

OVERVIEW OF IMPACT EVALUATION METHODS OF PUBLIC SECTOR INITIATIVES

Juraj Mikus¹ - Anna Pilkova²

Abstract

The main aim of this article is to present an overview of different methods of economic, social and environmental impact evaluation. The content is as follows: first, the basic concepts are defined, such as impact and impact evaluation. Consequently, the current state of the impact evaluation of public initiatives is analysed, next, the theoretical background of value creation is explained as an important factor for understanding the key aspects of impact evaluation. Finally, different categorization approaches of impact evaluation are outlined. The categorization and overview of the approaches to the impact evaluation of initiatives addressing different issues in society serve as an important knowledge base for designing a comprehensive framework model which would reflect the specifics of the environment and would be able to take into account all the different aspects of public policies.

Keywords: Impact Evaluation, Impact evaluation methods, Theory of Change, Value Chain

Introduction

Nowadays academicians and politicians around the world, including Slovakia, are focused on such issues as stagnant economic growth, low innovation activities, aging population, gender issue in women employment and low employment of youth. One way to solve these problems is entrepreneurship, which is an important phenomenon recognized as a key factor in economic development (Bohlmann et al., 2017, Ferreira et al., 2017, Lukeš, 2013, Koellinger and Thurik, 2012). However, this complex phenomenon has many dimensions which should be taken in consideration if we want to fully use its potential. Among them the inclusion of less represented groups of population to entrepreneurship. The barriers and risks that these population groups like seniors, youth, women, migrants, etc. must overcome to become entrepreneurs, are substantially greater than those individuals who do not belong to these groups. The main measures many national governments, as well as international organizations such as European Commission (2017) and OECD (2017) promote, are to develop appropriate policies, programs and projects to support these entrepreneurs, their education and training as well as the formation of financial support systems. If these are to function effectively and continuously improve, tools to evaluate them are needed. These

¹ Mgr. Juraj Mikus, Comenius University in Bratislava, Faculty of Management, Odbojarov 10, P.O.Box 95, 820 05 Bratislava, e-mail: juraj.mikus@fm.uniba.sk

² prof. Ing. Anna Pilkova, PhD., MBA, Comenius University in Bratislava, Faculty of Management, Odbojarov 10, P.O.Box 95, 820 05 Bratislava, e-mail: anna.pilkova@fm.uniba.sk

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tools must be able to capture economic, social as well as environmental impacts, to be able to holistically evaluate the scope of these interventions. Evaluation studies are based on quantitative data focused on output indicators. Results and impacts are barely mentioned or qualitatively assessed. Domestic publications in this area of research are absent. However, research abroad presents some very useful methods and evaluation rules that could have significant benefits for practice. The need for evaluation models also increases with the growing activities of the non-profit sector (non-profit companies want to maximize their impact), social entrepreneurship (company shareholders require clarification of money management), corporate social responsibility initiatives (such initiatives want to promote the most effective projects) and governmental initiatives (transparency in the handling of public funds) because it is not clear to what extent these initiatives leave lasting positive change.

This article aims to present an overview of different methods of economic, social and environmental impact evaluation. In order to do so, basic concepts such as impact and impact evaluation are explained at first, then current status of public initiatives impact evaluation is presented. Next, the article focuses on theoretical background of impact evaluation, concepts of Value chain, the Theory of change, logic model and different phases of impact evaluation are explained. Finally, various approaches to categorization of impact evaluation methods are outlined and based on those an overview of actual impact evaluation methods is provided.

1 Basic concepts of impact evaluation

Impact is any effect of a service (events, interventions or initiatives) on an individual or a group (Fitz-Gibbon, 1996). An intervention is an intended engagement in solving some problem, which aims is to create impact. As a result of externally induced change, the impact includes both intended and unintended effects, negative but also positive effects and long-term or short-term consequences (Wainwright, 2002). According to Clark et al. (2004) impact is a part of the overall result that occurred as a consequence of a specific activity beyond what would have happened without it. Clifford's (2014) definition of the impact is based on four main components:

- value generated by a particular activity,
- value perceived by the beneficiaries and all parties involved,
- value that includes both positive and negative effects,
- value that is determined on the basis of what the situation would be without the intervention.

Impact evaluation is also defined as the process of collecting qualitative and quantitative evidence on the impact (whether and how the intervention is directly responsible for specific changes or benefits) and their indicators (metrics) that are subsequently applied to ensure the sustainability of the provided services (Streatfield and Markless, 2009). The impact evaluation also aims to understand to what extent, and how the initiatives correct a problem they are addressing, the effects of intervention, the suitability of the intervention proposal, costs and effectiveness of the intervention, its unintended effects and how to use the gained experience to improve the design of future interventions (OECD, 2015). Impact evaluation

focuses on characteristics, procedures, results and / or value of activities (McKinsey & Company, 2010).

Impact evaluation has become a "field of growth", where evaluation systems with their methodologies, organizational infrastructures, textbooks and professional associations exist (Leeuw and Furubo, 2008). The reason for a greater attention is that it has not been clear to what extent results of developed initiatives are satisfactory. It seems that many initiatives do not leave a trail of lasting positive change, and it is difficult to determine what changes have been made upon their completion.

The most frequently stated reasons for impact evaluation are (Leeuw and Vaessen, 2009):

- Impact evaluation provides evidence of which initiatives function properly and which do not, under what circumstances and how large the created impact is.
- Impact evaluation and the attribution of variations of dependent variables to various initiatives serve as a tool for their creation and improvement.
- Impact evaluation provide information that is important in terms of accountability and transparency, making available knowledge of created (social) impacts of initiatives that may be linked to the (financial) resources used to achieve these impacts.
- Impact evaluation can provide evidence of the sustainability of interventions effects.
- Impact evaluation stimulates individual and organizational learning.
- Impact evaluation serves to inform decision makers on whether to extend, modify or remove given initiatives.
- Impact evaluation allows sponsors, partners and beneficiaries of effects to compare the effectiveness of alternative interventions

The most important reason to support the impact evaluation of public initiatives is simply to find out what works, what does not and why. That way, it can contribute to the effectiveness of future interventions.

Our focus is on less represented groups, which face different problems and barriers when they want to start their business. Research shows that public initiatives really stimulate less represented groups to engage in entrepreneurship and thus increase their entrepreneurial activity. Upon finishing an entrepreneurial course, the participants are better able to identify opportunities while generating more entrepreneurial ideas with higher innovation, which has a significant impact on business activity (DeTienne and Chandler, 2004, Tsyganová, 2010) and increased recognition of opportunities may improve entrepreneurial behaviour (Bohlmann et al., 2017). Therefore, trainings should be considered a crucial point in designing public policies and stimulating entrepreneurship in general, both for women and men. These programs may include entrepreneurial training, different types and forms of coaching and mentoring, grant programs, options of loans for start-up entrepreneurs, and support to build networks. However, it is crucial to know if these initiatives have the expected effects and meet the objectives pursued. Therefore, it is important to properly evaluate their impacts. But how is it done and what are the requirements for the impact evaluation?

2 The current status of impact evaluation of public initiatives

An important part of the policy making process, is knowing what and how much impact is created, in order to efficiently allocate resources where they can have the greatest effect. Over the last few years, governments and other public sector organizations have paid much more attention to the impact evaluation. Whereas, only a certain part of the public benefits while using public funds, transparency and efficiency is crucial. It is based on the following (GECES Sub-group on Impact Measurement, 2014):

- the obligation of program and intervention providers to be accountable (and to recognize responsibility) for the public money they spend and for the services provided;
- the need to be transparent in explaining how funds are spent on providing services that meet public needs, including the results they achieve;
- the need for programs and interventions to stimulate and facilitate the involvement of the public, consumers of services and others, in expressing their needs and engaging in their fulfilment;
- the need for structured management of the involved organizations to effectively achieve the first three steps.

The need for a comprehensive impact evaluation of public initiatives is based on the fact that common indicators and impact evaluation methods mostly focus on economic impacts (Fazzi, 2010). In addition, Fazi argues that the impact evaluation of initiatives addressing social aspects is limited by data available from national and international accounting systems, which focus primarily on the commercial sector.

Those countries which draw resources for public programs from the European Structural and Investment Fund, these programs must be evaluated under the conditions set by the European Commission. The European Commission has increased the requirements for evaluating the impact of programs in the last programming period, while they recommend using counterfactual analysis.

The key requirements of the European Commission for evaluating the impact of programs are (European Commission, 2017):

- Impact evaluation must include a logical justification that combines the problem (including subsidiarity issues) with its underlying causes, objectives and a whole range of policy options to address this problem. The likely impacts of different options must be presented, who will be affected and how.
- Stakeholders must be able to provide feedback based on an initial impact evaluation that describes the problem, subsidiarity issues, objectives, different program options and an initial consideration of their relevant impacts.
- Impact evaluation must compare the possibilities of different programs based on their economic, social and environmental impacts (quantified costs and benefits, if possible) and present them in the Impact evaluation report.
- There are elements that need to be included in the impact evaluation report. These include: (i) a description of the environmental, social and economic impacts and an

explicit statement if some of them are not considered significant; (ii) a clear description of who will be affected by the initiative and how.

- Considering the whole life-cycle of the created program, the impact evaluation should define the monitoring and ex-post evaluation mechanisms in order to be able to review whether the policy action actually delivers the intended results and informs any future revisions of the program.

For a specific impact evaluation of initiatives to promote entrepreneurial activity among less represented groups the European Commission, together with the OECD (2013), produced a document defining the impact evaluation process in three stages:

- *Initial stage* - establishing an evidence basis for the proposed policy measures. At this stage, there are three key data sources and evaluation methods: benchmarking and meta-evaluation, statistics and research and stakeholder consultation. Activities at this stage take place before the intervention and its main aim is to create a coherent vision of future policy measures.
- *Ex ante evaluation* - after proposing an intervention in the frame of public policies or a set of measures, it is important to carry out an ex ante evaluation, to see whether these proposed interventions are relevant, coherent and likely to be successful and effective in achieving their objectives. The key indicators to be used to monitor and evaluate interventions, should be identified at the ex-ante evaluation stage in order to create an effective process of gathering the necessary information during interventions.
- *Ex-post evaluation* - after launching the relevant initiative (intervention), it is necessary to focus the attention on the impacts it generates. The concept of counterfactual analysis is used to evaluate what would have happened without political intervention. The impact of the intervention is considered to be the difference between what was caused by the intervention and what would have happened without it. As a part of the impact evaluation it is important to answer the question: what change has been achieved by the intervention?

To understand the concept of impact evaluation as well as existing methods, it is necessary to know the theory behind value creation. In the following chapter, the starting points of value creation will be introduced through the Impact Value Chain concept, the "Theory of Change" and the different phases of impact evaluation.

3 Theoretical background of impact evaluation

Rosenzweig and Olsen (2004), authors of the Impact Value Chain concept, contributed significantly to the definition of value creation. They found that the language used by various stakeholders in the field of impact evaluation was confusing and inconsistent, coming from the fields of program evaluation, business activities, social sciences, policies and NGOs. They designed a logical model to better understand the relationship between inputs, activities, outputs, outcomes and impact, and described the mechanism of change, the model of how the value is generated.

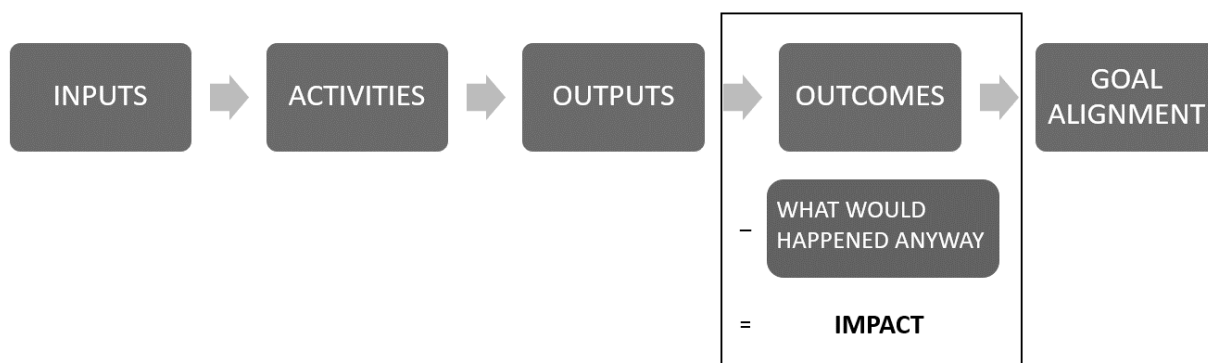


Figure 1. Impact Value Chain (Source: own elaboration according to Clark et al., 2004)

Characteristics of the individual components entering the Impact Value Chain are the following:

- *Inputs*: resources (money, employee time, capital assets, etc.) that are needed for the operational activities of an organization, initiative or a program.
- *Activities*: operations that are being developed to achieve impact.
- *Outputs*: indicators and other measurable variables from the operational activities that can be directly measured.
- *Outcomes*: specific changes in attitudes, behaviours, knowledge, skills, status or level of performance resulting from developed activities, such as finding a job, reducing emissions or unemployment etc.
- *Impact*: the difference between the results that occurred after delivering the activities and the results that would have occurred without performing any action.
- *Goal Alignment*: the process of managing the evaluation whether the results or impacts meet the desired goals and determine what can be done to improve the activities.

The Impact Value Chain is important because it has set a single vocabulary in the field of impact evaluation and present a way of generating value. The logic model that connects these five components is known as the "Theory of Change". Weiss (1995) defines the Theory of Change simply as the theory of how and why an initiative works. The Theory of Change is based on the field of program evaluation. This term appeared in the mid-90s as a new way of analysing theories behind programs and initiatives that promote social and political change. It is a specific type of planning, participation, and evaluation methodology used in philanthropy, non-profit and governmental sector to support change. It is used to define long-term goals and subsequently identify the assumptions necessary for the set goals to occur (Brest, 2010). It illustrates and explains the causal link between activities carried out and their targeted outcomes and impact. The causal link principle must always be understood and explained to make clear that certain activities will lead to certain outcomes. The reason why it is assumed that the outcomes are created by a specific activity, should always be supported by appropriate evidence (Reisman and Giennap, 2004). The Theory of Change explains the

process of change by outlining the causal links of the initiative. Thus, the identified changes, the short-, medium- and long-term outcomes, are mapped and show each outcome in a logical link to everything else, as well as the chronological flow. The links between the outcomes are explained by justifications or statements, why the specific outcome is assumed to be the assumption of another (Taplin and Clark, 2012).

The European Commission requires programs to have defined specific goals that reflect the change that is intended. This evaluation is in the form of an expert judgment and is based on the theory of change, being carried out before the intervention. The additional required impact evaluation is in the form of indicators for monitoring and measuring changes and output indicators that characterize specific measures implemented. This evaluation takes place after the intervention. It answers questions such as: how many people joined the program, how much their income increased after graduation the program, etc. Outputs are the result of activities that can be directly measured or evaluated, and various qualitative research or quantification methods are used.

International leaders at the G8 summit in London in June 2013 set up a working group focused on impact evaluation, as they have recognized its importance. Based on the research, this working group constructed a report outlining seven guidelines (broadly accepted sets of actions) underpinning the four phases of impact evaluation. These seven guidelines provide their users with a model for effectively defining, collecting and analysing impact data. The model consists of the following four phases (Social Impact Investment Taskforce, 2014):

1. *Planning*

- *Goal setting* - defining the required impact. Goal setting not only defines the purpose of the evaluation, it also guides the investment of resources and helps stakeholders evaluate the created progress.
- *Determining the impact framework and selecting methods* - determining methods to be used for impact evaluation and which data will be used in the impact evaluation process. An effective impact framework includes methods and a description of how they will be used, considering the needs and perspectives of different stakeholders.

2. *Activity*

- *Data collection* - matching information technologies, tools, resources, human capital and data acquisition methods. Proven data collection and storage procedures are used, which are important for reducing reporting burden and ensuring data integrity.
- *Data validation* –ensures data quality, ability to check relevant processes and calculations.

3. *Evaluation*

- *Data Analysis* - investigating and analysing data to understand how the resources invested achieve the intended goals. It can provide information on how decisions are made and how capital is allocated. Standard and objective processes are used as far as possible to ensure results that are interpretable, comparable and understandable.

4. Review

- *Data reporting* - sharing obtained information with key stakeholders to help them understand how the set goals are being achieved. Effective reporting is evidence-based and is in line with their expectations in terms of details. It allows comparison and is the basis for decision-making.
- *Data-based decisions* - identifying and implementing mechanisms to improve outcomes. They lead to constant improvement and long-term changes.

Widely accepted sets of actions, and the before-mentioned four stages of the impact evaluation process, have led to the development of a large number of methods and tools that vary according to the impact they are trying to evaluate. The impact evaluation is usually targeted at a specific set of impacts, which often represent a rather narrow picture of outcomes of an intervention. This applies in particular when the impact evaluation is too focused on economic impacts (OECD, 2015).

Many tools have been developed to capture impacts, as well as different methods, but there is no broader consensus on their acceptance (Social Impact Investment Taskforce, 2014). This is because the evaluation of the impact is not easy, especially because of difficulties in identifying qualitative and quantitative methods which should be able to pass on information to stakeholders. It is also difficult to estimate social and environmental impacts, as they can sometimes appear after years, and it is difficult to determine to what extent certain interventions affect them. This complexity has resulted in the development of several models and methods aimed at providing guidelines and indicators for evaluating impacts. This continued development of new models is due to the fact that organizations differ in size, capacity, activities and focus, and therefore there is no single model that would be suitable for all of them (Grieco et al., 2014). In addition, Molecke and Pinks (2017) in their study point out that most institutions that measure their social and environmental impacts do not do so exclusively through one tool or method, but they use a variety of them, moreover, they often choose only the elements of the individual tools (for example according to data availability or interpretations) and then create their own evaluation system that suits them. In the next section, different forms and types of impact evaluation will be introduced.

4. Methods for evaluating the impacts

The impact evaluation, enables organizations to identify, measure and collect evidence about benefits they create for stakeholders in the environmental, social and local development area. Within the wider process of creating value, organizations need to recognize the importance of the evaluation process for discovering new value and creating valuable opportunities for innovation and growth, that would otherwise be lacking (Porter et al., 2012). The main problem is not the evaluation itself, but the conversion of qualitative data regarding the achievement of the social mission into quantitative measures. The objective of the evaluation should be to integrate economic, social and environmental output in order to maximize value creation as well as return to shareholders (Grieco et al., 2014). In this context,

the impact evaluation can be considered as a process of providing evidence that a program or organization provides real and tangible benefits to society or the environment.

Quantification and explanation of the interventions effects are the basis for evaluating the development of public policies programs. In order for managers to make competent decisions, it is important to understand what works or does not, how and why, for whom and in what contexts. On this list of questions, available analytical methods provide at best, only preliminary and incomplete answers. Therefore, it is very important to clarify what methods can answer different questions and under which circumstances.

A large number of different methods and tools also cause their categorization to be extremely important, as its absence could be an obstacle for organizations that want to start using them. Many existing options are confusing for managers who want to select a way to evaluate the impact of their organization, because it is difficult for them to compare different methods and tools and decide which one may be the most appropriate for them. In addition, this may hinder the work of researchers involved in the development of new models of impact evaluation and of academics trying to analyse progress in this area (Maas & Liket, 2011).

In the following section, an overview of the key categories that divide various available methods and tools into certain groups is provided. They will enable to further analyse their usage.

Concerning the categorization of impact evaluation methods, two conceptually different sets of questions arise: one of them deals primarily with the quantification of effects, second one with their explanation. Based on this, two approaches to the categorization of impact evaluation methods have been distinguished (European Commission, 2013):

- *Theory-based impact evaluation*

The importance of this approach stems from the fact that, in addition to the quantifiable causal effects, more information is useful for managers according to which they can decide or present their activities. Questions why a set of interventions have certain impacts, both intended and unintended, for whom and in what context are as important and as demanding as the question of how much impact has been created. This approach is based on examining the "Theory of Change" and therefore it is called the theory-based impact evaluation. The outcome of using this approach is not a number, but rather a story. Therefore, it cannot be used to calculate costs and revenues, it is not immediately communicable and is not supported by a set of statistical tools. Some users therefore might find it less scientific or less objective. But it can provide a rare insight, in understanding why an initiative works or not. This approach is based on the idea that the main component is not the hypothesis (how things would evolve without intervention), but the theory of change (how things should logically work to achieve the desired change).

- *Counterfactual impact evaluation*

The main question of the counterfactual impact evaluation approach is: how much difference does the intervention cause? This approach gives answers that are usually numerical, which are further supported by causal explanations based on empirical evidence and certain assumptions. Determining whether the difference observed in the result, after the

intervention is caused by the intervention itself or by something else, is a very challenging task. The counterfactual impact evaluation approach is useful for decision-taking because of the following reasons (European Commission, 2013):

1. provides easily interpretable information;
2. uses the basic components for the calculation of cost-benefit / efficiency analysis;
3. may be divided into separate subgroup numbers, under the condition that the subgroups are defined in advance.

The challenge for impact quantification is to find a trusted approximation of what would occur in the absence of an intervention, and compare it to what actually happened. This difference is the estimated impact of the intervention on a specific result (whether it is GDP per capita, R & D expenditure or unemployment rate).

Another categorization of impact evaluation methods can be found in the work of Epstein and Yuthas (2014). They divided the impact evaluation methods into four basic categories:

- *Expert judgment* – interviews, discussions and program observations by experienced professionals. Many impact reports are currently evaluated by experienced observers. These evaluations are based on interviews with beneficiaries or their observations. Ideally, evaluations should be based on evidence such as observation by field workers or independent experts. This type of evaluation is appropriate for programs whose impacts cannot be really measured (e.g., programs that support peace). Expert judgment can be valuable and reliable, especially when supported by well-developed logic. In many cases, this approach is insufficient to fully understand the impacts of developed activities.
- *Qualitative research* - systematic in-depth impact research, which may include on-the-spot visits, structured interviews, and focus groups. When processes, operations and outcomes are established, it is advisable to systematically evaluate them. The objective may be to evaluate the overall success or review specific inputs, activities, outputs, or outcomes that are most likely to affect the success of a program. Qualitative research can be a part of the development of a clear mission, theory of change, or logic model of a program. It requires a systematic formulation of the research design and testing of the hypotheses, directly related to the logic model. Unlike expert judgment, qualitative methods are based on objective assessment, systematic documentation and analysis.
- *Quantification* - data and reports in numerical form. It may include direct measurements as well as survey results. This approach is increasingly demanded over expert judgment or qualitative research. Outputs are more often measured and evaluated than actual impact (e.g. the number of participants in the program as opposed to how the intervention impacts on their employability - the effect of outcomes on their beneficiaries). What should be evaluated depends on the purpose of the evaluation, the objectives of an initiative and the logic model. Measurement may be in a form of a score, percentage, or a comparison with a reference value.
- *Monetization* - a quantitative evaluation that converts some or all measured impacts into monetary value. The best known is the cost-benefit analysis, which attributes monetary

values to market and non-market impacts. It is extensively used in the public sector to evaluate social programs. It attributes monetary value to measured outcomes and deducts costs of achieving them, resulting in the value of "net social benefit (or cost)". The challenge of this approach is to estimate fair value of market and non-market benefits. Some estimations may lack objectivity and accuracy, but the evaluation can still be beneficial, if the assumptions of the evaluation are known.

Another categorization of impact evaluation methods can be found in the study of Grieco et al. (2014), who performed cluster analysis based on seven chosen variables. The result is four clusters that provide an overview of over 70 impact evaluation methods of initiatives and programs subdivided into further subgroups. This study contributes to the understanding of the studied methods and provides a simple overview. The disadvantage is that it includes only a limited number of methods.

Based on the literature study and the analysis of different approaches, an overview of different options for categorizing of impact evaluation methods has been put together according to their characteristics, type and authors.

Table 1. Categorization of impact evaluation methods by authors

Characteristics	Type	Authors
Timeframe	Future Ongoing Retrospective	Tuan, 2008 Maas and Liket, 2011
Accountability	External stakeholders Internal stakeholders	Gibbon and Dey, 2011 Mulgan, 2011
Approach	Process Impact Monetization	Clark et al., 2004 Maas and Liket, 2011
Analytical view	Cost-effectiveness Cost -benefits Others	Tuan, 2008
Purpose	Testing Monitoring Reporting Evaluation	Olsen et al., 2008 Maas and Liket, 2011 Krlev et al., 2012 Mulgan, 2010
	Analysis for stakeholders	Krlev et al., 2012
Orientation	Inputs Outputs	Maas and Liket, 2011
Length of timeframe	Short-term Long-term	Maas and Liket, 2011 Schober and Rauscher, 2014
Perspective	Micro Meso Macro	
Type of data	Quantitative Qualitative Quali-quantitative	Nicholls, 2005
Impact typology	Holistic People Environment Social Economic	Rinaldo, 2010
Model complexity	Basic Simple Complex Highly complex	Maas and Liket, 2011 Zappalà and Lyons, 2009
Sector	General Specific	TRASI

Source: based on Dufour, (2015), own completion

These categorizations were the basis for processing a review of the most commonly used impact evaluation methods contained in Table 2. Two main categories were chosen, namely the Theory-based and Counterfactual impact evaluations. We have further divided them to expert judgment, qualitative research, quantification and monetization. The individual categories include methods sets and techniques, authors or organization and source.

Table 2. Classification of impact evaluation methods

Classification		Methods and techniques	Author/Organization	Source
Theory-based impact evaluation	Expert judgement	Discussion Observation Expert analysis Delphic method		Evalued sourcebook: Methods and techniques ³
	Qualitative research	Structured interviews On-site visits Focus groups		
Counterfactual impact evaluation	Quantification	Surveys Direct measurement Cost analysis		
		NEF methods ⁴	New Economic Foundation	Prove and Improve
		RF methods ^{5,6}	The Rockefeller Foundation	Catalogue of Approaches to Impact Measurement
	Monetization	IRIS methods ⁷	Global Impact Investing Network	https://iris.thegiin.org/metrics
		Cost-benefit analysis Social return on investment ⁸	SROI Network	Evalued sourcebook: Method and techniques A guide to Social Return on Investment
Standards and procedures for measurement and impact evaluation	EU standards	European Commission/GECES group	Proposed Approaches to Social Impact Measurement ⁹	
	Other standards and procedures	European Venture Philanthropy Association	A Practical Guide to Measuring and Managing Impact ¹⁰	
		The World Bank	Guide to Evaluating Capacity Development Results ¹¹	

³ European Commission: EVALSED - The resource for the evaluation of Socio-Economic Development: Sourcebook - Method and techniques, 2014. Available on: http://ec.europa.eu/regional_policy/en/information/publications/evaluations-guidance-documents/2013/evalsed-the-resource-for-the-evaluation-of-socio-economic-development-sourcebook-method-and-techniques

⁴ Currently more than 150 methods for evaluating and measuring impact. The Foundation Center is an association of around 500 foundations that have collected these metrics. The TRASI database has until recently provided the opportunity to freely view these techniques and filter them according to the chosen criteria. These methods are currently being reviewed and updated. Some metrics and a short description are available freely on: http://b.3cdn.net/nefoundation/ee604b9c7787bf1b80_aym6ivqnu.pdf

⁵ Catalogue of 25 impact evaluation methods collected by the Rockefeller Foundation. Available on: <http://www.midot.org.il/Sites/midot/content/Flash/CATALOG%20OF%20APPROACHES%20TO%20IMPACT%20MEASUREMENT.pdf>

⁶ Other methods collected by the Rockefeller Foundation. Available on: https://centers.fuqua.duke.edu/case/wp-content/uploads/sites/7/2015/02/Report_Clark_DoubleBottomLineProjectReport_2004.pdf

⁷ A number of different methods that can be filtered by specific criteria such as purpose, organization type, sector, focus, and orientation. Descriptions of individual methods, application manuals, and best practices are available on the web page.

⁸ The description of this method as well as the detailed application procedure is available on the Internet: http://b.3cdn.net/nefoundation/aff3779953c5b88d53_cpm6v3v71.pdf

⁹ http://ec.europa.eu/internal_market/social_business/docs/expert-group/20131128-impact-measurement-subgroup_en.pdf

¹⁰ <http://evpa.eu.com/knowledge-centre/publications/evpa-publicatio>

	Toniic Institute	Toniic E-Guide to Early Stage Global Impact Investing ¹²
	Rockefeller Philanthropy Advisors	Assessing Impact ¹³
	Social Impact Investment Taskforce	Measuring Impact ¹⁴

Source: authors

Foundation Centre methods as well as IRIS methods are available in online catalogues and can be freely browsed. There is a possibility to filter them according to different criteria. A brief description, application procedure and recommendations are available. Impact evaluation standards and procedures are very important, as they provide guidance on how to apply different impact evaluation methods, thereby improving their quality and standardization.

Conclusion

The topic of the impact evaluation has been extensively discussed by scientific researches as well as practitioners from different sectors. The need to evaluate the economic, environmental and social impact often comes up not only in the public sector but also in other sectors. For example, in profitable companies, the growth of this trend is directly linked to the growing importance of corporate social responsibility and the consequent need for appropriate measures to demonstrate the created impacts. Reasons for increasing interest from social entrepreneurs and non-profit organizations in this area can be found in financial accounting restrictions that exclude items that are not monetary and are aimed only at shareholders and creditors, while employees, beneficiaries, consumers of their services, companies, governments, volunteers and the environment are excluded. The new competitive environment which these organizations face requires a proper evaluation of their impact in order to improve their performance and effectively inform about the benefits of their activities. Incorporation of social and environmental benefits is therefore the key to providing a more comprehensive view of overall intervention or society.

The overview and subsequent categorization of the approaches to the impact evaluation of initiatives addressing different issues in society serve as an important knowledge base for designing a framework model which would reflect the specifics of the environment and would be able to take into account all the different aspects of public policies. In this paper the theoretical background of value creation and an overview of various types of categorization and different available methods of the impact evaluation was the basis for their systematic processing and presentation. In the next step it is important to study each of them in depth to identify further opportunities for more precise way of evaluation impact.

¹¹ <http://wbi.worldbank.org/wbi/document/guide-evaluating-capacity-development-res>

¹² <http://www.toniic.com/toniic-institute/early-stage-e-guide/#top>

¹³ <https://www.rockpa.org/document.doc?id=>

¹⁴ <http://www.socialimpactinvestment.org/reports/Measuring%20Impact%20WG%20paper%20FINAL.pdf>

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References

- [1] BOHLMANN, C. et al. (2017) *A Lifespan Perspective on Entrepreneurship: Perceived Opportunities and Skills Explain the Negative Association between Age and Entrepreneurial Activity*. *Front. Psychol.* 8:2015. doi: 10.3389/fpsyg.2017.02015.
- [2] BREST P. (2010) *The Power of Theories of Change. 2010*. Stanford Social Innovation Review. [Online] Available from: https://ssir.org/articles/entry/the_power_of_theories_of_change. [Accessed 3th November 2018].
- [3] CLARK, C. et al. (2004) *Double bottom line project report: Assessing social impact in double bottom line ventures*. Rockefeller Foundation, [Online] Available from: http://www.riseproject.org/DBL_Methods_Catalog.pdf. [Accessed 3th November 2018]
- [4] CLIFFORD, J. (2014) *Impact Evaluation by Social Enterprises: Measuring the unmeasurable?*, 10th annual meeting of the OECD LEED forum on partnerships and local development, Stockholm, [online]. Available from: <http://www.oecd.org/cfe/leed/10th-fplg-meeting.htm>. [Accessed 3th November 2018]
- [5] DETIENNE, D. and CHANDLER, G. (2014) *Opportunity Identification and Its Role in the Entrepreneurial Classroom: A Pedagogical Approach and Empirical Test*. In *Academy of Management Learning & Education* Vol. 3, No. 3.
- [6] EPSTEIN, J. and YUTHAS, K. (2014) *Measuring and Improving Social Impacts, A Guide for Nonprofits, Companies and Impact Investors*. Greenleaf Publishing, ISBN 987-1-907643-99-6.
- [7] EUROPEAN COMMISSION (2017) *Entrepreneurship 2020 Action Plan*. . [Online] Available from: https://ec.europa.eu/growth/smes/promoting-entrepreneurship/actionplan_en. [Accessed 3th November 2018]
- [8] FAZZI, L. (2010) *The provision of welfare and general-interest services. The economics of social responsibility*. *The world of social enterprises.*, pages 55– 71. Routledge, London.
- [9] FERREIRA, J. et al. (2017) *Effects of Schumpeterian and Kirznerian entrepreneurship on economic growth: panel data evidence*. *Entrepreneurship & Regional Development*. 29 (1-2), 27-50.
- [10] GECES SUB-GROUP ON IMPACT MEASUREMENT (2014) *Proposed Approaches to Social Impact Measurement in European Commission legislation and in practice relating to: EuSEFs and the EaSI*. [Online] Available from: http://ec.europa.eu/internal_market/social_business/docs/expertgroup/social_impact/1406_05-sub-group-report_en.pdf. [Accessed 3th November 2018]

- [11] GIBBON, J. and DEY, C. (2011) *Developments in social impact measurement in the third sector: scaling up or dumbing down?* Social and Environmental Accountability Journal, 31(1), 63–72.
- [12] GRIECO, C. et al. (2014) *Measuring Value Creation in Social Enterprises: A Cluster Analysis of Social Impact Assessment Models*. Nonprofit and Voluntary Sector Quarterly 1–21, DOI: 10.1177/0899764014555986.
- [13] KOELLINGER, P. D. and THURIK, R. A. (2012) *Entrepreneurship and the business cycle*. Review of Economics and Statistics, 94(4), 1143-1156.
- [14] KRLEV, G. et al. (2013) *Social Return on Investment (SROI): State-of-the-Art and Perspectives*. CSI Report. [Online] Available from: https://www.csi.uniheidelberg.de/downloads/CSI_SROI_Meta_Analysis_2013.pdf. [Accessed 3th November 2018]
- [15] LEEUW, F. A VAESSEN, J. (2009) *Impact evaluations and development : NONIE guidance on impact evaluation*. Washington, DC: World Bank. [Online] Available from: <http://documents.worldbank.org/curated/en/411821468313779505/Impactevaluations-and-development-NONIE-guidance-on-impact-evaluation>. [Accessed 3th November 2018]
- [16] LEEUW, F. and FURUBO J. (2008) *Evaluation Systems – What Are They and Why Study Them?* Evaluation. Vol. 14(2), 157–169.
- [17] LUKEŠ, M. (2013) *Entrepreneurs as Innovators: A Multi-Country Study on Entrepreneurs' Innovative Behaviour*. Prague Economic Papers, 22(1), 72-84.
- [18] MAAS, K. and LIKET, K. (2011) *Social Impact Measurement: Classification of Methods*. Environmental Management Accounting and Supply Chain Management. (pp. 171– 202). Springer Netherlands. DOI: 10.1007/978-94-007-1390-1_8.
- [19] MCKINSEY & COMPANY (2010) *Learning for social impact - What foundations can do*. [Online] Available from: <https://iris.thegiin.org/research/learning-for-social-impact-what-foundations-can-do/summary>. [Accessed 3th November 2018]
- [20] MOLECKE, G. and PINKSE, J. (2017) *Accountability for social impact: A bricolage perspective on impact measurement in social enterprises*. Journal of Business Venturing 32. 550 – 568.
- [21] MULGAN, G. (2010) *Measuring Social Value*. Stanford Social Innovation Review. [Online] Available from: https://ssir.org/articles/entry/measuring_social_value. [Accessed 3th November 2018]
- [22] NICHOLLS, A. (2005) *Measuring impact in social entrepreneurship: New accountabilities to stakeholders and investors?* ERSC Seminar, Local Government Research Unit, London. [Online] Available from: <http://eureka.sbs.ox.ac.uk/2878/>. [Accessed 3th November 2018]
- [23] OECD & EUROPEAN COMMISSION (2017): *Missing Entrepreneurs 2017. Policies for Inclusive Entrepreneurship*. OECD Publishing, Paris.
- [24] OECD (2013) *Policy Brief on Evaluation of Inclusive Entrepreneurship Programmes*. [Online] Available from: http://www.oecd.org/cfe/leed/Policy_brief_evaluation_inclusive_entrepreneurship_programmes.pdf. [Accessed 3th November 2018]
- [25] OECD (2015) *What is impact assessment?* [Online] Available from: <https://www.oecd.org/sti/inno/What-is-impact-assessment-OECDImpact.pdf>. [Accessed 3th November 2018]

- [26] OLSEN, S. and GALIMIDI, B. (2008) *Catalog of Approaches to Impact Measurement - Assessing social impact in private ventures*. The Rockefeller Foundation. [Online] Available from: <http://www.midot.org.il/Sites/midot/content/Flash/CATALOG%20OF%20APPROACHES%20TO%20IMPACT%20MEASUREMENT.pdf>. [Accessed 3th November 2018]
- [27] PORTER, M. E. et al. (2012) *Measuring shared value: How to unlock value by linking social and business results*. FSG. [Online] Available from: http://animuscsr.com/docs/Measuring_Shared_Value.pdf. [Accessed 3th November 2018]
- [28] REISMAN, J. and GIENNAP, A. (2004) *Theory of change: A practical tool for action, results and learning*. Rotterdam, The Netherlands: Organizational Research Services, Erasmus University. [Online] Available from: <http://www.aecf.org/m/resourcedoc/aecftheoryofchange-2004.pdf>. [Accessed 3th November 2018]
- [29] RINALDO, H. (2010) *Getting started in social impact measurement: A guide to choosing how to measure social impact*. Norwich: The Guild. [Online] Available from: http://www.socialauditnetwork.org.uk/files/8113/4996/6882/Getting_started_in_social_impact_measurement_-_270212.pdf. [Accessed 3th November 2018]
- [30] SCHOBER, C. and RAUSCHER, O. (2014) „*Was ist Impact. Gesellschaftliche Wirkungen von (Nonprofit) Organisationen. Von Der Identifikation Über Die Bewertung Bis Zu Unterschiedlichen Analyseformen*“, WU Vienna University of Economics and Business Working Paper.
- [31] STREATFIELD, D. and MARKLESS, S. (2009) *What is impact assessment and why is it important?* Performance Measurement and Metrics, Vol. 10 Issue: 2, pp.134-141.
- [32] TAPLIN D. A CLARK H. (2012) *Theory Of Change Basics - A Primer On Theory Of Change. ActKnowledge – Theory to Results*. [Online] Available from: http://www.theoryofchange.org/wp-content/uploads/toco_library/pdf/ToCBasics.pdf. [Accessed 3th November 2018]
- [33] TSYGANOVA T. and SHIROKOVA G. (2010) *Gender Differences in Entrepreneurship: Evidence from Gem Data*, Organizations and Markets in Emerging Economies, Vol. 1, No. 1(1), ISSN 2029-1581.
- [34] TUAN, M. T. (2008) *Measuring and/or estimating social value creation: Insights into eight integrated cost approaches*. Final Paper. Bill and Melinda Gates Foundation. Seattle, Washington. [Online] Available from: <https://docs.gatesfoundation.org/documents/wwl-report-measuring-estimating-socialvalue-creation.pdf>. [Accessed 3th November 2018]
- [35] WAINWRIGHT, S. (2002) *Measuring impact: A guide to resources*. London, England: National Council for Voluntary Organization (NCVO). [Online] Available from: <http://portals.wi.wur.nl/files/docs/ppme/measuringImpact20012003.pdf>. [Accessed 3th November 2018]
- [36] WEISS C. H. et al. (1995) *New Approaches to Evaluating Community Initiatives: Concepts, Methods, and Contexts*. Washington, DC: Aspen Institute. [Online] Available from: <https://eric.ed.gov/?id=ED383817>. [Accessed 3th November 2018]
- [37] ZAPPALÀ, G. A LYONS, M. (2009) *Recent approaches to measuring social impact in the third sector: An overview*. Background Paper No. 5. Centre for Social Impact. [Online] Available from: http://www.socialauditnetwork.org.uk/files/8913/2938/6375/CSI_Background_Paper

No_5_-_Approaches_to_measuring_social_impact_-_150210.pdf.
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INFLUENCE OF COSTS FOR PROFIT FORMATION OF MINING COMPANIES IN PRAXIS

Katarina Teplicka¹

Abstract

Costs constitute the basic economic indicator that affects the business activities of companies. We will search costs in mining companies in Slovakia. Cost optimization in the mining company is a key factor of business and the goal to successful growth and profit formation. The costs of the mining company are high and costs affect negatively corporate profit. The goal of this paper is to find out the development costs in the mining companies in Slovakia relative to the size of the business. We will use economic cost analysis in the mining companies through a chain index. The results of this economic analysis present a decreasing development of costs in the small and medium mining companies and increasing development of costs in large mining companies.

Keywords: costs, profit, optimize, economic indicator.

1 Introduction and theory overview

The main idea of the cost management in companies is to direction, to evaluation and to improve of all processes. The company which wants to be successful is focused on effectivity and flexibility of own activities and processes and their optimization (Serina, 2013). Cost management activities become part of the management tools that mining companies use to achieve economic efficiency and profit. Costs create basic economic category. Costs are instrument of barriers to business, leading to bankruptcy or liquidation of business. Financial accounting is a system for evidence all costs of business. The main body of evidence is to prepare very effective system. Mann, Modrak, Grabara (2011) point out that the marginal costs are very important indicator for efficiency of production. Marginal costs are intimately connected with productivity optimum which is determined by the level of activity of the company where production achievement is done at the lowest medium cost, and both mathematical calculus and economic reasoning show that this optimum appears when medium cost is identical with marginal cost. It is very important mathematical formula for financial situation in companies.

The new innovative method for accounting named targeting lean process improvement (Darlington, Francis, Found, Thomas, 2015). Cost management in many companies is not systematic and that is why the question of the introduction of cost controls as a tool for effective decision making, planning and cost management is very important and necessary

¹ doc. Ing. Katarína Teplická, PhD., Fakulta BERG TU Košice, Park Komenského 19, 040 11 Košice, email: katarina.teplicka@tuke.sk

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(Šatanová, Potkány, 2004). Prosperity of the firms depends in present time mainly from the timely and proper decision of management about way for obtaining of financial, raw material, material, technical and human sources, decision about work efficiency achieving for individual working places and employees in the production, about efficiency of firm's fixed capital using, about optimal management of stocking and sales, about localization of clients and transport, about environment of the firm (Šatanová, Závadský et.al., 2014). Cost management in the mining companies and their impact on profit represents a measure of financial success business (Kassay, 2001). Process approach in cost management is the key of efficiency and productivity in business today. Very important method for managerial decision is activity based costing and using of this method is possible in cost management (Floreková, Teplická, 2001). Łęgowik - Świącik (2015) applied decision making process for chemical company with aim to present information flow in production by analysis of linear correlation and comparative analysis of cost information in production process.

2 Methodology

Monitoring of the costs can be made on the basis of different approaches. For evaluation of economic and statistical indicators we can use arithmetic mean and economical chain index (Petřík, 2005). Development of costs we follow through graphical methods. Arithmetic mean indicates the average value of expenses in the period in relation to the size of the mining companies. The average value of costs is monitored in relation to the size of the business to be able to see the difference in the cost of small, medium and large mining companies. Individual chain index informs of changes in the cost of two consecutive periods. Individual index follows the development of economic indicators and suggest ways to optimize costs in the mining companies. Cost optimization is important in terms of generating profit and achieving efficiency in the mining companies.

3 Results and discussion

We implemented statistical indicators of costs in mining companies in Slovak republic. We classify companies - small, medium, large mining companies. We obtained information about costs in mining companies from statistical database SLOVSTAT and accounts register in Slovak republic. We analyzed costs according to this classification. We summarized the costs for three years and we express arithmetic mean. We solved statistical indicators of costs in mining companies. Economic analysis in mining companies points out decrease and increase of costs. We used mathematical, statistical indicator – arithmetic mean for specification of cost changes in the mining companies for three years.

Results of this economic analysis shows to decreasing of costs in small and medium mining companies but in large mining companies was recorded soft increasing of costs (table 1). Decreasing of costs for mining companies is positive indicator for profit creation.

Table 1: Economic indicators in mining companies.

Arithmetic mean of costs (€)	2014	2015	2016
Small mining	2 059 119	1 882 716	1 808 618
Medium mining	8 620 761	8 534 399	8 010 235
Large mining	120 164 732	130 505 770	130 554 878

Source: www.statistic.sk

Continual decreasing of costs in mining companies is base in cost management. Monitoring and evaluation costs create one part of cost controlling and this part of cost controlling affords information for managerial decision. Costs are element of all activities in company and every process in company generates costs. Bain & Company has identified several factors that differentiate successful businesses from unsuccessful businesses in cost management. One of them is the respect of external market conditions when setting cost targets (Teplická, 2004). An international consulting firm Bain & Company based on its own survey identified four success factors that companies must comply with if they are to achieve sustainable is a necessity to take into account external market environment to define cost objectives - the actions of competitors, the price elasticity of the market, technological innovation.

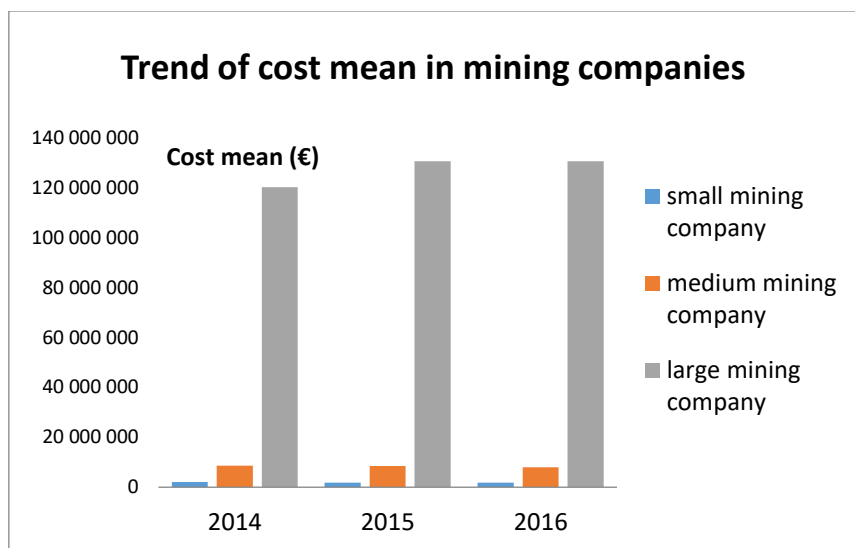


Figure 1. Trend of costs mean in mining companies (Source: www.statistic.sk)

We analyzed chain index in economic analysis. Chain index under value 1 means cost decreasing and chain index over value 1 means cost increasing table 2, 3, 4.

Table 2: Economic indicators- chain index in small companies.

Company / costc(€)	I_{N(15/14)}	I_{N(16/15)}
Agro Matúškovo s.r.o.	0.91	1.19
Agro Rátka s. r. o.	0.94	0.96
Delta Stone s. r. o.	1.18	1.06
Gazda Slovakia s. r. o.	1.19	0.75
Chyžbet SK s. r. o.	0.69	1.20
Ikra s. r. o.	0.87	0.49
Is - Lom s. r. o.	0.75	1.32
Kabe s. r. o.	0.92	1.10
Kam-Bet s. r. o.	0.91	0.83
Kamenivo Slovakia a.s.	0.81	1.70
K.L.K. s. r. o.	1.14	0.92
Lesostav Sever s. r. o.	0.99	0.78
Mhrč s. r. o.	0.58	0.89
Rekos s. r.o.	0.66	1.01
Sehring Bratislava s.r.o.	1.62	1.36
Stemp - M & G s. r. o.	0.90	0.80
Štrkopiesky Batizovce s.r.o.	0.83	0.48
Štrkopiesky Hrubá Borša s.r.o.	0.73	0.98
Vestkam s. r. o.	0.79	1.35
Zempra s.r.o.	0.72	0.75
Zemplínska Plavebná	1.27	0,70

Source: www.statistic.sk

In small mining companies is situation various. Some of mining companies minimalize chain index for example IKRA s.r.o., ŠTRKOPIESKY s.r.o. Batizovce. In those companies was expressive decreasing. In some companies chain index was increasing it means negative trend for costs. We have seen a reduction of difference between chain indexes in company for example DELTA STONE s.r.o., Sehring s.r.o. Bratislava. This trend is positive for cost management.

Table 3: Economic indicators- chain index in medium companies.

Company / COSTS (€)	I_{n(15/14)}	I_{n(16/15)}
Agrocoop Imeľ a.s.	1.02	1.05
Agrorent a. s.	0.97	1.05
Cestné stavby Žilina s.r.o.	1.08	0.43
D.a.L. s.r.o.	1.42	1.17
Intocast Slovakia a. s.	0.91	0.97
Mestský podnik Spišská Belá s.r.o.	1.00	0.58
PK Doprastav a.s.	0.86	0.99
Prefa-Stav s.r.o.	0.92	1.04
Prefa Sučany a. s.	1.19	0.69
Vod-Eko a.s.	0.50	1.49
Zapa Beton s.r.o.	1.19	0.97

Source: www.statistic.sk

In medium mining companies is situation various. Some of mining companies expressive minimalize chain index for example Cestné stavby Žilina s.r.o., PREFA Sučany S.K. a.s., Mestský podnik Spišská Belá s.r.o.

Table 4: Economic indicators- chain index in large companies.

Company / costs (€)	I_{n(15/14)}	I_{n(16/15)}
Holcim a. s.	1.43	1.00
Lesy SR š. p.	1.03	1.01
Vion a. s.	0.60	0.96

Source: *www.statistic.sk*

In one large mining company Holcim a.s. chain index was increasing (1,43 – 1,00) it means negative trend for costs but reduction of difference between chain indexes was expressive and it means positive situation of cost management in this mining company.

We obtained information that some of mining companies increased chain index very expressive in medium mining company VOD-EKO a.s. (0,5-1,49), in small mining company CHYŽBET SK s.r.o., (0,69-1,20), IS LOM s.r.o. (0,75-1,32), KAMENIVO SLOVAKIA a.s. (0,81-1,70), VESTKAM s.r.o. (0,79-1,35). Significant changes in costs may negatively affect for profit formation and for business activities in mining companies. In conclusion we can say that the development of costs in the mining companies in relation to size of companies is positive, what may appear to the profit of mining companies and preparing cost budgeting for individual costs of companies for the future strategy. Cost budget can deliver cost reduction and saving of resource. Reducing of costs is one of the main ways to get a competitive advantage in the market. 40% of companies that are among the best in the industry, cost leadership is considered a pillar of its competitive strategy. Bain & Company research shows that companies that have set measurable goals based on performance indicators achieved good results in cost reduction. Condition of performance indicators was to respect the competitive situation.

Table 5: Economic indicators – profit in mining companies.

Mean of costs (€)	2014	2015	2016
Small	2 059 119	1 882 716	1 808 618
Medium	8 620 761	8 534 399	8 010 235
Large	120 164 732	130 505 770	130 554 878
Mean of revenues (€)	2014	2015	2016
Small	3 560 780	3 563 450	3 852 230
Medium	9 653 785	9 763 652	9 156 456
Large	350 620 456	265 236 254	258 654 320
Formation of profit (€)	2014	2015	2016
Small	1 501 661	1 680 734	2 043 612
Medium	1 033 024	1 229 253	1 146 221
Large	230 455 724	134 730 484	128 099 442

Source: *www.statistic.sk*

Influence on profit formation: The results of this economic analysis present a decreasing development of costs in the small and medium mining companies and increasing

development of costs in large mining companies. We obtain influence of cost optimization to profit formation. Profit (Figure 2) in small mining companies is increasing because costs in mining companies in period 2014-2016 are decreasing and it is positive progress. Profit in medium mining companies is increasing and in year 2016 is soft decreasing but results of economic situation is positive because mining companies to achieve profit. This influence to profit creates decreasing of revenues but costs are decreasing.

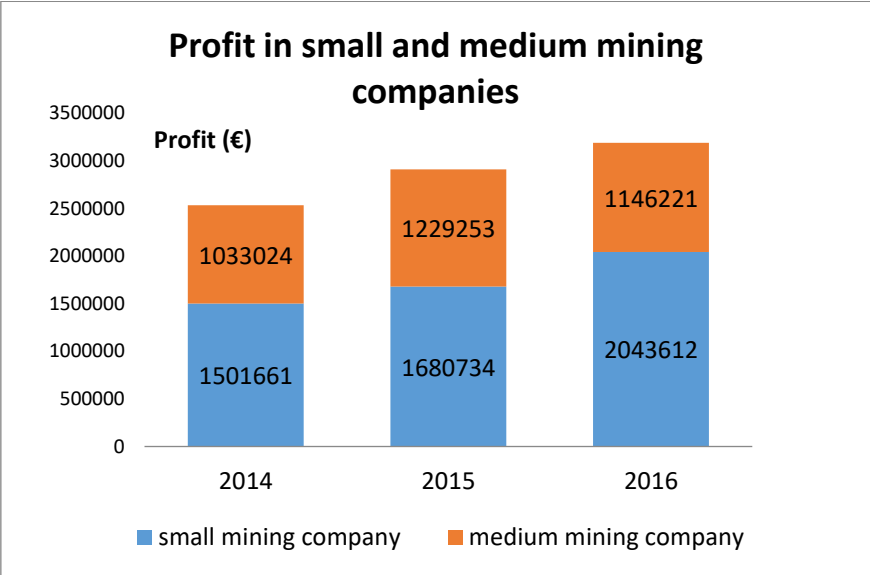


Figure 2. Trend of profit in small, medium mining companies (Source: www.statistic.sk)

Profit (Figure 3) in large companies is decreasing. This influence to profit creates decreasing of revenues and increasing of costs. This financial situation is not acceptable for large mining companies. This situation decreases competitiveness.

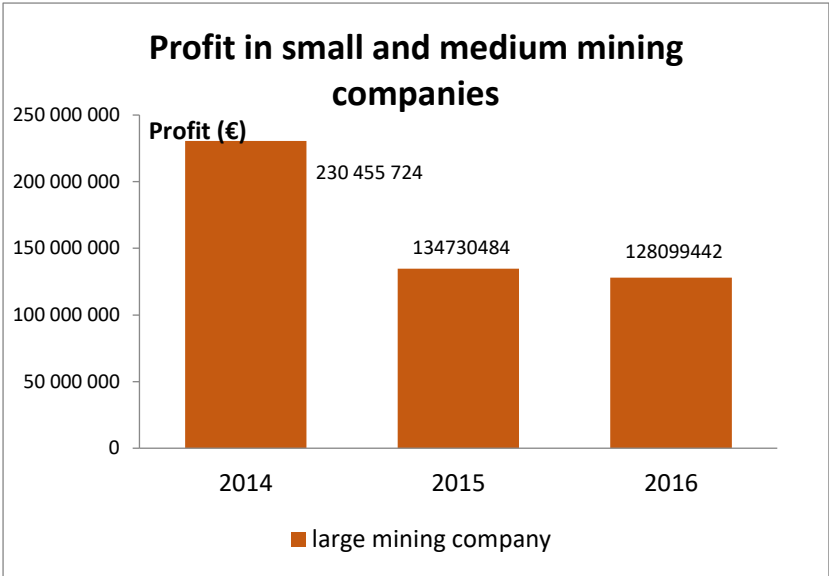


Figure 3. Trend of profit in large mining companies (Source: www.statistic.sk)

Conclusion

Continual improvement is one part of management. Improvement of business processes create base for costs decreasing. Awkward set up processes of more expensive products and lower corporate profits (Wagner, 2009). The current goal of mining companies is cost reduction. Traditional methods for costs reducing such as saving material, energy, the reduction of the workforce, inventory is limited. It needs to look for a new methods and tools for reducing costs. One such method is to optimize the costs of the processes (Kassay, 2001). Processes and activities that show significant inefficiencies must be optimized. Economical – mathematical model create base for cost optimization. The highest costs are incurred in production processes. These processes are priority in optimization and optimization solutions to deliver profitable growth. In mining companies are very important to use new methods of process optimization. Process optimization is connected with cost reduction in mining companies. Cost controlling is a tool for the effective management of costs in mining companies. An important part of the data basis. Information on the costs needs to be linked with information from the financial accounting (Potkány, Hitka, 2015). Through controlling can successfully manage critical business processes and enable the enterprise as a whole to build a concept of permanent continuous improvement in the direction of reducing costs. Reduce costs in the future has to bring enterprise positive to eliminate the risk and prioritize economic effect. A very important change in cost is the cost of innovation. Enterprises to innovate are reserved approach because innovations are very demanding on resources. Mistakes are part of upgraded and it is very important to reduce and eliminate errors which reduces the cost. Open innovation represent expense management a new approach for mining companies.

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References

- [1] DARLINGTON, J. et al. (2015) Targeting lean process improvement projects for maximum financial impact. *Production Planning and Control*, 27 (2), p. 114-132.
- [2] FLOREKOVA, L. and TEPLICKA, K. (2001) Metóda activity-based costing-moderný prístup k riadeniu. *Acta Montanistica Slovaca*, 6 (2), p. 134-139.
- [3] KASSAY, S. (2001) *Podnik svetovej triedy*. Nové Zámky: STRATEG.
- [4] Łęgowik-Świącik, S. (2015) Evaluation of decision making processes with reference to cost information management. *Polish Journal of Management Studies*, 11 (2), p. 91-99.
- [5] MAN, M., MODRAK V. and GRABARA, J.K. (2011) Marginal cost of industrial production. *Polish Journal of Management Studies*, 3/2011, p. 62-69.
- [6] Petřík, T. (2005) *Ekonomické a finanční řízení firmy. Manažérske účetnictví v praxi*. Praha: Grada Publishing.

- [7] POTKANY, M. and HITKA, M. (2005) Controllingová koncepcia integrovaného manažmentu v spojitosti s motivačným programom organizácie. *Manažment v teórii a v praxi*, 1 (3), p. 42-48.
- [8] Šatanová, A. and Potkány, M. (2004) Controlling – modern tool of company control. *Ekonomický časopis*, 52 (2), p. 148-165.
- [9] Šatanová, A. et al. (2014) How Slovak small and medium manufacturing enterprises maintain quality costs: an empirical study and proposal for a suitable model. *Total Quality management and Business Excellence*, 25 (6), p. 145-153.
- [10] SERINA, P. (2013) Performance of company improved by processional calculation. *Conference on Current Problems of the Corporate Sector 2013*. Bratislava, p. 486-491.
- [11] Teplická, K. (2004) Applying of modern development trends in the firm of the world class. *Acta Montanistica Slovaca*, 9 (2), p. 68-71.
- [12] Teplická, K. (2004) Achieving the economic-environmental harmonization in firm through environmental costs. *Acta Montanistica Slovaca*, 10 (3), p. 334-339.
- [13] WAGNER, J. (2009) *Merění výkonnosti. Jak měřit, vyhodnocovat a využívat informace o podnikové výkonnosti*. Praha: Grada Publishing.

HEDGING STRATEGIES ON PURCHASE OF NATURAL GAS - A CASE STUDY ON EXAMPLE OF A SOLUTION MINING COMPANY

Peter C. G. Davids¹ - Milan Fekete²

Abstract

Risk management has become more and more a key factor of success in all kinds of enterprises during the last 15 years. Consequently, evaluation and functional tests of risk management cultures in each kind of business are in the focus of auditors as a high priority. German corporate law has adopted the need to run a functional risk management as well, hence, the derivations of an individual liability of each manager involved if such systems are not duly implemented.³ This paper is about a case study based on the example of a German medium-sized enterprise in the field of solution mining. As solution mining is a very energy intensive process, one of the main focusses of risk management is on the purchase of natural gas. The company runs an own Combined Heat and Power generation plant, which is exclusively fed with natural gas. The annual cost of gas purchase is about 55% - 60% of the total costs. This study tries to find out the current status of risk treatment in this regard, as well as possible ways of improving the entire process of gas purchase under risk management aspects. As the global market for natural gas is deregulated, hedging of quantities and prices is crucial and basically the best way to set up a counter-strategy. This paper will show possible approaches to natural gas hedging as a contribution to the treatment of this key risk to the company.

Keywords: risk management, medium-sized enterprise, natural gas, raw materials, hedging.

Introduction

Hedging of commodities is essential for companies, which are considerably dependent on those. It is an integrated part of modern risk management systems, but in the same way possible source for various mistakes in using this tool.

The benefit of a working hedging strategy is clearly the avoidance or at least reduction of financial risks to the company having their origin in extremely volatile commodity markets. As hedging does not only reduce risks, but in turn might cut off potential chances by compensation of falling prices, the focus needs to be put on a reasonable balance of the risk / opportunity level.

¹ Peter C. G. Davids, Comenius University in Bratislava, Faculty of Management, Odbojarov 10, P.O.Box 95, 820 05 Bratislava, e-mail: pcg.davids@gmail.com

² doc. Ing. Milan Fekete, PhD. Comenius University in Bratislava, Faculty of Management, Odbojarov 10, P.O.Box 95, 820 05 Bratislava, e-mail: milan.fekete@fm.uniba.sk

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³ Aktiengesetz § 91 Nr. 2

Hedging as a risk management tool is already well researched on a theoretical basis and broadly implemented. However, there is no general recipe for all of the thinkable cases of application, which makes a decent evaluation and implementation to each individual enterprise absolutely necessary.

Consequently, this paper will cope with the mentioned demand of individuality by analyzing and evaluating the status of an existing hedging set-up of a company working in the solution mining business. This business is very energy consuming and acquires its energy demands such as electricity and heat through an own Combined Heat and Power generation plant, which solely uses natural gas as a primary energy source. Energy cost per annum is in the range of 55% - 60% of the total costs, which illustrates the urgent need to handle this key risk for the sake of viability of the entire company.

After analysis, firstly, the authors try to find the ways of improving the existing hedging strategy for the benefit of the company and, secondly, to show a basic approach of how existing hedging systems especially for natural gas could be improved.

1 The market for natural gas in Germany

Many manufacturers consume natural gas, both as a feedstock and as a fuel for their manufacturing process. Generally, there is no other fuel that can be used for these purposes, or else the potential substitutes are costly, so this portion of industrial demand is not sensitive to residual fuel oil prices. However, both processing demand and boiler fuel demand are sensitive to changing levels of industrial activity — especially in the glass, food, paper, chemical, petroleum refining, primary metals, fabricated metals, and machinery industries (Miller, 2007).

Most of the natural gas consumed in Germany is imported from Russia and Norway with equal shares of about 1/3 each. Another ~13% comes from domestic production; the remainder is split over various countries (www.verivox.de, 2017).

The German gas market was liberalized in 1998 with the “Energierrechtsnovelle” and opened to competition. The German electricity industry was characterized by electricity supply companies (RUs) each with a monopolistic public supply obligation in contractually delimited supply areas (Fritz et al., 2001). From 1998 onwards, a change of the supplier was possible, but the practical implementation of the liberalization took many years. The majority of the market is firmly in the hands of some large conglomerates. For smaller vendors the market entry was still difficult, especially through complex and cost-intensive network access regulations. Only when the Federal Network Agency took over and regulated the supervision of the gas grids in July 2005, network access became more and more untightened.

At present, there are over 700 gas suppliers, of which the vast majority is only regionally active (www.strom-magazin.de, 2018). However, twelve years after liberalization, the market is determined by seven large-scaled super-regional gas companies, which also cover most of the grids. In addition, they do not have just numerous subsidiaries operating on the gas market, but also hold shares in about 350 regional gas suppliers (www.toptarif.de, 2018).

Due to the strong commitment as long-distance gas importers, grid operators and distributors of natural gas, these long-distance gas companies play an important role in the market. Seven companies together contribute to around 80% of the domestic gas, accounting for 90 to 100% of natural gas import and accounting for almost 80% of the storage capacity. Unlike electricity, gas is not produced locally, so the end-users, often municipalities and other local suppliers are dependent on the gas and the transport capacities of the long-distance gas companies (www.toptarif.de, 2018).

In order to ensure fair competition on the German gas market, the EU Commission has already repeatedly challenged competition proceedings against the gas grid operators and examined whether the companies are using their market power to exclude other providers from the market. It is currently being discussed to transform the private grids into a public operating company thus facilitating market entry for other providers.

Other than private households which are obliged to cover their demands through local suppliers, commercial or industrial users basically have got access to the energy exchange (EEX) situated in Leipzig after liberalization of the gas markets. Commercial / industrial entities can choose whether they cover their demands by using full supply contracts (almost the same as those for private households), which provide fixed prices over a certain period at no price transparency or whether they rather buy the gas on the energy exchange or OTC at full price transparency.

The final gas price in Germany comprises of the cost of natural gas, the transportation costs for using the grid, and several surcharges as well as energy tax and VAT.

Transportation costs are determined by the physical way from the Virtual Trading Point (VTP) to the first flange on the property of the customer. Within each market area so-called VTPs are set up at the level of the superregional long-distance gas networks, where gas can be supplied and traded. Access to this virtual trading venue is given via a contract or capacity booking with the competent grid operator (Jänig, 2007). There are two VTPs where gas can be bought in Germany, which are 'Gaspool' for the north and 'NetConnect Germany' (NCG) for the south. Dependent on where the end-customer is situated, one or the other VTP applies. Fig. 1 explains the composition of the total purchase costs for a natural gas in Germany.

Taxes and contributions are legally binding and grid costs are legally controlled, hence, both are not negotiable.

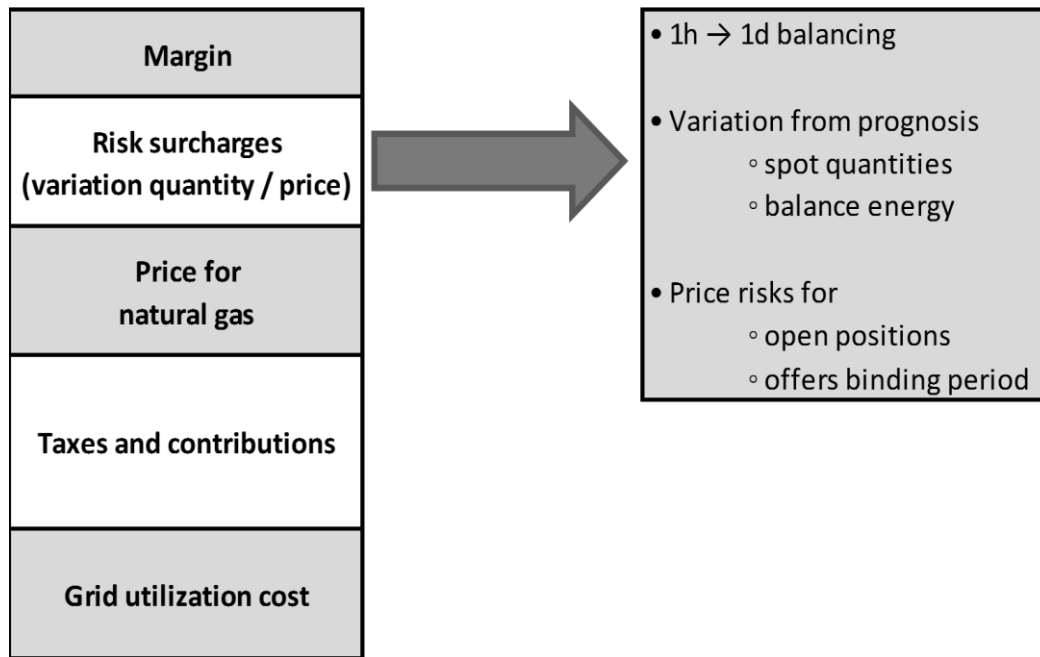


Figure 1. Determination of Purchase Cost for Natural Gas (Source: authors)

2 Options to hedge natural gas

The traditional means of risk transfer are insurance (i.e. the coverage of a specific, but overall foreseeable resource requirement based on collective and time risk compensation) and hedging (i.e. the transfer to the capital market) (Romeike et al., 2013).

Trading in securities, foreign exchange, precious metals or commodities always involves the risk for every investor of having an adverse price movement. Therefore, some traders secure their financial transactions with a counter-transaction. This transaction is also called a ‘hedge’ in the figurative sense, that you build a protective hedge around your depot.

Hedging is a tool that experienced investors have been using for many years. However, the term is somewhat discredited by a part of the so-called hedge funds, which have led to significant financial losses and bankruptcies of renowned banks and companies in the global financial crises of recent years.

Hedging has only a limited share in common with hedge funds. As it turns out, hedging requires investment in the opposite direction. Taking of short position or short sales is only allowed to hedge funds, therefore, the likelihood of confusion. Hedging is still used by many traders today.

When done well, the financial, strategic, and operational benefits of hedging can go beyond merely avoiding financial distress by opening up positions to preserve and create value as well. But done poorly, hedging in commodities often overwhelms the logic behind it and can actually destroy more value than originally was at risk. Perhaps, individual business units hedge opposite sides of the same risk, or managers make too much effort on hedging risks that are immaterial to a company’s health. Managers can also underestimate the full costs of hedging or overlook natural hedges in deference to costly financial ones. No question,

hedging can entail complex calculations and difficult trade-offs. But in our experience, keeping in mind a few simple pointers can help nip problems early and make hedging strategies more effective (McKinsey & Company, 2010).

Derivatives are financial instruments that 'derive' their value from an underlying asset; in this case the price of natural gas. Derivatives can range from being quite simple, to being exceedingly complex. Basic types of derivatives include futures, options, and financial swaps (Miller, 2007).

The term "derivative" can be traced back to the Latin word "derivare" which means "derive, derived". Long before its use in finance, this term has been used in chemistry where it refers to a chemical compound derived from another (= split-off product, e.g. acetylsalicylic acid [aspirin] is a derivative of salicylic acid; Derivative of morphine). As a similar approach exists in the development of financial products derived from components of other products, the term has been transferred from chemistry to the financial sector (Kloch, 2007).

As pointed out earlier, financial hedging is just one option to get a grip on volatile price movements of commodities. Another option is the so-called natural hedge. Natural hedge works, when a product to be sold has a more or less direct correlation of price movement with a commodity used for production.

If the natural hedge is large enough to reduce the net cash flow volatility sufficiently, the channel member will prefer to use the less complex natural hedge. In case of a negative IRAP, the channel member is motivated to increase or even maximize the volatility of the net cash flow stream. This can be accomplished by using asymmetric contract relationships on the buying and selling side (Pennings et al., 2004).

In the enterprise in our example, which produces potash, there is a correlation between the price for natural gas (which is needed for production in considerable quantities) and the final product potash itself. The following graph illustrates this correlation.

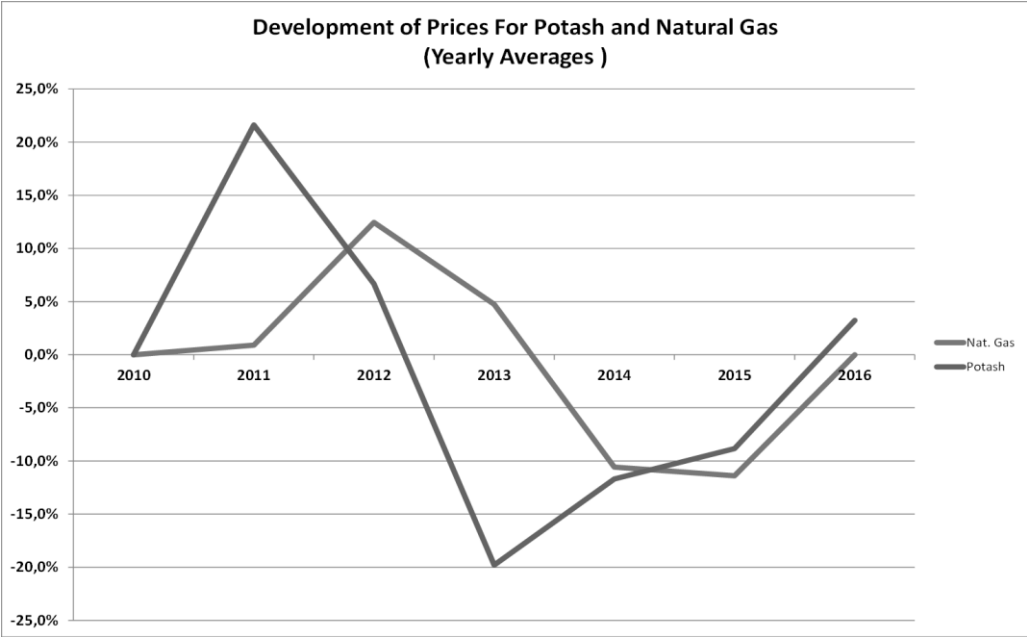


Figure 2. Development of Prices for Potash and Natural Gas (Source: authors)

The graph shows that the correlation is not strongly parallel, but the basic effect is obvious. It is essential to the company of this example to consider natural hedging as part of the overall hedging strategy. Otherwise the risk of over- or under-hedging through financial instruments is unavoidable.

Another option to hedge natural gas prices is a strategical approach. Sales contracts can be structured in a way that the price risk is simply passed through to the customer. Practically this can usually be done by implementing an index-based price mechanism. However, the counterpart, having in mind his own risk, might not be happy with such a clause. But the way, as a common practice in business, it could be a compromise resulting in a split of the risk where each party involved can cope with.

An effective risk management program often includes a combination of financial hedges and nonfinancial levers to alleviate risk. However, few companies fully explore alternatives to financial hedging, which include commercial or operational tactics that can reduce risks more effectively and inexpensively. Companies should test the effectiveness of different risk mitigation strategies by quantitatively comparing the total costs of each approach with the benefits (McKinsey & Company, 2010).

3 Methodology

The research methodology used in this paper is the *case study*, which is deemed to be a comprehensive strategy in empirical research that uses a variety of techniques and methods to find answers to the triggering research questions. A case study ideally combines several techniques for collecting data from different sources and can apply case-by-case different methods of analysis of those data.

Qualitative research methods in economics and business research are still dwarfed by large quantitative analysis and economic modelling. Nevertheless, on an international level the stance towards qualitative methods becomes increasingly open-minded. Therefore, in this article case study research is highlighted as a representative of qualitative research methods (Göthlich, 2003).

Business case studies enable the reader to record individual business functions (e.g. purchasing, production, sales, financing, human resources management, etc.) using case histories that are as close to reality as possible in an overall context (www.wikipedia.de, 2018).

The reason why case study is the preferred research method used in this paper is the fact that reliable data from the company's risk management system is broadly available and easily accessible as the company already runs a special risk management system especially on mitigating price risks related to the purchase of natural gas. In the same way, historical data is available. The goal of this study, namely, to show opportunities to improve the existing system, requires a target-performance comparison. This, in the opinion of the authors, is best done by using a case study.

4 Evaluation of the Status Quo of the Example Enterprise

The company runs an own combined heat and power generation power plant gaining steam and electricity needed for the process. The power plant is based on two gas engines, a steam engine as well as two active and one passive steam boiler. The primary energy source is solely a natural gas. The average annual consumption of natural gas amounts to 280,000 MWh. The entire plant is certified as a high-efficiency power plant, thus, benefiting from various energy tax reliefs after German law.

The company is in the solution mining business and energy, which is mainly a saturated steam, is crucial for the extraction and refining process. As solution mining is a very energy intensive process, one of the main focusses of risk management is on the purchase of natural gas. The cost position for the purchase of natural gas is about 55% - 60% of the annual total costs.

Unlike the conventional potash mining, solution mining extraction and processing is an environmentally-friendly process, because there are no dissolution residues, which need to be disposed of in tailings piles. Furthermore, the staff does not need to work in the underground compared to conventional potash mining, which is a big advantage in terms of work safety. Amongst other solution mining technologies, the opportunities of solution mining of carnallite are felt more and more attractive since the beginning of the 21st century. Carnallite solution mining projects have been initiated around the world since then. The double salt carnallite ($\text{KCl} \times \text{MgCl}_2 \times 6 \text{H}_2\text{O}$) is a relatively low graded potash source, which makes its conventional mining uneconomical. Currently, there is just one active mine in the world using the innovative process of hot selective solution mining of carnallite, which meanwhile has proven the economic feasibility of the process (Davids, 2016).

Other than in times before, nowadays, the company is able to purchase natural gas on a full price transparency due to the liberalization of the gas market (see remarks above). It is possible to buy the gas at the European Energy Exchange (EEX) directly or alternatively through a broker. In the past, just full supply contracts could obtain those offerings, just one price comprising of the entire price components mentioned in Chapter 1. The main disadvantage of full supply agreements is the impossibility of deriving margins of the intermediate trade. As the company is able to purchase on full transparency, margins can clearly be seen and consequently be negotiated.

The brokers' margin is the only price component which can be negotiated. The option to negotiate price of the natural gas is twofold: if the purchase is done directly on the energy exchange (the same as on the stock exchange), the price is not influenceable. If the purchase is done via OTC, the price is partly suggestible, for instance, if a market actor tries to get rid of a long position for whatever reason.

Currently the company is using a service provider instead of the direct access to the energy exchange. This broker also arranges for the hourly and daily clearing of gas consumption. Furthermore, the company has several frame supply agreements with producers of natural gas. All of the quantities purchased elsewhere were collected and cleared by the

service provider as well. So the provider has no exclusivity, thus, not hindering the company's ability to create a diversified portfolio when it comes to suppliers.

A typical annual consumption load curve on a daily basis is shown in the graph below.

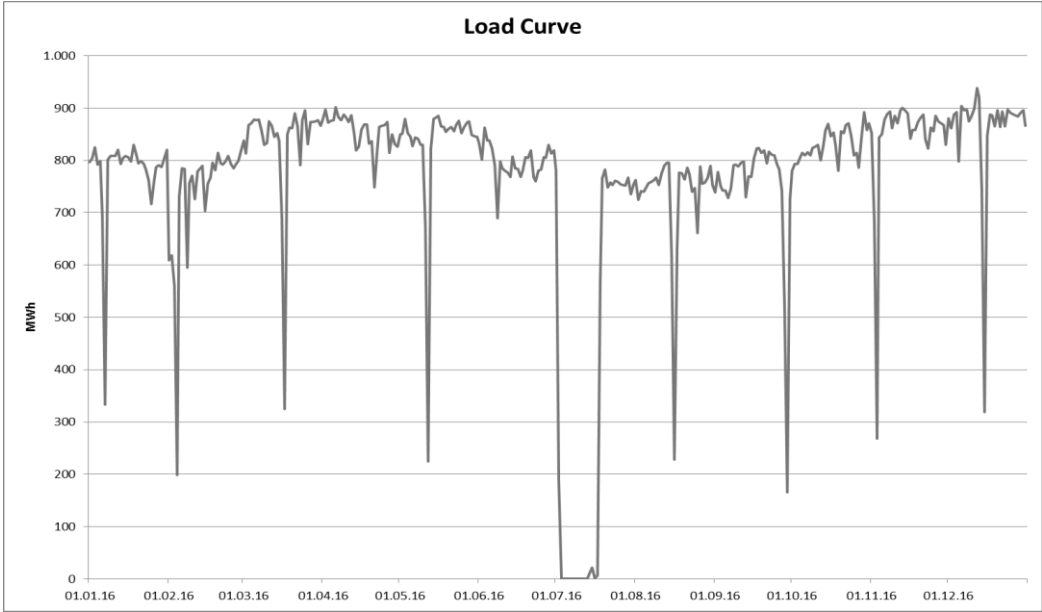


Figure 3. Load Curve (Source: authors)

The more or less stable consumption of 700 MWh/d over the year is evident. The range from 700 MWh/d through 900 MWh/d represents a high volatility in comparable short periods. This volatility is following adjustments in process control, which is typical for the plant's process design. The down peaks are mirroring planned maintenance stops and a longer maintenance break in the summer.

Currently the front year and the following year are hedged with calendar-year products, which means that the company is committed to take and pay a fixed quantity of x MW per each hour of the year at a fixed price. The company in this example is committed to 15 MWh/h for each of the above mentioned years. This gives a daily quantity of 360 MWh. The remaining demand is bought on the spot market at varying prices. Hence, the range from 360 MWh to about 900 MWh is exposed to price volatility risks on one hand, but could also benefit from lower prices compared to the hedged quantities on the other hand. The hedged range from 1 to 360 MWh (illustrated in Fig. 4) is capped to both sides, thus, eliminating price risks and opportunities in the same way.

The company does not use short term futures like quarterly, monthly, BOM (Balance of the Month) or day-ahead products for hedging so far. Theoretically, financial instruments could be used as well, but do not make any sense as the market at the competent GASPOOL hub is liquid and is able to provide all of the mentioned products through original suppliers of natural gas or through traders. Another reason not use financial instruments is the fact that financial instruments have to be paid fully immediately after purchase whereas the underlying products only must be paid on a monthly basis after consumption.

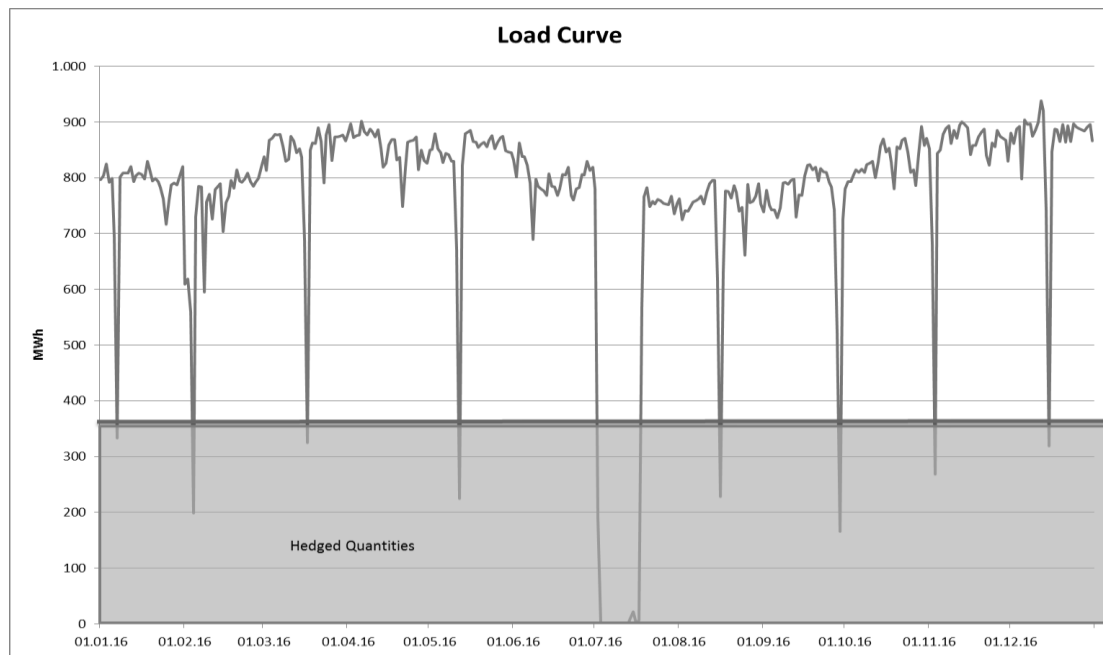


Figure 4. Load Curve with Hedged Quantities (Source: authors)

Depending on creditability of a company, there might be a demand from the supplier(s) for a certain security deposit in cash or by an appropriate bank guarantee. For the company in this example this is not the case due to its top rated status.

5 Guidance to Improve the Existing Hedging System

The approach to an improvement of the current hedging strategy is not quite easy due to a number of variables to be considered. The first question must be ‘how can we secure a certain range of profit in our overall product calculation’? All other questions, e.g. for optimization, have to subordinate to this first question. As, in our example, the potash price cannot be set by the company itself and needs to be derived from the world market price, it is an important variable as well when it comes to calculation. As outlined earlier, there is broadly seen a certain level of self-hedging between the potash price and the price for natural gas (see Fig. 2). So should there be a considerable price slip in potash prices, it would influence the gas price in the same direction as well. Nevertheless, there could be an offset in timing and in magnitude. However, this phenomenon needs to be considered in any case. The approach to the product calculation is now to set the estimated revenues at first and this in a conservative way. Subsequently, a sensitivity analysis on the gas price will help to find the least profit level to be achieved. Ideally, the result is the maximum price for natural gas the company should pay in order to secure calculation. Despite of the fact that product calculation is not the matter of this paper, a few initial words on that have been deemed necessary.

The following things have to be taken into account for a diligent natural gas hedging strategy:

- Being aware of the maximum price which should be paid
- Having access to up-to-date market information

- Being able to trade on short term
- Being able and ready to provide a certain level of securities to suppliers
- Setting the maximum quantity to be hedged
- Having an idea of future price development
- Setting buy triggers
- Being aware of the cost of balancing energy

The first point has already been discussed. Market information can be obtained through daily publications like the ICIS Heren report or through online accounts with real time indications of all of the available products. The latter one is appropriate when a company is certified as a trader and employs an own portfolio manager. In the company in this example this task does not justify a fulltime job so, as mentioned earlier, a service provider is looking after trading and balancing issues. In that case daily (instead of intraday) market information is sufficient and reasonable rather than using a costly online account.

It is crucial to use historical market information and to compare spot market and future prices, because the only two options are to remain on spot market prices or to buy forward. Anyone who has ever dealt with futures markets, be it stock, interest rate or currency futures knows, from its own observation, that the prices between the respective spot markets and the related futures markets for one and the same underlying may vary significantly depending on the maturity date of the closed transaction (immediately, early in the future, later in the future).

This is also the case with commodity futures: Each future on the same commodity has a different price, depending on the maturity date, which also differs from the current spot price. The prices for each individual futures maturity derives in each case from supply and demand of the market participants and thereby also indirectly from their expectations concerning the future price development for the observed raw material (www.boerse.de, 2018). The historical data should be collected and subsequently visualized in a graph as shown in Fig. 5.

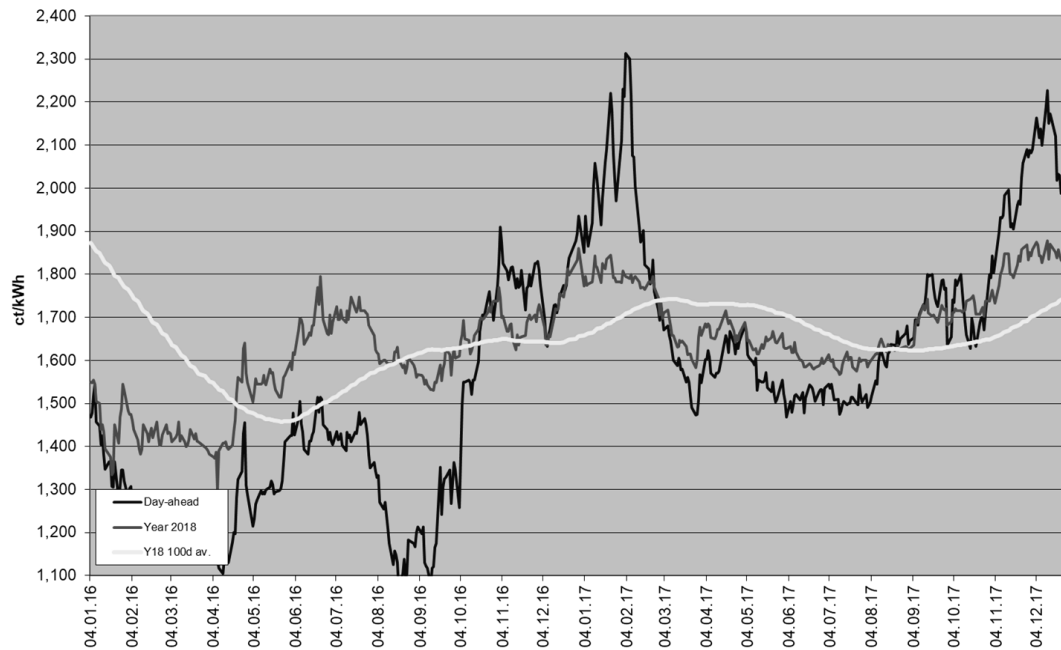


Figure 5. Development of Natural Gas Prices (Source: authors)

Depending on which constellation applies to a commodity at the moment, whether the prices for longer-term futures are lower or higher than for shorter periods, there is a contango (long-term prices higher than short-term ones) or a backwardation market for the opposite. Looking at the graph in Fig. 5, it is evident that contango and backwardation are basically changing, but most of the time a contango situation can be stated. This indicates, that a future buy in contango circumstances always comprises of a certain risk surcharge.

Another important information, which can be gained from historical data, is the 100d average line on a future contract, which can easily be implemented. In the example in Fig. 5 the 100d average line is based on the calendar year 2018 of natural gas future. Almost each time when the 100d average line has been crossed (from above or from below), longer periods of stable price range above / below the line occurred. Amongst traders who are acting based on chart techniques, a line crossing from above is a potential buy trigger and vice versa. If many traders comply with this ‘rule’ which often seems to be true, a self-fulfilling prophecy is created, which in turn enhances the reliability of the mentioned buy- / sell-trigger. However, some deeper knowledge of how the market is working and which conclusions are to be drawn is essential for a successful decision making on buying forward.

In terms of trading, say opening or closing of positions, it is crucial to be able to close a deal immediately after having obtained the relevant offer. If more time like an hour or more is necessary to confirm the offer (possibly due to a time consuming decision process) the offer might become a void or considerable risk surcharges might emerge. So the person to trade and buy should be vested with sufficient competencies to decide directly upon offer, thus, being not endangered to potential loss of the offer, because of the earlier mentioned volatility of the prices. Furthermore, funds or bank guarantees must be made available for the case a supplier has a demand, which is mostly dependent of how far the maturity date of the closed transaction is in the future and on the company’s creditability and/or credit rating.

The question of the size of the quantities to be hedged is a difficult one and the way to an answer can only be an approach. In the enterprise of our example, we already worked out a certain level of potential self-hedging by the development of the potash price (see Fig. 2). However, this is hardly to quantify, but the general conclusion is that the effect has more an impact on the long term than on the short one. In order to avoid over-hedging, each future purchase on a calendar year basis should be started with no more than 25% of the demand. This initially provides a reasonable cushion of risk avoidance, but on the other hand leaves enough headroom for self-hedging opportunities. The closer the maturity date of a contract comes, the more quantities could be hedged as now the self-hedging effect disappears and the volatility of the short-term futures as well as of the spot market prices warrants attention. In order to keep the balance between risk avoidance and preservation of opportunities, also short-term futures should be taken into consideration. Nevertheless, it must be borne in mind that every future contract has a take-or-pay automatism in the way that in each hour of the duration period the contracted load (like 10 MWh etc.) must be taken and paid. Due to technical reasons like unforeseen shut-downs, reduction of the output or maintenance periods of the power plant this is not constantly possible in practice. Consequently, the energy needs to be balanced, which was realized by the owner of the balance circle through the so-called balancing energy – surplus energy will be sold to the grid owner and missing energy will be purchased. As balancing energy in both directions is expensive, its dimension should be reduced to the absolute minimum when plannable. This must have an influence as well on the decision to what extent hedging should be brought. It is obvious that it is more expensive to sell 20 MWh as balancing energy for a certain period of time than 10 MWh. If there is, for example, a planned stop of the power plant, it is possible and even better to sell the surplus quantity actively on a day-ahead basis at the energy exchange.

The following illustration shows an optimized hedging portfolio compared the one displayed in Fig. 4.

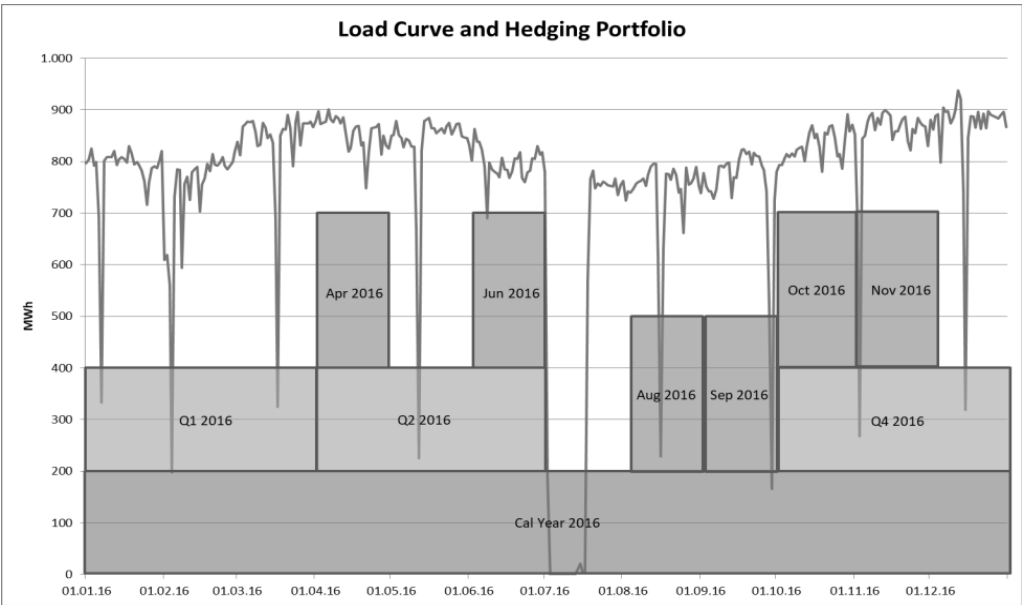


Figure 6. Load Curve and Hedging Portfolio (Source: authors)

This optimized model considers quarterly and monthly futures rather than just the calendar-year product. As already mentioned, the deep down peaks in the load curve are planned maintenance stops of the facility so this fact provides a good opportunity for budgeting the gas quantities needed. Furthermore, the volatility between 600 MWh and 900 MWh warrants some attention. Selling surplus (or non-used) future gas quantities day-by-day is very risky when it comes to prices because demand and supply may vary frequently. In each case, selling and buying out of a non-planned situation on the spot-market involves trading cost on both of the energy exchange and the grid, which should be avoided or at least minimized to its absolute minimum level wherever possible.

Consequently, it makes sense to leave out or working around the mentioned area of volatility when thinking about hedging. Coming back to the model in Fig. 4, the calendar-year product shows a half month selling situation in July. As this is a planned stop, the surplus quantity can be sold in a controlled way, thus, avoiding pricewise uncontrolled balancing. The same is true for the comparable events crossing the quarterly and monthly products.

The volatility on the top-end of the curve is mirroring the operational situation of a power plant, which is influenced by various factors like power and heat demand from the production plant, smaller incidents and even ambient temperatures. If there are some deeper dips like by the end of January / beginning of February, analysis is necessary whether this was a smaller one-off effect or a typical situation, which can also be assumed for the future.

6 Open Questions and Unsolved Issues

One question that has not been answered is the risk to the company from risk aggregation in the context of natural gas purchase. Adding up the static risks of all risks involved, one certainly arrives at a value that the company cannot bear. Since it is unlikely that all risks occur together, it will probably not come to a default. The value of the static risk is, therefore, only suitable for the individual consideration of the single risks.

The question of assessing soft risks has also remained unanswered, although it is precisely this that can pose a high risk when aggregated. Nevertheless, these soft risks must be taken into account and, therefore, require at least close monitoring.

Furthermore, it was kept open to associate risk management with opportunity management. A risk has the property of being permanently latent. An opportunity usually results from a short-term favorable situation, hence, is not constantly present. Therefore, an opportunity search decoupled from risk management should take place.

The question about the risk owners has not been stressed. These responsibilities can only be clarified after implementation of the relevant part of the risk management. First, the members of the Risk Committee need to appoint risk owners in their subordinate areas. But that's not enough. Due to risk interdependencies and overlaps in risk categories, responsibilities may shift for a number of single risks. For example, the default risk of a natural gas supplier is present in the technical department. However, since it is also a financial risk, it can also be assigned to the financial division. Thus, responsibilities cannot be determined solely by the structure of the organizational chart. This is just an auxiliary construction.

Summary

Hedging is not a kind of speculation, but may help to reduce speculation (Rotter et al., 2016). It is a fact that the current status of increasing volatility of commodity markets associated with rapid market cycles, the professional application of hedging instruments within the broad risk management system of a company is an essential element to preserve competitiveness and sustainability as a result of it.

On the practical side, some experience and expertise is crucial in order to find the right balance between risk and opportunity. To do nothing on this is just speculation in the direction that prices will always go down. To hedge at 100% means the other way around. There is no universal recipe for the right way in every kind of business. But coming from the product calculation as a driver and taking it from there should not be misleading. Another point is to always have in mind the core business of a company. Taking the example enterprise, the core business is producing salt – and not gaining profit through commodity – or financial instruments transactions on the exchanges. Even when a back test of past hedging activities provides that a better solution could have been found this is more or less hind side and needs detail analysis whether or not lessons from this can be learnt. In any case, there is a premium to pay when taking out risks. The trick is to keep that premium as low as possible.

References

- [1] DAVIDS, P.C. G. (2016) Evaluation and treatment of selected risks in the Solution Mining industry. *The 4th International Conference Innovation Management, Entrepreneurship and Corporate Sustainability (IMECS 2016)*. Prague: VSE.
- [2] FISHER, B. and KUMAR, A. (2010) The right way to hedge. *McKinsey & Company, Strategy & Corporate Finance*. 2 (4). p. 54-65.
- [3] FRITZ, W. and KÖNIG, S. (2001) *Der liberalisierte Strommarkt — eine Einführung*. In: Kahmann M., König S. (eds) Wettbewerb im liberalisierten Strommarkt. VDI-Buch. Berlin, Heidelberg: Springer
- [4] GÖTHLICH, S. E. (2003) *Fallstudien als Forschungsmethode: Plädoyer für einen Methodenpluralismus in der deutschen betriebswirtschaftlichen Forschung*. Manuskripte aus den Instituten für Betriebswirtschaftslehre der Universität Kiel, No. 578.
- [5] JÄNIG, CH. (2007) *Netzzugang im Gasmarkt*. Vortrag im Rahmen der Veranstaltung „11. Jahrestagung Stadtwerke 2007“ am 10. Mai 2007 in Berlin.
- [6] KLOCH, O. (2007) *Hedging-Strategien. Risikomanagement mit derivativen Finanzinstrumenten*. Seminararbeit, 2007.
- [7] MILLER, L. (2007) *Hedging Natural Gas Prices*. [Online] Available from: https://www.fortlewis.edu/Portals/157/Docs/business_news/07feb_hedg.pdf. [Accessed 15th October 2017].
- [8] N.N. (2017) Backwardation + Contango – Einleitung. [Online] Available from: <https://www.boerse.de/grundlagen/rohstoffe/Backwardation-Contango-Einleitung-33>. [Accessed 23rd December 2017].
- [9] N.N. (2018) *Der deutsche Gasmarkt*. [Online] Available form: <https://www.toptarif.de/gas/wissen/gasmarkt/>. [Accessed 7th February 2018].

- [10] N.N. (2018) *Fallstudie*. [Online] Available from: <https://de.wikipedia.org/wiki/Fallstudie>. [Accessed 8th February 2018].
- [11] N.N. (2018) *Gasanbieter in Deutschland*. [Online] Available from: <https://www.strom-magazin.de/gasvergleich/>. [Accessed 28th March 2018].
- [12] N.N. (2018) *Woher kommt das Erdgas in Deutschland?* [Online] Available from: <https://www.verivox.de/nachrichten/woher-kommt-das-erdgas-in-deutschland-73728/>. [Accessed 6th February 2018].
- [13] PENNING, J., M.E. and WANSINK, B. (2004) Channel Contract Behavior: The Role of Risk Attitudes, Risk Perceptions, And Channel Members' Market Structures. *The Journal of Business*, 9 (4). p. 15-24.
- [14] ROMEIKE, F. and HAGER, P. (2013) Erfolgsfaktor Risiko-Management 3.0. *McKinsey & Company, Strategy & Corporate Finance*. 4 (2). p. 42-55.
- [15] ROTTER, F. and SCHIMA, G. (2016) Hedging in Industrieunternehmen. 6. *Österreichischer Aufsichtsratsstag*, 25th Februar 2016, WU Wien.

STRUCTURAL CHANGES IN EMPLOYMENT IN SLOVAK FORESTRY AND ITS INFLUENCE ON COMPETITIVENESS OF THIS SECTOR

Miroslav Kovalcik¹ - Jana Dibdiakova²

Abstract

Competitive pressure and the current globalization force enterprises to reduce costs and increase efficiency of all production activities. Efforts to optimize realization of business activities lead the enterprise managers to such strategic decisions that are aimed at the shifting of the chosen enterprise performance to the external subjects. These subjects are able to provide such activities at the higher quality and lower costs. Similar situation is in present also in the case of Slovakia as well as in the case of forestry where now more than 95 % of silvicultural and harvesting activities are provided by the independent hired contractors. In comparison with the year 2000, the volume of outsourced operations is more than tripled. Today the business sector in forestry achieves sales of around 500 – 600 mil. €. The first part of the paper presents the development of business sector (business companies and self-employed persons) as well as employment in forestry sector divided into forest enterprises and business entities for the period 1990 – 2017. The number of business companies is currently about 1 300, their turnover is in the amount of 220 to 250 million € yearly and employ 1 700 employees. The number of self-employed persons is currently about 10 to 11 thousand, their income is in amount of 250 to 370 million € yearly and employ directly 1 000 employees. The paper in the second part analyses the development value added of forestry in context of total employment in the forestry sector. Based on the results can be concluded, that shift to the outsourcing has positive influence on the overall performance of the forestry sector. On the other hand, it has brought negative effects such as the gradual reduction of average wages in the supply sector, labor-related problems and the timely provision of the necessary forestry work.

Keywords: employment, competitiveness, Slovak forestry, structural changes.

Introduction

In forest management, as in other sectors of the economy, business sphere providing forestry-related services to forest enterprises was created as well. In present the vast majority of forestry operations in Europe are performed by forestry contractors. Forestry services are mainly carried out by small and medium-sized enterprises (SMEs), which employ up to 50

¹ Ing. Miroslav Kovalčík, PhD., National Forest Centre, T.G. Masaryka 22, 960 92 Zvolen, Slovak Republic, e-mail: kovalcik@nlcsk.org

² Ing. Jana Dibdiaková, Technical University of Ostrava, 17. listopadu 15/2172, Ostrava-Poruba, Czech Republic, E-mail: naja1023@azet.sk

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workers. They are not owners of forest land or wood-processing capacities, but operate as service providers only (Bouriaud et al., 2011). It results from the outsourcing theory that activities, which are unrelated to the main purpose and the main activity of enterprise (so-called core business) are usually bought as a service from external contractors. However, in case of contractor services market in forestry, main production activities e.g. silviculture and timber harvesting are carried out externally, by forestry contractors. It is a peculiarity of this market, which is related to the specifics of forestry production. The transition to contracting services in silviculture and timber harvesting out to private entrepreneurs has been one of the ways of costs reduction in forest management during last years. Nowadays in Slovak forestry, more than 90% of silvicultural and felling operations is carried out by contractors (Kovalčík M., Šulek R., Lichý J., 2016).

The aim of this work was analysis of development of business sector (business companies and self-employed persons) as well as employment in forestry sector and evaluation of competitiveness of forest sector. Evaluation of competitiveness was done by using indicator of value added per employee and worker

1 Assessment of competitiveness

Efficiency and competitiveness evaluation has received the increasing attention in last two decades parallel to technical development. Increasing competitive pressure and decreasing public budget are reasons of searching for any possibilities of an efficiency and competitiveness increase not only at the private enterprises but also at the public institutions and private non-profit organisations. Efficiency and competitiveness evaluation of the forest land management is the scientific field, which many scientists dealt with (Nociarová et al., 1997; Holécy 1999; Pulkráb 2001; Kaňok 2001; Hajdúchová 2002, Balážová, 2009; Pulkráb, Šišák, Bartunek, 2009 and others). These scientists focused on adaptation of knowledge from the past, which have been transformed to present market conditions, or their research based on the foreign papers, which have been modified for Slovak conditions.

Competitiveness in general means the ability to place the products, material and non-material benefits on market in order to satisfy market demand, allow practical use for their high quality and optimal price. It can be achieved by applying scientific and technological development in practice. Due to economy stability it is necessary to maintain balance in fulfilling economic, ecological and social functions of forests (National Forest Programme, 2007). Ideally, measures of competitiveness should satisfy three basic criteria (Durand - Giorno, 1987):

- first, they should cover all the sectors exposed to competition, i.e. represent all goods traded that are subject to competition and only those goods;
- second, they should encompass all the markets open to competition;
- and third, they should be constructed from data that are fully comparable internationally.

In practice, none of the indicators is available to fulfil these three criteria. Data and other limitations mean that compromises have to be made at every stage, so that any measure of competitiveness is in fact only a rough approximation of the ideal (Durand - Giorno, 1987). As was mentioned, there is no universal indicator of the competitiveness. Value of gross domestic product (GDP) per capita and its growth may be considered for relevant indicator of competitiveness. GDP of forestry per employee and contribution of forestry to the GDP are suitable indicators for forest sector. Competitiveness of forestry may be evaluated by value added at basic prices per employee as well. Value added was chosen based on the indicators used in similar studies (e.g. Durand - Giorno, 1987; Marsh – Tokarick, 1994; Siggel, 2007; Hajdúchová et al., 2016 and others) on the one hand and on the other hand on available data.

2 Materials and methods

As a data sources the Finstat-database was used (business companies database and self-employed persons database). The business companies according to the statistical classification of economic activities in the European Community were divided into two groups: forest enterprises and forest contractors. Data on business companies were obtained as well as from publicly accessible register of financial statements, namely balance sheets, income statements and annual reports. Results of national accounts from DATACUBE-database of Statistical Office of the Slovak republic (gross and net value added) were used for assessment of competitiveness of forestry sector for single years.

The overall approach to analysis of competitiveness is based on a simple comparison of individual time periods. Employment in the forestry sector was calculated as total labour input (number of employees + self-employed persons as working average unit). Value added at basic prices was calculated as a difference between production at basic prices and intermediate consumption at purchase prices. The production consists of products produced during the current accounting period and intermediate consumption is composed of the value of products and services consumed in the production process as inputs with excluding the fixed assets, consumption of which is received as a consumption of fixed capital. Value added of forestry sector was calculated as:

- Gross value added = output of the sector – intermediate consumption
- Net value added = gross value added – fixed capital consumption

3 Results and discussion

3.1 Development of business sector in the forestry

The creation of the business sector in Slovak republic began with the formation of ownership and use rights to forest land after 1990. In the years 1991 to 1993, 10 to 15 commercial service companies operated in forestry. In 2000 it was ten times more. This increase was mainly related to restitution of forests and the creation of a private sector in the forestry sector. A significant increase in the number of business companies was also in the years 2003 to 2007, when it grew from 191 to 489. During this period, the biggest forest

owner - the state enterprise LESY SR has begun with transition to contracting services in silviculture and timber harvesting out to private entrepreneurs. The growth of the number of companies continued in the post-2007 period. In 2017, 1,293 companies provided forestry services (Figure 1).

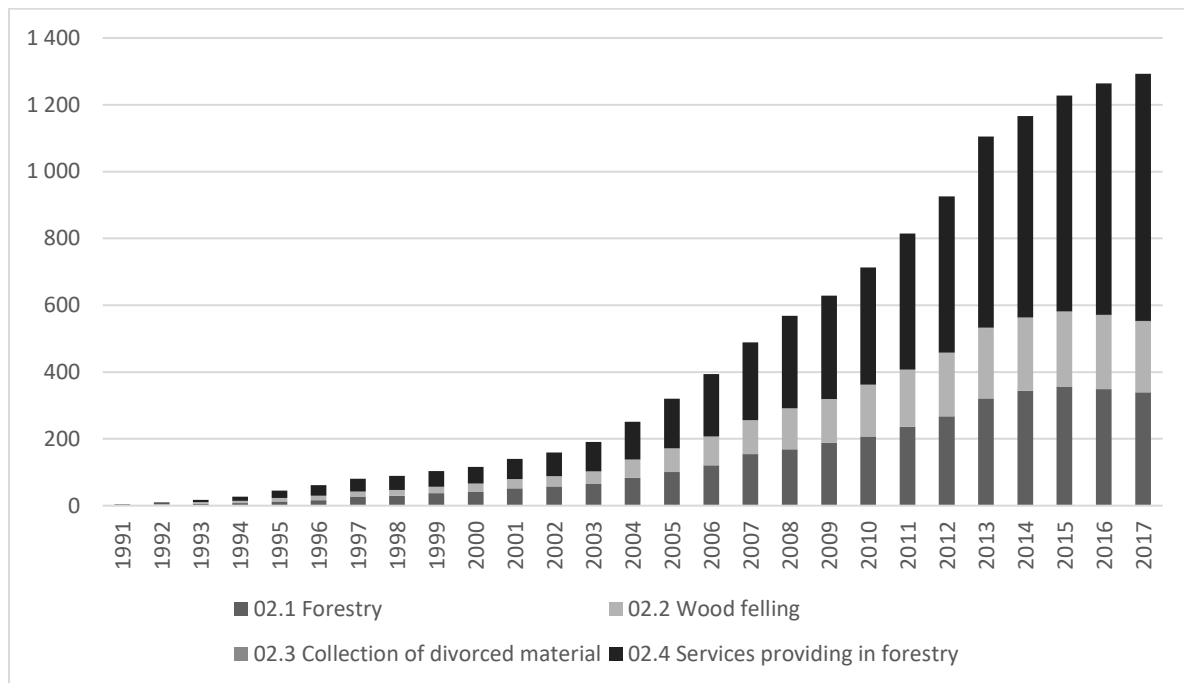


Figure 1. Development of business companies in 1990 - 2017

A similar development was also experienced by self-employed persons. In 1990, the forestry sector had 123 self-employed persons, already in 1993 it was ten times more. Another significant increase in the number of self-employed persons was in the years 2004 to 2007, when it increased from 6,669 to 12,009 self-employed persons. Since 2007, the situation with regard to the number of forest-based self-employed persons has been more or less stabilized at 11-12 thousand. In the last years there is a decline in the number of tradesmen, which may be related to the change of business to a trading company in relation to the tax-deductible aspects of the State's financial policy (Figure 2).

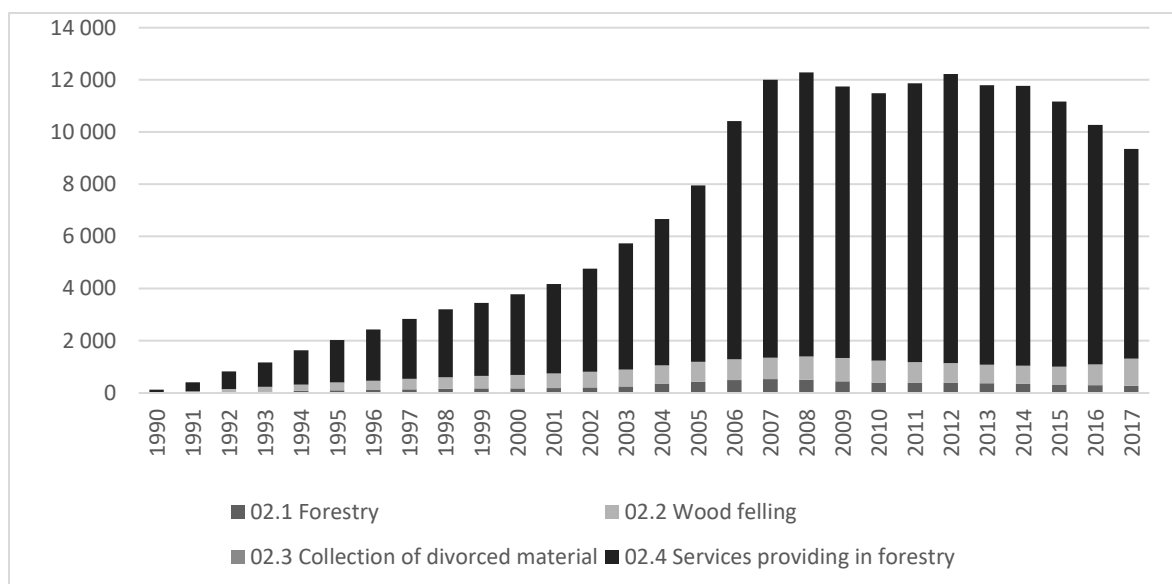


Figure 2. Development of self-employed persons in 1990 - 2017

3.2 Development of employment in the forestry

The Slovak economy has undergone several important stages since 1990. After the fall of the planned economy, it was the transformation process in the nineties, the standardization process after 1998, the accession to the European Union in 2004, the financial and economic crisis in 2008 and 2009. All these facts have affected employment in the national economy as well as in the forestry sector.

In the early 1990s, employment in forestry reached a level of about 36,000 people, which can be considered as overemployment. In the following period, until 2003, it declined significantly, which was related to rationalization of work, private sector creation and the introduction of technological innovations. The next stage was the transition of the largest forests manager in Slovakia - the state enterprise Lesy SR to the outsourcing of forestry services in the years 2003 to 2005. During this period, the number of persons working in the forestry sector increased gradually until 2008 to 26,872 persons. Then, as a result of the financial and economic crisis, there has been a significant decline in the number of forestry workers. In the last three years, despite the relatively high logging of raw wood at the level of 9 mil. m³, the decline the number of persons working in the forestry sector has been decreasing as a result of the labor market situation in Slovakia - demand for labor force, low unemployment, average wage growth and other (figure 3).

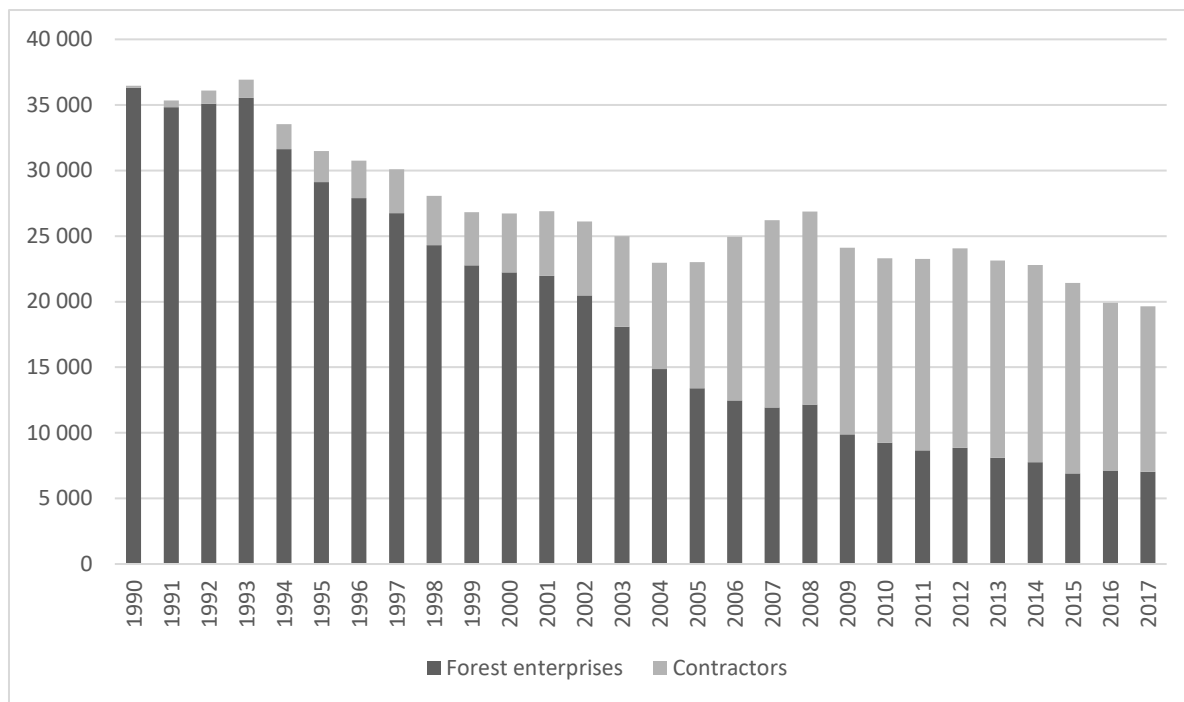


Figure 3. Development of persons working in the forestry sector

3.3 Development of competitiveness of forestry

Added value is a key indicator to express the performance of a sector throughout the national economy. As we can see, higher share of outsourced silvicultural and felling operations has led to an increase of performance of forestry assessed by value added indicators.

Added value of forestry per person working in this sector has increased rapidly since 2005 mainly due to an increase in the proportion of forestry outsourcing. The decline in 2009 and 2010 was due to a fall in the price of forestry production as a result of the impact of the financial and economic crisis. Between 2011 and 2014, added value growth was due to increased forestry production (increase in raw wood production and average prices of raw wood) but also to a reduction in the number of forestry workers. The value added per person working in forestry currently amounts to 30 000 € (gross value added), respectively 26 000 € (net value added). Development of gross and net value added per average working unit in forestry is on figure 4.

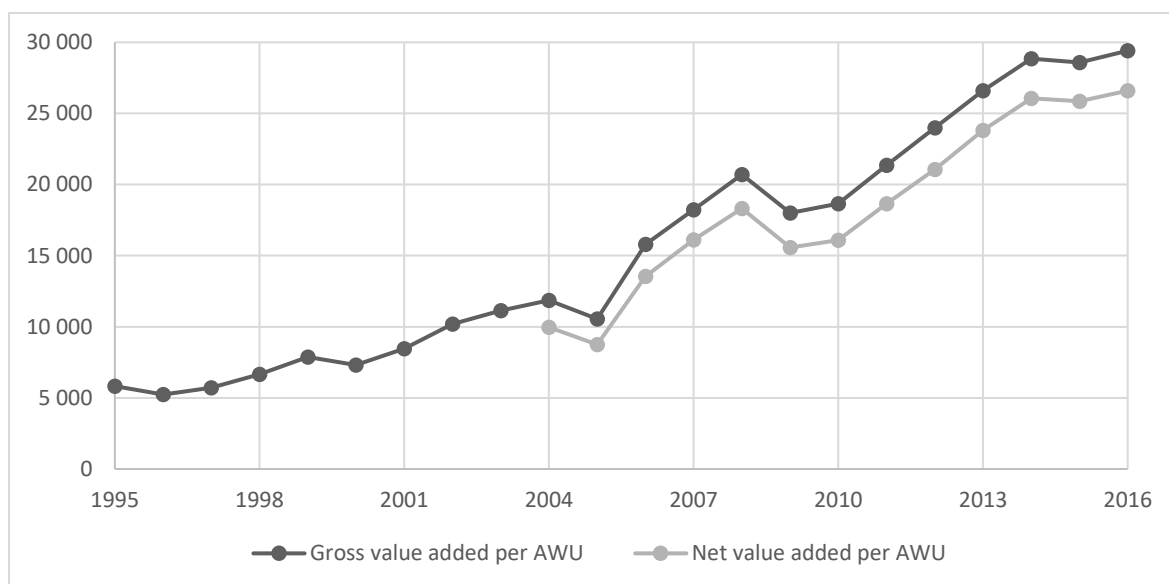


Figure 4. Development of value added per average working unit in forestry

4 Conclusion

In Slovak forestry, like in other primary industries, we have witnessed a steady increase in the number of entrepreneurs in recent years, as the development is directed to the establishment of micro-enterprises. Forestry is one of the sectors of the economy with high accident rate and morbidity. This condition is due to the nature of the work in the forests, the climatic conditions of the workplaces, the terrain and the influence of the technique. The most risky groups in terms of accidents include workers in harvest and transport of wood. Given these facts and the conditions in the labour market, the form of self-employed persons prevails in forestry. Small businesses, with a minimum number of employees, also dominate in business companies.

Based on the results can be concluded, that shift to the outsourcing has positive influence on the overall performance of the forestry sector. On the other hand, it has brought negative effects such as the gradual reduction of average wages in the supply sector, labour-related problems and the timely provision of the necessary forestry work.

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References

- [1] BALÁŽOVÁ E. (2009) Hodnotenie nákladových položiek so zameraním na osobné náklady. In *Recenzovaný zborník z odborného seminára, Zvolen 21.-22. október 2009*. Zvolen: Národné lesnícke centrum - Lesnícky výskumný ústav Zvolen, p. 65-69.
- [2] DURAND M. and GIORNO C. (1987) Indicators of international competitiveness: Conceptual aspects and evaluation. *OECD Economic and Studies*, No 9, p. 147-182.
- [3] HAJDÚCHOVÁ, I., SEDLIAČIKOVÁ, M., HALAJ, D., KRÍŠTOFÍK, P., MUSA, H. and VISZLAI, I. (2016) The Slovakian forest-based sector in the context of globalization. *BioResources* 11 (2). p. 4808-4820.
- [4] HAJDÚCHOVÁ, I. (2002) Efektívnosť výstavby lesných ciest. In *Financovanie výstavby lesných ciest na Slovensku a v zahraničí, zborník referátov z odborného seminára medzinárodného charakteru*. Zvolen: TU Zvolen, p. 69-75.
- [5] HOLÉCY, J. (1999) Odhad rentability hospodárenia na neštátnej lesnej pôde Slovenska, In *Súčasnosť a budúci vývoj neštátneho lesného sektora SR, Zborník z konferencie s medzinárodnou účasťou*. Zvolen: TU Zvolen, p. 65-74.
- [6] KAŇOK, F. (2001) Současné aspekty ovlivňující finančně ekonomickou rentabilitu hospodaření na lesní půdě a ekonomické nástroje uplatňované LČR s.p. v řízení přímo řízených závodů. In *Tvorba a meranie hodnoty lesa 2001, Zborník z konferencie s medzinárodnou účasťou*. Zvolen: TU Zvolen, p. 105-112.
- [7] KOVALČÍK, M., LICHÝ, J. and ŠULEK, R. (2016) Možnosti outsourcingu v lesnom hospodárstve v slovenských podmienkach (Possibilities of outsourcing in condition of Slovak forestry). In HAJDÚCHOVÁ, I. a kol. *Finančná výkonnosť lesných podnikov, Zborník vedeckých prác*. Zvolen, p. 11.
- [8] MARSH, L.W. and TOKARICK, S.P. (1994) Competitiveness Indicators: A theoretical and empirical assessment. *IMF Working paper No. 94/29*.
- [9] NOCIAROVÁ, G. a kol. (1997) *Možnosti zvyšovania ekonomickej efektívnosti LH SR, Záverečná správa referenčnej úlohy č.11/1997*. Zvolen: LVÚ Zvolen.
- [10] PULKRAB, K. (2001) Ekonomické aspekty trvalé udržiteľného obhospodarování lesů. In *Tvorba a meranie hodnoty lesa 2001, Zborník z konferencie s medzinárodnou účasťou*. Zvolen: TU Zvolen, p. 153-165
- [11] PULKRAB K., ŠIŠÁK, L. and BARTUNEK, J. (2009) *Hodnocení ekonomické efektívnosti v lesním hospodářství*. Kostelec nad Černými lesy: Lesnícka práce s.r.o. – nakladatelství a vydavatelství, 130 p.
- [12] SIGGEL, E. (2007) *The many dimensions of competitiveness*. CESifo Venice Summer Institute 20-21 July 2007. 33 p.