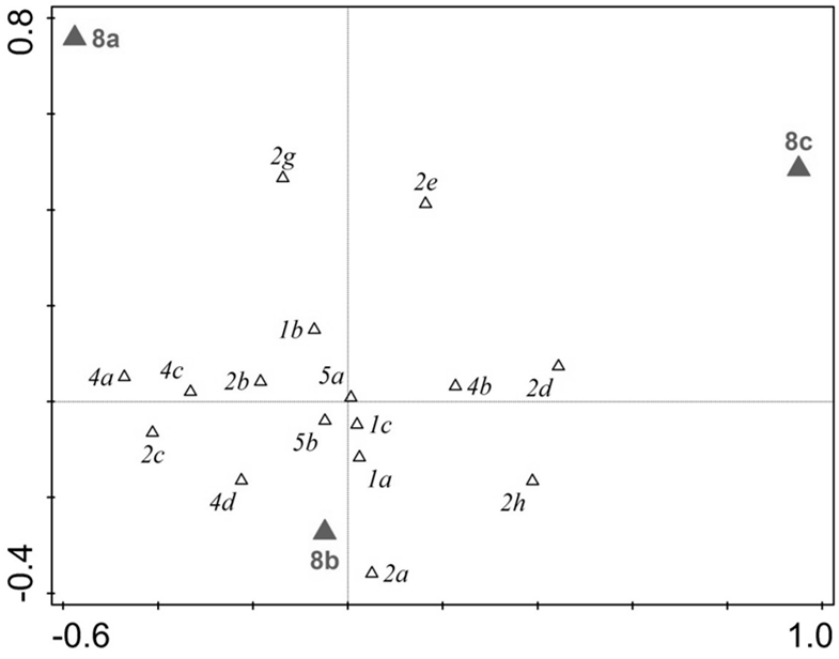
1. Do you know the total balance of your money? How often do you check it?
2. Do you plan your financial needs: incomes, outcomes, budget? Seven optional answers were given here.
3. What is important for you to know if you need credit? The respondents were asked to write down the information they find important in the process of credit approval by the bank.
4. Do you think about (or do you already have) a financial product, which will help you with your retirement (pension)? Three possible answers were outlined.
5. Do you know who can help you if you are not able to pay any installment of your debt?
6. What would you buy on consumer credit, if you decided to select this option? (You are theoretically in the situation of taking credit, you have a need, and you are able to pay in installments).

The calculation was made by the CANOCO program for Windows (TER BRAAK & ŠMILAUER 2002).

3 Research results

The result is the diagram, which we interpret in the following way : if point „A“ in the diagram is close to point „B“, then in the case of the respondent giving the answer „A“ (in the questionnaire), it means probably they signed answer „B“ simultaneously. If point „A“ is on the opposite side of diagram in comparison with the localisation of point „B“, than the respondent gave the answer „A“, but not „B“.

Figure 1 Ordination diagram of Canonical Correspondence Analysis (CCA)



Source: own work

Empty points express those answers from the questionnaire about financial behaviour of respondents (see table 4 – 6 for legend to labels). Full red points represent age of respondents (8a – up to 20 years, 8b – 21 to 30, 8c – 40 and more). The first axis shows 1.6 % of variablility, the second axis shows 0.3 % of variability. The effect of age is significant ($F = 2.7$, $p = 0.002$).

There is a gradient of financial literacy ranging from people with prevailingly right answers (2d –preparation of financial budget regularly, 4b – have financial product for safe pension, 1c – regular information about financial situation, 5a – knowledge about help in debt), to people with wrong answers (4c – no financial product for a safe pension, 2h – no budget, 5b – no knowledge about help in debt, 1d – no information about their financial situation). Only the age of respondents had a significant effect on the composition of answers ($F = 2.7$, $p = 0.002$). The most apparent is the difference in the answers to the question of resources in old age, because young people do not think about it too much.

In the left part we can see the results of younger students, on the right side the results of the older part of respondents. Younger answered as follows : 4a, 2c, 4c, 2b, 2g. The older respondents – 2a, 2c, 4b, 2h, 2d. Here, the role of their life experience probably plays a part.

4 Conclusions

In the current world of economic development an increasing number of countries choose to deal with the financial literacy needs in their populations through the design and implementation of tailored, articulated and coordinated National Strategies for Financial Education. This happens both in advanced and emerging economies across different financial systems and in response to specific national needs and contexts.

This paper is focused on the levels of financial literacy among the young and working Czech population between 20 and 44 years of age. This group of people was specifically chosen because of the importance of knowing the level of financial literacy of this generation, as it is the time of starting life, along with all of its difficulties, and out of which will arise the next generation. The results can be used by the Ministry of Education, Youth and Sports as the basis for the evaluation of the level of financial education of this generation and for the possible adaptation of the Strategy. In our country we are only starting with the implementation of such lessons and do not have enough teachers educated in this field. At basic and high schools, the teachers are mostly trained to teach maths without financial education. Teachers of civic lessons are in the same position of having no financial education. They need new methodology, courses, and lecturers.

To solve the situation of life insurance and the much discussed pension funds, the government has been preparing new rules of law for the last five years. Unfortunately for the public, this was only with the attendance of staff of these funds, but without the public, or clients who called for the improvement (Kalvoda, 2014). The old problem lies in the fees covered, which from miliards of Czech crowns saved in these funds make a nice sum for the funds, but which their clients do not want to pay. Clients ask for clear information about the product, which now is not a duty with the calculation of all fees. They ask about the savings of fraudulent agencies. They ask about the official licences of the agents and their professional training – some of them sell products with only basic knowledge about them. There is not stated any moral and ethical background of these professions. It is the same with all kinds of instance products in the Czech Republic, unfortunately.

The improvement will probably come from the programme of the Ministry of Interior, which wants to prepare the training of staff of communal authorities from small villages to big cities and offer accessible help with finance to people living in these places.

This survey was conducted at the University of South Bohemia in Ceske Budejovice, with the aid of a questionnaire, and was statistically evaluated. The results show that there follows a big area of change in the educational process in the raising of young people.

What is surprising is that the only differences are in the the time of doing a household budget and in the answers of the very young and not so very young students (age difference). What matters more is the education and care at home, and in the family, than at school. Education, gender and even taking a financial course did not have a significant effect on respondents‘ behaviour in this survey.

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Selected Aspects of Regional Organic Food Market – Price Analysis

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Abstract: *The paper deal with problems of price of organic food compared to the price of their conventional equivalents and the price differences between specialty shops and retail chains' stores in the context of the consumers' willingness to pay a premium for organic food and their perception of value for money. Most of the respondents are willing to pay a premium of not more than 10% or 20% for organic food. The average acceptable premium for organic food is about 18 %. The research of prices has been undertaken for seven groups of organic food: Legumes, cereals, dairy products, meat, eggs, beverages, sweet and sweeteners and vegetables. The price of more than 80% of sorts of organic food and of almost 75% of items included in the research exceeded the level that is acceptable for most respondents. Relatively lowest premium was discovered in the groups of milk and dairy products, sugar and alternative sweeteners and cereals. Contrariwise, the highest premium was found in groups of vegetables and meat and eggs.*

Key words: Organic food · Price · Pricing · Consumer attitudes

JEL Classification: M31 · Q13 · D40

1 Introduction

Organic food is viewed differently among both expert and professionals and non-professionals. Many studies prove basically similar nutritional characteristics to the conventional food. Other studies confirmed significantly lower levels of pesticides or higher level of certain nutrients (Crinnion, 2010) or a generally natural character (Dussault and Desaulniers, 2014). Likewise, a part of consumers do not trust to the specific character of organic food. However, a permanently increasing number of consumers is confident of both sensory and health aspect of organic food. The less perceived aspect in consumer attitudes is the environmental-friendly influence of organic farming and support to the employment in less favoured areas from the point of view of the labour demand. Those non-commodity outputs are also meaningful and the sustainability and sustainable regional and rural development could be considered by consumers.

Organic food is generally more expensive compared to the conventional food. That price difference could have several reasons. One reason issues from the higher farmers' price – organic food production is linked with additional costs. First to be cited is certification of the compliance with the standards: "For the grower, certification entails considerable paperwork, including the farm plan. In addition, he or she pays various dues, fees, and assessments in accordance with the pricing structure of the certifier and again, growers receive much more surveillance than they do as conventional growers" (Guthman, 2004). The necessity to forego synthetic fertilizers makes organic farmers subject to lower yields – then the unit price increases. The crop rotation is more complex than the rotation used in the conventional system (Pimentel et al., 2005). Organic crops and meat are generally produced in lower quantities: economy of scale is lower than in case of conventional farming. Organic food production as well as the transport should be separated from the conventional ones: another source of increased costs (Hamplová, 2008).

With regards to the different way of production and processing, it is possible to expect a different level of quality organic food, compared to the alternative conventionally produced food (Cooper and Leifert 2007; Zagata and Lošťák, 2012). Even if there is certain amount of criticism in supporting the concept of being natural to characterize organic food (e.g. Trewavas 2001), this concept plays a role here (Verhoog et al. 2003; Murdoch, Marsden and Banks 2000). Generally speaking, it can even be declared that the quality of food is closely linked to the nature and locally embedded supply. This is a supporting argument for organic food and products.

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According to Lockie, Lyons, Lawrence & Mummery (2002); principle factors limiting the consumption of organic foods (where organic foods were considered desirable) are price/cost, convenience and availability. The consumers' willingness to pay more for organic products is mainly affected by food quality and security, trust in the certification, and, for some products, brand name (Krystallis, and Chryssohoidis, 2005). Consumers with convenience and price orientation in their food choices less incline to buy organic products (Zakowska-Biemans, 2011). Price is generally seen as the most important barrier to organic food choice (e.g. Padel and Midmore, 2005; Hughner et al., 2007; Aertsens et al., 2009; O'Doherty Jensen, Denver, and Zanoli, 2011; Aschemann-Witzel, Zielke, & Thøgersen, 2014).

Conventional food retailers, including traditional supermarkets have significantly increased their organic market share (Hsieh, & Stiegert, 2011).

Organic food consumption in the Czech Republic

The survey by Median agency shows the number of Czech consumers purchasing organic food has increased. The part of households purchasing food increased from 37% in 2010 to 41% in 2014 (Jordán, 2014). The agency STEM/Mark in 2010 concluded its survey: consumers are aware of organic food and understand well the meaning of it; 40% of households buy organic food; one third of households buy it regularly; the main barrier for bigger consumption of organic food is the price (Singr, 2011).

Many retailers offer organic food, the complex purchase should be done, however, only in specialized shops. Retailers with a wider variety of organic food products in 2007 were Interspar, Albert Hypermarket, Billa, Albert Supermarket, Kaufland and Tesco. A purchase of regularly purchased food costed 80% more for organic food than for conventional food (Valeška, 2012). According to the web portal Kupi.cz (price monitoring in retail), the biggest differences among prices for organic and conventional food are in case of eggs (250%) or chicken meat (up to 300%), the smallest difference is in case of yoghurts: the price of white yoghurts is similar (Tomková, 2013).

The aim of the article is to analyse the pricing in case of organic products, more precisely to assess the consumers' attitude to and the willingness to pay a premium for organic food, to quantify differences among price of organic food and organic food and to compare price strategy of specialized shops and retail chains.

2 Methods

2.1 Data collection

The questionnaire survey took place in 2013 and 2014 and lasted eight months. 1100 questionnaires were collected. The price research survey was done in 2015 in 80 stores of retail chains and 33 specialized shops in the South Bohemian region, in 13 towns.

2.2 Data analysis

The analysis of consumer survey was done only by means of arithmetic mean and frequency analysis. The aim of the survey was to discover the current attitude of Czech consumers to the organic food, and to identify main motives as well as the barriers to the purchase of the organic food.

The analysis of prices employed following analytical methods and technics: arithmetic mean, weighted arithmetic mean, range and coefficient of variation. The aim was to compare the prices of organic food products and the equivalent conventional food products. Another comparison was done between specialized shops and in retail chains' stores: prices of organic food in those two groups of food shops were compared. Additionally, the prices in particular retail chains were mutually compared.

The surveys were undertaken with financial support of the project GAJU 019/2013/S. They are part of a broad research of the regional (South Bohemian) organic food market. This research includes surveys in organic farms, in retail stores (various formats) that sell organic food and consumer surveys.

3 Research results

3.1 Consumers and organic food

The article summarizes the parts of the research with a narrow link to the problems of price and pricing. The analysed data set of the surveyed consumers included 425 respondents – those who purchase organic food.

- *Satisfaction with the quality of particular organic food and the perception of the price adequacy (n=425)*

Respondents were invited to assess quality and price adequacy of 19 groups of organic food products by means of a 5-point scale (1=very high quality and 5=very bad quality; 1=price absolutely adequate and 5=price absolutely

inadequate). The best ***perceived quality*** is in case of fruit, vegetables, and milk and dairy products. On the other hand, a relatively lower satisfaction was identified in case of organic sweets, wine and coffee. The range of 2.24-2.95 indicates there are no extreme differences. We are sorry to conclude that the general perceived quality is rather average than excellent in case of all researched groups of organic food products. Mainly the ***price*** of organic meat and meat products is considered to be disproportionately high. Price of the organic milk and dairy products as well as legumes is perceived as more adequate with regard to the quality. In general, the organic food price is seen as rather inadequate compared to the perceived quality (the average grade =3.06).

- *Maximum acceptable value of the premium price (n=425)*

Respondents had 6 options to choose as for their willingness to pay a premium price for organic food – extra payment of 10%, 20%, 30%, 40%, 50% or more than 50%.

39% of respondents are willing to pay a premium price of 110% and an equal group would accept 120%. 19% would pay extra 30% of basic price. Only very few respondents are willing to pay 140% (2%) or 150% (1%). No respondent is willing to accept an increase of more than % of the price. The average acceptable value of the "organic premium price" is about 18 %

3.2 Consumers and the price of organic food

The objective of the research in retail store formats (specialized shops, retail chains with supermarket, hypermarkets or discount stores) was to assess the range of offered products in particular store formats and the price variability including the comparison with the price of relevant conventional products. Additionally, the prices were compared between retail chains and specialized shops (SS) and among the stores of particular retail chains (RC) as well.

The research of prices has been undertaken for seven groups of organic food: Legumes, cereals, dairy products, meat, eggs, beverages, sweet and sweeteners and vegetables.

As the extent of the article is quite limited, we further only summarize our findings in case of particular groups of organic food.

A Legumes

Surveyed kinds: *yellow split pea, green split pea, red lentil, green lentil, white beans, mung beans, chick-pea*

- Analyzed items and availability: 260 legumes items (118 in SS and 142 in RC). The most available was red lentil. The least available was green split pea.
- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of chick-pea and mung beans (40%), the biggest difference was in case of green split pea (200%).
- Organic food price variability: the lowest variability was in case of green split pea – range (R): 4, coefficient of variation (CV): 2.58). The highest variability was in case of mung beans (R=73, CV=26.46)
- Organic food price SS x RC: The price level of legumes is mostly lower in specialized shops (except for green lentil). The price difference was maximum 15% (the smaller difference was for red lentil: 2%, the biggest difference for white beans: 15%).
- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range is in Globus, Tesco and COOP. The lowest price of legumes was in Albert.

B Cereals

Surveyed kinds: *buckwheat, rice, millet grains*

- Analyzed items and availability: 183 cereals items (66 in SS and 117 in RC). The most available was red buckwheat. The least available (among the surveyed items) were millet grains.
- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of buckwheat (30%), the biggest difference was in case of rice (120%).
- Organic food price variability: the lowest variability was in case of buckwheat : R=32; CV=15.2. The highest variability was in case of millet grain (R=55.7) and rice (CV=27.7)
- Organic food price SS x RC: The price level of cereals is lower in specialized shops. The price difference was maximum 19% (the smaller difference was for millet grains: 9%, the biggest difference for rice: 19%).

- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range of organic cereals is in Albert supermarket, Albert hypermarket, Globus, Tesco and COOP, dm drogerie markt and Billa. The lowest price of legumes was in COOP.

C Milk and Dairy Products

Surveyed kinds: *cow milk, Edam cheese, white yoghurt, goat yoghurt, goat milk, goat cheese*

- Analyzed items and availability: 172 dairy products items (50 in SS and 122 in RC). The most available organic milk product was white yoghurt. The least available (among the surveyed items) was goat yoghurt.
- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of goat cheese and cow milk (10%), the biggest difference was in case of Edam cheese (60%).
- Organic food price variability: the lowest variability was in case of Edam cheese: R=5; CV=4.8. The highest variability was in case of goat milk: R=43; CV=32.2)
- Organic food price SS x RC: The price level of dairy products is mostly lower in specialized shops (except for goat yoghurt). The price difference was maximum 15% (the smaller difference was for white yoghurt: 4%, the biggest difference for cow milk: 15%).
- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range of organic dairy products is in Albert hypermarket and Billa. The lowest price of legumes was in Albert hypermarket.

D Meat and eggs

Surveyed kinds: *eggs, chicken, chicken legs, chicken breast fillet, fore beef, lamb meat, pork leg, rib eye, hind beef, beef shoulder, beef foreshank, beef liver.*

- Analyzed items and availability: 41 products items (19 in SS and 22 in RC). The most available organic product in this group was egg. The least available (among the surveyed items) were chicken legs and fore beef.
- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of fore beef (10%), the biggest difference was in case of chicken legs and chicken breast fillet (180%).
- Organic food price variability: the lowest variability was in case of rib eye and porc leg: R=0; CV=0. The highest variability was in case of lamb meat: R=300; CV=42.86)
- Organic food price SS x RC: The price level of meat and eggs is mostly lower in specialized shops (except for chicken breast fillet and fore beef). The price difference was maximum 49% (the smaller difference was for eggs: 11%, the biggest difference for fore beef: 49%).
- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range of organic meat and eggs is in Albert hypermarket. The lowest price of eggs was in Tesco. The comparison of the prices is difficult to be done because of a very low appearance in the stores of retail chains.

E Beverages

Surveyed kinds: *cereal coffee, coffee, cocoa, tea, fresh juice (apple), almond milk*

- Analyzed items and availability: 275 beverages items (128 in SS and 147 in RC). The most available organic beverage was cocoa. The least available (among the surveyed items) was coffee.
- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of cocoa (10%), the biggest difference was in case of fresh fruit juice (130%).
- Organic food price variability: the lowest variability was in case of cocoa: R=90.76 and cereal coffee: CV=19.1. The highest variability was in case of fresh juice: R=395.1; CV=91)
- Organic food price SS x RC: The price level of beverages is mostly lower in specialized shops (except for cereal coffee). The price difference was maximum 63% (the smaller difference was for cereal coffee: 2%, the biggest difference for fresh juice: 63%).
- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range of beverages is in dm drogerie markt and Globus. The lowest price of beverages was in Billa.

F Sugar and Alternative Sweeteners

Surveyed kinds: *cane sugar, vanilla sugar, agave syrup, honey*

- Analyzed items and availability: 180 product items (78 in SS and 102 in RC). The most available organic product in this group was cane sugar. The least available (among the surveyed items) was honey.

- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of agave syrup (2%), the biggest difference was in case of vanilla sugar (100%).
- Organic food price variability: the lowest variability was in case of honey: R=4.28; CV=4.1. The highest variability was in case of cane sugar: R=67.1 and vanilla sugar: CV=70.4
- Organic food price SS x RC: The price level of sugar and sweeteners is mostly lower in specialized shops (except for agave syrup). The price difference was maximum 59% (the smaller difference was for agave syrup: 1%, the biggest difference for vanilla sugar: 59%).
- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range of beverages is in dm drogerie markt and Globus. The lowest price of beverages was in COOP.

G Vegetables

Surveyed kinds: *onion, garlic, tomatoes, carrot, potatoes, cucumber, beet, Hokkaido pumpkin, wild cabbage (kale)*

- Analyzed items and availability: 75 product items (30 in SS and 45 in RC). The most available organic product in this group was carrot. The least available (among the surveyed items) was wild cabbage.
- Price of organic x conventional product: the smallest difference of price between organic and conventional item was in case of potatoes (70%), the biggest difference was in case of beet (220%).
- Organic food price variability: the lowest variability was in case of potatoes: R=4.28 and garlic: CV=17.2. The highest variability was in case of beet: R=175.5 and vanilla sugar: CV=70.4.
- Organic food price SS x RC: The price level of vegetables is generally lower in specialized shops (except for carrot, cucumber and beet). The price difference was maximum 183% (the smaller difference was for garlic: 5%, the biggest difference for vanilla sugar: 183%).
- Organic food in retail chains: There are quite important differences in the range of goods among particular RC. The widest range of vegetables is in Billa. The lowest price of vegetables was again in Billa.

4 Conclusions

There is a relatively small group of consumers in the Czech Republic who are actively interested in organic food (10%). More important is the group with ambivalent attitude to organic food: the degree of interest = 3 or 4 on a 5-point scale (63%). Consumers perceive particularly the lack of basic information. Situation of the organic food market could be significantly improved by for instance the exogenous support (by government) in manner of many developed European countries where organic food found their place in schools or health-care facilities. The Czech organic market without such a support runs the risk of persisting low demand. The stimulus for organic production remains subsidizing of the organic farming (Doležalová et al. 2014)

Price is the important barrier discouraging the purchase of organic food. The survey among consumers confirmed their willingness to pay a premium price most often if that price is maximum 10% or 20% higher than the price of an adequate conventional product (78% of respondents). Within the researched seven groups of organic (38 sorts of organic food; 1,042 items), only few items were priced with such a low value of the premium price:

a) if the consumer accept the premium of 10%, he could choose from 6 sorts of organic food (15.8 of surveyed sorts, 197 items = 18.9 of surveyed items);

b) if the consumer accept the premium of 20%, he could choose from 7 sorts of organic food (18.4 of surveyed sorts, 265 items = 25.4 of surveyed items);

Basically, more than 80% of sorts of organic food and almost 75% of items included in the research had a price above the level that is acceptable for most respondents. Relatively lowest premium was discovered in the groups of milk and dairy products, sugar and alternative sweeteners and cereals. Contrariwise, the highest premium was found in groups of vegetables and meat and eggs.

When comparing prices in specialized shops and retail chain stores, 15 kinds of researched organic food (47% of all compared kinds) are sold for lower price in retail chains. In all other cases, the price of organic food is lower in specialized shops. More precisely, lower price in retail chains was in case of milk and dairy products (except for goat milk products), sugar and sweeteners (except for agave) and beverages (except for cereal coffee).

Organic food prices are higher. They usually overpass the limit of acceptability from the side of consumers. The approach of the price policy is not significantly different in case of specialized shops and retail chains. Organic

food prices are often higher in retail chains despite the expected pressure of retail chains on lower suppliers' prices and the expected positive effect of the bigger traded volumes of organic products on the price amount.

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GIS as a decision-making tool for small businesses in the retailing

Marian Toman, Pavol Kita, Ján Prílepok

Abstract: *Development of advanced technologies in management of SMEs provides wider scope for their use in decision-making of small businesses. By using the acquired information thoroughly and processing it with the advanced technological procedures, we can more accurately assess and then predict the purchasing behaviour of consumers in the territory in which the company operates. The paper will focus on the analysis of retail units, from acquired local data of three opticians' stores within individual districts of the city Bratislava. The analyzed sample consists of 2,874 consumers. For analysis of such a large number of data, which include the spatial aspect as well, means that we will link the acquired geographic information with spatial information, and we will use the specific application of spatial marketing GIS - Geographic Information System. Processing of the acquired data locating the consumers in connection with spatial data of that territory at the retail level, will allow us to better understand consumer shopping behaviour in the context of the population's increased mobility, correct set-up of the marketing mix for retail and effective communication with existing or potential customers.*

The aim of this article is the evaluation and classification of a small business in relation to a consumer and its preferences in the city of Bratislava and its individual stores.

The paper is an output of the project VEGA 1/0282/15 Instruments of Marketing Policy in New Business Models Orientated at Creating Multiple Value for Customer under the Conditions of Sustainable Development.

Key words: Marketing · Geomarketing · Marketing analysis · GIS

JEL Classification: M30 · C81

1 Introduction

Undeniable fact of the present time is that the progress, which we meet with every our step and see it all around us, is a driving tool for many processes of the present-day life. Employing modern procedures in successful development of companies is an important aspect of a business philosophy of each company. From the marketing point of view, we see a successful activity of retailing unit as a complex of the right decisions which influence each other in many cases. The more influencing factors are included in this process the more complicated this process is. Territory is included in every single process of functioning of retailers and it influences their decisions. Based on the philosophy of distributing management, we will analyse a large amount of data, containing the spatial aspect, in this paper. This means that we will link acquired geographical information with spatial information, and then process it by means of specific application of spatial economics (Cliquet, 2006).

For processing and analysing data we will use one of the tools which links dimension of territory with geographical information and this is geomarketing. Some authors define geomarketing as a specific application of spatial marketing. Geomarketing and its application GIS enable us to process acquired geographical data, link it with spatial data with a possibility of graphic illustration in the form of various kinds of outputs e.g.: cartographical maps, tables, graphs etc.

We will focus on the analysis of retail units, from the local data of already existing stores within particular districts of city Bratislava, in this paper. The goal of processing acquired data, localizing consumers in connection with the spatial data of particular area on the level of retail unit, will be the understanding of consumer´s purchase streams in the ontext of increasing population´s mobility. Afterwards, it will help us for example with the right setting of marketing mix of store, or with more effective communication with existing or alternatively potential customers. These aspects influence the whole realization process of the right marketing decisions necessary for successful managing of small companies on the level of retail trade.

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2 Methods and Data

Marketing research can be understood as a sequence of follow-up activities or steps which are focused on determination, gathering, processing and interpretation of the data for the use of marketing management. This sequence is called the process of marketing research (Richterová, 2007). In this paper we will proceed from the theoretical and practical findings about the work of distributor within retail trade and also from the data provided by company Queen´s optik Ltd. - from its three specialized opticians´ stores.

Main aims of this paper are the analysis of consumer´s behaviour and gradient fields of particular already existing stores within relevant districts in the area of city Bratislava, and the analysis of available geographical and spatial data in the area of the store location. In the first part we will analyse the place of retail store according to the purchase stream of consumers by the application of geomarketing GIS and we display it in a cartographic way; then in the second part we analyse this data by statistic software. The database is composed of existing or potential customers arranged according to selected criteria. Every customer of opticians´ store who will come for the examination or he will come with a prescription is registered in customer´s system of the opticians´ store. This way he will provide us priceless information necessary for analysis of consumer´s behaviour through geomarketing. We acquire not only address, or more precisely post code, but also customer´s age, phone number, e-mail address, amount of the purchase, number of purchases for a certain period, sort of a purchase. All this enables us to not only keep in touch with customers, by means of e-mails, sending the catalogues and more direct advertisement; but it also enables us to keep detailed history of their mutual communication and response in addressing each other. Such form of created relationship with customer offers us to draw up a specific typology of customer and his profile.

All data acquired for time period 01. 11. 2013 - 31. 10. 2014 has been processed per each store separately by graphic information software GIS and afterwards by statistic software. Chi-square test of independence was used for the research and testing of stated research questions.

3 Research results

3.1 Analysis according to territory

Figure 1 Location of the stores in the area of city Bratislava

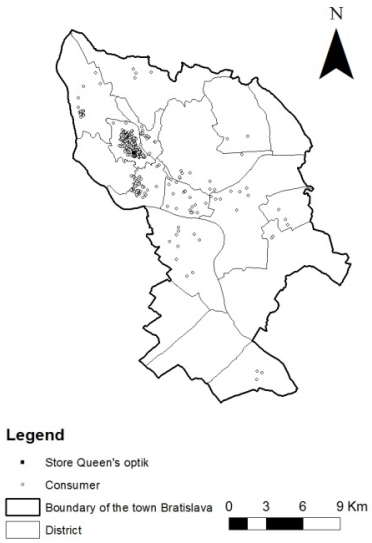
Source: Own processing

Store on the street M.Sch. Trnavského 8- MUSITZOVA

In the picture 2 we can see a buying gradient of opticians´ stores, concentrating in the area of district 4, Dúbravka. The opticians´ store is situated at the health centre Paracelsus and cooperates with two ophthalmologists. One ophthalmologist works directly at the health centre and focuses her work more on medical processes and thus she has less time for commercial activities. The other one, children's ophthalmologist, not far from the place of operating of the opticians´ store, mainly takes care of children´s patients. The range of products, presentation and also communication with customers is adjusted to the fact that this store, which has no its own medical practitioner for examination and thus has to relay on outside ophthalmologists, concentrates on less solvent customers and children. It is

not possible to engage commercial examination in the future in this store mainly because of the potential interference of cooperation with ophthalmologists. Concentration of the competition is low in district 5 which is partly caused by small spatial options of this store.

Figure 2 Graphic illustration of purchase gradient of the store M.Sch. Trnavského 8- MUSITOZOVA

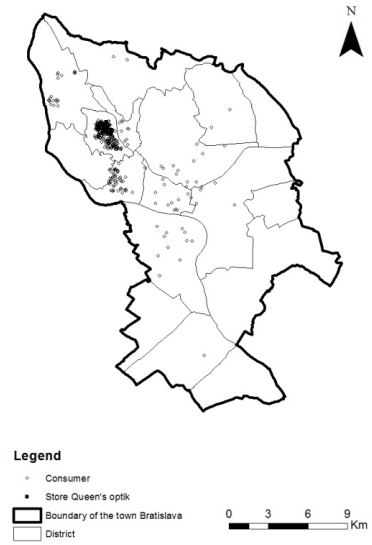


Source: Own processing

Store on the street Saratovská 28- OD Saratov

In the picture 3 we can see a graphic illustration of purchase gradient of the store situated in shopping mall Saratov. It is a store located in in shopping mall. This store provides an examination and contact lenses application. Opticians' store operates in the area of district 5 and its product portfolio is diversified from the range of products and offer of the opticians´ services at the health centre M. Sch. Trnavkského 8, which is also situated in this district. The product range of these two opticians´ stores, operating close to each other, is diversified so that mutual cannibalism would not appear- this means sale decrease of one store at the expanse of the other one. That is the reason why the opticians´ store in OD Saratov focuses on the sale of more expensive and brand goods, and ready-made products for example branded sunglasses. Even though, competition in district 5 is not high we can observe that opening the second store in this district larger area has eliminated for it.

Figure 3 Graphic illustration of purchase gradient of the store OD Saratov

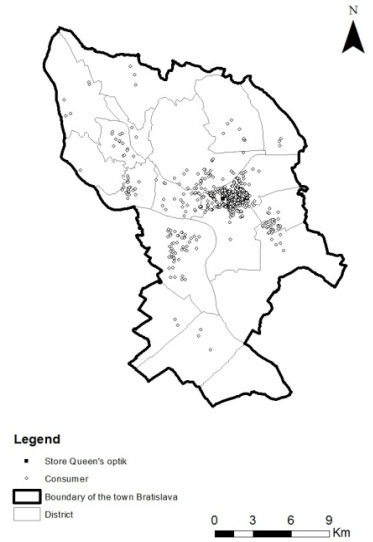


Source: Own processing

Store on the street Ružinovská 5

In the picture 4 we can see a purchase gradient of the opticians´ store in district 2, Ružinov. This store as we can see in the cartographic illustration has a wide purchase gradient within the research area of the city Bratislava. The store is designed as a universal opticians´ store with its own medical practitioner for examination, and contact lenses application. It is a classical type of store situated in multifunctional building opposite the health centre Ružinov. Therefore, we can say that this store covers the complex service offer. Due to the nearby hospital, where a larger number of ophthalmologists is situated, products´ range of the store universally consists of the cheapest to the most expensive products, and from the children´s to senior´s products. As the independence from cooperation with ophthalmologists is store´s advantage, so the great concentration of competition in the district is disadvantage.

Figure 4 Graphic illustration of purchase gradient of the store Ružinovská 5



Source: Own processing

Firstly we analyse acquired data from the territory point of view. We observe number of orders, their total sum and average value of the order.

Table 1 Basic characteristic of the orders according to territory – MSch. Trnavského

	N	Σ	Φ
District 1	17	1314,3	59,28
District 2	19	1712,4	59,32
District 3	11	1721,6	108,92
District 4	731	64741,31	88,049
District 5	17	1197,6	43,21
Total	795	70 687,21	88,92

Source: Own processing

Table 2 Basic characteristic of the orders according to territory – Ružinov

	N	Σ	Φ
District 1	25	3264,3	91,2425
District 2	906	108721,4	119,7842
District 3	68	12082,77	162,1592
District 4	64	8237,11	113,1992
District 5	75	10594,29	121,1258
Total	1138	142899,87	125,57

Source: Own processing

In table 1 we can see that the most customers (731) are coming to the opticians´ store M.Sch. Trnavského from the district 4. Total sum of the orders is 70 687,21 € and average value of one order is 88,915 €. The most customers, as we can see in table 3, are also coming from district 4 in case of OD Saratov. In OD Saratov total sum of the orders is 146 588,76 € and the value of average order is 155,78€ which is almost two times more than in opticians´ store M.Sch. Trnavského. Only to opticians´ store Ružinov the most customers are coming from district 2 (906). In table 2 we can see that the amount of orders is 1138 and their total sum is 142 899,87€. Average order value is 125,57€.

Table 3 Basic characteristic of the orders according to territory- OD Saratov

	N	Σ	Φ
District 1	17	4440,88	173,7017
District 2	7	2177,3	106,8042
District 3	17	3135,48	144,2892
District 4	883	132413,2	150,0175
District 5	17	4421,9	136,8542
Total	941	146588,76	155,78

Source: Own processing

Research question: Is there in particular opticians´ stores reliance between orders and the districts which they come from?

We will search for the answer to this research question through the analysis of data from the standpoint of the number of orders, amount (quantity, sum) of orders as well as from the point of view of average sum of order. For the detailed analysis we draw up following statistic hypothesis:

a) Number of the orders:

- H_0: There is no reliance between the number of orders in particular opticians´ stores and the district which the order comes from.
- H_1: There is reliance between the number of orders in particular opticians´ stores and the district which the order comes from.

b) The sum of orders:

- H_0: There is no reliance between the sum of orders in particular opticians´ stores and the district which the order comes from.
- H_1: There is reliance between the sum of orders in particular opticians´ stores and the district which the order comes from.

c) The amount of average order:

- H_0: There is no reliance between the amount of average order in particular opticians´ stores and the district which the order comes from.
- H_1: There is reliance between the amount of average order in particular opticians´ stores and the district which the order comes from.

We will decide about the acceptance of some of the stated statistic hypothesis based on the statistical analysis of acquired through chi-square test of independence for pivot table. We compare calculated figure p with the level of importance α (0,05). If it is true that $p<\alpha$ then we accept H_1; otherwise we accept H_0.

Table 4 Results of statistical analysis according to district

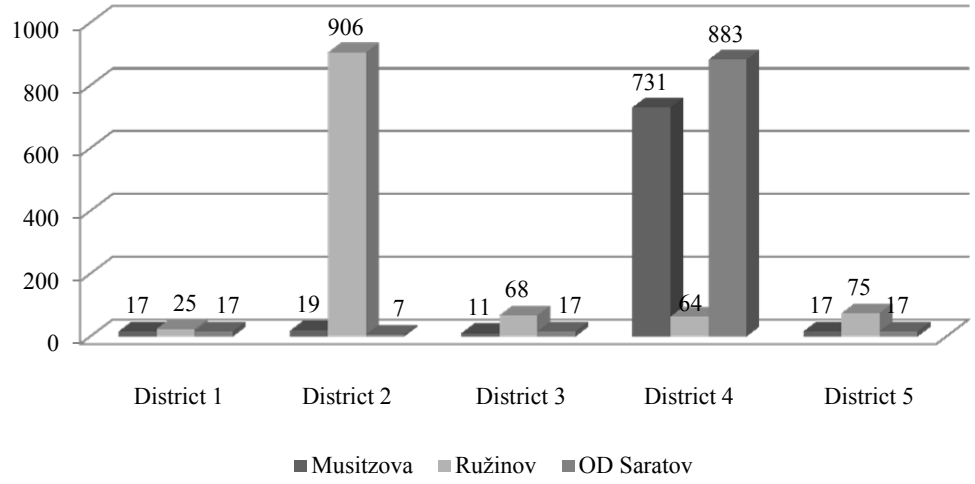
	p-value	**α**	**Comparison**	**Accept**
Number of the orders	000	0,05	$p<\alpha$	H_1
Sum of the orders	000		$p<\alpha$	H_1
Average order	000		$p<\alpha$	H_1

Source: Own processing

From the table 4 it can assumed that in all three researched levels of the statistical analysis we calculated the figure p lower than the level of importance 0,05. Based on this fact we accept H1 in all three levels, and this confirms us that there is reliance between the number, the amount and the average value of the order, and the district which the customers come from (is relationship). On the basis of the results of the statistical analysis we can state that it has been confirmed that there is reliance between the orders and the districts, which the orders come from, in particular locations

of opticians´ stores. Below in the picture 5 we can see distribution of the orders in particular stores according to districts.

Figure 5 Graphic illustrations of the orders´ number according to district



Source: Own processing

4 Conclusions

Marketing researches are influenced by more and more factors which are necessary for doing them. We acquire great amount of information which directly influence each other. It is a very dynamic process in which the methods and solutions constantly change. Due to the globalization trends there are changes in distribution streams of particular products, and under the influence of the consumer´s behaviour there are also changes in marketing activities of particular companies necessary for the provision of companies´ progress and process of constant well-run. In many cases customers do not behave according to usual rules. Empirically acquired findings do not give us sufficient basic outputs for analysing of marketing activities very often. We have to take these and other influencing factors into the account when running small companies in retail trade.

Practical contribution of this paper is the knowledge that through the application of correctly selected marketing procedures, when running business activities, we can achieve an adequate development, and we can keep competitive advantage as a defence against always bigger globalization of markets and still increasing competition.

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Methodology of Theoretical Physics in Economics: Vector Theory of Retail Gravitation Law

Tomáš Zeithamer

Abstract: *We assume that non-satiation axioms are general economic axioms which are associated with the genetic essence of life existing in any part of the Universe. Maximizing utility under given initial and boundary conditions is the foremost interest of every individual. Genetically coded into this maximizing of utility is the survival instinct of both the given individual and the species as a whole. The noosphere continually manifests through the geosphere and biosphere in the form of human interventions in these, and is visibly represented by the physical and economic development of the Earth. One of the many phenomena which may be used to characterize the United States in the late nineteenth and early twentieth centuries is the rapid change which occurred in retail trade relations in various parts of the country. The common feature of these changes was the flow of retail business from small towns to large cities. However, no general analytical laws were known to describe the rise and distribution of this flow of retail business in space and time. From 1927-1930 W. J. Reilly conducted a nationwide study of retail dynamics. One of the findings of this study was the scalar law of retail gravitation. This law of Reilly considered the unidirectional flow of retail trade from small towns to cities. The reverse flow of retail trade from large cities to small towns was not considered because at the time it was far less significant compared to the flow of retail trade from small towns to large cities. Reilly's scalar one-dimensional model of retail gravitation is generalized in the three-dimensional vector model of retail gravitation for the geoid. The scalar potential of retail gravitation is introduced along with the vector of an intensity of retail gravitation.*

Key words: Consilience · Law of Inertia · Law of Force · Law of Interaction · Law of Gravitation · Law of Retail Gravitation · Space Economics

JEL Classification: A12 · C65

1 Introduction

The relationship which describes a possible movement of a body in space is called an equation of motion. We understand a body to be a body or particle or possibly a set of particles. Space is understood to be the forces and fields of force acting upon the body and the constraints which limit its motion. By solving the equation of motion, we obtain the position of the body at any given moment. In classical mechanics, the solution describes the trajectory of the body. In quantum mechanics it is the result of a time-varying wave function.

In their most general form, equations of motion are typically differential equations of the second order, where we take the derivation of time. The solution is a vector function describing the position of the body in relation to time $\vec{r} = \vec{r}(t)$, which is an expression of the trajectory of the end point of the vector radius. If $m = const.$, the basic dynamics equation takes the form

$$\vec{F} = m\vec{a} = m\frac{d\vec{v}}{dt} = m\frac{d^2\vec{r}}{dt^2}, \tag{1}$$

resultant force $\vec{F}$ and acceleration $\vec{a}$ of the rigid body are vectors in the same direction. We call this a motion equation. For force, we substitute the functions of time, position or velocity, i.e. in general $\vec{F} = \vec{F}(\vec{r}, \vec{v}, t)$.

With respect to consilience in economics and physics as well as social sciences and physics, physics is presented with the question of whether it is possible to derive Reilly's law of retail gravitation from Newton's law of gravitation. In this paper we will attempt to provide a brief answer to this question.

2 Theoretical background

The universal law of gravitation formulated by Isaac Newton (Newton, 1960) can be expressed in the modern language of physics as: „every body of the universe attracts every other body towards its centre of gravity, with a force, which

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is proportional to the product of the gravitational masses of the bodies and inversely proportional to the square of the distance between them“. For mass points at a distance r with gravitational masses M_1 and M_2, the law of universal gravitation is expressed in the form

$$F_g = \kappa \frac{M_1 M_2}{r^2}, \tag{2}$$

where F_g is the value of the force of attraction between the two mass points. The constant of proportionality κ is the universal gravitational constant. The value of the universal gravitational constant is as follows: $\kappa = 6.67408\ (31)\ .\ 10^{-11} m^3\ kg^{-1}\ s^{-2}$.

The word gravitation is derived from the Latin *gravitatem*, i.e. mass, gravity, and the law of retail gravitation states that the amount of retail trade which a large city attracts is dependent on the number of inhabitants of that large city and the distance of the small town from which the trade is drawn as well as on the number of inhabitants of the small city. Let us attempt to explain the significance of this claim using a model. Let us assume that on a Euclidean plane there are two cities with different populations. The number of inhabitants P_b of city B is much smaller than the number of inhabitants P_a of city A. Let r_{AB} be the shortest distance between the borders of the two self-governing cities. The large city A attracts retail trade from town B to the territory of the city A. The amount of retail trade attracted from town B to city A is directly proportional to the product $P_b \cdot P_a$ of the number of inhabitants of both cities and inversely proportional to the square of the distance between the cities r_{AB}. This correlates directly with Newton’s Law of Gravitation. That is why Reilly´s law is called "law of retail gravitation".

Everyone knows two qualitative laws which describe retail flow from smaller cities and towns to larger cities. The first law states that, under similar conditions, the larger a city is the greater external retail trade it attracts (Reilly, 1931, p. 7). The second law states that a large city attracts more retail trade from closer towns than from more distant towns (Reilly, 1931, p. 7).

Let us assume that long-term economically active adult inhabitants of the attracting large city have a dominant influence on attracting external retail trade to the large city. We will divide the long-term economically active adult inhabitants of the city into two groups. The first group consists of inhabitants who are economically active in the market as passive consumers and only occasionally share their experience regarding certain commodities with other consumers. Only by sharing their experience with commodities with other inhabitants do they affect the draw of retail trade to the large city, but they are less influential than the second group. The second group consists of adult inhabitants who in addition to passive participation are also active participants in the market exchange. This means that every member of this group of inhabitants intentionally maximizes his/her benefit from the exchange of goods on the market, both with respect to the quality and quantity of goods offered. This active market participation of the second group of inhabitants attracts the majority of retail activity to the large city (e.g. through the number of business loans, expressed in *c.u.* (currency units); targeted advertising in newspapers, which is quantitatively characterized by costs for advertising and distribution expressed in *c.u.* etc.).

Let there be two separate self-governing cities in Euclidean plane (cities A and B) with respective areas S_A and S_B. The number of long-term economically active adult inhabitants in city A at time t is N_A. The gravitational mass M_A of the given part of the population of city A at time t equals the sum gravitational masses $m_{i,A}$ of the individual long-term economically active adult inhabitants, i.e.

$$M_A = \sum_{i=1}^{N_A} m_{i,A}\ . \tag{3}$$

Then M_A / N_A is the average gravitational mass $\overline{m_A}$ of a single long-term economically active adult inhabitant in city A at time t;

$$\overline{m_A} = M_A / N_A = \left(\sum_{i=1}^{N_A} m_{i,A} \right) / N_A\ . \tag{4}$$

The gravitational mass of all long-term economically active adult inhabitants in city A at time t is expressed by the average gravitational mass of a single long-term economically active adult inhabitant and the relationship

$$M_A = \overline{m_A}\ N_A . \tag{5}$$

The average gravitational mass $\overline{m_B}$ of a single long-term economically active adult inhabitant in city B at time t is expressed by the relationship

$$\overline{m_B} = M_B / N_B = \left(\sum_{i=1}^{N_B} m_{i,B} \right) / N_B , \tag{6}$$

where

$$M_B = \overline{m_B}\ N_B . \tag{7}$$

is the total gravitational mass of the number of long-term economically active adult inhabitants at the time t in city B; N_B is the number of long-term economically active adult inhabitants in city B at time t.

In the next step we will no longer consider the unequal density distribution of the long-term economically active adult inhabitants of cities A and B. For simplicity of expression allowing the application of Newtonian physics, we will consider cities A and B to be mass points with masses M_A and M_B. The magnitude of the gravitational force F_g between mass points A and B with gravitational masses M_A and M_B respectively is given by Newton's Law of Gravitation $F_g = \kappa\, M_A\, M_B / r_{AB}^2$, where $\kappa = 6.67408\ (31)\ .\ 10^{-11} m^3\ kg^{-1}\ s^{-2}$ is the gravitational constant and r_{AB} is the distance between mass points A and B while Earth´s rotation is neglected.

The relationships $M_A = \overline{m_A}\ N_A$ and $M_B = \overline{m_B}\ N_B$ expressing the gravitational masses of the numbers of long-term economically active adult inhabitants of cities A and B are then substituted into Newton's law of gravitation. Following this step, Newton's law of gravitation has then the form

$$F_g = \kappa\ \overline{m_A}\ \overline{m_B}\ \frac{N_A\ N_B}{r_{AB}^2} . \tag{8}$$

If we assume that $\overline{m_A} = \overline{m_B} = \overline{m}$, then Newton's law of gravitation acquires a simpler form

$$F_g = \kappa\ \left(\overline{m}\right)^2\ \frac{N_A\ N_B}{r_{AB}^2} . \tag{9}$$

From this last expression of Newton's law of gravitation, we obtain the relationship

$$\frac{F_g}{\kappa\ \left(\overline{m}\right)^2} = \frac{N_A\ N_B}{r_{AB}^2} , \tag{10}$$

which is the foundation of Reilly´s scalar law of retail gravitation.

3 Findings and results

In the 1930s the volume of retail trade attracted to intermediate town T was small and W. J. Reilly did not consider this in the theoretical part of his study. At the present time, the attraction of retail trade from the large city to intermediate town T is considered a common and economically significant phenomenon.

Let us assume that City A is represented on the geoid by a mass point, the gravitational mass M_A of which is equal to the sum gravitational masses of individual members of the city's population, i.e. P_a. For the reason that retail flows are realized in three dimensional space and time we define the potential of retail gravitation of the city *A* with the relation

$$\varphi(x,y,z) = \varphi(r) = -\alpha \frac{P_a}{D_a} = -\alpha \frac{P_a}{\sqrt{x^2 + y^2 + z^2}} , \tag{11}$$

where D_a is the distance from City A, $D_a = \sqrt{x^2 + y^2 + z^2}$, $\overrightarrow{D_a} = (x, y, z)$ is the position vector of the place of observation of retail trade volume with respect to mass point A. The proportionality constant α is expressed in units $[\alpha] = c.u.\ m^2\ pers.^{-2}$. Vector field $\overrightarrow{K_a}$ of the intensity of retail trade gravitation is determined by the negative gradient of potential of retail gravitation φ

$$\overrightarrow{K_a} = -grad\ \varphi\ . \tag{12}$$

If we express position vector $\overrightarrow{D_a}$ through its components along the axes of the coordinate system, i.e. $\overrightarrow{D_a} = x\vec{i} + y\vec{j} + z\vec{k}$, then the intensity of retail trade gravitation is expressed in the form

$$\overrightarrow{K_a} = -\alpha \frac{P_a}{D_a^3}\overrightarrow{D_a} = -\alpha \frac{P_a}{D_a^2} \cdot \frac{\overrightarrow{D_a}}{D_a} = \left(-\alpha \frac{P_a}{D_a^3}\right) x\ \vec{i} + \left(-\alpha \frac{P_a}{D_a^3}\right) y\vec{j} + \left(-\alpha \frac{P_a}{D_a^3}\right) z\ \vec{k}\ . \tag{13}$$

This means that for the magnitude K_a of the vector of intensity of retail trade gravitation follows from the equation (13)

$$K_a = \left|\overrightarrow{K_a}\right| = \alpha \frac{P_a}{D_a^2}\ . \tag{14}$$

Let A and B be two cities with large populations, which we mark P_a and P_b. Let us assume there also exists intermediate town T with population P_t, which is much smaller than the population of cities A and B, i.e. $P_t \langle\langle P_a$ and $P_t \langle\langle P_b$. We mark the distances of cities A and B from town T as D_{ta} and D_{tb}. The law of retail gravitation for pairs of cities A, T and B, T is then in analytical form expressed by the following relations

$$B_{ta} = \alpha(T, A) \cdot \frac{P_t\ P_a}{D_{ta}^2}\ , \tag{15}$$

$$B_{tb} = \alpha(T, B) \cdot \frac{P_t\ P_b}{D_{tb}^2}\ , \tag{16}$$

where B_{ta} is the business which City A draws from any given intermediate town T and B_{tb} is the business which City B draws from that intermediate town T. In equation (15) $\alpha(T, A)$ is the constant of proportionality for populations P_t and P_a of cities T and A. In equation (16) $\alpha(T, B)$ is the constant of proportionality for populations P_t and P_b of cities T and B. In accordance with W. J. Reilly, we further assume that in equations (15) and (16) there is a universal constant of proportionality, i.e. $\alpha(T, A) = \alpha(T, B) = \alpha$. It then follows

$$\frac{B_{ta}}{B_{tb}} = \frac{\alpha\ \dfrac{P_t\ P_a}{D_{ta}^2}}{\alpha\ \dfrac{P_t\ P_b}{D_{tb}^2}} = \frac{P_a}{P_b} \cdot \left(\frac{D_{tb}}{D_{ta}}\right)^2\ . \tag{17}$$

Quantities from equations (15) and (16) are expressed in basic units in the following manner: $[B_{ta}] = [B_{tb}] = c.u.$ (currency unit), $[P_t] = [P_a] = [P_b] = pers.$ (person), $[D_{ta}] = [D_{tb}] = m$ (meter). From equations (15) and (16) we get a dimensional equation for proportionality constant α in Reilly's law of retail gravitation

$$c.u. = [\alpha] \cdot \frac{pers.^2}{m^2} \tag{18}$$

from which we get

$$[\alpha] = c.u.\ m^2\ pers.^{-2}\ . \tag{19}$$

Now let us define an equilibrium point for the retail gravitation through the vector intensity $\vec{K}$ of retail trade gravitation. Let A and B be two cities with large populations, which we mark P_a and P_b. In a sufficiently small neighborhood of the equilibrium point between the two cities (A and B), the vector intensity magnitude of retail gravitation K_a for the city A is equal to the vector intensity magnitude of retail gravitation K_b for the city B, since the ratio $\frac{B_a}{B_b}$ at any equilibrium point is always equal to one or almost equal to one, i.e.

$$\frac{P_a}{D_a^2} = \frac{P_b}{D_b^2} \tag{20}$$

and

$$D_a + D_b = D_{ab}\,, \tag{21}$$

where D_{ab} is the total automobile highway distance between cities A and B, D_a is the total automobile highway distance of equilibrium point from the city A and D_b is the total highway automobile distance of equilibrium point from the city B. The equilibrium point lies on the shortest connecting line between the two cities attracting retail trade. The distance of the two cities is measured along the shortest highway connecting cities A and B.

Under the assumption that $P_a = 160\ 000$ inhabitants, $P_b = 250\ 000$ inhabitants and distance between the two cities $D_{ab} = 150\ km$ we get for the position of the equilibrium point on the shortest highway connecting cities A and B that $D_a = 66{,}7\ km$ and $D_b = 83{,}3\ km$.

4 Conclusion

In this work we only briefly outline the basic construction of three-dimensional vector theory of retail gravitation on a geoid. This means that we describe the course of economic processes in space and time with respect to the cosmic space near Earth (i.e. in Space Economics). Analysis of the relationship of vector theory of retail gravitation to other retail trade theories will be the subject of a separate article.

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Session 7

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Analysis of Firm Profitability in Terms of Size Structure in the Czech Food and Beverages Industry

Ivana Blažková

Abstract: *The paper deals with the profitability of enterprises in the food and beverages industry of the Czech Republic and analyses the relationship between the level of profitability and the firm size. The development of the average ROA of individual size groups of enterprises is analysed graphically in period 2003-2013 and the correlation between company size and the level of ROA is statistically validated by using parametric ANOVA.*

Based on the analysis it can be concluded that the level of profitability in the Czech food and beverages industry is relatively low, and moreover, there is a tendency to decrease during the observed period. The highest values of ROA are achieved by the largest companies (expressed by the number of employees) and on the contrary, the ROA values of the smallest companies are often negative and in the whole observed period there are significantly lower than ROA values of other size groups of enterprises. The analysis has shown that the level of profitability is determined by the company size. Significant differences in the size of ROA in different size groups were also statistically verified with the use of ANOVA.

Key words: Profitability · ROA · Firm Size · Food and Beverages Industry

JEL Classification: D47 · L11 · L66

1 Introduction

The economic theory says, that under competition, profit rates will tend towards equality. However, the real markets are not perfectly competitive – industries are characterised by market imperfections such as high sunk costs, barriers to entry, asymmetric information and other impediments to competition – which can cause variations in firm profits.

The hypothesis, based on Baumol´s proposition (Hall, Weiss, 1967), says that "large firms have all of the options of small firms, and, in addition, they can invest in lines requiring such scale that small firms are excluded". Therefore, higher rates of return should be found in large enterprises even in the long run and even in the absence of barriers to entry other than those directly associated with availability of capital.

The relationship between the firm profitability and the firm size is the subject of this paper. On the example of the Czech food and beverages industry, the paper gives an empirical evidence about the variability of profitability in terms of firm size.

In the economic literature, the concept of profitability or performance is often associated with the essence of an enterprise existence, which means the appreciation of the company's capital and consequential increase in company value. However, it is clear that performance is assessed by various market subjects differently because they have different expectations from the company. While for shareholders the performance means the appreciation of the investment, the customers consider the company as efficient if it meets their needs and requirements. Banks and lenders assess business performance according the ability of an enterprise to meet their obligations, whereas for employees the level of wages and working conditions are important, etc.

The effectiveness of enterprise can be assessed by various indicators, which are expressed quantitatively in order to compare or assess developments in terms of time. The existence of a large number of performance indicators shows that there is no "ideal measure".

For purposes of this analysis the return on assets (ROA) was chosen, which provides information about the profit, which was made through the investment in business (Jindřichovská, 2013), and is also used in various studies, e.g. Hult et al. (2008), Richard et al. (2009), Šiška and Lízalová (2011).

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2 Methods

The aim of this paper is to analyse the profitability of enterprises in the food and beverages industry of the Czech Republic in terms of size structure. The aim is implemented through two partial steps. First, the development of the average profitability of individual size groups of enterprises in the Czech food and beverages industry is analysed graphically in period 2003-2013. Second, correlation between company size and the level of profitability is statistically validated by using parametric ANOVA.

The data for the analysis were obtained from the corporate database Albertina – Gold Edition (Bisnode, 2015). The analysed period is from 2003 to 2013. The sample of the accounting data of enterprises involved in the analysis is made of 12343 observations across 11 years and 10 food sectors in the Czech Republic. Companies are classified in four size groups defined according to the number of persons employed – with 0-19, 20-49, 50-249 and 250 or more persons employed. The profitability was evaluated on the basis of the return of assets ratio (hereinafter referred to as "ROA"), which is defined as follows:

$$ROA = \frac{EBIT}{Total\ Assets} \tag{1}$$

The statistical data and graphs were processed with the use of software Gretl and Excel.

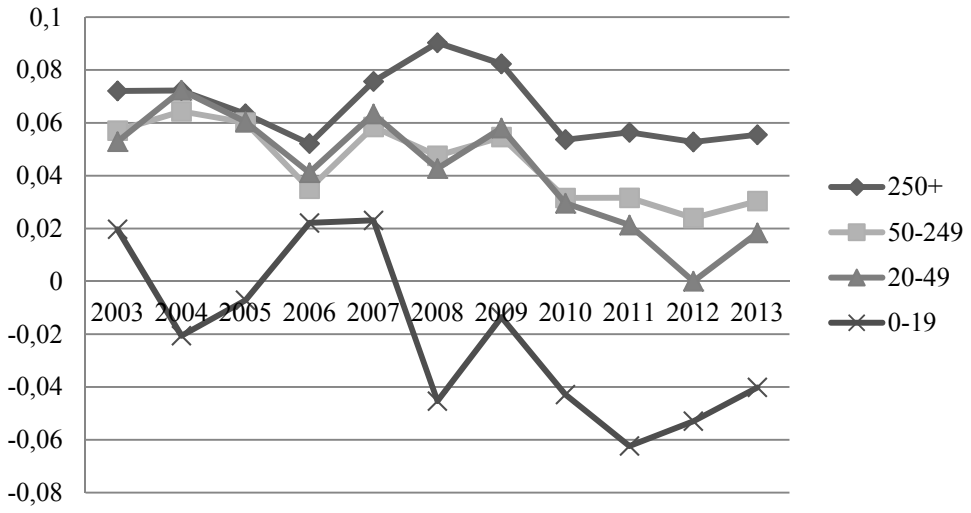
ANOVA provides a statistical test of whether or not the means of several groups are equal. The one-way ANOVA was used to determine whether there are differences at the level of the variable of profitability by particular size groups of enterprises. (Hocking, 2013)

The null hypothesis says that means are equal (H0: $\mu1 = \mu2 = \mu3 = \mu4$) and the alternative hypothesis says that not all means are equal, i.e. at least one of the mean values are different from others. The null hypothesis is rejected or accepted on the basis of statistical significance (the significance level $\alpha = 0.01$).

3 Research results

The development of average profitability (ROA) in particular size groups of food enterprises in the Czech Republic in 2003-2013 is shown in Figure 1.

Figure 1 Average ROA of the Czech food enterprises by size groups in 2003-2013



Source: Own processing

As seen from the figure 1, the development ROA is not favourable in the Czech food and beverages industry. ROA values are relatively low in all years, moreover, there is a tendency to decrease during the analysed period. The largest companies (measured according the number of employees, i.e. with 250 or more employees) achieve definitely the highest values of ROA in all observed years except 2004 and 2005, when the similar profitability is reached also by smaller enterprises (with 50-249 and 20-49 employees).

On the contrary, ROA values of the smallest enterprises (with 0-19 employees) are significantly lower than ROA values of other size groups of enterprises. Moreover, these enterprises often achieve a negative profitability.

On the basis of the Figure 1 it can be stated, that larger enterprises reach in average higher profitability in the Czech food and beverages industry.

Subsequently, it was statistically verified whether there are differences between different size groups of enterprises within the ROA indicator during the analysed period. For the analysis of comparison of various size groups in terms of ROA the parametric analysis of variance (one-way ANOVA) was used. The ROA ratio was used as the dependent variable, four different size groups of enterprises was used as the factor. The results of ANOVA are presented in the Table 1.

Table 1 The results of the analysis of variance (ANOVA)

	n	Mean	Standard Deviation
0-19	5967	-0.02562	0.30819
20-49	2526	0.03885	0.16214
50-249	3065	0.04385	0.13149
250+	785	0.06568	0.09118

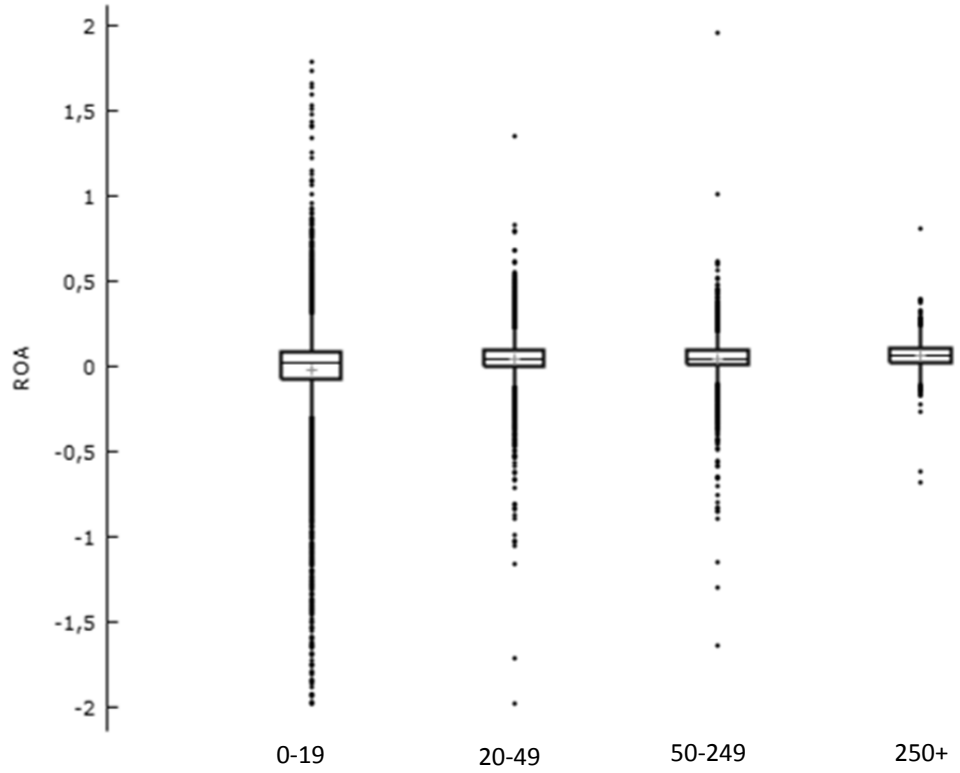
F(3, 12339) = 5.20464 / 0.056124 = 92.7347 [p-value 2,4e-059]

Source: Own processing (in software Gretl)

Based on the results of ANOVA, the p-value was lower than the significance level ($\alpha = 0.01$), which allows to reject the null hypothesis and to accept the alternative hypothesis. It is therefore possible to conclude that there have been statistically confirmed significant differences between ROA by size groups of enterprises.

The variability of ROA among four size groups of enterprises can be seen on the box-and-whisker graph in Figure 2. The largest enterprise (with 250 or more employees) show relatively stable values of ROA during the analysed period in comparison with the smallest enterprises, where the values of ROA are very fluctuating.

Figure 2 The variability of ROA within the size groups of Czech food enterprises



Source: Own processing (in Software Gretl)

4 Conclusions

Based on the graphical analysis of the ROA variable in terms of size structure of enterprises in the Czech food and beverages industry in period 2003-2013, it was found that the size of ROA is determined by the company size (expressed by number of employees). It should be noted that profitability is influenced also by other factors, but the size of the business appears to be a significant prerequisite for achieving higher firm profitability. Significant differences in the size of ROA in different size groups were also statistically verified with the use of ANOVA.

The profitability in the food and beverages industry of the Czech Republic is at a low level, food companies are exposed to competitive pressures from subsequent stages of commodity vertical, i.e. retail. Due to the concentrated structure of the retail market and related market power it can be concluded, that large food enterprises have better position to compete with the retail, as evidenced by the analysis in this paper.

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Shortcomings of accounting legislation to the needs of the agricultural sector due to its specifics

Kristýna Dvořáková

Abstract: *Agriculture is a very specific area, whose specifics are reflected in the accounting and in the related economic assessment of companies. Czech accounting legislation in its current form does not provide a necessary perspective on the various fields due to their specificity as in the case of the International Financial Reporting Standards (IFRS) and the GAAP. It is reflected in the financial analysis. The IFRS include one standard dedicated only to agriculture and its specifics, IAS 41 Agriculture.*

The main problems were found at the level of making calculations, including the animal (to the accounts of fixed assets or inventory), valuation pups or measurement of crop production. This leads to different values in the financial statements of the entities that do not provide a sufficiently fair view of the accounting, and are incomparable both between companies and in time.

In this article the specifics of agriculture, generally applicable legislation in the Czech Republic, its confrontation with IAS 41 are discussed. There are used own processed documents and publications especially from The University of Economics, Prague. The aim is partly to handle the change of Czech accounting legislation, which would lead to the unification of the manner of reporting, enhance the comparability and presentation of the financial statements in the financial analysis of various economic entities from agricultural sector. As supplementary material, the Czech accounting legislation will be confronted with the methods used in countries with the accounting system GAAP.

Key words: Agriculture · Specifics · Accounting standard · Biological assets · Financial statement

JEL Classification: M41 · Q14 · C35

1 Introduction

The Czech accounting legislation deals with general principles and accounting problems which are identical for all branches of the economic activity. Due to the specifics of the farm accounting encounters to irregularities or law unresolved facts that could lead to a distortion of true and fair view of accounting, which is a fundamental principle not only in the Czech Republic. The introduction of a new accounting standard for Czech agriculture would therefore be useful. International financial reporting standards are devoted to specific disciplines in greater detail. For agriculture there is a separate standard IAS 41-Agriculture.

The aim of this paper is to compare Czech and international accounting legislation with needs of practice and to suggest possible extensions of the Czech accounting legislation, which would help farms with accounting. This extension would also lead to the unification of reporting problematic facts and to increase the presentation of the financial statements and more faithful picture of an economic situation of farms.

2 Methods

The Czech accounting legislation and regulations on international accounting standards were used as the main data source. Articles and publications, related to accounting in agriculture mainly by authors Kouřilová, D. Dvořáková, Kopta, Drábková, Pšenčík, Valder, were other sources of information. The article belongs to a theoretical research in the current phase. The main used methods include: analysis of evidence on the issue, the comparison of the Czech accounting system and international accounting standards and the proposal of possible measures that would increase comparability and could reduce distortion of the financial statements of farms.

3 Research results

3.1 Deficiencies in the Czech legislation

During analysing the current legislation and the practical needs several problems were identified that lead to confusion or distortion of financial statements. The main problems include calculations, including the animal in the financial category, valuation of pups and crop production.

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Valuation

Methods of valuation of assets are regulated by Decree no. 500/2002 Coll.. There are different methods of valuation in accordance with the method of charging fixed asset. The fixed assets acquired by purchase are valuated at the purchase price, the assets produced internally are valuated at their own costs and the fixed assets acquired free of charge at replacement cost. The situation is similar for stocks. All awards are therefore based on historical prices. Legislation does not pay any attention to the specifics of animals and plants. According to the Czech legislation there is possible to use valuation at replacement cost by the valuation of animals born in own breeding, if it is not possible to determine its own costs incurred in the new-born animal.

The acquisition price may not answer the value of the animal after some time. The problem occurs mainly by individuals who gain the value in the course of life or have valuable genetic traits. The depreciation by these animals also does not make sense. This depreciation reduces their value. (Kouřilová & Drábková, 2009 II)

Agricultural land is valued as well as other fixed assets in our conditions at cost and carried at historical valuations. It is not revaluated at current (market) value, as is the case in accordance with international accounting standards. The quality of land does not affect its value. Land is valued by the locality where the land is situated. High quality soil can have a much lower value than land nearly unusable for agriculture. This leads to distortion of the value of the assets of company. (Valder)

Subsidy

Subsidies for the acquisition of assets affect the amount of the award. The value of assets acquired through subsidies is reduced by their amount. The asset is therefore maintained at a lower value in the accounting. This will also reduce depreciation of the asset and increase the profit. The actual value of the asset can be read in off balance sheet accounts. But they are not a part of the published information. This method of accounting reduces the fidelity of company assets. (Kouřilová & Pšenčík & Copt, 2009)

"From a tax perspective, however, there is an obvious reason to reducing the value of the asset purchased for the subsidies. There would be a deduction of depreciation from the subsidies provided by the state. "(K. Dvořáková, 2014)

Inclusion of animal, classification

In fixed assets may be included animals whose usage period is longer than one year and whose value is greater than the threshold set by the entity. Previously, there was the only condition for the inclusion into fixed assets and it was the breeding period of the animal. Cattles, pigs, horses, sheep, goats, donkeys, geese and mules had to be kept in fixed assets. To enable small animals to be included in the fixed assets, the entity must set a low threshold for inclusion or keep animals as a herd (flock). (Dvořáková D., 2012)

But another problem comes with keeping animals as a herd. If the valuation of the animals is at the lower limit of the classification and valuation will be reduced due to the death of an individual, what to do in this case? The animal should be replaced as soon as by the entity, in order to increase the value, or animals must be converted to the inventory account. (Kouřilová & Drábková 2009, I)

The possibility of setting your own limits does not only lead to discrepancies between enterprises, but also can distort the true and fair view of the assets of the company.

Animals in fattening and all young animals are included in current assets (inventories). There are also adult animals included in fixed assets due to a lower valuation than the set limit. These animals may be breeding for longer than 1 year.

Calculations in livestock production

Awards at the costs can be made according to the final or preliminary calculations. Calculation formula is chosen by each entity itself. This can lead in inconsistencies between different companies. The main problem is the determination of the cost of the animal. Newly born animals and additions (weight gain in young animals) are value by using calculations. For newly born animals it is very difficult to determine the proportion of costs on a new-born animal. Besides the baby there is a new production of milk, a manure or a slurry. All costs must therefore be split between these items. Determination of the percentage ratio is also problematic. This leads to the fact that the valuation of new-born animal in livestock production often has a low explanatory power. Since it is difficult to separate the costs incurred for the baby and mother the valuation at the replacement cost is often used. But even the determination of the replacement cost is not without problems. The sale is usually carried out after weaning, so the market price for a new-born animal does not exist. Thus, it is adjusted the price of the baby after weaning. (Kouřilová & Drábková 2009, I)

Calculation formula contains many items and it is not always easy to determine the amount of the costs attributable to the animal.

Classification of assets in plant production

In the long-term assets under Perennial crops are posted only fruit trees and shrubs on a certain area, and permanent vegetation vineyards and hop gardens without bearing structures. Of course, the period of use must be taken into account.

The problem with plant assets is a discrepancy between the calendar and the marketing year. Many farms in the Czech Republic does not use the possibility to set an accounting period as the marketing year, although it would be more appropriate in many cases. (Dvořáková D., 2012)

Purchased permanent crop is valued at the purchase price. Permanent crop planted by entity is valued at own cost. The value of the valuation increases by costs incurred in growing the crop until fertility. Permanent vegetation is depreciated after the period of fertility and other following associated costs are accounted in costs of that period. If an entity acquires vegetation by land acquisition, the purchase amount must be divided between land and permanent crops. Depreciation is similar to other long-term assets and is determined according to the expected useful life of the stand.

Accounting treatment of the forests is very specific. The forest itself is not recorded in the accounts on the assets side separately. If the forest id acquired by purchase, it is recorded in the price of land, if the entity fork out the forest itself, costs go up in consumption in the current period and the forest is not registered at all. Newly there is the obligation to disclose the information about forests, if an entity owns, has the right or competence to manage 10 ha of forest land in the notes to the financial statements. (Dvořáková D., 2012)

Calculation of crop production

The calculation is used by valuing of crop production as well as of livestock production. Direct production costs and a portion of production overheads are include into the value. The problem with the calculation of costs crop production occurs in the associated production when determining the cost to the individual types of output.

The main problem with the calculation of own costs of crop production is the cost of fertilizer, particularly by fertilizing with organic fertilizers. The problem arises already by the evaluation of these fertilizers, which is subject of the calculation in livestock production. Another problem is the fact that not only the current crops but the whole crop rotation is fertilized. (Dvořáková D., 2012)

3.2 Approach to the problem of agriculture in the context of international accounting standards

The international accounting standard IAS 41 – Agriculture solves some of the above problems. The subject of the IAS 41 are biological assets and agricultural produce at the point of harvest and state subsidies provided in connection with agricultural activities.

Valuation

Except the definitions of basic terms there is provided information that the biological assets are measured at fair value reduced by estimated costs to sell in the time at recognizing assets and each balance sheet date. The same is the award of agricultural production at the point of harvest, which represents the cost of acquisition, for example, for the application of IAS 2 - Inventories. (IAS 41 - Agriculture)

Standard sets out exactly how to determine fair value under many different conditions. By valuation at fair value the valuation of property can be not only reduced but also increased, in Czech conditions it is not possible. Conditions for the valuation at the fair value are consolidated by IFRS 13- Valuation at fair value since 2013. Biological assets measured at fair value must be required to revalue each balance sheet date, they are not depreciated and there is no need to test them for impairment. (IFRS 13 - Fair Value Measurement)

Unfortunately, the land used for agriculture or intangible assets linked to agriculture such as preferential limits or quotas are not subjects of the IAS 41.

The combined assets are also distinguished in international accounting standards when the biological asset is associated with land and the fair value of the biological asset is not separately determined in the market. The firm may use a combined valuation of assets for their valuation, which is reduced by the fair value of the land and the value of land improvements. (Dvořáková D., 2012)

Biological assets can be valued at historical cost but only when a small part biological transformation was carried out since the valuation of biological assets at historical prices or the impact of this transformation on price is not significant. This can be used only if the price determined by the market for a particular asset is not available and determination of the fair value by estimation is unreliable. The asset is then valuated at costs reduced by accumulated amortization and impairment losses. If the fair value of the asset exists in future, the asset is revalued at the fair value and kept at fair value until its disposal. The transition from fair value to the valuation at the costs is impossible. (IAS 41 - Agriculture)

Subsidies

The IAS 41 also deals with subsidies for the acquisition of biological assets, which are valued at fair value. The international accounting standards distinguish two kinds of subsidies provided to agriculture - conditional and unconditional. An unconditional subsidy is recognized as revenue at the time of admission. The conditional subsidy is recognized as revenue after the fulfilment of certain conditions. (IAS 41 - Agriculture)

Classification

This standard sets out what a biological asset is. These are animals or plants that are the subjects or the means of agricultural activity of the company. For their reporting the same conditions as for other assets are set, as such that the company controls the asset (there is no need to own it), that the future economic benefits associated with the asset will flow to the company and that asset can be measured reliably. These terms are defined in the Framework.

According to the international standards, it is necessary to show the value of biological assets separately for consumable and fruiting assets. Both groups must be further divided into mature and immature assets. (IAS 41 - Agriculture)

Advantages and disadvantages

Historical prices – their advantage is the robustness, relatively easy feasibility and also reduction of the possibility of subjective affecting of the valuation. The disadvantage is the link to the past, when the valuation of an asset may not answer the real value for some time. For many assets occurs evaluation conversely.

Fair value - the biggest disadvantage of appreciation in fair value is the ability to influence the reported values. Market prices are often volatile and may be seasonal in nature. Market prices of biological assets and agricultural products are affected by the subsidy policy of the state.

The mandatory disclosures should partially reduce the impact of the disadvantages of appreciation in fair value. It must include methods of determining the fair value of each group of biological assets and agricultural production. Causes of changes in the carrying amount of assets must be reported in disclosures. These information must be divided into profit or loss resulting from the change in fair, into changes resulting from the sale or acquisition, into increasing as a result of the business combination and income and expenses incurred due to unfavourable climatic conditions, disease states and others natural factors.

For assets measured at the costs basis, there must be disclosed further information. To the main information belong the description of the biological assets; the explanation why the fair value is not used; the description of the methods of depreciation.

The posting of subsidies to income does not affect the fair value of the acquired biological assets. The real value is not distorted.

3.3 The comparison and the recommendations for the Czech practice

The distribution to mature and immature, to the consumable and fruiting cannot be found in the Czech concept. The scope of obligatory disclosures in our conditions is minimal. The information obligatory disclosed in accordance with IAS 41 are not even detectable from Czech accounting system. It is easier to determine the financial situation of the company from the information disclosed in accordance with international accounting standards.

There is a big difference in the valuation. In terms of Czech legislation the valuation is based on historical cost. Purchased assets are valued at purchasing price, the own production assets at the amount of the incurred costs. In some situations, it is possible to use valuation at the replacement cost. In contrast, the International Accounting Standards require the valuation at fair value and the revaluation to each balance sheet date. The valuation at fair value more reflects the true value of the asset and thus it is more consistent with the principle of true and fair view of reality. On the other hand there is the problem with her findings and relevance the fair value. There is also a greater risk

of affecting the value of the awards. The problem with finding and conclusive evidence also occurs in the calculations, which are used for measurements in both animal and crop production in the Czech Republic.

The posting of subsidies received for acquisition of fixed asset is recognized as income according to international accounting standards, it does not diminish the value of the asset. There is no distortion of its value and thus it gives a truer picture of the company's assets. Implementation of the same posting to the Czech accounting practice could be conditioned on depreciation treatments. The depreciation of assets acquired through grants should not be posted as costs.

The differences between these two systems are summarized in the following Table 1.

Table 1 Comparison of Czech and international accounting legislation in the field of agriculture

AREA	CZECH LEGISLATION	IFRS
Measurement – purchased assets	Purchasing price	Fair value, (costs)
Measurement of assets from own production	Own costs (replacement costs)	Fair value, (costs)
Classification	• The setting the limits for the classification of assets as fixed assets • The distribution to the crop and the livestock production • The distribution to the long-term and short-term assets • The forest is not recognized in assets	• The valuation is not restricted (even babies are the biological assets • The main distribution to consumable and fruiting assets • The distribution to mature and immature within this groups
Subsidies for the acquisition of assets	reduce the value of assets	are posted as income
The mandatory disclosures	• The methods of valuation of all types of assets • The amount of subsidies for purchased assets	• The method of determination the fair value (where the expert opinion was used) • Causes of changes in the value of each separately reported group of biological assets (distributed by the various causes) • For assets valued at costs there must be their description, the reason for non-use of fair value, the band in which high probable the fair value is

Source: Own processing

In the Czech accounting legislation, there would be possible to introduce some changes. The abolition of border of valuation for inclusion in long-term assets would lead to keeping all biological assets, which are not owned for sale, in the same group. This would lead to a more faithful representation of the assets. Further applicable measures is offered for representation of forests in the Czech accounting. The value of forest is included in the value of the land (not affect the value of assets), but the separate display would serve as a truer picture of the assets of the farm. The reason for reducing of the valuation of the asset, for which a subsidy was awarded, is to avoid depreciation of the subsidy.

Very problematic seems to be the valuation. Setting their own costs is complicated and there are not active markets with most just born animals, where their fair value could be determined. A legislative change in this area is therefore a question of a longer time horizon with a lot of discussions about what is better.

4 Conclusions

Czech accounting legislation is devoted to general accounting principles and practices. It does not address individual fields and their specifics in detail, giving rise to discrepancies between businesses and it may also lead to a distortion of true and fair view, which is one of the main accounting principles. At the level of international accounting standards, there is the IAS 41 - Agriculture that is trying to cover specific areas of agricultural activity. There is set the classification of biological assets, the valuation and disclosure requirements. This standard attends to subsidies for agricultural activity. Along with the obligation to disclose much information related to agricultural activity and biological assets this concept leads to a more faithful representation of assets and liabilities of the company. Of course, in addition to positive, problematic areas can also be found in the legislation. For example, the valuation

at the fair value carries a higher risk of affecting the value by management, than the valuation according to Czech accounting legislation at the purchased price that is clearly established. Taking into account all possibilities, their advantages and disadvantages there should be created a new accounting standard for enterprises engaged in agricultural activities in the Czech Republic. This extension of legislation would unite the carrying values of companies and increase the faithfulness of the financial statements and their explanatory power.

Already in the previous works there were relatively large differences, for example by a different classification of dairy cows in inventory and fixed assets. Due to the depreciation there is the difference in profit or loss in the amount of CZK 6,000 per one piece of the animal. In other materials these problems will be illustrated on the cases. There will be assessed the results achieved in the Czech accounting system, in accordance with IFRS or US GAAP. There will be evaluated their impact on the indicators of the financial analysis, or estimate the level of the risk of objectivity of the data collected.

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Structure and Economics of Czech and Foreign Enterprises in the Food Industry

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Abstract: *The food industry is one of the most important sectors in the world economy with high importance for economic and environmental development as well as social welfare. The contribution deals with the food industry enter-prises operating on the Czech market. The aim of this contribution is to compare the development of basics economic indicators of the Czech and foreign food industry businesses operating in the Czech market over the period 2010-2014. Special attention is paid to the position of the Czech and foreign enterprises of CZ-NACE 10.1 Processing and preserving of meat and meat products. Data needed to process this paper was obtained from the Czech Statistical Office (CZSO) and Ministry of Industry and Trade of the Czech Republic (MIT). Businesses are compared in basic economic indicators such as number of employees, sales, performance consumption, value added and personnel costs. The method of linear regression trend estimation was used to analyse the indicators development of the Czech and foreign enterprises (in the period 2010-2014). To determine the differences, the comparison of development between the Czech and foreign enterprises was made by using the coefficient of determination. The analysis shows a significant position of foreign-owned enterprises on the Czech market, which, by their market power and economies compete with other foreign companies that supply production to the Czech Republic. More detailed results and impacts are presented in the article.*

Key words: Food industry · Foreign business · Performance · Economic indicators

JEL Classification: L66 · M21

1 Introduction

The food industry in Europe is one of the most important sectors in the world economy with a particular importance for economic and environmental development, and even social welfare. The food chain is relatively complex, i.e., it contains a wide variety of economic activities, which includes a variety of products according to the frequency of consumption (Guerin and Vellila, 2010; Wijands et. al., 2007).

According to the publication European Food and Drink Industry 2014-2015 (2015), the European food and beverages industry is the largest in the manufacturing sector with a turnover of 1.244 billion Euro and is also the leader in the number of employees (employs 4.2 million people in the EU) and consists of 289 000 companies. The main shares on total industry´s turnover have meat products (20 %), of other food products (16 %), and 14% beverages. Most workers are employed in bakeries (32%) and meat processing enterprises (21%). These two groups of product also make up the highest number of enterprises in the EU (54%, resp. 14%).

The characteristic of the production of food products and beverages (CZ NACE 10 and 11) have closely relationship to agriculture, whose crop and livestock production and other production is further processed and delivered to distributors or directly to consumers. It is a strategic sector in relation to nutrition assurance (Putićová and Mezera, 2008).

The issue of food industry is engaged in the publication Panorama of the Food Industry (2013), which focuses on the position of individual branches, the main economic indicators and foreign trade. In 2014, production of food, beverages and tobacco products in the Czech Republic contributed to GVA by 2.44%, to employment in the CR by 2.73%. In terms of share of sales of own products and services are among the key branches 10.1 Production, processing and preserving of meat and meat products, 10.8 Manufacture of other food products 10.5 Manufacture of dairy products 10.9 Manufacture of prepared animal feeds and 10.7 Manufacture of bakery and other flour products.

Puticová and Mezera (2008) analysed the evolution of the food industry and trends in in development in economic indicators compared to the whole manufacturing industry. In this comparison are obvious dynamic development of the manufacturing industry and the declining importance of the food industry. The individual branches are recognizable differentiated and volatile trends, but productivity for the period 2000-2006 grew. Mejstříková et al. (2011) evaluated

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the positive and negative economic results of the food business. The authors give the overall profitability of the CZ-NACE 10 and NACE 11, which improved despite the worsening economic conditions. The aim of this article is to compare the development of fundamental economic indicators of the Czech and foreign companies operating on the Czech market in the years 2010-2014. Special attention is paid to the position of the Czech and foreign companies within the CZ-NACE 10.1 Processing and preserving of meat and meat products.

It is a confirmation or refutation of the hypothesis that foreign-owned enterprises achieve better economic results than national operators and, if so, how they can contribute to the further entry of foreign capital and thus improve the economic position of the food industry and its competitiveness and thus create conditions for overall development of agriculture and food industry in the country.

2 Methods

Proceedings of the contribution intended for use to achieve the aims the financial data of food business. These businesses are divided into two categories, namely to companies owned by Czech entities and enterprises operating in the Czech market with foreign owner. Foreign enterprises are entities controlled by a foreign entity with ownership interest greater than 50 %. Data for the analysis were obtained from the Czech Statistical Office (CZSO). Recalculation of 2014 were carried out by the Ministry of Industry and Trade (MIT), it is not the final data. The paper presents the basic indicators of industry´s structure as the number of enterprises, number of employees and economic indicators (sales of own products, services and goods, production consumption, labour productivity and wages). Economic indicators are recalculated per employee (for better comparison). Labour productivity is calculated as value added per employee. Wages include basic wages, bonuses, remuneration and compensation, and other wage components. They are calculated excluding other personnel costs, i.e. royalties under contracts for work outside employment, severance pay, remuneration of members of statutory bodies. These indicators, respectively, their values, are compared across branches of the food industry.

The development of basic economic indicators is provided for CZ-NACE 10 and its branch CZ-NACE 10.1 Processing and preserving of meat and meat products and NACE 11. There are discussed as well as the results of the indicators in other branches CZ-NACE 10. Statistical analysis used the coefficient of determination was prepared for individual branches CZ-NACE 10 and CZ-NACE 11 as a whole. In frame to protect individual data are not said the results of the statistical analysis for branches CZ-NACE 10.2 and CZ-NACE 10.4.

The method of linear regression trend estimation was used to analyse the indicators development of the Czech and foreign enterprises (in the period 2010-2014*)*. In framework of this the development between Czech and foreign companies was compared by using the coefficient of determination. For sectoral developments we assume a linear development, which indicates a stable development in the industry, we mean growing and also declining or stagnant development. Significantly stable is evaluated the development, where the coefficient of determination values range from 0.7 above. The values below 0.5 indicate significantly volatile and unstable development of indicators over time.

3 Research results

In the first part of the results (Table 1, 2, 3) are the basic economic characteristics of foreign (F) and the Czech enterprises (CR) CZ-NACE 10 Manufacture of food products CZ-NACE 11 Manufacture of beverages and CZ-NACE 10.1 Processing of the a preserving of meat and meat products.

Table 1 Economic and structural characteristic CZ-NACE 10

	Number of enterprises		**Number of employees**		**Sales**		**Production consumption**		**Labour productivity**		**Wages**	
CZ-NACE 10	CR	F	CR	F	CR	F	CR	F	CR	F	CR	F
2010	6 384	124	71 691	20 868	2 485	4 389	1 839	2 795	426	922	205	307
2011	7 008	109	71 652	19 010	2 575	5 052	1 974	3 165	393	1 162	206	318
2012	7 197	108	71 751	17 921	2 677	5 502	2 043	3 537	394	1 101	213	333
2013	7 068	98	71 649	15 520	2 822	5 539	2 589	3 940	452	1 077	211	334
2014	7 435	103	69 476	16 320	2 866	5 655	2 121	3 849	511	1 039	224	339

Source: Own processing from CZSO and MIT data

Note: indicators sales, production consumption, labour productivity and wages they are in thous .CZK per employee

On the Czech market is clearly dominated by food businesses owned by Czech entities, as in case of CZ-NACE 10 and CZ-NACE 11. The numbers of Czech enterprises grew consistently until 2013, in 2014 there was a slight decline. In the case of foreign companies leads to their decline in 2013, in 2014 there was a slight increase. Dominant in terms of number of foreign companies in 2014 are branches 10.8 Manufacture of other food products (37 companies), with a very heterogeneous production structure, from the sugar production to the manufacture of prepared meals. In the branch 10.7 Manufacture of bakery and farinaceous products are16 companies, and in the branch 10.5 Manufacture of dairy products are 14 companies.

Foreign enterprises CZ-NACE 10 and 11 are among the major employers in the food industry. In 2014, foreign-owned firms employed with regard to their low numbers (103 companies in the CZ-NACE) 19 % of all staff working in the sector of CZ-NACE 10. In the case of businesses CZ-NACE 11 the number of foreign companies is also a minority, but they are very important employer. In 2014, the beverage industry employed nearly 50 % of all employees. Most employees work within the CZ-NACE 10 in branch 10.8 (7345 employees), which is almost half of the employees working in this branch. In the branch of foreign enterprises 10.3 Processing and preserving of fruit and vegetables employs 40 % of all employees in this branch. Major employers are also foreign enterprises of the branch 10.5 Manufacture of dairy products, which operates over 30% of employees in this branch.

In general, the foreign-owned companies have better economic indicators than the Czech companies. Sales from foreign firms per employee in CZ-NACE 10 and 11, almost two fold than those reported by Czech companies. Minimal differences in this indicator between Czech and foreign companies are in the branch 10.1 Processing and preserving of meat and production of meat products and 10.3 Processing and preserving of fruit and vegetables. On the contrary, the highest are in branch 10.9 Manufacture of prepared animal feed, 10.8 Manufacture of other food products and 10.7 Manufacture of bakery and farinaceous products.

Foreign companies are also able to report much higher labour productivity and also their employees are remunerated better (higher wages). The higher revenues of foreign enterprises are also related to higher production consumption (the biggest differences are again between Czech and foreign companies in branch 10.7 and 10.9). The labour productivity is also higher in foreign companies than in Czech. The biggest differences are in the branch 10.9, 10.8 and 10.7. Likewise, employees in companies owned by a foreign entity are better rewarded than if they were employed in a Czech company. When comparing foreign firms in manufacture of food products (CZ-NACE 10) and manufacture of beverages (CZ-NACE 11) are clearly better results manufacture of beverages, which are achieved mainly by the fact that in this industry is significantly larger enterprises (according to the number of workers per enterprise). The dominant size of CZ-NACE 10 tends to medium-sized enterprises.

Table 2 Economic and structural characteristic CZ-NACE 11

CZ-NACE 11	Number of enterprises		Number of employees		Sales		Production consumption		Labour productivity		Wages	
	CR	F	CR	F	CR	F	CR	F	CR	F	CR	F
2010	1 202	30	6 949	7 819	2 315	5 707	2 057	3 447	487	2 084	252	433
2011	1 253	24	6 621	7 260	2 731	5 722	2 306	3 652	683	1 976	268	435
2012	1 197	25	6 337	7 238	2 663	6 045	2 293	3 966	585	2 020	288	440
2013	1 243	23	6 763	6 530	3 110	6 134	2 589	3 913	729	2 112	296	452
2014	1 239	28	6 588	6 488	3 127	6 427	2 641	4 175	704	2 104	324	479

Source: Own processing from CZSO and MIT data

Note: indicators sales, production consumption, labour productivity and wages they are in thous. CZK per employee

The following Table 3 documents the development of structural and economic indicators of the branch 10.1 Processing and preserving of meat and meat products from 2010 to 2014. The number of foreign companies operating in the meat industry declined until 2013, in 2014 there was a slight increase. That occurred also by domestic owners of enterprises in the overall recovery situation of the market.

When comparing CZ-NACE 10.1 with CZ-NACE 10 and 11 there can be seen a similar development. Foreign enterprises in monitored branch are not numerically significant, in 2014they employed only 8 % of the workers in meat industry. These businesses also have higher sales than Czech companies. The difference is not so pronounced as in other branch included above. The labour productivity of foreign enterprises of branch is much higher, but in the

observed time series variable. Czech firms from 2012 managed to improve productivity, which is important for strengthening the competitiveness of domestic firms.

Table 3 Economic and structural characteristic CZ-NACE 10.1

CZ-NACE 10.1	Number of enterprises		Number of employees		Sales		Production consumption		Labour productivity		Wages	
	CR	F	CR	F	CR	F	CR	F	CR	F	CR	F
2010	1 202	30	6 949	7 819	2 315	5 707	2 057	3 447	487	651	252	433
2011	1 679	13	20 244	1 561	2 716	3 466	2 267	1 843	376	594	199	241
2012	1 708	10	19 677	1 962	2 871	3 450	2 397	2 048	349	580	211	242
2013	1 701	8	19 859	1 424	2 867	3 517	2 402	1 766	382	666	207	257
2014	1 771	10	19 197	1 854	2 957	3 759	2 417	2 226	478	553	214	261

Source: Own processing from CZSO and MIT data

Note: indicators sales, production consumption, labour productivity and wages they are in thous. CZK per employee

Table 4 Results of coefficient of determination

CZ-NACE	Number of enterprises		Number of employees		Sales		Production consumption		Labour productivity		Wages	
	CR	F	CR	F	CR	F	CR	F	CR	F	CR	F
10.1	0.7107	0.7506	0.4623	0.2192	0.9227	0.7342	0.8505	0.1635	0.3530	0.1663	0.7196	0.9385
10.3	0.9494	0.5208	0.8155	0.7931	0.2413	0.3704	0.4893	0.1558	0.5314	0.9587	0.0768	0.6045
10.5	0.7722	0.8427	0.6337	0.8405	0.1945	0.9465	0.0647	0.8862	0.3294	0.6802	0.0792	0.8749
10.6	0.7178	0.2547	0.2074	0.5061	0.7673	0.3274	0.6239	0.2230	0.7588	0.2185	0.8729	0.0931
10.7	0.7021	0.7117	0.7697	0.9174	0.0264	0.0047	0.7550	0.8825	0.7124	0.4897	0.7570	0.0978
10.8	0.8808	0.0962	0.0020	0.1181	0.0013	0.1847	0.4691	0.2547	0.6276	0.4540	0.0330	0.1000
10.9	0.2573	0.7805	0.5662	0.3829	0.9526	0.9594	0.7108	0.8699	0.0638	0.7039	0.8484	0.7363
10	0.7655	0.7287	0.5021	0.8700	0.9821	0.8371	0.4255	0.9066	0.5475	0.0698	0.8007	0.8950
11	0.1539	0.0805	0.1643	0.9164	0.8696	0.9395	0.9189	0.9130	0.5726	0.2243	0.9774	0.8264

Source: Own processing

Table 4 shows the results of the coefficient of determination, which was used to determine the development in individual sectors and the branch of the food industry. Assumed was a linear development, which indicates a stable development in the industry or in the branch. We mean by this both, growing and declining or stagnant development. As significantly stable was evaluated the development, where the values of coefficient of determination range from 0.7 above. Values below 0.5 indicate significantly volatile and unstable development indicators over time.

For a stable industry in terms of number of companies can be evaluated manufacture of food products where is a linear development in the number of employees (in Czech and foreign companies). A detailed view on, development of businesses CZ-NACE 10 shows very unstable number of foreign enterprises of the branch 10.8, where the coefficient of determination is very low. In contrast, the Czech companies in this branch have a linear development. Conversely, Czech firms of branch10.9 in terms of number of enterprises can be considered as very unstable compared to foreign companies. Better development of Czech companies also have branch 10.6 or 10.3, compared with an unstable development of foreign enterprises in these branches. The stability of the development of enterprises (Czech and foreign) is evident in the branches of 10.1, 10.5 and 10.7.

The number of employees is very volatile in Czech companies in foreign unit there is evident the constant development. For the unstable Czech industry can be considered in terms of the number of employees - branches 10.1, 10.6, 10.8. Very good development in the number of employees is evident in the branches of foreign enterprises of the branches 10.7, 10.5 and 10.3.

But the Czech companies have better stability than the reported foreign (resp. increasing) sales. Within CZ-NACE 10 there are branches 10.1, 10.6 and 10.9, which are very stable (values above 0.9). Considerably volatile, they are however sales in the branches of 10.3, 10.5, 10.7 and 10.8. When comparing with foreign units, they are more stable

compared to Czech industry (enterprises of the branch 10.5). Conversely, poorer sales development, very unstable, they have foreign enterprises of branch 10.6, compared to Czech companies. In the case of Czech and also foreign enterprises are unstable branches - 10.8, 10.7 and 10.3.

Keep developments in labour productivity is the major problem of foreign companies CZ-NACE 10. The problems have mainly branches 10.1, 10.6, 10.7 and 10.8. Conversely, stable development of productivity is in foreign units in the branches of 10.3, 10.5 and 10.9. By comparing the labour productivity, there is better development in the Czech branches of 10.6, 10.7.

The stability of wage developments in Czech and foreign companies is very similar. However, there are big differences between the branches. For example, development of wages has been maintained in the field 10.5 (foreign companies), in the case of Czech development is very volatile. Conversely, significant volatility is evident in the branches of foreign enterprises of 10.6 and 10.7 (Czech businesses are, however, very stable). Regardless of ownership is similar wage development in the branches of 10.1 and 10.9.

CZ-NACE 11 can be in terms of the number of enterprises as Czech as well as foreign as very unstable due to the very low coefficient of determination. Some different development, however, is evident by foreign enterprises in the number of employed persons, where Czech companies are very unstable. Without distinction are reflected sales growth, production consumption and wages. For both categories of firms is problematic labour productivity.

The position of Czech enterprises of meat industry (CZ-NACE 10.1) can be due to foreign companies evaluated favourably without significant differences in this branch. Both, the Czech and foreign companies are stable in a number of enterprises, in both cases the problem is fluctuating number of employees. The Czech companies have small advantage in greater stability in sales and production consumption. On the contrary, wages are evolving a more stable in foreign companies. Labour productivity has adverse development in both categories.

4 Conclusions

According to the comparison, foreign companies in the food industry are major employer and its economic indicators outperformed companies owned by Czech entities. They are therefore important parts of the food market, performance and economic structure. In some cases, these businesses are able to develop more stable than Czech entities. Therefore, it can recommend the entry of foreign capital into the food companies in the Czech Republic. For this it is necessary to create conditions.

In addition to macroeconomic conditions associated with the potential for economic growth goes also about appropriate business structure industry. For the food industry in the EU and in the Czech Republic is characterized by a arge number of small and medium-sized companies. Small and local companies, foreign capital do not tempted so much because they introduce often regional foods on market that are associated with the tradition which has its own local businesses. Foreign capital is more suitable larger companies, but we can found in the Czech Republic only in smaller numbers, respectively they are already part of bigger capital formation. We can expect a process of mergers medium-sized companies as in the EU, in the context of production concentration, supporting the investment activities and the like. In these firms could foreign capital exhibit serious take interest. This process, however do not have be quick and it also depends on the ability of acquisition teams. We take into account also the risk of the foreign enterprises that in the CR closes the capacity and production relocates to another country.

Other conditions for entry into the reporting industry like food and veterinary law, would not seem as problematic because this law is harmonized within the EU. The situation is different with non-EU countries, respectively, global multinational companies, which however in Europe are building their centers, including logistics. Also to distortions of competition principles would be for medium-sized companies may not to occur.

In terms of development of number of enterprises, however, they are more stable Czech companies (constant development was confirmed in all branches except branch 10.9, which is in terms of the number of units unstable). On the Czech market in the reported years they are successful foreign companies applied in the branches 10.1, 10.5, 10.7 and 10.9, where there is the trend coupled with stability in the evolution of this indicator. There were difficulties for foreign companies to keep them in the branch of 10.3, 10.6 and 10.8. Significant instability due to the declared sales without distinction to business ownership, however, is in the branches of 10.3, 10.7 and 10.8.

Enterprises of the meat industry have very similar development, resp. common characteristics whether they are owned by Czech or foreign entities. They are stable in terms of the development of number enterprises, generated sales or wage growth. These characteristics could become, when the increases in size of units, a challenge to enter

the monitored manufacturing branch. The entry of foreign capital could increase the competitiveness of the whole reported branch and the food industry.

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Comparison of Operating Subsidies in Agriculture in EU Countries

Jaroslav Svoboda, Jana Lososová, Radek Zdeněk

Abstract: *The Operational subsidies are the basis of CAP, which is financed from the EU budget. Although its share in the budget has decreased lately to approx. 40%, it still represents the key EU policy. The aim of the article is the analysis of the policy of subsidies in the field of operational subsidies in the EU countries in years 2004 to 2012, which represents its comparison based on selected economic indicators. The objective was to find suitable connections and links among these indicators and operational subsidies. The article deals with comparison of agricultural subsidies in the member states of the EU in the period 2004-2012 based on the database FADN. The linkage of paid out operational subsidies related to area value of utilised agricultural area is obvious – the co called decoupling occurs (i.e. breaking away of subsidies from output). The subsidy range has a dropping trend over time and the values of minimum and maximum draw near each other during the monitored period.*

Key words: Agriculture · CAP · Operational subsidies · Outputs · Inputs

JEL Classification: Q14 · Q18

1 Introduction

The support of agricultural production in some form occurs in all world states. The reasons for this are the particularities in agricultural production which form externalities not appreciated by the market. The common agricultural policy (CAP) belongs to the most elaborated policies of the European Community. The common agricultural policy has three dimensions: market support, income support and rural development. These three dimensions are mutually connected and total sustainability of policy depends precisely on how well they complement one another (European Commission, 2014). CAP represents approximately 40 % of the EU budget. This implies that this policy is one of a few fields in which the common policy is financed predominantly by the EU. Therefore, it is necessary to put the CAP budget into connection with total public expenses in the EU. In this case the given budget seems to be small – it represents only 1% of all public expenses in the EU. In 2014 it amounted to 58 billion euros. Furthermore, we need to point out that the share of the CAP's budget in the EU budget in the last 30 years has decreased considerably, from not quite 75 % to approximately 40 % (European Commission, 2014).

Problems regarding agricultural subsidies and predictions of their impacts on international markets and the EU are the topic of many studies, e.g. Fárek & Foltýn (2004), Donaldson et al. (1995), Beard & Swinbank (2001), Benjamin et al. (2006), Latruffe & Davidova (2007). Most foreign studies are directed at the impacts caused by the enlargement of the EU (Ciaian et al. 2007).An analyses of the impacts of the CAP on the new member states was carried out by e.g. Pokrivčák, Svinnen & Gorter (2003). Impacts of the CAP on the results of management of agricultural enterprises together with the reference to disparity of results according to the types of companies, natural conditions of management and economic prosperity were studied by Szabo & Grznár (2002).

Svatoš (1999) defines subsidies as the evaluation of the public sector, influencing the prices of products and services and prices of factors of production. Bečvářová et al. (2008) defines subsidies as transfers reflecting changes in the division of income which are not connected with the flow of goods and services. Grega (2005) defines them as an interference into the allocation powers of the price mechanism. Subsidies evoke discussions whether to subsidize agriculture or not. According to the opponents of subsidies, the problems with the economic situation are caused by bad management and subsidies into the agrarian sector are very high from the point of view of a taxpayer. Van Beers & Van den Bergh (2001) say that subsidies are introduced to support certain aims, changing in the course of time, and the impacts of subsidies are unpredictable. Subsidies lead to prices that convey fundamentally incorrect information about real costs relating to production, extraction or resource scarcity. Subsidies run the risk of favouring less profitable

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over more profitable firms, where profitability includes social costs. Therefore, subsidies should never be structural, but merely serve to guide transition periods.

The defenders of subsidies stress the particularity of the agrarian sector and the formation of social, environmental, consumer and other negative impacts on the dissolution of a higher number of agricultural companies. To which extent the removal of direct payments could influence the dynamics of land exploitation in Europe including impacts on structural changes and environment is discussed by e.g. Uthes et al. (2011), Acs et al. (2010), Offermann et al. (2009).

Reforms of the CAP are rather complicated and emerge in historical and political contexts and in the interaction of several institutional mechanisms, thus their results are not fully predictable (Moyer & Josling, 2002; Garzon, 2006; Swinnen, 2010). Erjavec & Erjavec (2015) detected that in the process of CAP reform decision-making, European institutions justified the CAP with a transformation of key discourses (productivist, multi-functional and neo-liberal) by emphasising the hugely popular environmental element while, at the same time, employing a strong productivist discourse at the level of measures and the budgetary distribution between the EU member states and farmers' groups. The prediction of impacts of changes in the CAP after 2013 is dealt with by Ciaian et al. (2014). They presume the strengthening of competition on the estate market and higher estate values, especially in the countries where subsidies will be balanced.

2 Material and Methods

In the article we use calculations based on the database of selective research; The Farm Accountancy Data Network (FADN) in the EU. Standard output FADN is a set of indicators– the results of agricultural companies published officially per particular company types within FADN systems. The purpose of EU methodology is to enable the evaluation and comparison of economic results of agricultural companies in individual EU countries according to a single methodology, which is not influenced by divergences of tax accounting records (http://ec.europa.eu/agriculture/ricaprod/).

From many recorded indicators we have chosen those which are relevant for the given points at issue and are linked to operational subsidies. The indicators were:

- Total Utilised Agricultural Area-ha (SE 025).
- Total output –c.u. (SE 131) – i.e. total output crop, livestock –c.u.
- Total Inputs (SE 270) –i.e. specific (direct) costs, overheads (e.g. energy, maintenance, repairs, fuel, etc.), depreciation -c.u. and external factors (wages, rent, interest).
- Operational subsidies (SE 605).

FADN EU methodology within operational subsidies contains more types of subsidies. More detailed structure of operational subsidies was determined at the level of following groups:

- Total subsidies on crops (Compensatory payments, Set aside premiums, Other crops subsidies)
- Total subsidies on livestock (Subsidies dairying, Subsidies other cattle, Subsidies sheep/goats, Other livestock subsidies)
- Environmental subsidies
- LFA subsidies
- Decoupled payment (Single Farm payment, Single Area payment, Additional aid)
- Others subsidies (Other RD subsidies, Subsidies on intermediate, consumption, Subsidies on external factors).

Considering the fact that the system of most paid out subsidies is directly dependent on the farm size, the indicators of total output, total costs and total operational subsidies were calculated per ha of Utilised agricultural area. Thus, the size of individual farms of given states is taken into consideration.

In another part, the links between defined indicators are described with the help of correlation and regressive analysis. Indicators related to utilized area value from FADN EU were further completed by relative indicators (total output/operational subsidies, Operational subsidies/total costs, total output/total costs).

3 Results and Discussion

Comparison of Selected FADN EU Indicators in EU Countries

On comparison of the division of EU countries in 2004 and in 2012 (tab. 1 and 2), according to the extent of operational subsidies per ha of Utilised agricultural area, the shift of the CR from the position where subsidies reached only 50% of EU average to subsidies 7% higher than the average, is apparent. The biggest increase of operational subsidies in the monitored period happened in Slovakia, the CR and Poland. These countries gained more than double the subsidies per

ha of Utilised agricultural area in 2012 than in 2004, although neither Slovakia nor Poland have reached the EU average so far. In 2004 subsidies exceeded the EU average only in Slovenia (from the newly added countries). Contrary to 2004, a decrease of subsidies per ha occurred only in Malta, Austria and Great Britain.

Table 1 Division of EU countries according to the extent of operational subsidy in €/ha in 2004

Subsidy	**Country**
Up to 200 €/ha	Estonia (95); Slovakia (98); Lithuania (117); Latvia (122); Poland (129); Czech Republic (154); Hungary (176);
200 - 400	Spain (209); Portugal (225); United Kingdom (281); **EU (305);** Sweden (324); Netherlands (333); France (351); Italy (363); Denmark (367); Ireland (381); Germany (388); Belgium (396)
400 - 600	Slovenia (461); Luxembourg (504); Cyprus (514)
More than 600	Austria (610); Greece (658); Finland (889); Malta (2 289)

Source: FADN, own results

Table 2 Division of EU countries according to the extent of operational subsidy in €/ha in 2012

Subsidy	**Country**
Up to 200 €/ha	Lithuania (183); Latvia (190); Bulgaria (191); Romania(194); Estonia (196)
200 – 400	Spain (244); United Kingdom (263); Slovakia (272); Portugal (281); Poland (299); Hungary (328); **EU (341);** France (361); Czech Republic (364); Denmark (383); Sweden (385)
400 – 600	Germany (409); Italy (420); Ireland (427); Belgium (515); Cyprus (537); Austria (574); Netherlands (578)
More than 600	Luxembourg (613); Slovenia (626); Greece (710); Finland (921); Malta (1 102)

Source: FADN, own results

However, a substantial problem is also the structure of individual subsidies (tab. 3). Years 2004 and 2012 are presented here again to get a basic comparison. Unambiguously, this implies a diversion from the support of particular crops or animals (vegetable or animal production), whose share (in total operational subsidies) decreased in average from about 63% in 2004 to not quite 8% in 2012, to the so-called decoupling, where the proportion is in fact the opposite, i.e. from about 9% in 2004 to about 60% in 2012. The other types of subsidies can be considered as relatively stable – environmental subsidies 10.4% and 13%, LFA subsidies 10.5% with a slight drop to 8.8% and other subsidies 69% and 10%.

The starting amount of subsidies of vegetable and animal production were in the competence of given states with their political decisions respecting the particularities of their countries and determined priorities.

Table 3 Structure of operational subsidies in EU countries (in %)

	Total subsidies on crops		**Total subsidies on livestock**		**Environmental subsidies**		**LFA subsidies**		**Decoupled payments**		**Other subsidies**	
State	2004	2012	2004	2012	2004	2012	2004	2012	2004	2012	2004	2012
Belgium	27.5	0.5	51.5	14.8	4.7	7.6	1.8	1.9	0.0	63.7	14.5	11.6
Bulgaria	-	3.7	-	7.5	-	5.3	-	3.9	-	65.6	-	14.0
Cyprus	54.6	0.0	32.7	9.0	0.0	22.1	0.0	8.6	12.7	53.5	0.0	6.8
Czech Republic	21.4	0.2	8.1	2.5	6.8	14.5	14.9	9.1	35.5	58.3	13.3	15.3
Denmark	74.3	0.1	18.8	1.3	3.9	2.1	0.1	0.1	0.0	90.3	2.9	6.0
Germany	56.2	0.4	18.8	0.3	10.6	9.1	5.4	4.0	0.0	77.1	9.1	9.1
Greece	72.1	9.1	18.2	1.3	0.1	1.5	7.9	6.7	0.0	73.6	1.6	7.7
Spain	65.5	6.9	27.0	8.0	1.3	5.7	2.8	3.8	0.0	73.3	3.4	2.3
Estonia	17.4	0.0	13.2	2.5	31.3	27.8	9.0	4.8	25.5	47.6	3.5	17.3
France	59.0	3.9	26.2	9.5	6.1	4.4	4.8	5.5	0.0	72.2	3.9	4.5
Hungary	32.8	4.3	9.2	5.0	0.1	17.2	0.2	0.8	35.7	62.3	22.0	10.4
Ireland	7.8	0.0	62.1	1.4	14.0	14.5	13.5	9.6	0.0	72.1	2.6	2.5

Italy	74.7	2.6	14.9	1.4	5.6	10.3	2.2	5.1	0.0	76.3	2.6	4.3
Lithuania	22.3	0.0	11.0	4.1	0.0	1.8	27.3	9.6	27.4	63.8	12.0	20.7
Luxembourg	17.7	0.0	29.6	0.1	20.5	20.2	25.7	20.2	0.0	44.3	6.4	15.2
Latvia	28.3	0.2	19.2	13.1	8.0	15.8	19.6	13.1	14.1	37.6	10.8	20.2
Malta	10.1	9.9	58.1	0.0	1.9	8.6	9.3	20.6	0.0	60.2	20.6	0.6
Netherlands	38.7	0.0	43.4	0.7	13.8	9.4	0.0	0.4	0.0	77.8	4.1	11.7
Austria	23.1	2.4	18.5	4.0	40.7	34.6	13.8	14.5	0.0	36.6	4.0	8.0
Poland	54.8	1.5	0.1	0.9	0.2	7.4	1.1	7.0	35.9	58.6	7.9	24.6
Portugal	34.6	8.8	35.8	19.2	13.6	10.1	12.8	15.1	0.0	42.6	3.1	4.2
Romania	-	0.7	-	5.2	-	3.1	-	1.3	-	61.4	-	28.3
Finland	23.1	6.0	33.5	20.1	19.5	21.9	21.2	26.3	0.0	22.9	2.8	2.8
Sweden	41.8	0.0	27.7	4.3	21.4	25.8	5.5	8.5	0.0	60.0	3.7	1.4
Slovakia	11.4	0.0	3.4	3.0	0.0	10.1	36.4	18.4	43.3	62.8	5.4	5.6
Slovenia	14.0	0.2	27.0	3.9	28.9	23.1	22.1	15.3	0.0	44.5	8.0	13.1
United Kingdom	36.3	0.0	45.2	0.8	7.5	17.2	6.1	3.2	0.0	77.3	5.0	1.5
Average	***36.8***	***2.3***	***26.1***	***5.3***	***10.4***	***13.0***	***10.5***	***8.8***	***9.2***	***60.6***	***6.9***	***10.0***

Source: FADN, own results

The starting extent of direct payments (subsidies on crops, subsidies on livestock, decoupled payments) for NMS was determined at 25 % in 2004 with 5% growth up to 2007 (40 %) and further 10% annual growth with the possibility of paying off from national resources right to 30%. Table 4 illustrates a gradual start of direct payments on the example of the CR and a real share of direct payments per ha of Utilised agricultural area towards the EU average (including NMS) and towards Germany´s average. Direct payments in NMS (except Malta and Cyprus) reached the EU average in the monitored period only in Slovenia.

Table 4 Conditions for gradual start of direct payments NMS

Year	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Share of direct payments from the EU	25%	30%	35%	40%	50%	60%	70%
Maximum top up from national resources (Top-up)	30%	30%	30%	30%	30%	30%	30%
Totally	55%	60%	65%	70%	80%	90%	100%
Real share of direct payments in the CR towards the EU average	41%	55%	63%	41%	53%	59%	69%
Real share of direct payments in the CR towards the DE average	34%	46%	49%	30%	38%	43%	52%

Source: FADN, own results

The Relationship of Operational Subsidies and Other Derived Indices

Table 5 contains correlation coefficients of the relation of operational subsidies and other derived indices. These indices are in the relation:

$$\frac{\text{Total outputs}}{\text{Operational subsidies}} \times \frac{\text{Operational subsidies}}{\text{Total inputs}} = \frac{\text{Total outputs}}{\text{Total inputs}}$$

Based on the results of the correlation matrix (tab. 5) the following conclusions can be drawn:

- neither the share of output on subsidies (r = -0.004) nor cost productivity(r = 0.06) d depend on the extent of operational subsidies
- higher subsidies per ha will occur only very slightly in a higher share of subsidized costs (r = 0.17)
- the share of output on subsidies influences the cost productivity very slightly (r = 0.24)

- the share of subsidized costs is in a very slight correlation relation with the cost productivity (r = -0.06)
- the share of output on subsidies is in a strong negative dependence on the share of subsidized costs (r = -0.72)

Table 5 Correlation matrix of monitored indices

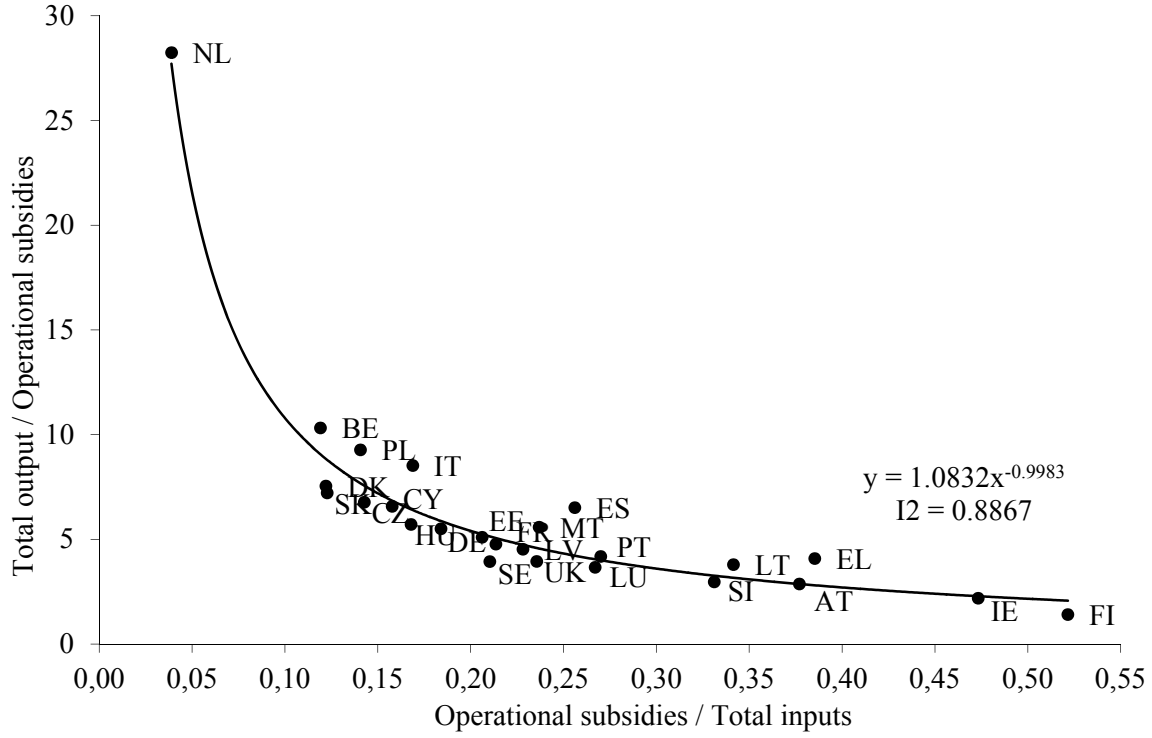
Variable	**Operational subsidies**	**Total output/ Operational subsidies**	**Operational subsidies /Total costs**	**Total output/ Total costs**
Operational subsidies	1	-0.004	**0.17**	0.06
Total output / Operational subsidies	-0.004	1	**-0.72**	**0.24**
Operational subsidies / Total costs	**0.17**	**-0.72**	1	-0.06
Total output / Total costs	0.06	**0.24**	-0.06	1

* red marked correlations are significant at p < 0,05, N=237

Source: FADN, own results

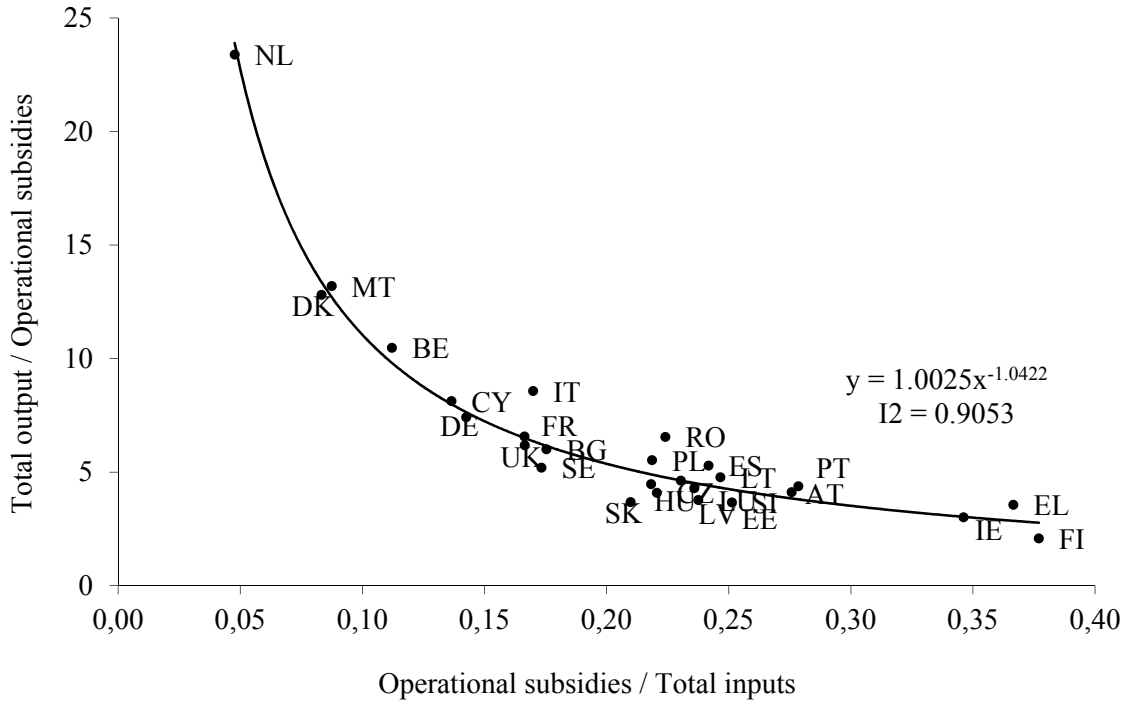
The relationship between the share of subsidized costs and output towards subsidies explains non-linear power function (fig. 1 and 2), where in 2012 the determination index was I^2 = 0.91. The highest share of subsidized costs in 2012 shows Finland (0.38) and Greece (0.37), where the output of 2.08 EUR (Finland or 3.56 Greece) falls on 1 EUR of accepted operational subsidies. Another group is formed by states Spain, Slovakia, Poland, Portugal, Hungary, the UK, the CR and Baltic republics. Here the share of subsidized costs is lower and the output falling on subsidies higher, e.g. the CR´s subsidized costs make 22% and the share of output in subsidies makes 4.09. A lower share of subsidized costs with their higher effectivity is characteristic for states Belgium, Holland, Luxembourg, Cyprus, Austria, Slovenia, France, Sweden, Italy, Denmark, Germany and Ireland.

Figure 1 The relationship between the share of subsidized costs and production in subsidy in 2004



Source: FADN, own results

Figure 2 The relationship between the share of subsidized costs and production in subsidy in 2012



Source: FADN, own results

4 Conclusion

The aim of the article was to analyse operational subsidies in the EU countries. Together with investment subsidies and other possible measures, they are the basis of CAP, which is financed from the EU budget. Although its share in the budget has decreased lately to approx. 40%, it still represents the key EU policy. Using standard output of FADN EU figures in 2004 – 2012 enabled us to draw particular conclusions. The linkage of paid out operational subsidies related to area value of Utilised agricultural area is obvious – the co called decoupling occurs (i.e. breaking away of subsidies from output). It unambiguously implies the diversion from particular crop or animal support (vegetable or animal production), whose share in total operational subsidies dropped on average from about 63% in 2004 to not quite 8% in 2012, in fact the share is converse here, i.e. from about 9% in 2004 to about 60% in 2012.

Comparing the development from 2004, we can see that the area value of an average company increased by more than 10% in most original member states, in the Baltic countries and Poland (from NMS). A drop of area value of an average company happened in Slovakia, Cyprus, Hungary, Malta, and the CR, and Slovakia and the CR are countries with the biggest area value of an average farm and also with the biggest share of rented land.

The average extent of subsidy in the EU shifted from 305 €/ha in 2004 to 341 €/ha in 2012. The median shows an average growth rate of 1% annually and the variability of subsidies compared to production and costs is the lowest and proves a dropping trend. The subsidy range has a dropping trend over time and the values of minimum and maximum draw near each other during the monitored period. Naturally, in the first years of the EU enlargement new member states had a lower starting value, which caught up gradually. Among the least subsidized states both at the beginning and the end of monitoring we can rank Lithuania, Latvia, and Estonia. On the other hand, Malta, Finland, and Greece traditionally rank among the most subsidized states. The biggest growth of operational subsidies in the monitored period happened in Slovakia, the CR, and Poland, yet still neither Slovakia nor Poland reached the EU average. Contrary to 2004, there was a drop in subsidies per ha only in Malta, Austria and the UK.

The correlation analysis implies that neither the share of subsidies in production nor the productivity defined as the share of costs in production depends on the extent of operational subsidies. Increasing subsidies per ha of Utilised agricultural area will not occur in a higher productivity of costs and only very slightly it will occur in a higher share of subsidized costs. The share of output in subsidies influences the productivity of costs very slightly and the share of production in subsidies is in a strong negative dependence on the share of subsidized costs.

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Session 8

Economic Impacts of Changes and Policies in the Fields of Finance, Accounting and Taxation

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Comparative Analysis of the Health Insurance System in the Czech Republic and Slovakia

Tereza Schusterová, Jarmila Rybová

Abstract: *The aims of this article are to compare and evaluate the health insurance systems of both countries, as well as to identify those factors that may possibly explain the differences. It is also the intention to examine how these factors and differences can influence the future development of both systems.*

Key words: health insurance system · legislative changes · Czech insurance system · Slovak insurance system · Czech and Slovak comparison

JEL Classification: I13

1 Introduction

The current system of health insurance in the Czech Republic and Slovak Republic are based on the common roots from times when Bohemia and Slovakia formed one state. The basic principles of organization and the financing of health care have remained the same since the division. However, some aspects of the two systems differ. The financing is based on compulsory public health insurance in both countries. The number of insurance companies is different. There are eight insurance companies in the Czech Republic and three in Slovakia. Risks by age and sex of the insured are balanced among health insurers in both states.

The costs of insurance and assessment bases are different in both countries. Differences are subsequently reflected in macroeconomic indicators as total health expenditure to GDP or total health expenditure per capita per year (USD PPP).

Geographical, historical and cultural similarities of these two countries allows for the mutual transfer of experience in the application of health insurance and cooperation between the two countries, etc.

The aims of this article are to compare and evaluate the health insurance systems of both countries, as well as to identify those factors that may possibly explain the differences.

2 Literature Review

OECD (2010, p. 9-12) informs us that many health indicators, including population health in Europe, have improved in the last decade. The growth of GDP increases life expectancy and other factors, while pointing out the shortage of doctors and nurses. Risk factors are the dependence on alcohol, tobacco, overweight and obesity.

Bartak (2013) compares the health systems fo different countries of the WHO European region including the Czech Republic and Slovakia. The publication followed indicators of population, gross national income per capita, life expectancy at birth for men and women (in years), the probability of dying before their fifth year (per thousand live births), the probability of death between the 15th and 60th years for men and women (per thousand inhabitants), the total expenditure on health per capita to the year 2009 in US dollars converted at purchasing power parity and total expenditure on health as a % of GDP up to the year 2009. Czech Republic usually achieves better results than Slovakia.

Health Minister Svatopluk Němeček in a press release of the Ministry of Health said: „Quality health care has extended the life span of men by 7,5 years for women by 5,5 years. Now we have to focus on the extension of healthy lifestyles. No economy can afford to finance the long-term costs associated with unhealthy lifestyles and the resulting illnesses. Therefore, for me, prevention and the support program Health 2020 are one of the key priorities. The most important thing is to make people realize what most affects their health, better eating habits and a healthy lifestyle. If, as a result, we succeeded in reducing the incidence of lifestyle diseases by 5%, health care could generate savings of up to $ 10 billion per year and the contribution to GDP would be another $ 10 billion."

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The press release goes on to say that population health is most influenced by lifestyle choices, especially obesity, lack of physical activity, smoking, alcohol consumption and the high consumption of salt. An important role is also played by new problems such as antibiotic resistance an increase in the incidence of whooping cough and HIV positivity in connection with the disproportionately rising costs of health and social care.

Hovorka, J. (2015) reports that the Czech Republic has proposed an amendment, according to which by the end of 2016 all insurance accounts will be transferred into the Czech National Bank. The Ministry of Finance would then be partially able to economize their money and thereby slow the growth of government debt. However, the health insurance companies have rebelled and refuse to transfer their accounts to the central bank. The Ministry of Finance would like, with the money from health insurers, to improve the performance of the Czech state. In the case of transferring the accounts of insurance to the CNB, the ministry could partially manage money for health insurance. However, insurance companies will not have funds at their disposal because funds deposited with the CNB will be restricted. The principle of financing health care through health insurance, according to the Ministry of Finance, remained the same. Furthermore, health insurance companies will lose the interest payments that bring them money when their money is deposited in banks other than the CNB.

3 Results

Although both systems are evolving separately, it is possible to find a number of common elements for both health insurance systems in the Czech Republic and Slovakia. There may be many reasons, e.g.. neighbour countries, similar to the level of health care and more.

It is possible to examine the differences and similarities of the two health insurance systems from different perspectives. For example, it is possible to consider the views of stakeholders and in terms of income and expenditure in the system, etc.

The results of the comparison are divided into two parts. The first part consists of comparing the conditions on the part of the collection of premiums, i.e., assessment bases, rate and method of payment of premiums. The second part is devoted to the total expenditure of health insurance in the Czech Republic and the Slovak Republic. Data are presented for the period 2000-2009.

Choosing health insurance in CZ and SK

The vesting period is different between the two countries only in the case of employees. The relevant period is the calendar month in the Czech Republic and the calendar year (as well as for the self-employed) in the Slovak Republic. The payment of health insurance premiums from monthly gross salary is a prepayment in the Slovak, unlike the Czech Republic. Overpayment or underpayment of advances should be balanced. The calculation basis is the gross wage in both countries.

The assessment base of the self-employed is similar in both countries. The calculation basis of 50% of the difference between income and expenditure is applied in the Czech Republic as well as in Slovakia. Persons who receive income from profit sharing in Slovakia lay down the basis of assessment in the amount of taxable income. Health insurance is used for the payment of dividends and won over 350 Euro. In the Czech Republic health insurance is not collected in these cases. The spectrum of income that are the basis of assessment for insurance is wider in Slovakia than in the Czech Republic.

Table 1 Premium rates of health insurance in the Czech Republic and Slovakia in 2015

	Czech Republic	**Slovakia**	
	All payers	**A person without a disability**	**Disabled person**
Employer	9%	10%	5%
Employee	4.5%	4%	2%
Self-employed	13.5%	14%	7%
State	13.5%	4%	4%

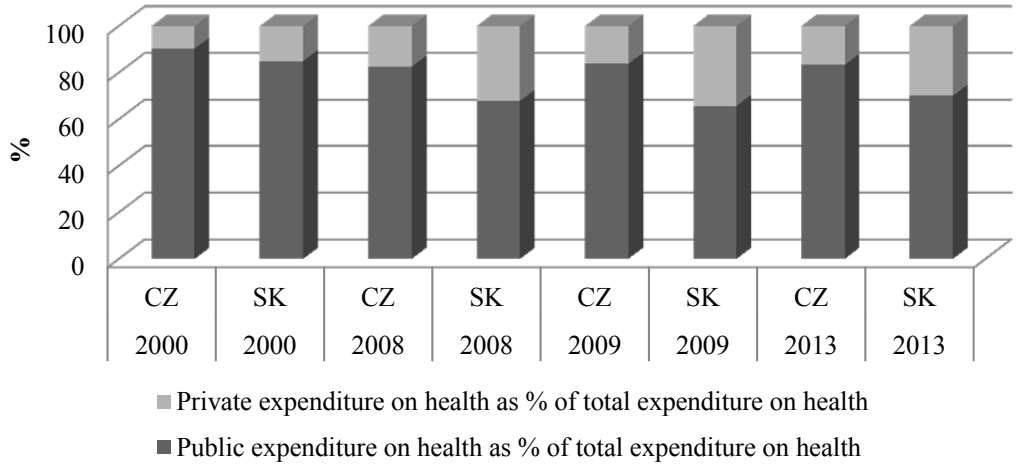
Source: Czech Republic - Health Insurance Act no. 48/1997 Coll., Slovakia - Health Insurance Act no. 580/2004 Coll.

Levels of premium rates are similar in both countries and they are used to calculate the amount of the premium from assessment base.

The total expenditure of health insurance in the Czech and Slovak Republics

Total and public expenditure on health insurance are generally higher in the Czech Republic than in Slovakia. The following chart contains the years 2008 and 2009. In those years, private expenditure accounted for the highest share of total expenditure for the period under review.

Figure 1 The proportion of public and private spending in the Czech Republic and Slovakia in the year 2000, 2008, 2009 and 2013



Source: http://apps.who.int/gho/data/node.country.country-SVK?lang=en

On the other hand, indicators of public health such as life expectancy, lower probability of dying before their fifth year, are also better in the Czech Republic than in Slovakia. Data were available only until 2013 when processing the article.

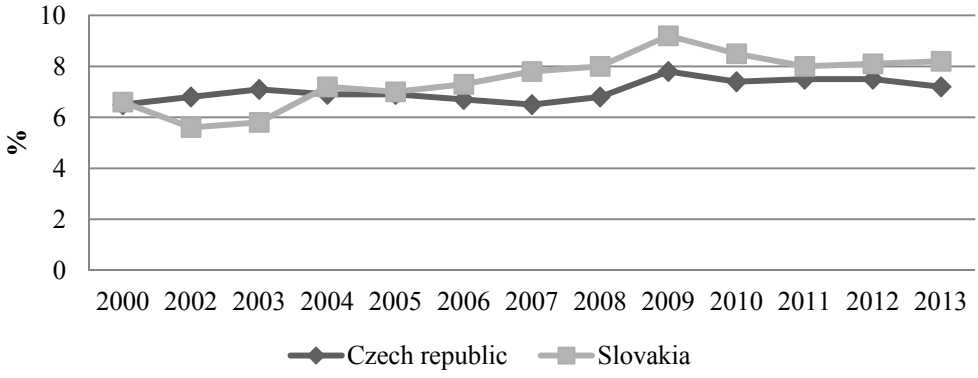
Table 2 Indicators of the health insurance in the year 2013

Indicators	Czech Republic	Slovakia
Number of citizens	10,702,000	5,450 000
National gross revenues per person (US $ PPP in the year 2012)	24,980	24,740
Total expenditure on health per person per year (US $ PPP)	1982	2147
Total expenditure on health as % of GDP	7.2	8.2
The share of health insurance to finance health care (%), the rest is private spending	83,3	70

Source: World Health Observatory. Available: http://apps.who.int/ghodata/?theme=country

Total expenditure on health as a % of GDP are lower in the Czech Republic than in Slovakia. This is probably due to lower levels of GDP in the Slovak Republic. This indicator is affected by the economic recession in both countries in the period 2008-2010. The level of economic recession was different in each of these countries.

Figure 2 Total expenditure on health as % GDP in the Czech Republic and Slovakia in the period 2000-2013



Source: http://www.oecd.org/policiesanddata/oecdhealthdata2012-frequentlyrequesteddata.htm

4 Conclusions

Both countries have a system of health insurance relatively similar. Differences are mainly in the different assessment bases breadth and level of rates. Indicators of the health of the population are better in the Czech Republic than in the Slovak Republic. Czech Republic has higher public spending on the health insurance system. The health insurance system in the Czech Republic applied more redistribution effects than in Slovakia, where the system implies a higher proportion of private payments. The disposable incomes of the poorest people in the Czech Republic are less burdened than in the Slovak Republic. Could this paradoxically lead to higher individual care of their health in Slovakia?

The economic recession in both countries was reached in the year 2008 and 2009. Growth in the share of private expenditure in total expenditure on health can associate with these events. This increased the share of private expenditure since 2009 lasts until 2013.

According to recent trends that have been identified, it can be expected that the share of private expenditure will grow in the coming years. This situation could become critical for the poorest people in the future. Another problem is the aging population and the increasing proportion of retirees. This will increase the burden on public budgets. You will need to be gradually modify the health insurance system, eg. an extention of the assessment base and increasing the premium rates for the economically active population. It may also consider limiting the scope of primary health care.

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Czech Republic: *Health Insurance* Act no. 48/1997 Coll.

Slovakia: *Health Insurance* Act no. 580/2004 Coll.

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Financial and Accounting Issue in the Selected Area of Public Transport

Martin Telecký

Abstract: *The Road Transport Act No. 111/1994 Sb. divides the transport into the national, international, public, private, passenger and freight transport.*

The paper discusses the national public passenger transport or, more precisely, the public line transport and urban public transport (the trolleybus transport and the tram transport are governed by Railway Act No. 266/2004 Sb.). Passenger public transport is an integral part of the national economy and fulfils the important function – to ensure transportation of passengers and goods. It requires a good quality transport infrastructure, suitable means of transport, labour, fuel and energy. The performance and contribution of the passenger public transport must be monitored both financially and technically, technologically and, last but not least, environmentally. In doing so, not only the financial accounting, but especially the management accounting can be helpful.

The paper presents the basic legislative rules, method of calculation of the provable loss and adequate profit in accordance with the Act on Public Transport, Subsidy System and the Method of Financing Provable Loss from the Public Budget. The accounting issue of passenger public transport in the double-entry accounting will also be analyzed. The calculation of the demonstrated loss and adequate profit will be exemplified on the report on costs and sales in the public line transport as well as based on the deficiencies of the explanatory power of this report. Then, the structure of costs in the internal accounting and the basic structure of sales in the public line transport will be analyzed. Finally, the paper draws attention to the removal of the above deficiencies which are valid in the new regulation on the procedures for establishing the financial model and determining the maximum amount of compensation. The new regulation suggests more detailed structure of the report of costs and revenues coming from transport activities; the basic report for calculation of provable loss and adequate profit is, however, the same. Some changes to this structure will be recommended.

This paper is a part of the doctoral thesis which is being prepared. The presented part focuses on the review of the applicable legislation in the course of time and in relation to the trends, worsening or improvement of the explanatory power of the reported values for the financial analysis. It specifically concerns the economic issues in the national public passenger transport, the accounting issue, the method of calculation of the provable loss and the adequate profit upon the statement of costs and revenues from the transport activities. Then, the insufficient explanatory power of this statement is pointed out. Finally, the attention is paid to the elimination of drawbacks which stem from the new regulation. The modification of the accounting document structure is also proposed.

Key words: Public line transport · urban public transport · provable loss · adequate profit

JEL Classification: M41

1 Introduction

The basis for determining the problem is the method of calculating the provable loss and the adequate profit in the public transport in the Czech Republic. The method of calculation, including the accounting records, is currently carried out pursuant to Regulation No. 493/2004 Sb., which ceased to be in force. In case of the currently applicable Regulation No. 296/2010 Sb. there is a problem in individual cost assessment. Some public transportation companies are forced to follow the Regulation No. 493/2004 Sb. due to the effect of the public service contract made with the clients. On the other hand, where new selection procedures happened, the contractual relation is already dealt with in line with Regulation No. 296/2010 Sb. This paper analyzes the issue of insufficient explanatory power of the Regulation No. 493/2004 Sb. and compares it with the valid Regulation No. 296/2010 Sb. on the procedures for establishing the financial model and determining the maximum amount of compensation. Basic reports on the transportation activities of both regulations are provided for. They are slightly different in their form and content. At the conclusion, the recommendations are provided to improve the explanatory power of the valid Regulation No. 296/2010 Sb.

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2 Methods

Fundamental legislative framework of the public transport:

- Road Transport Act No. 111/1994 Sb., as amended;
- Railway Act No. 266/1994 Sb., as amended;
- Regulation of the Ministry of Transport No. 241/2005 Sb. on the provable loss in the public track-based passenger transport and the definition of the parallel public passenger transport (in relation to the contracts concluded with the carriers);
- Decree of the Czech Republic Government No. 493/2004 Sb. regulating the provable loss in the public line transport and establishing the method of exercise of the professional government supervision in the road transport over funding of the traffic services;
- Regulation (EC) No. 1370/2007 of the European Parliament and of the Council of 23 October 2007 on public passenger transport services by rail and by road, which came into force on 3 December 2009;
- Act No. 194/2010 Sb. on public services in the passenger transportation and on amendment to some other laws;
- Regulation No. 175/2000 Sb., on the transportation code for the public passenger track-based and road transport;
- Regulation No. 388/2000 Sb. on timetables in the public passenger line transport;
- Regulation No. 478/2000 Sb. implementing the Road Transport Act;
- Decree of the Czech Republic Government No. 63/2011 Sb. on establishing the minimum values and indicators of the quality and safety standards and on the method of their proving in the context of providing the public services in the passenger transport;
- Regulation No. 296/2010 Sb. on the procedures for establishing the financial model and determining the maximum amount of compensation.

The above set of legislative rules gives rise to relatively benevolent conditions to carry out the traffic services. As a result, the essence of traffic services is understood in a different way. This is demonstrated by very different methods of organizing the public transport within the traffic services in individual regions of the Czech Republic.

Indicators and trends

Traffic services are characterized by Act No. 194/2010 Sb. on public services in the passenger transport. Traffic services refer to the public services satisfying the basic transportation needs of the citizens, i.e. assuring the transportation to schools, jobs and healthcare facilities, and satisfying the cultural, societal and recreational needs on an every-day basis.

The carrier undertakes

- To transport the passengers using the public means of transport on a continuous and regular basis according to the approved timetable and to ensure other additional transport services,
- To transport the passengers even under the special pricing conditions, such as providing all discounts arising from individual legal rules,
- To transport the passengers for a regulated price.

The provable loss in the public regular transport services is addressed in the Regulation of the Ministry of Transport No. 493/2004 Sb. **The provable loss** is characterized as the difference between the **sum of economically substantiated costs** and the **adequate profit** and **between the earned receipts and revenue**. The provable loss is covered from public budgets (of municipalities and regions); more exact terms and conditions for payment of the loss are provided in the public service contract concluded between the client and the carrier. Under this contract, the provable loss may be paid out as advance payments for every quarter provided that the preliminary report of costs and revenue from the transportation activity in the public line transport is made. These financial means designed to cover the provable loss cannot be used for any other business purposes. In my opinion, the method of provable loss calculation is difficult especially in the track-based transport.

Regulation No. 493/2004 Sb. defines the "adequate profit" term. Under the contract, the carriers are allowed to pay out the adequate profit, which is designed for the renewal of vehicles in the public line transport and the urban public transport (buses) only. As the provable loss, the adequate profit cannot be spent on any other business purposes. It is understood as an option of obtaining the financial means (resources) for the rolling stock renewal.

The adequate profit is defined as follows: "The amount calculated as the sum of the amount which after taxation and a minimum allocation to the mandatory funds does not exceed 1/8 of the price of buses used, as a rule, for the public line transport by meeting the public service obligation, and the amount which does not exceed the share of the price of investment related to the operation of the public line transportation corresponding to the service life as per the special law provided that the transportation authority (client) has given consent to inclusion of these investments into the calculation of the provable loss."

Basic calculation of the adequate profit:

$[(\frac{Number\ of\ buses\ \ x\ bus\ price}{8} - depreciation\ of\ the\ buses)/coefficient]$ - earmarked subsidy from the state budget and the client´s budget for the purchase of buses;

The coefficient is calculated as follows: $\frac{100-\%\ of\ income\ tax}{100}$. The coefficient is used for the needs of including the corporate income tax.

Figure 1 Provable loss in the public line transport

	Public line transport - actual values as of 31/12/201x	
Number of buses (pcs)		
Mileage (thousand km)		
Average price of buses (thousand CZK)		
Total company´s own costs (thousand CZK)		
Costs per 1 travelled km		
Sales from transportation (excl. VAT) (thousand CZK)		
Sales per travelled kilometre for a regular passenger transport		
+Profit/-Loss (thousand. CZK)		
Income tax rate (%)		
Depreciation of buses (thousand CZK)		
Leasing instalments (thousand CZK)		
Subsidies to purchase a bus (thousand CZK)		
Adequate profit (thousand CZK) including the income tax		
Adequate profit per 1 km, including the income tax		
Adequate profit (thousand CZK), excluding the income tax		
Adequate profit per 1 km, excluding the income tax		
Provable loss (thousand CZK)		
Provable loss / 1 km		
Price of transport performance / 1 km		
Income tax		

Source: author

Under the new regulation, the carriers are obliged to submit more detail reports for review. These reports will be then used in the final calculation of the provable loss and the adequate profit. The carrier, thus, cannot include in the calculation those factors which would overestimate the amount of provable loss and the adequate profit. The report contains the basic data needed for this calculation.

The Regulation No. 296/2010 on the procedures for establishing the financial model and determining the maximum amount of compensation supersedes the term "provable loss and the adequate profit" by the term "amount of compensation."

The maximum amount of compensation will be calculated in the same way as the adequate profit, however, the requirement of the maximum permissible rate of return per the capital (see below) must be met.

Paying of the adequate profit to a specific carrier especially depends on the amount of possible funds from the public budgets.

The carrier must present the following documents to the client:

- Method of calculation of the indirect costs (overheads) dissolution (mostly, the costs of administration);
- Method of calculation of the dissolution of other costs of the public line transport, especially the energy, wages, repairs, etc.,
- Bus performance statistics per a unit of performance (kilometre);
- Ticket sale statistics to find out the actual value of sales,
- Necessary documents on the purchase directly related to the direct costs, i.e. fuel, tyres, wages, insurance, etc.
- Method of direct cost calculation,
- Annual report, profit and loss account, balance sheet, report on the costs and revenue from the transportation activity, and the like.

Under the new regulation, the carrier is required to submit to the client all information on the situation of its assets related to providing the traffic services, the performance and all activities. The carrier is thus more intensively controlled and the more demanding requirements are applied than in case of the previous regulation. Even this procedure is, however, insufficient to identify the costs in the track-based transport.

The report contains the basic division of costs and sales from the transport activity pursuant to Act No. 493/2004 Sb. on the provable loss.

The sales and revenue from the transport activity are provided in the amounts excluding VAT. The sales are divided into:

- Sales from transportation (sales obtained from the passengers - fare)
- Other sales (revenue from the sale of timetables, fines collected from passengers, revenue from the sale of buses, extraordinary revenues, etc.)
- Sum of sales = total sales

Pursuant to Regulation No. 296/2010 Sb. on the procedures for establishing the financial model and determining the maximum amount of compensation, the sales are divided as follows:

- Sales from the fare (sales obtained from passengers – fare)
- Other sales from transportation (sales from the luggage transportation, other surcharges for failure to meet the transportation code)
- Other revenue (revenue from the sale of the fixed assets is not included; pursuant to the agreement in the "contract", we can include the revenue from the sale of assets in case of the leaseback transaction which can accrue throughout the leasing period).

The economically substantiated costs pursuant to Regulation No. 493/2004 Sb. on the provable loss are classified as follows:

- **Fuel** – consumption of fuel, consumption of diesel, oil, gasoline, lubricants for the mileage in the bus line transport for the whole accounting entity
- **Rubber rims** – new tyres, inner tubes, valves, etc.
- **Other direct material** – spare parts, electric parts, cleaning and washing detergents, anti-freezing mixtures, uniforms, protective aids, common repairs (it is a direct material directly consumed for the buses)
- **Direct wages** – wages of drivers, inspectors, guards/conductors, cleaning staff, cash desk personnel, technical and economic staff, etc.
- **Depreciation of buses** – depreciation of the buses, tangible fixed assets which are directly associated with the bus line transport, depreciation of the capital goods related to the information system of the pre-sale of tickets; the accounting entity will determine the procedures for the fixed assets depreciation and will set the depreciation rates by itself (as per the performance, in terms of time, etc.).
- **Means of transport leasing** – lease instalments for the means of transport, equipment related to the operation of the public line transportation, cost of down payment
- **Repairs and maintenance of buses** – external repairs quantified upon individual invoices, their own repairs
- **Road tax** – buses providing the internal national transport are exempt from the road tax
- **Third party liability insurance** – it is the statutory insurance and the collision insurance related to the bus line transport

- **Fare** – travel costs pursuant to the Transport Compensations Act
- **Payments to the funds** – social security insurance, contribution to the State employment policy and the premium paid for the general health insurance
- **Overhead costs** – costs directly related to the bus transport operation and the regular line transport operation; the accounting entity must determine the method of the overhead cost dissolution in the contract (as per the mileage, number of drivers and vehicles, or based on the operating costs).

Prior to making the contract, all cost items directly related to providing traffic services must be discussed.

Pursuant to Regulation No. 296/2010 Sb. on the procedures for establishing the financial model and determining the maximum amount of compensation, the initial financial model must be established prior to making the contract and all prerequisites and the expected development must be known so that the net income is not negative. Unless this factor is known prior to making this contract, the following can be included in the initial and actual costs:

Costs spent to achieve, ensure and maintain the income which, under the Income Tax Act, is directly related to providing the traffic services (obligation under the contract) except for:

  - Tax depreciations pursuant to the Income Tax Act (only the accounting depreciations apply)
  - Gifts
  - Amortised cost of the sold or disposed tangible fixed assets and intangible fixed assets
  - The costs spent on promoting which does not arise from the public contract service.
- Costs spent on meeting the obligation under the contract – travels to shunt, park or pass through
- Instalments as the costs related to the lease of the goods with the consequent purchase right (leasing)
- Provisions and depreciation of bad debts when ensuring the execution of the obligation under the contract
- Damage not caused by the carrier, not covered by the insurance benefit
- Costs of promoting the carrier´s own services under the contract
- Instalments to the leasing company for the things (in case of the leaseback only)
- *Costs of the means of transport operating reserve to the amount of 15 % of the rolling stock necessary to ensure the performance under the contract*
- Remuneration for the carrier´s board members (the remuneration for each individual, however, must not exceed six times the average monthly salary for the national economy always in December of a previous calendar year according to the Czech Statistical Office)

Pursuant to Regulation No. 296/2010 Sb., each carrier is required to recognise all of its operating assets before making the contract. This necessity was directly required in Regulation No. 493/2004 Sb. The reason for recognising operating assets is a new requirement for not exceeding the maximum permissible rate of return per the capital, being **7.5%** annually from the operating assets. The maximum permissible rate of return per the capital is calculated as a share of net income and the value of operating assets under the public service contract. Only the value of operating assets in the amortised cost at the end of the immediately preceding accounting period will be included in the operating assets. In my opinion, this condition is satisfactory as the maximum amount of compensation is established in this way. Upon the amortised cost the client receives the information on the age of rolling stock and, finally, provides higher compensation for the renewal of the older rolling stock with partially new vehicles. The requirement for not exceeding a maximum permissible rate of return per a capital, however, must be met. In practice, the amount of compensation (adequate profit) of approximately 2 % is paid out, but not in case of the urban public transport.

Included is:

- Tangible and intangible fixed assets arising from the public service contract.

Not included is:

- Tangible and intangible fixed assets in progress
- Advances paid for the tangible and intangible fixed assets in progress
- Valuable rights and goodwill according to another legal regulation
- Assets or part of the assets procured using the subsidy

The transportation companies must use the assets which are always procured and recorded as their property. Advances for the tangible and intangible fixed assets do not provide any information on the amortised cost of the assets.

To calculate the adequate profit, it is necessary to determine the exact amount of depreciation and the average prices of buses providing the traffic services.

If the assets are leased, the carrier may include only the first extraordinary instalment to the leasing company in the operating assets and reduce its value evenly throughout the leasing period. In case of the leaseback, the assets must not be included in the operating assets. If the assets are sold to the leasing company and then leased again in the form of leasing, the accounting entity will not own these assets. The accounting entity, on the other hand, will post this transaction in the Other revenue item.

Figure 2 Report on the costs and revenue from the transport activity pursuant to Regulation No. 493/2004 Sb.

Item		Line	**Public line transport**		**Public line transport**	
			Actual values as of 31/12/201x			
			Total thousand CZK	**CZK/km**	**Total thousand CZK**	**CZK/km**
Fuel, oils		1				
Rubber rims		2				
Other direct material		3				
Direct wages		4				
Buses in total	Depreciation	5				
	Rental/leasing	6				
	Repairs and maintenance	7				
	Road tax	8				
	Insurance (statutory, collision)	9				
Other direct costs	Fare	10				
	Payments to the funds	11				
	Any other direct costs	12				
Overhead costs		13				
Total operating costs		**14**				
+Profit/-Loss						
Sales	**Total**	**15**				
	Sales from transportation	16				
	Other sales	17				
Payment of operational loss	**in total sales**	18				
	From municipalities	19				
	From the Regional authority	20				
Loss paid from the pupils´ fare		20a				
Subsidies for the bus renewal		21				
Subsidies for the bus renewal (leasing)		21a				
Total discounts provided according to the Assessment of the Ministry of Finance		21b				
Performance of transport (in thousand passengers)		22				
Mileage (thousand km) (according to the timetable)		23				
Mileage (travels to shunt, park or pass through)		24				
Average occupation (persons)		25				
Number of buses		26				

Source: author

If the costs in the report on the actual costs and revenue in the public line transport are lower than in the initial financial model or if the revenue is higher, the accounting entity will return the different amount of compensation to the client and will transfer the difference into the next period as agreed in the contract. If the actual costs are, on the other hand, higher than in the initial financial model, only a half of the value from the different deviation will be paid. The contract may require the payment of the full amount compensation.

Accounting Issue of Transportation in the Tax Records and the Double-Entry Accounting System

Pursuant to the accounting law, the accounting entity must not keep more company´s accounting records unless the object of business activities is the operation of public services only. In the contract, the accounting entity may agree on the extent and keeping the internal accounting separately to avoid disputes about the amount of the provable loss. Other binding regulations include the measures of the Ministry of Finance of the Czech Republic.

Accounting entities are allowed to post their transactions in the dual-entry accounting system or in the tax records.

Keeping of tax records is governed by the Income Tax Act and must comply with the certain rules for the correct calculation of the income tax. A situation may happen when the carrier not only provides the public line transport as a public service but also provides the coach trips or freight forwarding. If so, it must efficiently record its transactions in the cash book and correctly separate the transactions not concerning the traffic services covered from the public budgets. This is, however, so complicated to do in practice that the amount of provable loss may be calculated improperly. It is recommended that the tax records are kept electronically in this case as the various activities of a particular carrier will be correctly separated. In the tax records, the entrepreneur posts its expense concerning the bus transport upon individual invoices or documents

3 Research results

Many carriers who have negotiated (made) the public service contracts follow the still valid Regulation No. 493/2004 Sb. After the contract terminates, however, a new contract must be made. This contract will already contain the new rules and conditions of payment of a maximum amount of compensation pursuant to Regulation 296/2010 Sb. The principle of paying the maximum amount of compensation is similar to that of the provable loss and the adequate profit, however, the older terms were replaced with the new ones, and the new rules and the new reports with newly divided costs and sales were created to determine the maximum amount of compensation. The Regulation No. 296/2010 Sb. requires more detail information on the carrier providing the traffic services to avoid unnecessary overestimating of the amount of compensation.The Regulation No. 493/2004 Sb. does not require these detail requirements; they, however, must be specified in the contract between the carrier and the client. Originally, the requirements were negotiated between the carrier and the relevant transport authority.

At present, they are negotiated between the carrier and the client (Regional Authority - Department of Transport and Road Management, or the transport coordinators which closely cooperate with regional authorities). The payment of the provable loss and the adequate profit (maximum amount of compensation) is mostly negotiated in the contracts and may deviate from the relevant regulation. This means that the rules and conditions may be stricter than in the particular regulation. The relevant regulations just explain or recommend the methods of solutions of given situations.

For the purpose of the financial analysis, the provable loss can be compared with the reported costs. What is the percentage of the provable loss based on individual types of costs (wage costs, overhead costs, etc.)? The provable loss appears to be a suitable item for calculating the financial health of the transport companies and will be analyzed in the next period.

4 Conclusions

The task was to compare two regulations which determine the amount of the provable loss and the adequate profit. The Regulation No. 493/2004 was superseded with the Regulation No. 296/2010 Sb., which already meets the European standards and requires more detail information on the accounting entity providing the traffic services. The advantage of the Regulation No. 493/2004 is not the requirement for not exceeding the maximum permissible rate of return per the capital, but the carrier obtains just a part of compensation under the terms and conditions of the contract. The accounting entity must present to the client the initial financial models including the initial cost and sales (revenue) and the report of operating assets and prepare the reports of actual costs and sales (revenue) at the end of the accounting period and resolve the deviations, if any. This will remove the risk of overestimating the cost items and increasing the net profit which is closely related to the amount of compensation. Most transport companies still have the valid public service contract pursuant to Regulation No. 493/2004 Sb. For the external users it would be good to specify in more details some cost and revenue items in order to make the explanatory power of the reports more efficient. The Regulation No. 296/2010 Sb. lays down the basic requirements upon which the maximum amount of compensation is calculated by means of establishing the initial and actual financial models. For calculating the net profit, it is necessary to know the amount of operating assets included in these reports. The regulation should, however, justify inmore detail why some items are not included in the total value of operating assets.

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Regulation No. 296/2010 Sb. on the procedures for establishing the financial model and determining the maximum amount of compensation.

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Cost Allocation in Economic Activity in a Sample of Accounting Entities

Marie Vejsadová Dryjová

Abstract: *The Act no. 563/1991 Coll., on Accounting presents the list of the selected entities. They are for example the contributory organizations, state organizational units, local government units etc. Based on the Income Tax Act, these selected entities must allocate their costs to different types of activities that are either the mission of a non-profit organization or economic activities. The system of cost allocation requires demanding administrative procedures An entity must allocate costs to different activities and within these activities to cost that are and are not subjected to the tax. Examples of common costs include electricity, rent, management of organizations, etc. An entity allocates common overhead costs appropriately by selected criteria, known as the allocation base. The paper discusses a possible formation of an allocation basis for costs common to all activities while noticing the appropriateness of using allocation bases with an impact on profit of non-profit organizations.*

Key words: non-profit organization · economic activity · allocation base · costs

JEL Classification: M41 · H72

1 Introduction

Non-profit organizations are characterized as organizations that were not founded or established for the purpose of profit. The Act no. 586/1992 Coll., on income taxes until the end of 2013 defined the term "a taxpayer (poplatník) who has not been formed or established for the purpose of business." Since 2014, the term has been replaced by a new one:"a public utility taxpayer (veřejně prospěšný poplatník)". By the Act no. 586/1992 Coll., on Income Taxes, a public utility taxpayer is a taxpayer who is engaged in an activity that is not a business, as their main activity. Simultaneously, the Act no. 563/1991 Coll., on Accounting refers to selected types of non-profit organizations (indicated by the Act on Income Tax as public utility taxpayers) as the selected entity and exhaustively presents their list. They are the state organizational units, state funds of budget rules, local government units, and voluntary associations of municipalities, Regional Councils, contributory organizations and health insurance companies.

Non-profit organizations are engaged in activities that they were founded or established for. These activities are known as the main activities. As reported by Maderová Voltnerová (2011), for an example of semi-budgetary organizations established by local authorities, their main activity should by defined to follow the major reason for establishing the organization. As within the main activities the entities do not profit (they do not improve their profit), as they provide their goods or services either for free or for a minimal fee, they are also engaged in additional complementary activities.

A complementary activity (as defined by the Act no. 250/2000 Coll., on Local Budget Rules) also defined as other activity (see the Act no. 218/2000 Coll., on Budgetary Rules) and economic activity (in the financial statement of Profit and Loss). As reported by Nováková (2013), it is also known as business and taxation activity. Whatever we call this activity the most important cause is the implementation of complementary activities. An entity (and even a non-profit organization) is treated as a business entity in complementary activities. This means that the additional activity is of an economic nature assessed by the achieved profit. For this reason, complementary activities become an important source of financing, which is intended to improve the main activity. The basic condition for the implementation of complementary activities (an entity can be engaged in more complementary activities) as outlined in Act no. 250/2000 Coll., on Local Budget Rules, is that the complementary activities must follow the main purpose. Additional activity thus makes use of economic resources and qualified personnel. At the same time, complementary activities should not undermine the main purpose of the organization. The reasons for the separate reporting of main and complementary activities are define by the Czech legislation:

- § 5, paragraph 2, point. a) of Decree no. 410/20009 Coll., which implements certain provisions of Act no. 563/1991 Coll., on Accounting, as amended;

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- § 55, paragraph. 1 of Act no. 218/2000 Coll., on Budgetary Rules and amending certain related acts, as amended;
- § 28, paragraph 5 of Act no. 250/2000 Coll., on Local Budget Rules, as amended;
- § 18a, paragraph 4 of Act no. 586/1992 Coll., on Income Taxes, as amended.

2 Methods

It is possible to say that there is the same definition for the cost in the selected entities (non-profit organizations) as for the costs in businesses. The only difference can be seen in the need or necessity for distinguishing costs according to the activities to which they are associated, and in connection with which the income incurs. The main activities include costs incurred for the purpose for which an entity was founded or established. For some types of costs it is not a problem to distinguish to which activity they should be allocated. The problem is within costs that are common to both activities, main and complementary. These common costs are also known as overhead costs. Jurajdová, Šelešovský (2004) report water, electricity, rent, telephone, maintenance, security, management of an organization and management costs, staff wages and other as examples of common costs. There is no obligatory way (based on legislation) to keying costs (matching costs to activities). An entity chooses its own method of cost allocation, which is embedded in an internal directive. There may be a lot of allocation methods and rules. For each activity a different method of allocation may be appropriate. However, the methods of allocation of costs in economic activities have one thing in common; they must be reasonable and justifiable, as reported by Marek and Bošková (1999).

By Rektořík (2007) the most common keys include number of bed-days, number of collected hours (the difference between members and non-members of a sports club), number of kilometres travelled (kilometres relative to the taxed and untaxed activity) and number of machine hours (items accounted for the main and complementary activities). The above mentioned are just few examples, there definitely are more methods of allocating costs to complementary activities. Král (2008) also reports that allocation of the costs of complementary activities is used in management decision-making as a tool in horizontal and vertical perspective of an organization. Marek, Bošková (1999) describe two basic methods of cost allocation in common costs that may also be combined - it is a factual approach and value approach to allocation of costs.

2.1 Factual approach

Factual approach is possible to be used in case if it is possible to divide different activities (complementary activities mostly). In such approach, a number of criteria are used. As a clear example of a library, direct overhead cost for its operation can be defined. Other examples include number of kilometres travelled in a journey log; number of hours worked in different activities; energy consumption in case of more electricity meters; time of phone calls by different lines or by phone records and other. In conclusion, a factual approach is chosen by an entity itself. Such approach should be implemented into the entity´s inner directives. .

2.2 Value approach

Value approach is used if it is not possible to use the factual approach – in case it is not possible to allocate costs (expenses) by a factual criterion. The most common case is in case that there are the activities at the same time and in the same premises. A possible, recommended way is defined in the Decree no. 410/2009 Coll., defining the content of the costs and revenues and results of operations in the financial statements. Entities are required to separately record costs, revenues, income for the main and complementary activities. However, if a part of the cost of the main activity is shared with the costs spent on a complementary activity and therefore it is difficult, in terms of the amount to be distinguished, an entity can allocate such costs as the ratio of the amount of income arising in a complementary activity to an income arising in the main activity, including a subsidy or allowance provided for this activity; always to the balance sheet date. This method is based on the distribution of indistinguishable cost in the same proportion in which taxable and non-taxable income from individual activities were achieved. According to this approach, undifferentiated cost is shared in the same proportion in which they revenues (yields) and expenditures (costs) for the activity were achieved.

3 Research results

This chapter highlights examples on options of specific criteria (allocation bases) for costs common to all activities and also describes the suitability of use of allocation bases with an impact on profit of an entity.

3.1 Factual approach

To show the factual approach of cost allocation, an entity (such as a region) is chosen. The entity owns a building where they repair machines for road maintenance (such as plough, tractors, broadcast spreaders, etc.). Two garages are also a part of the building. The garages are rented to natural persons. The carrying value of the building is 3.5 mil. CZK

and accounting is amortized for 20 years. Room designed for the repair of machines (this is the main activity) covers an area of 180 m^2 with a ceiling height of 8 m. Each garage has an area of 20 m^2 with a ceiling height of 2.5 m.

The following methods of cost allocation (depreciation of the building) by different criteria cause different amounts of costs allocated to the activities resulting from a different allocation base. This may cause some distortion of the allocation of income to such costs, affecting income from the main and complementary activities and even the change of the tax base when calculating the income tax. Table 1 reveals the allocation of the overhead costs of depreciation in case of choosing floor area as the allocation base.

Table 1 Allocation of the overhead costs for floor area as the allocation base.

Property	Area in m^2	Share in%	Depreciation in CZK
Machine repair (main activity)	180	81,8	143 150
Garages (complementary activity)	40	18,2	31 850
Total	220	100,0	175 000

Source: Own processing

Table 2 reveals the allocation of the overhead costs of depreciation in case of choosing building volume as the allocation base

Table 2 Allocation of the overhead costs for building volume as the allocation base.

Property	Volume in m^3	Share in%	Depreciation in CZK
Machine repair (main activity)	1 440	93,5	163 625
Garages (complementary activity)	100	6,5	11 375
Total	1 540	100	175 000

Source: Own processing

Table 3 classifies the difference in amount of cost depreciation as a result of different allocation base.

Table 3 Difference in amount of cost depreciation as a result of different allocation base

Property	Depreciation for floor area in CZK	Depreciation for building volume in CZK	Difference in CZK
Machine repair (main activity)	143 150	163 625	+20 475
Garages (complementary activity)	31 850	11 375	-20 475
Total	175 000	175 000	0

Source: Own processing

In case of building volume as the allocation bases, depreciation in complementary activities were reduced by a third to 11,375 CZK compared to floor area as the allocation base. This causes an artificial increase of the profit (by 20,475 CZK) and the tax base for a complementary activity. On the other hand, allocation of the overhead cost by floor area as the allocation base would transfer bigger cost item into a complementary activity.

3.2 Value approach

An example of a secondary school shows the allocation of costs by the value approach. The example is based on fictional cost data. In this case, it is not possible to use the factual criteria. Let us suppose a secondary school with standard education. As their gym is not fully used in the main activity, the management of the school decided to rent it to other secondary schools (it means that the gym is used both for the main and complementary activities). Table 4 shows cost items and amounts for the main and complementary activities, overhead costs and common costs for cost items.

Table 4 Costs of a secondary school (in thousand CZK)

Costs	Education – direct costs (main activity)	Overhead costs	Gym rent – direct costs (complementary activity)
Water and sewage	16	25	3
Energy	82	45	23
Wage costs	550	144	5
Insurance	187	49	1,7
Depreciation	145	37	13

Source: Own processing

Table 5 reports the methods of ration calculation for the main and complementary activities and allocated overhead costs for different cost items.

Table 5 Cost allocation of a secondary school (in CZK)

Costs	Ratio for the main activity in %	Allocated overhead for the main activity in CZK	Ratio for the complementary activity in %	Allocated overhead for the complementary activity in CZK
Water and sewage	16 / (16+3) = 84	21 000	3/(16+3) = 16	4 000
Energy	82 / (82+23) = 78	35 100	23/(82+23) = 22	9 900
Wage costs	550 / (550+5) = 99	142 560	5/(550+5) = 1	1 440
Insurance	187 / (187+1,7) = 99	48 510	1,7/(187+1,7) = 1	490
Depreciation	145 / (145+13) = 92	34 040	13/(145+13) = 8	2 960

Source: Own processing

In such case, common costs were divided into activities in the same ratio as direct costs to these activities were achieved. In addition to this the procedure, an entity could use another method of allocation of overhead costs in proportion to total sales achieved in the main and complementary activities. The method would be the same as in the above mentioned case, with the only difference that the ratios of the main activity would be the same for all expense items, and the ratios as a part of additional activities would be the same for all cost items.

3.3 Advantages and disadvantages of the allocation approaches

The factual approach of allocation is usually more exact that means more correct and fairer. There is no distortion of the real situation. A disadvantage of this method is that it can be used in some cases only. At the same time, it is necessary to consider if administrative costs for factual allocation would not exceed the benefit resulting from the method. Another disadvantage is the fact that an entity can choose different allocation bases of the factual approach. One choice of an allocation base may not be recognized by the tax authorities and the tax authorities may require another schedule, which may cause a kind of uncertainty for an entity.

In comparison, the value approach is easier and simpler. It does not require further evidence. It is easily controllable and allowed to use for all costs. Its disadvantage is the difficulty of choosing an allocation base. It is difficult to decide if the overhead cost will be allocated by revenue, cost or expense ratios. Within this method, the classification of cost may not correspond to real situation. The results may be distorted. The question arises to what extent such accounting gives a true and fair view.

4 Conclusions

The Income Tax Act obliges public utility taxpayers to record income that is subject to taxation from income that is not subject to tax or is subject to tax and is exempt from tax to the latest balance sheet date. Proper cost allocation to incomes is important for non-profit organizations because of correct profit-loss reporting. Non-profit organization need to carefully choose the allocation base for their overhead costs. The allocation is, however, not defined by any laws. The method that an entity applies needs to be justified. At the same time, it is appropriate to modify the method of allocation in inner directives of an organization and do not change allocation methodology at least for one accounting period for a possibility to compare it in time. There are two possible approaches of cost allocation – a factual and value approach. Each approach has its advantages and disadvantages so that it is not possible to recommend one of them as better in general. It is possible to conclude that the benefits of one approach are the drawbacks of the other, and vice versa. A combination of both approaches could be a neutral way. Also, the entities may allocate costs by the factual approach til it is possible and economic. The rest of the overhead cost may be allocated as tax-ineligible. We cannot say which method of choosing allocation base is more acceptable. An entity should choose the approach based on a particular situation. Appropriate choice of allocation base in an organization can be used as a vital tool for optimization of tax liability. As shown for both approaches, the choice of several different allocation bases can result into various results, including tax bases, both in the main and complementary activities. For each activity, it is possible to find different solutions. It always depends only on the entity which way would be chosen. A properly chosen allocation basis would result into decreased tax base and optimization of tax liabilities. In addition to this tax optimization, non-profit organizations can take advantage of special deduction adjusted by the act on income tax. It defines the possibility of further reducing the tax base by 30% to a maximum of one million CZK. Now the question arises whether the limit defined by the Act on Income Tax would cover the tax base in the main activity. Will it be better suited for an entity to use a different allocation base in the next fiscal year, which would modify the tax base in such a way, that the entity needs to accomplish?

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Comparison of the Financial Data Quality in Audited and Unaudited Companies

Miroslava Vlčková

Abstract: *Accounting is, or based on accounting legislation should be, a description of reality in which the characteristic accounting principles and methods are used. Base on the quality of financial information, it is possible to measure business performance, financial position, calculate the expenses and revenues, incomes and expenses and profit or loss to manage and make decisions. The quality of financial information also depends on the quality of management and on the presentation of financial data and their conformity with the reality and applicable laws. This article describes how to use the analytic hierarchy process (AHP) to get an overview to the quality of the reported financial information. The most important step is, on the basis of Saaty´s method determine the weights of the criteria in each group and then by using the AHP method determine their importance. The data quality in companies is determined on the drafted model and then the differences between data quality of audited companies and data quality of unaudited companies are detected based on the statistical methods.*

Key words: Analytic Hierarchy Process · Saaty´s Method · Criteria Quality of Data · Audited and Unaudited Companies

JEL Classification: M10 · M41

1 Introduction

Quality financial information in its essence enables to correctly measure the business performance and financial position. Based on this information it is possible to determine how the company is able to generate profit, finance its activities and assessment of potential risks that may arise in the future. The basic element of the financial information evaluation is the level of data quality perceived by users of financial information. Accounting could be defined as a structured system of information that is captured in monetary terms and shows the process of the business. It should be said that quality financial data reduce the risk for potential investors, for the management and their decisions and also increase the ability of companies to raise finance at a reasonable cost of capital.

2 Methods

This paper discusses how to use the analytical hierarchy process method in order to obtain a quality overview ofreported data. The main goal of this paper is based on a survey determining the criteria that affect the quality of financial data and have impact to management. The concentration of interest is to determine the quality of the financial data of enterprises on the basis of established criteria and then determine whether there is a correlation between the quality of financial data in audited and unaudited enterprises. Looking into the quality of financial data should demonstrate the impact of negative criteria on financial accounting and decision making in business management.

According Laptese (2009) the firm affects the quality of financial data throughout its life cycle. Donnelly et al. (2008) argue that the more quality information the managers have the more the level of risk and uncertainty in their decisions are reduced. Companies should follow the accounting data on the base of accounting standards. Increased emphasis on compliance with the financial discipline and internal control of financial data can significantly contribute to improving the quality of financial information, especially with regard to making decisions. For certain decisions, some financial information may be available but the same information may be insufficient for different decisions (Neely & Cook, 2011). Working with financial information required by managers not only a good initial carrying data, but also their timely replenishment.

Accounting is defined as a system which is characterized by using the accounting principles and methods. Nenadál et al. (2002) like Easton & Jarrell (1998) have the opinion that if the quality control is carried out effectively the company can have considerable results especially from the financial point of view. Enterprises that have

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successfully established management systems achieve higher performance and better financial results. Accounting system (depending on the size of the company) is designed as a process of collecting information and creating financial reports. These activities are called as a cycle management accounting information by Short (1990).

The basic objective of financial accounting is to provide relevant information regarding the property, sources of finance, expenses, revenues and profit or loss based on the principle of true and fair view of accounting. According to Robbins & Coulter (2004) companies have to control the process of monitoring activities to determine whether all activities in accounting have been carried out according to the legislation and then correct variations. Internal control of data from accountants and managers at all levels of management causes the feedback which provides the possibility of a reality.

Method AHP (Analytic Hierarchy Process) is a method that solves tasks of multicriteria decision making. The method AHP, which was used to determine the significance of individual weights of negative criteria is a method that solves tasks of multi-criteria decision making. This method uses the decomposition of complex unstructured situation into simpler components that will be arranged to a hierarchical structure. At each level of the hierarchical structure, pairwise comparisons method is used in a way that each component is compared with the other components. The result of this mutual comparison is the weights of individual criteria. These weights determine which criteria have the biggest influence on the quality of financial data (Saaty, 2006). The method used in pairwise comparisons follows a nine-point scale from 1 to 9 composed of only odd numbers, but it can be also use the intermediate stage, even numbered:

1 - the criteria are equivalent,

3 - one criterion is weakly preferred to another,

5 - one criterion is strongly preferred over the other,

7 - one criterion is very strongly preferred over the other,

9 - one criterion is absolutely preferred over another.

The decision makers decide about the preferences by the pairwise comparison and the results should be written to the matrix subsequently:

$$W = \begin{bmatrix} w_1/w_1 & w_1/w_2 & \cdots & w_1/w_n \\ w_2/w_1 & w_2/w_2 & \cdots & w_2/w_n \\ \vdots & & \ddots & \vdots \\ w_n/w_1 & w_n/w_2 & \cdots & w_n/w_n \end{bmatrix} \quad (1)$$

where:
w_{ij} Saaty´s matrix element, $w_{ii} = 1$ and $w_{ij} = 1/w_{ji}$

Weights of the criteria can be calculated based on the normalized geometric mean lines of Saaty´s matrix. It is a logarithmic method of the least squares given by:

$$b_i = \sqrt[n]{\prod_{j=1}^{n} w_{ij}}, \quad (2)$$

where:
b_i geometric mean of the i-th row
n number of rows

By normalization of b_i is then calculated weights according to the following:

$$v_i = \frac{b_i}{\sum_{i=1}^{n} b_i} \quad (3)$$

where:
$v_i = (0, 1)$

Consistency index - this index should reach a maximum value of 0.1 and it is calculated by the following equation.

$$I_S = \frac{\lambda_{max} - n}{n-1} \quad (4)$$

where:
λ_{max} maximum number of inherent matrix
n number of rows

Standard deviation - standard deviation is the square root of the variance and dispersion rate of returns to scale of the original data.

$$s = \sqrt{s^2} = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}, \quad \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} . \tag{5}$$

3 Research results

A survey is aimed at uncovering incorrect accounting, discovering the quality of financial data in audited and unaudited companies and their comparison.

Based on the study of professional and scientific literature, but also based on consultations with experts like auditors and managers, the groups of data quality in financial accounting were compiled and within these groups the various negative criteria which have the biggest impact to the quality of financial and on the management as well were created. After combining these two perspectives and understanding their relation the items can be divided to the following groups and criteria:

Group F1 Errors and fraud

F11 - Accounting fraud by management, unethical behaviour of managers

F12 - Accounting fraud by employees, unethical behaviour of employees

F13 - Creative accounting

F14 - Accounting errors arising out ignorance, human error accounts

Group F2 Accounting Methodology

F21 - Methods of depreciation

F22 - Methods of evaluation

F23 - Methods of accounting organization, processing technique

F24 - Internal directive

F25 - Internal control

Group F3 Influence of information system

F31 - Lack of information, poor internal communication

F32 - Legislation - too wide or narrow, confusion, frequent changes

F33 - Requirements for managers in the enterprise's information system

A survey of financial accounting conducted on the basis of structured interviews with 78 managers, CFO´s and accounting leaders. Interviewed respondents identified the importance of individual ratios of criteria within each group; these ratios were then compiled to Saaty´s matrix (3 matrix for each respondent) and points and weights for the criteria were designated. Thus 234 Saaty´s matrix were compiled. On the drafted model of the quality of financial data, there is seen that the group of managers, CFO´s and accounting leaders set creative accounting in the group errors and fraud (46,41 %), methods of evaluation in the group accounting methodology (33,91 %) and lack of information, poor internal communication in the group influence of information system (50,21 %) as the critera which the quality of financial data affect the most.

In next step, the AHP method was applied. On the basis of structured interviews with 12 auditors (mainly from KPMG and private external auditors) 12 Saaty´s matrix were compiled. On the drafted model of the quality of financial data, there is seen that the group of auditors set the group of critera which the quality of financial data affect the most group F2 accounting methodology (42,78 %), then group F1 errors and fraud (39,55 %) and group F3 influence of information system (17,67 %). For more information you can see Vlčková (2014).

By applying the AHP method, there the model of the quality of financial data was proposed:

$$QFD = 0{,}3955 * (0{,}2756 * F11 + 0{,}1787 * F12 + 0{,}4641 * F13 + 0{,}0816 * F14) + 0{,}4278 * (0{,}2072 * F21 + 0{,}3391 * F22 + 0{,}1135 * F23 + 0{,}0818 * F24 + 0{,}2584 * F25) + 0{,}1767 * (0{,}5021 * F31 + 0{,}1344 * F32 + 0{,}3635 * F33) \quad (6)$$

where:

QFD Quality of financial data

F11…F33 individual criteria within the specified categories

This model was used for 71 companies; 37 companies are audited and 34 companies are unaudited. There were companies from South Bohemian Region, with number of employees from 10 to 1999, with annual sales from 10 to 1000 mil. CZK and principal activity in according to CZ NACE was Section C – Manufacturing. Values of the criteria was determined directly in a company, preferably based on surveys from the ranks of specialists in the company. For the individual criteria have to be valid that they are between the interval (0, 100). The higher the value of financial data quality is the worst quality of accounting date in the company is. It is on base that the criteria have negative position in the company. The results of their data quality are in the following table. As you can see, the final value quality of financial data in companies could be in the range from 0 to 4. The best value in audited companies have the company 2 with value 0,5524 and in unaudited companies have the company 15 with value 0,3649. On the other side, the worst value in audited companies have the company 6 with value 2,1511 and in unaudited companies have the company 28 with value 2,7436.

Table 2 Quality of financial data in audited and unaudited companies

Audited companies						Unaudited companies					
Comp.	**QFD**	**Comp.**	**QFD**	**Comp.**	**QFD**	**Comp.**	**QFD**	**Comp.**	**QFD**	**Comp.**	**QFD**
1	1,6247	14	0,955	27	1,4238	1	1,6493	14	1,135	27	1,4955
2	0,5524	15	1,1245	28	1,8849	2	1,5143	15	0,3649	28	2,7436
3	1,3112	16	1,2731	29	1,1481	3	0,915	16	1,731	29	1,833
4	1,6738	17	0,7589	30	0,6858	4	1,1777	17	1,3222	30	1,5658
5	1,3207	18	1,3675	31	1,8876	5	0,6871	18	1,9307	31	1,5845
6	2,1511	19	1,649	32	1,2591	6	1,5454	19	1,7632	32	1,6916
7	1,7852	20	1,3132	33	1,2794	7	1,5722	20	1,5526	33	0,925
8	0,6071	21	1,2264	34	0,9444	8	1,3012	21	1,2406	34	2,1717
9	1,2063	22	0,5857	35	1,7875	9	1,3027	22	0,6012		
10	1,4035	23	0,6639	36	1,1263	10	2,1254	23	0,6791		
11	1,7034	24	1,1697	37	0,9886	11	1,9013	24	0,5534		
12	1,2765	25	1,3035			12	0,9816	25	1,4328		
13	2,0351	26	1,2674			13	2,209	26	1,6628		

Source: Own processing

In the next step, range for financial data quality was compiled:

0 – 0,8 very good quality,
0,81 – 1,6 good quality,
1,61 – 2,4 average quality,
2,41 – 3,2 bad quality,
3,21 – 4 very bad quality

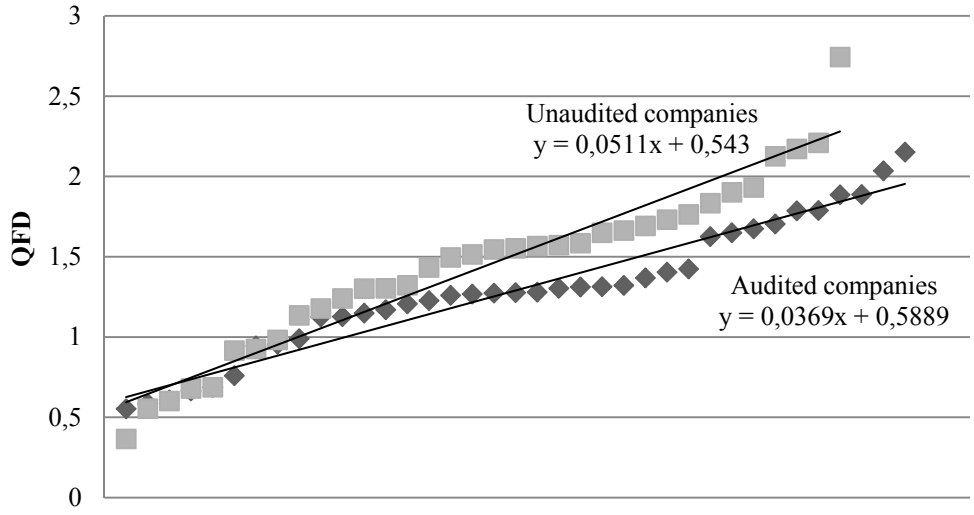
and the quality of financial data in audited and unaudited companies were evaluated. The results are in the following table and graph.

Table 3 Evaluation of financial data quality in audited and unaudited companies

Range QFD	Audited company - number	Audited company - %	Unaudited company - number	Unaudited company - %
Very good quality	6	16,22%	5	14,71%
Good quality	21	56,76%	17	50,00%
Average quality	10	27,03%	11	32,35%
Bad quality	0	0,00%	1	2,94%
Very bad quality	0	0,00%	0	0,00%
Total	**37**	**100%**	**34**	**100%**

Source: Own processing

Graph 1 Evaluation of quality of financial data in audited and unaudited companies



Source: Own processing

In the table 3 and graph 1, it is seen that unaudited companies have worse quality of financial data than audited companies. To verify this, in the final step, the statistical method T-test was used. It was found out maximal and minimal value, average of financial data quality and standard deviation. The results are in the following table.

Table 4 Statistic analysis of financial data quality in audited and unaudited companies

	Audited companies	Unaudited companies
Max value	2,1511	2,7436
Min value	0,5524	0,3649
Number of companies	37	34
Average	1,2898	1,4371
Standard deviation	0,4050	0,5183

Source: Own processing

The results of T-Test are as follows:

t = -1,32087
DoF = 69
p = 0,190907

F = 1,641652
p dispersion = 0,147970
For audited companies versus unaudited companies the T-Test shows statistically insignificant differences between them. P value is 0,19 at the significance level $\alpha = 0,05$.

4 Conclusions

The article is primarily concerned with comparison of the accounting data quality in audited and in unaudited companies. In the first step the criteria were determined, they were assessed and the quality determination model was compiled. Consequently, the values of the financial data quality in 71 companies were determined and divided into two groups – audited and unaudited companies. In the next step the values were compared and evaluated. It was found that average value of financial data quality in audited companies is on better level than average value in unaudited companies (1,29 and 1,44). Unaudited companies have also higher maximal value of financial data quality than audited companies (2,74 and 2,15) and it means that the higher this value is the worst financial data quality in a company is. Even this, by the statistical T-test was found out statistically insignificant p value 0,19.

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Readjusting Environmental Fees for Products with a Long Lifetime: Case of PV Module Recycling Fee in the Czech Republic

Lenka Zemková, Jan Macháč, Jiří Louda, Ondřej Vojáček

Abstract: *In the Czech Republic (as in many other countries), environmental fees belong among commonly applied economic tools of environmental policy. One of the fundamental issues that accompany their practical application is setting of the correct rates of the fees in relation to the time frame and targets to be achieved by the tool application. When setting the rate of an environmental fee for a short term, the price can be adjusted flexibly based on the current situation. For some longer-term environmental policy goals, fees are employed that are collected in the form of "advance" payments years or even decades before the actual meeting of the goals (typically, recycling fees when purchasing electrical appliances, for example, so-called acquisition fees), which entails numerous risks and ncertainties that have to be taken into account when setting the optimum rate of the fee. Moreover, the chance to modify the fee substantially during the period is lost in this case.*

The paper deals with readjusting the current rate of the recycling fee for PV modules (currently CZK 8.50/kg), which will be utilised in a time frame of 15-30 years after the collection. Its setting is influenced by the complexity and uncertainty of predicting future price trends and technological advancements. Using micro models and applying the precautionary principle, we propose an adjustment to CZK 5.2-7.8/kg based on the technological changes and the market situation.

Key words: Recycling fee · PV modules · Environmental policy · Micro models · Precautionary principle

JEL Classification: H210 · Q580 · Q550

1 Introduction

Act no. 165/2012 Coll. on Supported Sources of Energy entered into legal effect on 1 January 2013; it amends Act no. 185/2001 Coll. on Waste and thus introduces to the Czech legal system a responsibility of operators of photovoltaic power plants for financing the management of waste from photovoltaic modules. The Act imposes the obligation on operators of photovoltaic power plants incorporating photovoltaic modules introduced to the market before 1 January 2013 to ensure financing of the processing, reuse and disposal of electrical waste from photovoltaic modules by means of a collective system for recollection, separate collection, processing, reuse and disposal of electrical equipment and electrical waste. Therefore, all operators were required to register, by mid 2013, with collective systems, which took over the responsibility for ensuring proper handling of waste from photovoltaic modules for the operators of photovoltaic installations as of 1 January 2014. Directive 2012/19/EU specifies that at least 70% of the material has to be recycled and 80% has to be reused, meaning that only 20% of the material may be landfilled.

The minimum total amount of the contribution is defined, pursuant to Decree no. 178/2013, so as "to cover all the expected costs of ensuring handover for processing, recollection, separate collection, transport, processing and reuse and disposal of the expected amount of electrical waste from solar panels." (Decree no. 178/2013) The current amount of the contribution has been set at CZK 8.50/kg of module. However, the collective systems and photovoltaic power plant operators consider this amount disproportionately high given the potential revenues that may flow from the recycling and reselling of the material (Černá et al., 2015). Here, the adequate setting of the contribution amount faces the problem of time inconsistency between the money collection and utilisation. The total amount should be collected from the operators in periodic instalments by the end of 2018. The majority of photovoltaic power plants in the Czech Republic were put into operation during the so-called solar boom around 2010, and their life time

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is generally assumed to be around 20 years. The utilisation of the money collected can thus be expected only around 2030, which is why these fees are classified as long-term. The regulator's aim was to establish a tool that would help prevent a situation where photovoltaic power plants in the Czech Republic would remain without further use, nobody would be willing to remove them and there would be no resources for their removal. However, removing a power plant means not only removing the photovoltaic modules as such; the power plant additionally comprises a regulating unit, an inverter, connecting cabling, security elements, grid connecting modules, and other auxiliary structural components (such as aluminium brackets, concrete shoes, fencing), to which the regulation does not apply, and it is therefore not clear how the legislator envisages their removal if the power plant operator does not take care of them. Setting the contribution amount to be applied in the long run comes up against a large number of risks and uncertainties. Based on the problems described, the paper deals with a proposal for an adjustment to the charge, or resetting of the entire system, primarily due to the aforesaid time inconsistency between the collection and the utilisation of the fee. First we present the method using which the newly proposed fee amount should be adjusted. Then we make an enumeration of the potential risks and uncertainties that are associated with the fee in the authors' opinion and that need to be taken into account when setting the contribution amount. In addition, we briefly introduce the contribution components, using which the final amount is set in conclusion.

2 Methods

Numerous tools are applied in order to achieve environmental policy objectives; they are divided into administrative, economic and voluntary tools. The main attendant attribute of the economic tools is the use of a pricing mechanism to regulate economic activities. The most commonly used economic tools are taxes and fees, followed by subsidies and grants, tradable permits and advance payments (Slavíková, Vejchodská, Slavík et al., 2012). A tax is *"a mandatory and unreturnable, typically periodically recurring payment to the public budget without a title to equivalent and direct performance out of the public budget"* (Jílková et al., 2006). In contrast to taxes, fees are *"one-off payments made by a payer for specific services provided by the public sector, and their primary purpose is the full or at least partial coverage of expenditures associated with such services or coverage of other public budget expenditures"* (Jílková et al., 2006).

For the purposes of this study, fees can be divided into short-term and long-term. Utilisation of the money collected in short-term fees takes place immediately after the payment. Therefore, their amount can be adjusted without major difficulty depending on changing circumstances affecting the amount. For long-term fees, the amount has to be set long in advance; here, it is up to 15-30 years. The problem is how to approach this setting so that the fee reflects the true costs and revenues and that its amount takes into account the risks and uncertainties.

The current rate (S) for calculating the minimum amount of the contribution and the minimum amount of financial resources deposited in a purpose-bound bank account is calculated, pursuant to Decree no. 178/2013, using the following formula:

$$S = N_{os} + N_{př} + N_{zpr} + N_{adm} - P_{ds}$$

where

N_{os} is the expected costs of recollection and handover for processing

$N_{př}$ is the expected costs of transport of 1 kg of the electrical waste

N_{zpr} is the expected costs of processing using best available techniques

N_{adm} is the expected costs of administration

P_{ds} is the expected revenues from sale of secondary raw materials

The objective of the paper is to tackle the revenues and costs arising from future technologies, which are difficult to estimate. The proposal for a change of the amount of the recycling contribution for photovoltaic modules uses micro modelling for each of the components of the costs and revenues associated with the recycling, including the transport, administrative costs, costs of operation of collecting points, costs of disposal of residual components that cannot be recycled (landfilling, disposal of hazardous waste, etc.) et cetera. The new contribution amount should correspond to the precautionary principle, which should be inherently reflected in environmental policy in connection with long-term fees. The costs of recycling are therefore divided into the steps of the recollection process. The basic inputs for the micro model were the amounts of average revenues and costs of each component of photovoltaic modules (which differ according to the module type), obtained by a review of both domestic and international scientific literature and existing studies. This was followed by a sensitivity analysis to determine the interval for these revenue and cost items. Furthermore, the costs of transporting the panels turned out to be significant, judging based on micro models with variable module transport distance, vehicle capacity utilisation, and panel handling. The basis for the transport cost calculation was a market survey among small and large-scale hauliers. During the research, additional extensive consultations with representatives of collective systems (covering 71% of the installed output of photovoltaic power

plants) and operators of recycling plants in the Czech Republic and abroad were made by means of semi-standardised interviews, focusing on the component aspects of the contribution amount design, including the operation of collecting points, which can be regarded as a logical extension of the service offer of existing collecting points in the case of rooftop installations. Information from the collective systems was used as the basis for the calculation of their operating costs.

The modelling of revenues from sale of secondary raw materials reflected the different composition of modules with respect to both different types of modules and different manufacturers. The minimum and maximum proportions were determined for each component and their yield rate was determined based on the efficiency of techniques.

3 Research results

Determination of the adequate amount of the recycling contribution needs to take into account a number of risks and uncertainties that may significantly affect the future amounts of costs and revenues from recycling of photovoltaic modules. The contribution should reflect the amounts of future revenues and costs, which are difficult to estimate. The recycling economics (in general) is based on yielding of raw materials from the modules and their sale, which has to cover both the processor's costs and profits. Below, we present an identification of the essential risks and uncertainties affecting the setting of the recycling contribution, followed by a design of the adjusted contribution amount reflecting these risk factors.

3.1 Risks and uncertainties associated with determining the recycling contribution amount

The essential risk factors affecting the amounts of revenues and costs of recycling a module are as follows: (i) completeness of the module delivered, (ii) module damage, (iii) content of hazardous substances and additives in the module, and (iv) commodity price trend on the secondary raw material market. The determination of the adequate fee amount is further complicated by the wide range of various types of modules (crystalline, thin-film) and their specific material composition resulting from the production technique and process. As stated, e.g., by Černá et al. (2015), the composition of panels changes over the years, as expensive components are replaced with cheaper ones.

The majority of currently installed modules include an aluminium frame and copper cabling, which represent some of the principal items of the recycling economy. Incompleteness of modules delivered for recycling (i.e., if modules without these components arrive at the recycling plant) fundamentally reduces the recycling revenue and pressure is thus exerted to utilise the resources allocated under the recycling contributions to compensate for the recycling process costs. In comparison with the EU Directive mentioned above, existing Czech legislation (Decree no. 178/2013) imposes on recycling plants an obligation to recycle (or reuse) 80% of photovoltaic module material. If recycling plants receive damaged modules, some of the technologies in selected recycling plants will not be capable of recovering the binding percentage from damaged panels, posing a risk of potential increase in the recycling costs (in its extreme form, also risk of penalty from the EU for non-compliance with the mandatory minimum rate of reuse); for some technological processes, damaged modules may mean increased handling costs. Another potentially significant risk for the module recycling economy is the content of hazardous substances in modules. Their absolute amount may not necessarily be substantial (studies differ by an order of magnitude), but as a consequence, they may pose a risk of increased costs of separation of the module components and their subsequent cleaning, or a risk of impaired competitiveness selling the separated module component as a secondary raw materials (such as glass) due to lower material purity compared to primary raw materials. That said, the evolution of the secondary raw material market itself is a key (and hard to predict) factor for the recycling economy. Prices on the secondary raw material market may change significantly in the long term due to technological change. Analogously, the input costs may change too (prices of energy, fuels for transport, etc.).

Furthermore, there is the issue of technology efficiency for larger processing volumes and different module types delivered to the plant. A particularly varied mix of modules can be expected from municipal recycling yards, where individual modules from rooftop installations (e.g., single-family houses) from different manufacturers will be deposited.

With respect to the uncertain future development on the markets, in recycling technologies and other risks, the determination of the contribution amount has to be based on current technologies. For example, future development of processing technologies for CRT screens was also expected in the past, but no major advances have been made there. With respect to the returnability of the unused part of the contribution, it is advisable to include a reserve for unfavourable developments in order to secure the module recycling.

3.2 Revenues and costs of photovoltaic model processing

Taking into account all the risks described above, it is very difficult to set an adequate amount of the fee for the long run, and a number of assumptions therefore had to be introduced for the fee amount design:

(i) the revenue calculation builds on the average yield rate of each component of photovoltaic modules, achievable using existing technologies. This rate of success in separating and cleaning the components is then significantly reflected in the selling price of the raw material, thus also the revenues from selling the recycled materials;

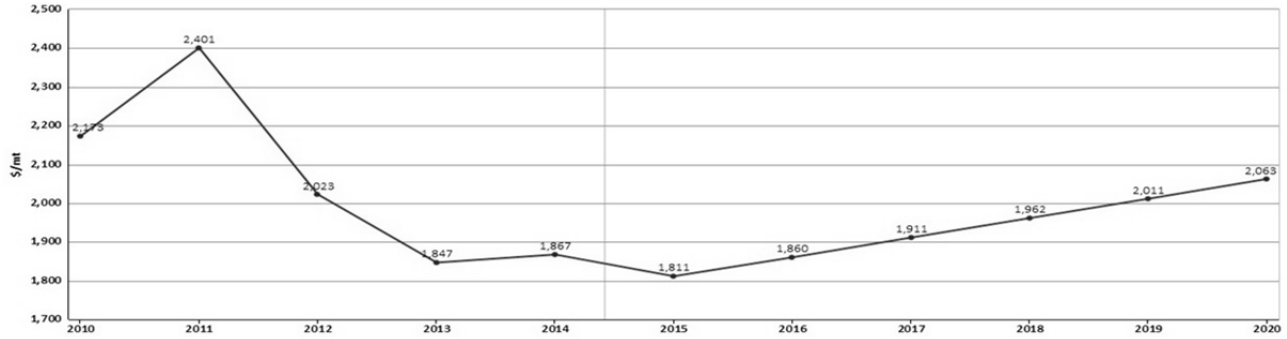
(ii) the prices of recycled materials are assumed to be 70% of the primary raw material market price, taking into account market volatility;

(iii) the determination of the recycling cost amount draws mostly in data obtained based on consultations in Germany and published in sources abroad. There are so far no larger facilities in the Czech Republic operating on a purely commercial basis from which we could obtain data on recycling costs (with the exception of one facility, so far in pilot operation).

The literature review indicates that the studies differ substantially in their calculated processing costs and revenues, by orders of magnitude in fact. The highest costs of processing were quoted by McDonald and Pearce (2010): CZK 47.71/kg of crystalline module. The lowest costs are quoted by Friedrichs (2015): CZK 1.08/kg for module processing in Germany. The mean costs are CZK 12/kg of module. Likewise, the estimated revenues from processing differ substantially across authors from CZK 4.80/kg to CZK 63.59/kg.

Based on our own analysis of raw material prices on world markets and interviews with representatives of different collective systems, we made an analysis of the market prices of different materials. Using current and historic prices and predictions and projects of future trends (World Bank, International Monetary Fund, Infomine and Knoema commodity information servers), we estimated the price range of the different primary raw materials relevant for photovoltaic panels on the raw material market. Graph 1 shows on the case of aluminium that there is a noticeable price volatility on the raw material markets. Based on the price interval, different module compositions and estimated yield rate proportions of different materials, we then estimated the lower and upper bounds of the selling price of separated materials from 1 kg of photovoltaic module. It must be noted that these are prices of primary raw materials and the prices of secondary raw materials may differ more or less depending mainly on the material purity and the quantity supplied, as well as other factors. The analysis indicates that there is a relatively consensual opinion on the market that the prices of secondary materials are approx. 70% of the prices of primary raw materials. Therefore, we use this information below as the assumption for determining prices on the secondary raw material market. The range of revenues from selling secondary raw materials recovered from silicon modules was predicted as CZK 10.9-37.2/kg; the range was narrower for other types. The width of the range is due not only to the different commodity prices but also the yield rate and content of these components in the panels. A certain maximum quantity of a commodity can be recovered using each of the alternative module processing technologies. The different micro modules each applied a different technology to each of the modules and determined the yield rates for them. Some studies collect these maximum yield rates and then apply the maximum yield rates for the current technologies to the total yield rate calculation. We regard this approach as inappropriate, as it does not provide adequate coverage for risks in case no major advancement is made in recycling.

Figure 1 Projection of aluminium price trend on the primary raw material market



Source: International Monetary Fund, 2015

The consultation with representatives of operators of a recycling plant in the Czech Republic produced the estimated costs of CZK 8-9/kg of module. The literature review produced average costs of CZK 12/kg of module. The cost analysis has to take into account a number of additional costs associated with disposal of unused module components, and landfilling and disposal of hazardous waste, which were included in the modelled costs. It can be assumed based on all the information obtained that, with a positive market development, the future costs of recycling of complete unbroken photovoltaic modules could be zero (excluding collection and transport costs) or slightly positive. In a very optimistic scenario, we may even assume that modules might be purchased in future (depending on the commodity prices and further development of processing technologies). Given all the risks mentioned above, we need to work with a certain reserve for the event of unfavourable development or for incomplete or broken modules delivered

for processing, amounting to approx. CZK 1-2.5/kg. This reserve also better reflects the quoted risks associated with the content of hazardous substances in the panels and the possible contamination of other components during the panel recycling process.

The transport costs have to be determined depending on the transport distance, difficulty of module handling and the percentage capacity utilisation of the vehicles. Based on a model of the transport costs and the variables, the transport costs including loading and unloading will most probably be around CZK 1.7-2.1/kg of module.

Another major item, covered by the collective system from the recycling contribution, is the administrative costs, partly caused by the mandatory reporting obligations and partly consisting of costs included under them by the collective systems. Unfortunately, there is no specific definition of eligible items for this portion of the contribution. The administrative costs of the collective systems interviewed were CZK 0.09-0.45/kg/year. Based on the data identified, the administrative costs can be expected at CZK 2-2.5/kg for the module life time.

Uncertainty problems remain in the analysis of module collection costs; it is difficult to estimate the future development of the collecting network, whether it will expand or contract. Based on information about the current network, the approximate amount may be CZK 0.5-0.7/kg.

4 Conclusions

The determination of the adequate amount of the recycling contribution for photovoltaic panels used the micro modelling method, taking into account risks and critical analysis of the different steps in the recollection and processing. The intervals for the revenue and cost components of the recycling contribution mentioned above were determined with respect to the possible risks and uncertainties in determining the contribution amount in the long run. First and foremost, the fee is supposed to cover the costs and risks that the national government would have to bear in case the original photovoltaic power plant operator "disappeared". With respect to the uncertain future development, we based our assumptions on current and historic prices of commodities and current recycling technologies. Adding up the individual cost items associated with the entire photovoltaic module recollection and recycling process, the resulting complete costs are CZK 5.2-7.8/kg. This alternative proposal is only slightly lower than the current setting.

In the event of there being a chance to amend the existing legislation on disposal of electrical waste from photovoltaic modules, the cost components that the contribution amount is to reflect need to be adjusted and specified precisely above all. Decree no. 178/2013, to which reference is made, also lacks a specification of the module condition upon acceptance for processing: the absence of the aluminium frame and other "external" components would jeopardise both the financial aspects and the chance of complying with legislative requirements on the percentage reuse of the modules.

The micro modelling of the cost and revenue components turned out to be indispensable for determining the amount of the recycling fee for the long run. The potential risks could be taken into account for each component and included in the costs. An appropriate example is the costs of handling of hazardous wastes comprising unreusable and unprocessable components of modules contaminated with hazardous substances.

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