Economics and Management of Global Value Chains: Regional Clusters, Local Networks and Entrepreneurship

Proceedings of the 4th Central European PhD Workshop organized by
the University of Szeged Faculty of Economics and Business Administration
Doctoral School in Economics

SZEGEDI TUDOMÁNYEGYETEM
GAZDASÁGTUDOMÁNYI KAR

the Hungarian Regional Science Association

MAGYAR REGIONÁLIS
TUDOMÁNYI TÁRSASÁG

the Regional Committee in Szeged of the Hungarian Academy of Sciences

Economics and Management of Global Value Chains: Regional Clusters, Local Networks and Entrepreneurship

Edited by:
Imre Lengyel – Zsófia Vas

University of Szeged
Faculty of Economics and Business Administration
Doctoral School in Economics

Szeged, 2016

Editors:
Imre Lengyel
Zsófia Vas

Copy editors:
Bettina Ambrus
Zsófia Vas

Reviewers:
Gábor Dávid Kiss
Balázs Kotosz
Balázs Lengyel
Szabolcs Prónay
Izabella Szakálné Kanó
Zsófia Vas

ISBN 978-963-306-501-3

Contents

PART FOUR PRINCIPLES AND PRACTICES IN MARKETING

Contributors

Thai Binh Dang PhD student, University of Miskolc, Enterprise Theory and Practice Doctoral School.

Zoltán Elekes lecturer, University of Szeged, Faculty of Economics and Business Administration.

János Gyurkovics PhD student, University of Szeged, Doctoral School in Economics.

Harun Ercan, PhD student, Corvinus University of Budapest, Doctoral School of Management and Business Administration.

Éva Gajzágó PhD candidate, Széchenyi István University, Doctoral School of Regional- and Economic Sciences.

Gergő Gajzágó PhD student, Széchenyi István University, Doctoral School of Regional- and Economic Sciences.

Sándor Huszár PhD student, University of Szeged, Doctoral School in Economics.

Sándor Juhász PhD student, University of Szeged, Doctoral School in Economics.

Balázs Lengyel research fellow, Centre for Economic and Regional Studies of Hungarian Academy of Sciences, International Business School.

Katalin Pap PhD student, University of Szeged, Doctoral School in Economics.

Speranta Olaru PhD student, Lucian Blaga University of Sibiu, Doctoral School in Economics.

Marianna Sávai PhD student, University of Szeged, Doctoral School in Economics.

Saysi Sayaseng PhD student, Corvinus University of Budapest, Doctoral School of Management and Business Administration.

Anna Szilágyi PhD student, Szent István University, Enyedi György Doctoral School of Regional Sciences.

Tanja Tekic PhD student, University of Novi Sad, Faculty of Technical Sciences.

Zsófia Vas assistant professor, University of Szeged, Faculty of Econimics and Business Administration.

Preface

This volume has been prepared by the Doctoral School in Economics at the Faculty of Economics and Business Administration at the University of Szeged on the occasion of the 4th Central European PhD Workshop on Economics and Business Studies, with the title "Economics and Management of Global Value Chains: Regional Clusters, Local Networks and Entrepreneurship", to be co-organized by the Hungarian Regional Science Association and the Regional Committee in Szeged of the Hungarian Academy of Sciences. The volume provides a review of 11 selected papers out of 37 presentation and 14 papers submitted for the PhD Workshop.

The Doctoral School in Economics at the University of Szeged aims at organizing a series of PhD workshops for Central-European doctoral schools. The workshop offers specific training and provides opportunity for interaction amongst senior and young researchers in line with the research activity of the doctoral schools on the field of economics and business administration.

The first part of the volume is dealing with clusters, networks and innovation systems. It consists of three articles revealing the dynamics of local knowledge networks, the impacts of industrial knowledge base on knowledge sourcing and the changes in the national innovation system of Hungary. The three articles of the second part are focusing on different perspectives of economic development, like related trade links, foreign firms and employment growth in less developed regions, challenges and economic perspectives in the Republic of Moldova and urban rehabilitation projects in Hungary. The third part takes fiscal policy and challenges in financing into account. Three articles provide insight into the banking system of Europe, fiscal sustainability in Poland and V4 Group and credit guarantee fund for SMEs in Hungary. Finally, the forth part aims at understanding the principles and practices in marketing from two aspects: neuromarketing and internalization of retail development.

We are grateful to Jiří Blažek, Mario Davide Parrilli, László Dinya and László Szerb giving plenary sessions and chairing the session of the PhD workshop, to the reviewers, Gábor Dávid Kiss, Balázs Kotosz, Balázs Lengyel, Szabolcs Prónay, Izabella Szakálné Kanó, Zsófia Vas for their contribution to the realization of the volume.

2016, Szeged, Hungary

Editors

PART ONE

Clusters, networks and innovation systems

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 11–28.

1. What if a cluster is declining? – The dynamics behind a local knowledge network

Sándor Juhász – Balázs Lengyel

Knowledge networks are important tools for analyzing the local flows of innovation-related knowledge and consequently on the success of regional clusters. An increasing number of studies focused on the forces that shape and form these networks but the role of these factors in shrinking networks is not well understood. Do firm characteristics or the network structure explain the emergence and decline of knowledge ties in a cluster? In order to address the above question, we map the knowledge network from micro-level relational data collected by a roster recall method questionnaire in the printing and paper product industry of the urban agglomeration of Kecskemét, Hungary in years 2012 and in 2015. The investigated knowledge network became smaller over the period, which is mainly due to increasing competition across the co-located firms. Results of stochastic actor-oriented models suggest that embeddedness, network status, cognitive proximity and the external knowledge ties of firms play an important role in the dynamics of knowledge networks, even in case of a declining cluster in a transition economic setting.

Keywords: knowledge networks, network dynamics, cluster life-cycle

1. Introduction

The relevance of regional clusters in firms' competitiveness and innovation performance is generally acknowledged by now. Along the past ten years the interest of researchers turned to the patterns of how firms gain and exchange knowledge in a cluster context. The flow of knowledge has been a central subject of research on regional clusters (Cooke 2002, Fornahl – Brenner 2003). In accordance to that, knowledge networks have been used as central concept in the literature dealing with local social networks behind clusters (Giuliani – Bell 2005, Morrison – Rabellotti 2009). Knowledge network is defined as a network that links firms through the transfer of innovation-related knowledge (Giuliani 2010). The analysis of this type of networks helps to capture industrial atmosphere or innovative milieu in a region, knowledge spillovers and social, economical embeddedness of firms. Along the examination of the above phenomena and in order to deeper understand clusters, local knowledge network analysis became a widely used tool (Giuliani – Bell 2005, Giuliani 2007, Boschma – Ter Wal 2006, Morrison – Rabellotti 2009). Interestingly, only a few studies have applied an evolutionary perspective and tried to capture the driving forces behind the change of local knowledge networks in time, however, it is very much in line with a new strand of research that investigates cluster evolution processes more generally (Iammarino –

McCann 2006, Glückler 2007, Menzel – Fornhal 2010, Boschma – Fornhal 2011, Martin – Sunley 2011, Staber 2011, Li et al. 2012, Giuliani 2013).

In this research – similarly to other empirical papers concerning network evolution behind clusters (Giuliani 2013, Balland et al. 2016) – we search for the driving forces of knowledge networks, but with two special settings. Firstly, there is still no empirical evidence about how knowledge networks evolve behind clusters in transition economies like Hungary. We argue that despite the special characteristics of transition economies, embeddedness of firms and their status in the knowledge network influence new tie formation. Secondly, we will test our hypothesis on a small scale cluster network that shrinks over time. Cognitive proximity of actors help to share tacit knowledge more easily and therefore facilitate new knowledge linkages, even if a network diminishes. Additionally, we argue about the importance of external linkages and their influence to new knowledge tie creation between local firms.

We test our hypotheses in the context of the printing and paper product cluster of Kecskemét, Hungary. There are no formal contracts behind the cluster, but it has long history in its region, the critical amount of SMEs, high concentration of employment and most of the local companies apply some kind of specialized technology to create unique paper products. We collected the necessary micro-level relational data by face-to-face semi-structured interviews in 2013 and 2016 from 28 firms. We investigated the dynamics of knowledge network formation with the help of Stochastic Actor Oriented Model (SAOM) developed by Snijders (2010). The empirical results show that embeddedness and network status are two main effects guiding the network evolution even in a diminishing network context. While cognitive proximity plays an important role in knowledge tie creation, micro-level geography has no significant effect on new knowledge tie establishment. Another interesting finding is that firms with more external knowledge relationships form more local linkages than firms with fewer ties to other regions.

Our article is structured as follows. The theoretical framework and research hypotheses are developed in Section 2. Section 3 presents the context of the research and the details of data collection. In Section 4 and 5 details the used methodology and the empirical results, followed by the concluding remarks and discussion in Section 6.

2. Literature and hypotheses

The basic idea of clusters – understood here as the geographic concentration of economic activities that operate in the same or interconnected sectors (Gordon – McCann 2000) – has earned high attention in the last thirty years as they have been recognized as drivers of regional competitiveness and growth (Porter 1990, Krugman 1991). This is mainly due to that they enable businesses to gain from complementarities, collaborations and knowledge spillovers (Cooke et al. 2007). Among the many research directions related to the field, particular attention was paid to the relationship between clustering, localised learning and innovation (Bathelt et al. 2004). According to a central claim, the share of knowledge basis enable cluster firms to continuously combine and re-combine similar or non-similar resources to produce new knowledge and innovations. Therefore, successful clusters are the ones that are able to build and maintain a variety of channels for knowledge sharing across members, which is largely shaped by social networks.

A great deal of studies on clusters and networks is focused on knowledge networks. *"Knowledge network is defined as the network that links firms through the transfer of innovation-related knowledge, aimed at the solution of complex technical problems. The knowledge network thus is based on the transfer of knowledge among firms, which occurs informally for problem-solving and is promoted by the local community of technicians and entrepreneurs"* (Giuliani 2010, p. 265). Studying local knowledge networks has already brought novel understanding of the underlying mechanism of knowledge sharing in clusters in two prominent way. On the one hand, knowledge is not automatically accessible for everyone in clusters, but its spread is determined by trust-based relationships of actors (Giuliani – Bell 2005, Giuliani 2007, Morrison – Rabellotti 2009). On the other hand, prominent position of actors in knowledge networks are associated with higher innovation performance (Boschma – Ter Wal 2007), as firms can get new knowledge easier and earlier.

Even though the need to understand evolutionary aspects related to clusters and their underlying networks are highly pronounced (Iammarino – McCann 2006, Glückler 2007, Boschma – Fornahl 2011), there are not much empirical studies concerned on the dynamic effects influencing the change of cluster knowledge networks. The few research on the evolution of these networks have identified that the embeddedness of actors, their status in the network and the different proximities between firms are the most influential factors of change (Giuliani 2013, Balland et al. 2016). However, none of the existing studies deal with transition economy cases, which could be especially interesting from the evolutionary

economic geography point of view. Because of the post-socialist transition setting, cooperation willingness and the lack of trust-based relationships can have a particular effect on network evolution (Grabher – Stark 1997). Moreover, there is still no empirical evidence about the dynamics of knowledge networks behind declining clusters (Menzel – Fornahl 2010). Since most of the related papers deal with empirics of developing or sustaining clusters, cases with diminishing knowledge linkages behind clusters can emphasize the importance of different effects on network dynamics. We argue that it is crucial to understand the latter phenomena because competition in the cluster may undermine the willingness to share innovation-related knowledge with co-located firms.

In this paper we try to answer the question: what drives the evolution of knowledge networks behind declining clusters in transition economy setting? In studies on clusters a central tenet is that embeddedness of actors in cohesive webs of relationships yield positive returns to its members (Asheim 1996). On the one hand, the embeddedness of firms in local networks has been considered crucially important in reducing transaction costs, as they build on personal, trust-based relationships among them (Granovetter 1986). On the other hand, embeddedness is particularly relevant for knowledge sharing between firms of clusters (Uzzi 1997). From a dynamic network point of view, embeddedness could be understood as the relationships of firms become more complex. A widely used network analogy for embeddedness is the notion of triadic closure (Giuliani 2013, Balland et al. 2016), as partner of partners become partners. In our view, this is such an influential effect on knowledge network evolution, that even in cases of diminishing networks it remains determinate. This leads to the following hypothesis:

H1: Despite the decline of network relations, embeddedness (triadic closure) is important for the dynamics of the local knowledge network.

Besides achieving higher embeddedness, the change of network relations behind clusters is also influenced by the hierarchy of the network. In social networks, new ties are established most likely with actors having the highest number of connections (Barabasi – Albert 1999), so as the dynamics of networks are strongly shaped by the network status of actors. In case of advice networks, actors ask advice from other members of a community who have higher status, more connections and therefore more direct linkages to other sources of knowledge (Lazega et al. 2012). There are several empirical evidence on the influence of central actors with the highest status of cluster network on the dynamics of knowledge

diffusion (Giuliani 2007, Morrison – Rabellotti 2009). However, the few studies concerned about the dynamics of knowledge networks behind clusters did not find any significant influence of status on knowledge network evolution. Even though all the empirically examined clusters were in a growing or sustaining stage and therefore the preferential attachment mechanism looked as an obvious dynamics, it could have a more important effect when the knowledge network behind the cluster declines. The above discussion leads to the following hypothesis:

H2: Despite the decline of network relations, network status (in-degree popularity) is important for the dynamics of the local knowledge network.

One of the core conceptual and also empirical elements of the discussion on clusters is the role of different proximities in knowledge sharing. In this literature, geographical proximity is an essential part of the cluster concept because it facilitates face-to-face interactions, communication between agents, and the exchange of knowledge (tacit knowledge, in particular). However, another question remains whether geographic proximity is sufficient for knowledge linkages and innovation too? Boschma (2005) proposed five different proximity dimensions (cognitive, institutional, organizational, social and geographical) that could influence knowledge exchange and therefore innovation performance and emphasized that geographical proximity is more likely to become effective indirectly through the other types of proximity. By now, not much study scaled down and tried to understand the role of geographic proximity behind clusters from a micro-level perspective (Pratt 2011), even though it could help the easy and fast physical contacting of actors and therefore facilitate the transfer of tacit knowledge. However, the importance of geographic proximity on knowledge network dynamics still has contradictory results (Ter Wal 2014, Balland et al. 2016). All these lead us to the following hypothesis:

H3: Micro-level geography plays an important role in the dynamics of the local knowledge network.

Since knowledge resides mostly in skills of individual workers and routines of firms (Nelson – Winter 1982), it makes difficult to be transferred across organizations. Even in clusters, where firms are related to the same sector, the difference of their knowledge bases makes the transfer of know-how difficult. Therefore, the similarity of firms knowledge bases,

so as cognitive proximity of firms is relevant for the transfer of knowledge, thus could significantly influence the development of knowledge linkages between firms of a cluster. This leads to the following hypothesis:

H4: Cognitive proximity plays an important role in the dynamics of the local knowledge network.

The relevance of external relationships of clusters is long established in the literature (Bathelt et al. 2004, Morrison 2008). Many studies indicate that the innovative performance of industrial districts are related to their ability to reach and absorb external knowledge. Firms who build and maintain linkages with other actors outside their region with the purpose of learning and knowledge sharing are often called 'pipelines' in the literature (Owen-Smith – Powell 2002, Bathelt et al. 2004). These firms with external linkages can impregnate the cluster with new knowledge and therefore foster local learning processes, increase international competitiveness and avoid the (technological) lock-in of the cluster. These firms are often associated with a central position in cluster network (Morrison 2008), however, there is still no empirical evidence on how external knowledge ties impact firms local connections over time and therefore the evolution of the local knowledge network. This lead us to the following hypothesis:

H5: Firms with more external knowledge ties are more likely to form local knowledge linkages than firms with less external knowledge ties.

3. The study setting

3.1. Printing and paper product industry in Kecskemét

In the centre of our empirical analysis is the printing and paper product industry of Kecskemét. This dynamically developing town is about 80 km south from Budapest, the capital city of Hungary, and accounts for around 115.000 inhabitants with an economy routed in agriculture as well as processing and manufacturing industries (heavy machinery and car manufacturing). The geographical unit of the analysis is the urban agglomeration of Kecskemét, which is joined by 9 settlements and accounts for about 140.000 inhabitants. Printing and paper product industry has a long tradition in the region of Kecskemét. The first

printing-house called Petőfi Press was established in the 1840s by Szilády Károly and it still works under this name. Since the 1990s, basically after the planned economy collapsed and it became possible to found self-owned firms, numerous small and medium enterprises (SMEs) was born around the town of Kecskemét and created a strong local base for the industry. International companies have also located their facilities (e.g. Axel-Springer). By now, 58 firms operate in the sector around the town resulting a high concentration of both printing and paper product creation in the urban agglomeration of Kecskemét. The location quotient (LQ) based on the number of employees in the region, compared to other manufacturing industries at national level shows significant concentration of both the manufacture of articles of paper and paperboard (LQ=4.602) and the printing and service activities related to printing (1.059)[1]. The high concentration and the simultaneous presence of small and big firms resulted in an intensive local competition, which requires flexible specialisation of SMEs and the local industry as such. Almost all of the present companies apply some kind of specialized technology to create unique paper products (e.g. specifically printed, folded, unique paper products, packaging materials, stickers and labels).

The printing and paper product industry in Kecskemét has several features – such as tradition, concentration, SMEs, specialization – that can help the establishment of a successful regional cluster. One can argue that the type of the organization should be an old social network based cluster (Iammarino – McCann 2006) due to its specific characteristics. The reason for the typology is that these clusters characteristically deal with customised traditional goods; these clusters are built on mature technological knowledge and smaller, customer-driven process oriented innovations are typical in order to satisfy the customers' unique needs. In case of social network based clusters social and historical ties play a crucial role in cluster governance and information and knowledge transfer.

3.2. Data collection

The study is based on primary micro level data collected at the firm level on the basis of face-to-face interviews with skilled workers (mostly with co-founders, operational managers or foremen) in two time points at 2012 and 2015. The interviews were structured by a questionnaire in order to get necessary information for the network analysis. The actual firms the analysis was concentrated on were those that have at least 2 employees, had a seat in the

[1] Location quotient is considered to be high above 1.00.

urban agglomeration of Kecskemét and the main activity was classified under the code 17 (Manufacture of paper and paper products) or 18 (Printing and reproduction of printed media) in the Statistical Classification of Economic Activities of Eurostat (2008). Based on 2012 datas, 38 firms suited the above conditions and we merged those firms that had identical addresses and similar names. Finally, there were 35 firms in the roster for the 2012 questionnaire and at the end of the list 3 opened questions tried to explore the linkages to partner organisations, schools and other important actors not mentioned in the roster. To the actual identification of the firms the database of the Hungarian Central Statistical Office was used. The questionnaire contained some additional control questions about the firms' main activities, the number of employees, total revenue and the proportion of export in total sales in the given year.

We managed to get answers from 26 different companies in 2012 and in order to examine the evolution of the network, we repeated the interviews in 2015 with the same 26 firms who responded in 2012. Due to the opened questions at the end of the roster we successfully managed entries and exits of firms, therefore, we collected 26 responses in 2016 too. These are especially good response rates (more than 70% of the local firms in the industry were reached at both time points) to capture and analyse the patterns of knowledge flow and the evolution of the network behind the local cluster.

The relational data was collected through the so called roster recall method (Wasserman – Faust 1994, Ter Wal – Boschma 2009, Maggioni – Uberti 2011) where each firm were presented with a complete list (roster) of the other firms and was asked to report about their relations to all the other firms. The question formulated to collect knowledge network data – as used in several studies (Giuliani – Bell 2005, Morrison – Rabellotti 2009) – were as follows:

If you are in a critical situation and need technical advice, to which of the local firms mentioned in the roster do you turn?

[Please rate the importance you attach to the knowledge linkage established with each of the firms according to its persistence and quality, on the basis of the following scale: 0= none, 1 = low, 2 = medium, 3 = high].

This question is related to the transfer of innovation-related knowledge and only reveal the inter-firms linkages that are internal to the cluster. They specifically address problem solving and technical assistance because they involve some effort in producing improvements and change within the economic activity of a firm (Giuliani – Bell 2005). This is meant to capture not only the bare transfer of information which is by now easily accessible by many

other channels (such as specialised reviews, the internet, etc.), but instead the transfer of contextualised complex knowledge which is eventually absorbed by localised firms. As an example, knowledge is transferred by providing a suggestion about how to set up a printing-press for a special type of paper or which lighting process is the best for specific materials. Accordingly, the knowledge transferred is normally the reply to a query about a complex problem that has emerged and that the firm seeks to solve (Giuliani – Bell 2005).

The questions related to firms' knowledge transfers have been used to construct two n x n matrix (where n stands for the number of respondents) for the two time points, in which each cell reports the existence of knowledge being transferred from firm i in the row to firm j in the column. As a result of these, the cell (i, j) contains 1 if firm i has transferred knowledge to firm j with the weight of at least 1. Cell (i, j) contains a 0 when no transfer of knowledge has been reported between firm i and j. Therefore, the outcomes of these questions are two directed adjacency matrices.

To have a more complex view on what are the driving forces of network evolution we used additional question on firms characteristics. We asked them about their size, ownership, export ratio, external knowledge linkages and their foundation (if they are spin-off firms or not). The statistical techniques we used to model the dynamics of the knowledge networks and the exact variables we used are described in the next section.

4. Methodology and variables

As we addressed above, knowledge in clusters is transferred by informal contacts between actors to solve technical problems or get professional advice. To explain how these local knowledge networks change over time, we have to model how the actors choose to ask for advice, and how its patterns change over time. Therefore, the dependent variable in this analysis is the formation of knowledge ties between actors (Balland et al. 2016). To analyse the evolution of the cluster knowledge network we apply stochastic actor-oriented models (SAOMs) because they allows simultaneous analysis of different effects on network change (Snijders et al. 2010). Concretely, we use SAOMs implemented in the RSiena statistical software for network analysis (Ripley et al. 2015). This methodology has been successfully applied to analyze global and regional knowledge network evolution in different cases (Balland 2012, Giuliani 2013, Balland et al. 2013, Ter Wal 2014, Balland et al. 2016). For a more detailed introduction of SAOMs see Snijders et al. (2010).

SAOMs can take account of three classes of effects. Firstly, endogenous or structural effects which came from the network structure itself (e.g. network closure effects, degree-related effects, reciprocity). Secondly, dyadic covariate effects based on the existence of similarity or proximity between pairs of actors in the network. If the dyadic covariate is larger, a linkage between two actors is more likely to be established. Thirdly, individual characteristics of actors is also taken account as influential effects of network evolution. An actor related ego-effect expresses the tendency that an actors with higher values for a given characteristic has higher network degree. SAOM model the change of the whole network by a time-continuous Markov chain and assumes that the further evolution of the network is determinable by a probability function based on the present state of the network. The model is actor-oriented, it explains the structural change of the network by the micro level decisions of actors, as they control their outgoing ties. The probability of changes is modelled by a multinomial linear regression which contains structural, dyadic and individual effects. The evolution of the network is simulated by a Monte Carlo algorithm, thereby it tries to connect the states of the network in the different times observed by simulating the internal steps. This stochastic approximation algorithm estimates the parameters that minimize the deviation between observed and simulated networks. For the deeper understanding of SAOMs see Snijders et al. (2010) and Broekel et al. (2014).

To estimate how structural effects or network cohesion shapes the evolution of the knowledge network behind the examined cluster we investigate the role of embeddedness (H1). Embeddedness is often operationalized by triadic closure (Giuliani 2013, Balland et al. 2016). Triadic closure is the notion when partner of partners become partners so as a triad is created by linkages. To capture the role of network status (H2) as a structural effect on network change we investigate the importance preferential attachment mechanism (Barabasi – Albert 1999) as in-degree popularity of actors. We used structural control variables along the estimations just as the out-degree density of the network, the reciprocity of ties and directed cycles (3-cycles) of ties.

To capture the importance of dyadic effects on knowledge network tie formation, we focus on geographical (H3) and cognitive (H4) proximities. Proximities are frequently used as dyadic effects in SAOM based studies on knowledge network evolution (Balland 2012, Balland et al. 2013, Ter Wal 2014, Balland et al. 2016). We measured geographical proximity as the physical distance between two firms. We created a valued measure for cognitive

proximity corresponding to the number of digits the two firms share in common in their NACE 4 codes (Balland et al. 2016). This assumes that two firms have similar knowledge bases and therefore are in cognitive proximity if they operate at the same sector category, which is in line with the related variety literature (Frenken et al. 2007).

We suggested above that the extra-regional knowledge linkages of firms influence their connections in the local knowledge network (H5). To measure the effect of extra-regional connections as an individual characteristics, we used the number of external knowledge ties (both in other regions of Hungary and abroad). Additionally, we used actor related control variables as ownership, age (or experience) and the number of employee for firm size. In the following section, we present the characteristics of the examined knowledge network in the two time periods and the results of the dynamic network analysis.

5. Empirical results

This section presents the results of our empirical analysis on the knowledge network evolution of the printing and paper product cluster of Kecskemét, Hungary. Table 1 shows the main characteristics of the examined firms in 2012 and 2015. Most of the firms were founded along the 1990s when self-owned firm foundation became possible in Hungary. Two companies were closed down along the 3 years, but two other companies joined to the sample by 2015. Spin-off activity is very important in our setting as nearly half of the questioned firms said that they were founded by a former employee of an incumbent firm of the industry. The number of firms operating in printing and paper product creation decreased between 2012 and 2015. Pre-printing processes became the main activity of more firms by 2015 than before. The examined firms are mainly SMEs and only a minority of them is foreign owned. The external orientation of firms, both as there export ratio from the net revenue and their extra-regional knowledge exchanges is decreased from 2012 to 2015.

As we can clearly see on Table 2, the knowledge network behind the cluster became less dense by 2015. From the 223 knowledge ties only 110 linkages maintained. Although, 113 edges dissolved after 2012, no firms became isolated by 2015. On average, actors only asked for technical advice to nearly 8 firms in 2012 and about 6 firms in 2015.

Table 1 Descriptive statistics of the sample in 2012 and 2015

Characteristics	**Number of firms**		
	2012 (N=26)	**Entry/exit**	**2015 (N=26)**
Year of establishment			
Up to 1990	2		2
1990s	14		14
2000s	8		9
2010s	2		1
Entry		2	
Exit		2	
Spin-off firm	11		12
Main activities			
Paper product creation	7		6
Printing	12		11
Pre-printing processes	4		6
Other related activities	3		3
Size (number of employees)			
Small (1-10)	18		18
Medium (11-100)	7		7
Large (101-)	1		1
Average number of employees per firm	27		26
Ownership			
Domestic	21		21
Foreign	5		5
Exporters	13		11
Average number of knowledge linkages outside the region	7		4

Source: own construction

Table 2 Descriptive statistics of the knowledge network in 2012 and 2015

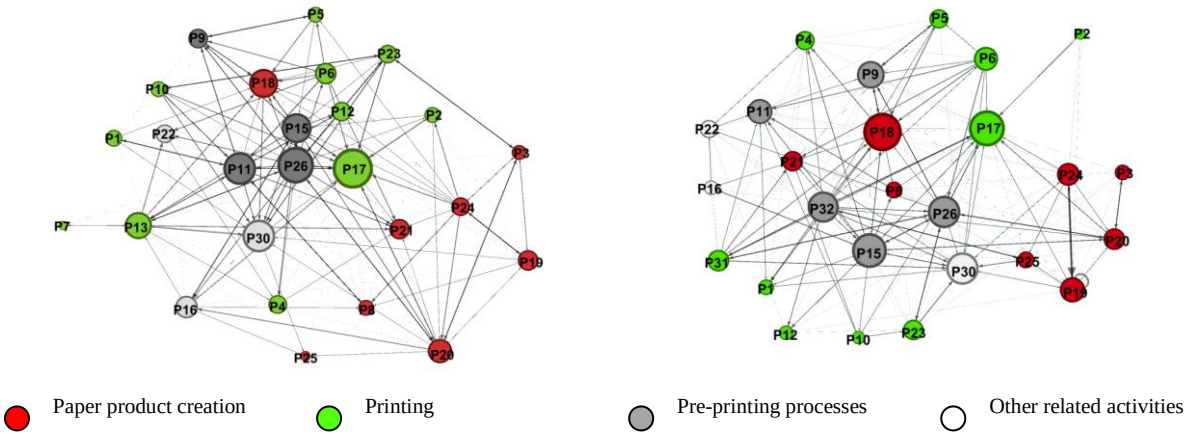
	2012	**2015**
Nodes	26	26
Ties	223	180
Density	0,295	0,238
Average degree	7,964	6,429
Tie created	-	70
Tie maintained	-	110
Tie dissolved	-	113
Isolates	0	0

Source: own construction

Even the visual representation of the knowledge networks (Figure 1) suggests that the knowledge network of the cluster is declining. However, in both cases the network is hyerarchical in a sense, that some actors have remarkably more connections than others. This

is in line with previous studies that have shown the uneven and hierarchical nature of knowledge exchange in clusters (Giuliani 2007). The descriptive statistics of the network emphasized that the case of the printing and paper product cluster of Kecskemét is special in a sense that the network is not growing or sustaining like in previous similar studies (Giuliani 2013, Balland et al. 2016), but rather shrinking. This makes our main question more interesting on what are the driving forces behind the network evolution. What characteristics are still important in a situation when the cluster knowledge network is declining?

Figure 1 The local knowledge network of the printing and paper product industry in Kecskemét in 2012 and 2015



Source: own construction

In order to test our hypotheses and capture the driving forces behind network change, we applied SAOM in RSiena. All parameter estimations are based on 2000 simulation runs. The convergence of the approximation algorithm is good for all the variables in the different models (all the t-ratios are smaller than 0.1) and there was no problem with multicollinearity. Estimations can be interpreted straightforward as they are non-standardized coefficients come by logistic regression analysis (Steglich et al. 2010, Snijders et al. 2010). Since the null hypothesis is that the parameter is 0, statistical significance can be tested by a simple t-statistics following normal distribution. Therefore, estimate coefficients are log-odds ratios, appropriate to how the log-odds of tie formation change with one unit change in the corresponding independent variable (Balland et al. 2016). The results of parameter estimations of SAOM applied for the knowledge network are presented in Table 3.

Table 3 Dynamics of the knowledge network evolution

	Estimates	**SD**	**t-value**
Embeddedness			
Triadic closure	0.126**	(0.061)	2.083
Cyclicity	– 0.132**	(0.066)	– 1.985
Network status			
Indegree - popularity (sqrt)	0.344**	(0.163)	2.102
Outdegree - activity (sqrt)	0.058	(0.143)	0.403
Proximity			
Cognitive proximity	0.097**	(0.045)	2.155
Geographical proximity	– 0.018	(0.037)	– 0.492
External linkages			
External ties	0.081***	(0.029)	2.759
Control variables			
Ownership	– 0.015	(0.246)	– 0.062
Age (experience)	– 0.021	(0.013)	– 1.633
Employment	– 0.000	(0.001)	– 0.285
Density	– 2.525***	(0.787)	– 3.207
Reciprocity	0.678***	(0.219)	3.100
Rate parameter	11.869	(1.240)	.

Note: Results of the stochastic approximation. Estimated parameters based on 4060 iterations. The convergence of the models was good in all cases, all the t-ratios were smaller than 0.064 (<0.1). The coefficients are significant at the * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$ level.
Source: own construction

Our first hypothesis refers to embeddedness as an influential effect on knowledge tie formation. As shown in Table 3, the coefficient of triadic closure is positive and significant. This means that even if the number of ties decrease, actors willing to ask their partners's partners for technical advice. This is consistent with the literature on clusters that describes them as dense, cohesive networks. This finding confirms H1, as structural embeddedness is a strong driver of knowledge networks behind clusters, even if a network diminishes.

Our second hypothesis concerns about the effect of preferential attachment on local knowledge network dynamics. The coefficient for network status (measured by indegree) is positive and significant. This suggests, that despite the overall network is getting smaller, those actors who receive more requests for technological advice tend to attract even more new requests in the following period. This suggests that professional reputation is important for knowledge seeking. This result confirms H2.

The third and fourth hypotheses concern about the role of proximities – as geographical (H3) and cognitive proximity (H4) – on cluster knowledge network evolution. In our case, the dynamics of the knowledge network seem to be driven by cognitive proximity, as its coefficient is positive and significant. However, micro-level geography does not affect new

tie creation in our case. Our finding on the role of cognitive proximity is in line with previous studies, however, the role of geographical proximity seems to be contradictional (Balland et al. 2016).

Our fifth hypothesis is about how the number of external knowledge linkages influence the tie formation of firms in cluster knowledge networks. The coefficient for external knowledge ties are positive and highly significant, which means that firms who can reach more external sources of knowledge forms more local knowledge ties over time. This could mean that in cases when the local knowledge network diminishes, firms in the cluster try to avoid the technological lock-in and renew or strengthen their knowledge base by incorporate more new knowledge.

As for our control variables, rate parameter and density are automatically reported in this type of estimation. The rate parameter indicates the estimated number of opportunities for change per actor, which refers to its stability over time. The positive and relatively high value suggests that there were significant changes in the formation of new ties, while the negative and highly significant coefficient of density indicates that firms tend not to establish knowledge linkages with just any other firm in the cluster (Snijders et al. 2007, Ripley et al. 2015). The negative and significant effect of cyclicity indicates, that there are a certain hierarchy in triads, but knowledge is not just circulates, rather there is a dominant actor who provides knowledge to the other two. Reciprocity came out to be positive and highly significant, which confirms in our case too, that knowledge is sensitive to stable, mutual ties between actors (Giuliani 2013, Balland et al. 2016). Additionally, we controlled for out-degree activity, which came out not significant at all. It means that the excessive activity of firms does not shaping the knowledge network. This is confirmed by our interviews with the local firms who unfold that because of the more and more intensive local competition, they became less opened for knowledge sharing and tend to ask less advice from local competitors. We also included control variables for firms ownership, age and employment, none of which turned out to be significant.

6. Conclusion and discussion

In this study we examined the driving forces behind the local knowledge network of the printing and paper product cluster of Kecskemét, Hungary. Our empirical setting was special in two ways. Firstly, the number of knowledge linkages behind the cluster drastically decreased by time. Secondly, this was the first dynamic network analysis related to a cluster

in transition economic environment, where trust based relationships and the attitude to cooperate considered to be different. However, we found that in line with the literature, embeddedness of firms is very important for the evolution of the cluster knowledge network. Against other studies where network status did not significantly influence the change of knowledge exchanges, in our case, it was very influential on network evolution. The reason behind it could relate to the transition economy setting as firms have a higher willingness to cooperate with firms who are asked for technical advice by many and therefore they are proved to be reliable. Due to the complexity of technical knowledge, cognitive proximity seems to be crucial for its exchange in our case too. As external linkages of firms seems to influence the local knowledge tie creation of firms, it suggests that firms who are the ’gatekeepers’ of new knowledge are more attractive for cooperation.

The effect of preferential attachment mechanism on network formation suggest the concentration of knowledge in few firms, as suggested in recent studies on knowledge networks behind clusters (Giuliani 2007, Giuliani 2013). We argue that a successful cluster should concentrate on the firms who are in the centre of the knowledge network, who have the most influence on knowledge tie formation and therefore on knowledge flow. The understand of the main driving forces of knowledge network evolution helps to appreciate the different roles in the cluster and to create better and more customized strategies for the development of local industry clusters.

This paper has some important limitations, which provide opportunities for further research, but also suggest careful interpretation for findings. Even though there are more and more empirical studies on knowledge network evolution behind clusters, further empirical investigations are needed for comparison. Our study is based only a single case, what makes generalization not possible. Additionally, the examined knowledge ties are assumed to be equal in a sense, that we do not have an understanding on the value of the transferred knowledge. Furthermore, the incorporation of change in individual characteristics could result a more complex understand on whether structural or individual effects are more important for knowledge network evolution behind clusters.

References

Asheim, B. (1996): Industrial districts as ’learning regions’: A condition for prosperity. *European Planning Studies*, 4, 4, pp. 379–400.

Balland, P. A. – Belso-Martínez, J. A. – Morrison, A. (2016): The dynamics of technical and business networks in industrial clusters: embeddedness, status or proximity? *Economic Geography*, 92, 1, pp. 35–60.

Bathelt, H. – Malmberg, A. – Maskell, P. (2004): Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, 28, 1, pp. 31–56.

Barabási, A.-L. – Albert, R. (1999): Emergence of scaling in random networks. *Science*, 286, 5439, pp. 509–512.

Boschma, R. (2005): Proximity and Innovation: A Critical Assessment. *Regional Studies*, 39, 1, pp. 61–74.

Boschma, R. – Ter Wal, A. L. J. (2007): Knowledge networks and innovative performance in an industrial district: the case of a footwear district in the South of Italy. *Industry and Innovation*, 14, 2, pp. 177–199.

Boschma, R. – Fornhal, D. (2011): Cluster evolution and a roadmap for future research. *Regional Studies*, 45, 10, pp. 1295–1298.

Broekel, T. – Balland, P.-A. – Burger, M. – Van Oort, F. (2014): Modelling knowledge networks in economic geography: a discussion of four methods. *The Annals of Regional Science*, 53, 2, pp. 423–452.

Cooke, P. (2002): *Knowledge Economies. Clusters, Learning and Cooperative Advantage*. Routledge, London.

Cooke, P. – De Laurentis, C. – Tödtling, F. – Trippl, M. (2007): *Regional Knowledge Economies. Markets, Clusters and Innovation*. Edward Elgar, Cheltenham-Northampton.

Fornahl, D. – Brenner, T. (2003): *Cooperation, networks and institutions in regional innovation systems*. Edward Elgar, Cheltenham-Northampton.

Giuliani, E. – Bell, M. (2005): The micro-determinants of meso-level learning and innovation: evidence from a Chilean wine cluster. *Research Policy*, 34, 1, pp. 47–68.

Giuliani, E. (2007): The selective nature of knowledge networks in clusters: evidence from the wine industry. *Journal of Economic Geography*, 7, 2, pp. 139–168.

Giuliani, E. (2010): Clusters, networks and economic development: an evolutionary economics perspective. In Boschma R. and Martin R. (eds): *The Handbook of Evolutionary Economic Geography*. Edward Elgar, Cheltenham-Northampton, pp. 261–279.

Giuliani, E. (2013): Network dynamics in regional clusters: Evidence from Chile. *Research Policy*, 42, 8, pp. 1406–1419.

Glückler, J. (2007): Economic geography and the evolution of networks. *Journal of Economic Geography*, 7, 5, pp. 619–634.

Gordon, I. R. – McCann, P. (2000): Industrial Clusters: Complexes, Agglomeration and/or Social Networks? *Urban Studies*, 37, 3, pp. 513–532.

Grabher, G. – Stark, D. (1997): Organizing diversity: evolutionary theory, network analysis and postsocialism. *Regional Studies*, 31, 5, pp. 533–544.

Granovetter, M. (1986): Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology*, 91, 3, pp. 481–510.

Iammarino, S. – McCann, P. (2006): The structure and evolution of industrial clusters: Transitions, technology and knowledge spillovers. *Research Policy*, 35, 7, pp. 1018–1036.

Krugman, P. (1991): *Geography and Trade*. MIT Press, Cambridge.

Lazega, E. – Mounier, L. – Snijders, T. – Tubaro, P. (2012): Norms, status and the dynamics of advice networks. *Social Networks*, 34, 3, pp. 323–332.

Li, P. – Bathelt, H. – Wang, J. (2012): Network dynamics and cluster evolution: changing trajectories of the aluminium extrusion industry in Dali, China. *Journal of Economic Geography*, 12, 1, pp. 127–155.

Maggioni, M. A. – Uberti, T. E. (2011): Networks and geography in the economics of knowledge flows. *Quality & Quantity*, 45, 5, pp. 1031–1051.

Martin, R. – Sunley, P. (2011): Conceptualizing cluster evolution: beyond the life cycle model? *Regional Studies*, 45, 10, pp. 1299–1318.

Menzel, M. P. – Fornahl, D. (2010): Cluster life cycles – dimensions and rationales of cluster evolution. *Industrial and Corporate Change*, 19, 1, pp. 205–238.

Morrison, A. – Rabellotti, R. (2009): Knowledge and information networks in an Italian wine cluster. *European Planning Studies*, 17, 7, pp. 983–1006.

Nelson, R. R. – Winter, S. G. (1982): *An evolutionary theory of economic change*. Harvard University Press, Cambridge MA.

Porter, M. E. (1990): *The Competitive Advantage of Nations*. Macmillan, London.

Pratt, A. C. (2011): Microclustering of the media industries in London. In Karlsson, C. – Picard, R. G. (eds.): *Media Clusters: Spatial Agglomeration and Content Capabilities*. Edward Elgar, Cheltenham, pp. 120–135.

Ripley, R. – Snijders, T. – Boda, Zs. – Vörös, A. – Preciado, P. (2015): *Manual for RSiena (Version October 10)*. Department of Statistics, University of Oxford, Oxford.

Snijders, T. A. B. – Van de Bunt, G. G. – Steglich, C. E. G. (2010): Introduction to stochastic actor-based models for network dynamics. *Social Networks*, 32, 1, pp. 44–60.

Staber, U. (2011): Partners forever? An empirical study of relational ties in two small-firm clusters. *Urban Studies*, 48, pp. 235–252.

Steglich, C. E. G. – Snijders, T. A. B. – Pearson, M. (2010): Dynamic networks and behavior: Separating selection from influence. *Sociological Methodology*, 40, 1, pp. 329–393.

Ter Wal, A. L. J. – Boschma, R. (2009): Applying social network analysis in economic geography: framing some key analytic issues. *The Annals of Regional Science*, 43, 3, pp. 739–756.

Ter Wal, A. L. J. (2014): The dynamics of the inventor network in German biotechnology: geographic proximity versus triadic closure. *Journal of Economic Geography*, 14, pp. 589–620.

Uzzi, B. (1997): Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science Quarterly*, 42, 1, pp. 35–67.

Wasserman, S. – Faust, K. (1994): *Social Network Analysis: Methods and Applications*. Cambridge University Press, Cambridge.

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 29–48.

2. Impact of industrial knowledge base on knowledge sourcing: the case of printing industry

János Gyurkovics – Zsófia Vas

Latest researches that investigate the creation, diffusion and utilisation of economically useful knowledge go beyond questions like how much resources need to be invested to these processes by enterprises and what the result of these investments are. The objects of analysis have been shifted to issues like how knowledge creation, diffusion and utilisation actually take place at firm level, what kind of characteristics could be observed in this process and how much do the outputs contribute to the performance of firms, sectors and regions. Several theoretical frameworks have been developed to answer these questions from which the differentiated (analytical, synthetic, symbolic) knowledge bases theory seems a prevailing one. Hitherto the approach has been mostly used in developed countries yet it seems an appropriate framework to analyse the creation, diffusion and utilisation of industry specific knowledge and its spatial aspects at the same time in less developed countries like Hungary.

In the present paper we apply this framework to investigate the local printing industry in Kecskemét (Hungary) presumably characterised by synthetic knowledge base mainly. The aim is to unfold and analyse the characteristics of knowledge flows in the industry and to explore whether the revealed pattern is in line with the theory. Therefore the following questions are addressed: what is the main geographical scene of knowledge acquisition, what are the main sources of new knowledge and who are the main partners in the knowledge sourcing process. Evidence proof theory-led expectations, and reveal the relevance of direct knowledge sources, the importance of co-localization and the dominancy of engineering-based knowledge in the industry.

Keywords: knowledge flow, knowledge base, printing industry, Hungary

1. Introduction

Alongside the growing knowledge-based economy and the increasing economic globalisation, there has been a higher interest in analysing industrial knowledge flows and exploring firms' competitive advantages on the one hand, and investigating industrial and regional interdependencies and their impacts on firms' knowledge acquisition activities on the other hand. Some notable conceptual frameworks addressing these issues are the theory of innovation milieu (Camagni 1991), the concept of learning regions (Florida 1995) and the approach of innovation systems (Lundvall 1992, Cooke et al. 1998).

These approaches no longer address questions like how much resources need to be invested to the creation, diffusion and utilisation of economically useful knowledge and what the result of these corporate investments are. The current issue is that how these activities

actually take place at firm level, what kind of characteristics could be observed and how much do the outputs contribute to the performance of firms, sectors and regions.

An increasing interest has been directed likewise towards the assumption that industrial knowledge and capabilities, i.e. industrial knowledge bases (Dosi 1988) describe the different knowledge acquisition patterns on firm and industrial level, and explain the spatial distribution of industrial players. Moreover, industrial knowledge base not only determines the industrial behaviour - how economically useful knowledge is generated, distributed and exploited - , but also the economic performance of regions, where the industrial actors are located.

Industrial knowledge bases, which dominate different industries, are classified by Asheim and his co-authors (Asheim – Gertler 2005, Asheim et al. 2007, Asheim et al. 2011) to three different ideal types: analytical, synthetic and symbolic knowledge base. The concept of differentiated knowledge bases takes both industrial knowledge and spatial aspects of knowledge flows into account. Nevertheless, the theory has been developed mainly on the bases of case study analysis from developed economies, and primary research approaches have been published only in the last few years. Owing to this their number is very small.

Therefore, the present paper aims at applying this framework to shed light on the patterns of knowledge flows in the local printing industry of Kecskemét in Hungary presumably characterised by mainly synthetic knowledge base. The objective is to unfold and analyse the characteristics of knowledge generation, diffusion and utilisation and to explore whether the revealed pattern is in line with the theory. Therefore, the study focuses on the following main questions: what is the main geographical scene of knowledge generation, diffusion and acquisition, what are the main sources of new knowledge and who are the main partners in the process of knowledge sourcing.

The paper is organized as follows. In the first part the conceptual framework of differentiated knowledge bases is presented. Then the second part aims at introducing the case and the methodology. The results, which origin from a primary, questionnaire based survey are shown in the third main part. The paper closes with the conclusions.

2. Theoretical framework

Due to the increasing complexity of knowledge creation, diffusion and utilisation the previously used twofold approach regarding the tacit and explicit nature of knowledge has become insufficient if it comes to the adequate investigation of these processes. Several

further features characterise knowledge creation, diffusion and utilisation yet disregarded, at least partially, by the tacit-explicit dichotomy. To overcome the drawbacks of the aforementioned notions other approaches like the differentiated knowledge bases theory has been introduced to the literature (Asheim – Gertler 2005, Asheim et al. 2007, Asheim et al. 2011, Martin 2012). It takes into consideration the characteristics and aims of knowledge creation and diffusion, the modes of knowledge utilisation, the actors in the process, the importance of geographical proximity and differentiates industries by dominant knowledge bases at the same time.

The proponents of the differentiated knowledge bases framework assume that the innovation performance of firms, industries and regions highly depends on the dominant knowledge base underlying their activities. The theory makes distinction between three ideal types of knowledge bases - analytical, synthetic and symbolic - (Table 1) as inputs to knowledge creation, diffusion and innovation.

The analytical knowledge base characterises industries where scientific knowledge is important thus the creation and utilisation of knowledge often take place in a highly formalised manner based on research and development results (Asheim – Gertler 2005, Asheim – Coenen 2005). Biotechnology and drug development are mentioned as typical industries that rely on analytical knowledge base. In these industries the type of innovation is mainly radical. Development of new products and/or processes is considered as the main aim of knowledge creation to which firms rely on basic and applied research. In-house research and development activities are significant, however often external collaborating partners, such as universities and research centres, are also involved to the process. The analytical knowledge base has strongly codified knowledge content, that is the inputs and results of innovation process could be easily documented and transmitted (Asheim – Gertler 2005). Such inputs and outputs include scientific publications, patent documents and research briefings. In this way highly abstract knowledge is produced with universal meaning which allows easier knowledge transmission between distant geographical places via global networks (Martin 2012). Naturally analytical knowledge base could also involve tacit component but it is negligible in terms of innovation compared to synthetic or symbolic knowledge bases.

Table 1 Types of differentiated knowledge bases

	Analytical (science-based)	**Synthetic (engineering-based)**	**Symbolic (arts-based)**
Aim of knowledge creation	Creating new knowledge about natural systems by applying scientific laws	Applying or combining existing knowledge in new ways in order to solve specific problems	Combining existing knowledge in new ways, creating meaning, desire, aesthetic qualities, immaterial goods, intangibles, symbols, images
Mode of knowledge creation	Scientific models, Deductive, Significant R&D: basic and applied research Know-why	Solving specific problems, custom production Inductive Moderate R&D: applied research and development Know-how	Creative process Negligible R&D Know-who
Type of knowledge	Strong codified knowledge content, highly abstract, universal	Partially codified knowledge, strong tacit component, more context specific	Builds mainly on tacit knowledge, importance of interpretation, creativity, cultural knowledge, highly context specific
Type of innovation	Radical innovation	Incremental innovation	Mostly recombination, occasionally radical innovation
Actors involved	Collaboration within and between research units (academic, industrial)	Interactive learning with customers, suppliers and other actors from the industry	Actors of short, project based co-operations
Spatiality	Global linkages	Few global linkages, moderate local embeddedness	Strongly embedded local networks
Typical industries	Drug development, biotechnology	Mechanical engineering	Film industry, publishing, music industry, fashion, advertising

Source: own construction based on Asheim − Gertler (2005), Asheim et al. (2007) and Martin (2012)

Synthetic knowledge base is dominant in industries such as mechanical engineering or shipbuilding (Asheim – Gertler 2005, Asheim – Coenen 2005). It forms the foundation of engineering-based activities where knowledge creation and adaptation rest on the application and combination of existing knowledge. Innovation is considered incremental focusing on specific problems rather than radical which focuses on transformative product or process innovations. Accordingly, research and development activities are least important in the innovation process compared to the analytical knowledge base and if R&D activities take place applied researches and development tasks are the most common. Although co-operating with universities or other research centres is not unusual, customers, suppliers and other actors from the industry are more prevalent partners. Synthetic knowledge base includes more tacit, context-specific component than the analytical one. Experimenting, testing and learning-by-doing are more important forms of knowledge production than formal R&D. Diffusion of

knowledge is harder since it is not possible to transmit every knowledge element in a codified way. Regarding spatiality few global connections characterise such an industry with a relatively higher local embeddedness.

With the increasing economic significance of creative activities and industries the proponents of differentiated knowledge bases approach introduced a third knowledge base category which is related to the creation of meaning, aesthetic qualities, symbols and other cultural artefacts (Asheim et al. 2007, Asheim et al. 2011). Typical examples of this symbolic knowledge base are film industry, publishing, music industry, fashion and advertising. Innovation in symbolic industries is similar to synthetic ones: combining existing knowledge elements in new ways. However the aim of knowledge production is to create new symbols or aesthetic value and not to renew process of physical production. R&D activities are negligible in these industries. The symbolic knowledge base consists of nearly exclusively context-specific tacit knowledge elements which are strongly embedded locally. Therefore firms source external knowledge from other firms in the industry which reside in geographical proximity, follow similar culture, values, norms and interpret symbols in similar way. Thus, firms characterised by symbolic knowledge base are concentrated in specific locations with different social and economic background and creating dense local networks.

It has been revealed that the concept of differentiated knowledge bases describe the inter-industrial differences in knowledge creation, diffusion and utilisation, and explain the spatial distribution of industrial players, thus the economic performance of the regions. To understand this phenomenon, several researches have been conducted using both primary and secondary data (e.g. Martin – Moodysson 2011, Liu et al. 2013, Asheim – Hansen 2009, Eriksson – Forslund 2014). Secondary data collection and analysis is more accurate mode to explore and compare the differences among industries and regions, even over a longer period of time. But certainly more sufficient to conduct primary research if in-depth study of sectors is in target. Given the fact, this study aims at deeper understanding of a particular industry, we focus on reviewing existing studies, which build on primary data collection.

Evidence from primary researches has been published only in the last few years, and owing to this their number is very small. The overview of existing articles allows us to draw a number of important conclusions. Generally, studies aim at providing a more accurate understanding on the differences in knowledge acquisition and utilisation, thus innovation performance. Most of the studies focus on presenting the impact of knowledge bases on industrial innovation performance, emergence of knowledge networks and industrial development trajectories (Martin – Moodysson 2011, Plum – Hassink 2012, Zukauskaite –

Moodysson 2013, Liu et al. 2013). The minority investigates the influence of regional economic environment on industrial knowledge flows and innovation performance (Chaminade 2011, Gülcan et al. 2011). Thus, authors use slightly different number and types of indicators to measure differentiated knowledge bases, and present several industrial examples with different knowledge bases (Table 2).

Table 2 Qualitative research approaches measuring industrial knowledge bases and regional effects

Authors (year)	Object of research	Data source	Measuring knowledge base	Methodology
Martin – Moodysson (2011)	Life science (analytical), food (synthetic) and moving media (symbolic) (Southern Sweden)	Structured and semi-structured interviews	Monitoring Mobility Collaboration	Descriptive statistical analysis, social networks analysis
Chaminade (2011)	automotive and software (Puna-India, Beijing China)	Survey, semi-structured interviews	Source of knowledge, interactions and spatiality	Descriptive statistical and comparative analysis
Liu – Chaminade – Asheim (2013)	Global innovation network of MNCs in telecommunication (analytical) and automotive industry (synthetic)	Interviews, questionnaires, websites, corporate internal reports, press news	Actors Type of interactions Intensity of interactions	Social networks analysis (intra and inter-firm relations)
Plum-Hassink (2011)	Biotechnology and automotive industry (Germany)	Interviews	Characteristics of partners, relevance of interactions, content and spatiality of knowledge transfer	Social networks analysis
Zukauskaite – Moodysson (2013)	Food sector (Southern Sweden)	Text analysis, semi-structured interviews	Nature of innovation activity (radical or incremental)	Abduction
Gülcan – Akgüngör – Kustepeli (2011)	Fashion design (symbolic), household textile (synthetic) industry in Turkey (metropolitan and rural region)	Secondary data analysis, In-depth interviews	Source of workforce, education, source and spatiality of information and knowledge, output of innovation, policy initiatives	Descriptive statistical analysis

Source: own construction

To collect the data structured or semi-structured, in-depth interviews, questionnaires and content analysis are conducted. However, in several cases these techniques are completed with others, like secondary data collection and overview of previous empirical studies, press news, corporate internal reports and websites. Most of the surveys cover the representatives of

firms (CEOs, executives, managers), but there are some, which address representatives from related industries and actors (e.g. policy makers), who have an impact on the innovation activity of firms. Results are mostly performed by social network analysis (Martin – Moodysson 2011, Plum – Hassink 2011, Liu et al. 2013), and there are only a few numbers of studies using descriptive statistical and comparative analysis (Chaminade 2011, Gülcan et al. 2011), and in one case the conclusions are drawn by abduction (Zukauskaite – Moodysson 2013).

Findings of the above-mentioned researches are in line with each other from lot of respects. All of the studies highlight the differentiating role of industrial knowledge bases and the heterogeneity of innovation patterns which vary from industry to industry, from region to region. Martin and Moodysson (2011) reveal that industries with analytical knowledge base use rather formalized knowledge sources, as well as workforce coming from universities and build science-based, global collaborations. In case of industries building on synthetic knowledge base, the knowledge sources are less formalized, the labour force rather comes from other firms and the collaborations are more regional and national. Finally, economic activities presenting symbolic knowledge base have less formalized knowledge sources, the sources of labour and the collaborations are local.

Results are slightly different if multinational companies (MNCs) are in target (Liu et al. 2013). Whether a MNC builds on analytical or synthetic knowledge base, its innovation network is global (or 'regionalized global' in case of MNC with synthetic knowledge base). However, the dynamics of the global innovation networks are different. Analytical MNC has no strong local embeddedness, and rather focuses on R&D activities. Synthetic MNC is embedded in the local environment. Similarly, Plum and Hassink (2011) reveals that knowledge networks depend on the dominant industrial knowledge base, and the knowledge base may change over the time. Additionally, Zukauskaite and Moodysson (2013) prove that those firms are more innovative, which build on more knowledge bases.

However, differentiated knowledge bases are not the only reasons for the differences in innovation activities and performance (Chaminade 2011, Gülcan et al. 2011). It has become clear that different regional innovation systems result different industrial innovation patterns. Moreover, bigger the difference between the same sectors in different regions than in case of two different sectors in the same region (Chaminade 2011). Beside these, the corporate strategy, the local market barriers, etc. also should be taken into account.

According to the existing evidence, we expect that an industry with synthetic knowledge base deals dominantly with tacit knowledge, possess rather regional knowledge

networks and collaborations with co-located partners. Use less formalized and largely industry-specific knowledge sources, and attract the skilled workforce from other firms, and finally focus not on R&D collaborations, but rather on solving customer-supplier problems. Due to the fact that the most comprehensive research to reveal the peculiarities of knowledge bases is done by Martin and Moodysson (2011), we build on their methodology. Our case and the methodology are presented in the following chapters.

3. Introduction to the case and methodology

In this study our aim is to unfold and analyse the characteristics of knowledge flows in the printing industry of Kecskemét as a synthetic industry in a transition economy in order to explore whether the revealed pattern is in line with the assumptions of differentiated knowledge bases theory. To do so we address the following questions: what is the main geographical scene of knowledge acquisition, what are the main sources of new knowledge and who are the main partners in the knowledge sourcing process.

As we presented in the previous chapter authors studying problems like these have come up with several different methods to measure knowledge flows and innovation patterns. For the purpose of our analysis we adapted the methodology used by Martin and Moodysson (2011). They examine industrial knowledge base and the knowledge acquisition activity of firms along three dimensions: monitoring, mobility and collaboration. Monitoring is an indirect way of knowledge acquisition. It refers to a situation when firms do not come into direct contact with knowledge sources (e.g. universities, competitors, agencies), but use intermediary carriers of knowledge, like: scientific journals, surveys, questionnaires, specialized magazines, fairs and exhibitions. Compared to this, mobility is a more direct way to access knowledge. It refers to the recruitment of new, skilled workforce from other organizations, like universities, technical colleges, firms in the same industry and firms in other industry. The third fundamental and direct mode of knowledge acquisition is collaboration. Collaboration provides knowledge exchange through direct interaction with other actors. Collaboration may focus on product development, exploitation of new market opportunities, technology procurement etc.

In our research a distinction is also made between regional, national and international level of knowledge acquisition in case of measuring mobility and collaboration. Furthermore, we are also interested in the differences between market and technological knowledge acquisition patterns of firms. Technological knowledge is defined as a type of knowledge

which is necessary for the development of new products or processes while market knowledge refers to knowledge about new trends or other market-related facts. With this distinction we could also examine which types of sources are important and what spatial level that really matters if it comes to one or to the other type.

To answer the proposed questions a survey has been conducted in January 2016. Data have been collected from 26 firms in Kecskemét. Firms with NACE code 17 and 18 were considered as printing industrial firms. Firms outside the city and its agglomeration and firms with less than 2 employees or considered inactive were excluded from the survey. In this way we were able to collect data from 70% of the potential firms from the local printing industry. Data collection was conducted in person. In most cases the firm's executive officer was asked to answer the questions. In cases when he/she was unavailable another representative of the firm, who has the appropriate knowledge, was interviewed.

Kecskemét, with its 115.000 inhabitants, is the 8th biggest city in Hungary. It lies about 85 km south from Budapest in the Southern Great Plain region, in the county Bács-Kiskun. The economy of the city is very diverse. From agriculture and food processing to mechanical engineering and car manufacturing several industries could be found in the city. Among them, according to Juhász and Lengyel (2016), the printing and paper industry has a significant concentration in the area. Based on their location quotient (LQ) analysis conducted in 2014 the former has a 1,048 while the latter a 3,777 value which means higher industrial concentration in the area (in terms of employment) compared to national level.

The history of printing and paper industry in the area goes back to 1840s when the first printing house, called Petőfi Press, was founded in the city and since then it has still operated (Juhász – Lengyel 2016). After the socialist era, in the 1990s, many private printing and paper companies are funded. Some of them originated from the Petőfi Press (e.g. Print2000, GoesslerKuverts) others funded by international companies (e.g. Axel-Springer). Besides the few bigger firms, currently the printing and paper industry in Kecskemét is dominated by small and medium sized companies which entails that the main focus is the creation of unique paper products in small series (e.g. specifically printed, folded, unique paper products, packaging materials, stickers and labels) mostly to satisfy regional demand. A higher education institution with and engineering faculty (Kecskemét College Faculty of Mechanical Engineering and Automation) and a specialised secondary school are also found in the city which could provide the necessary human resource for the industry. All in all the long tradition, the geographical concentration, the similar social and historical background of the

companies makes the printing industry in Kecskemét a suitable case to investigate the relevance of differentiated knowledge base approach in a transition economy.

4. Results

Our sample consists of 26 firms from the printing industry of Kecskemét. Regarding their main activity 42.3% marked printing activities as their main field, while both pre-press and pre-media services and manufacture of paper and paper products as main activity reached 23.1%. The rest (11.5%) indicated other fields as main sources of their revenues such as binding or manufacture of tools for printing firms. The average age of the firms are 18,1 years so the printing industry of Kecskemét can be considered as a mature one. Considering the average number of employees in 2015 the firms in the industry employ 28,1 person on average. However if we exclude STI (former Petőfi Press) from the sample it decreases to 13,4 person. The industry is mostly dominated by microenterprises (69.2%), only almost one fourth (23.1%) of the industry consist of small and medium sized companies, while STI is the only large firm in the city. Out of 26 firms, 12 can be considered as spin off companies from which 5 has their roots in the former Petőfi Press. One fifth (19.2%) of the firms has foreign capital in their ownership and almost 40% of them export their products to the global market.

Although the printing industry is generally presumed to be characterised by synthetic knowledge base, we explore the actual composition of workforce to assess this assumption. The interviewees were asked to categorise their employees into 4 categories according to their main tasks. The pre-press category includes employees who deal with graphics and design. They are mostly responsible for planning the appearance of products, creating aesthetic value or meaning which activities are, in our understanding, mainly based upon symbolic knowledge. Pressmen, plant engineers and managers and other employees who deal with the actual production process are classified under the printing category and considered as synthetic knowledge-based workforce. Technical assistance, also classified as synthetic knowledge related occupation, refers to employees with less specific knowledge dealing with labelling, packaging or cutting and also classified as synthetic ones. Finally the administrative label stands for employees dealing with management, procurement, marketing and other operation tasks.

Examining the composition of full-time workforce (Table 3) it becomes clear that the industry is dominated by synthetic knowledge-based occupations compiled under the label ‘printing’ (52.7%). Even if the STI, the largest firm in the area, is excluded the proportion of

this group remains the highest (43.7%). 7.6% of the workforce dealing with symbolic type pre-press activities if STI taken into account, however their share is twice as many if STI is excluded. It is almost the same with the workforce in category 'other' including part-time workers. This is well in line with the fact that the local industry is dominated by smaller firms focusing on unique and small series products where unique design and creative solutions are more important. The bigger share of technical assistance in the second case (23.4%) entails that smaller firms tend to employ people with least specific skills. All in all the composition of workforce shows the dominance of synthetic knowledge in the industry.

Table 3 Average composition of workforce (%)

	Pre-press	**Printing**	**Technical assistance**	**Administrative**	**Other**
With STI	7.6	52.7	16.5	20.9	2.4
Without STI	14.2	43.7	23.4	13.6	5.2

Source: own construction

Regarding mobility, knowledge acquisition through recruitment of highly skilled workers is a typical way to gather new knowledge. Knowledge creation in synthetic industry is driven by experimenting, testing and learning-by-doing so workforce with former experience seems more important than newcomers from professional, vocational schools or higher education institutions. Our results show a surprisingly low ratio in connection with the importance of different knowledge sources in terms of mobility (Table 4). Almost 40% of the firms do not mark any sources as important if it comes to recruitment of highly skilled workforce. Firms in the printing industry of Kecskemét hardly recruit highly skilled workers from higher education institutions or other vocational training schools. The latter is even more surprising knowing that a specialised vocational training school operates in the city.

However during the survey many interviewees complained about the quality of education. A little bit less than one third of the responders (30.8%) considered other firms from the same local industry as moderately or highly important source of skilled workers. Regarding importance, this group is followed by actors from the same industry on national level and actors from other industries from all spatial levels, all of them considered at least moderately important by 15.4% of the firms. For printing industrial firms local workforce is the most decisive.

Table 4 Mobility: Relative importance of sources of skilled workforce and their spatiality (%)

	Higher education institution			Vocational training school			Same industry			Other industry		
	L	N	I	L	N	I	L	N	I	L	N	I
Not at all	84.6	76.9	84.6	69.2	80.8	88.5	61.5	73.1	88.5	65.4	73.1	80.8
Low	3.9	7.7	0.0	11.5	7.7	3.9	3.9	7.7	3.9	15.4	7.7	11.5
Moderate	0.0	0.00	7.7	0.0	3.9	3.9	19.2	11.5	3.9	11.5	11.5	3.9
High	3.9	7.7	7.7	15.4	3.9	0.0	11.5	3.9	0.0	3.9	3.9	0.0
N/A	7.7	7.7	7.7	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
Total	100	100	100	100	100	100	100	100	100	100	100	100

Notes: L – local (county), N – national (country without the county), I – international
Source: own construction

Based on the responses collected during the survey two reasonable explanations occur if we would like to explain the low ratio of knowledge sourcing through mobility. Firstly, the local industry includes few bigger companies with large-scale production who rather employ workers without specific skills and train them in-house, and several smaller firms who specialised in unique products, thus provide special on-the-job training to their employees. Secondly firms do not recruit directly from the abovementioned actors but use other channels (e.g. websites) to gather sufficient workforce.

Regarding monitoring, the secondary, indirect knowledge sources, in line with Martin and Moodysson (2011) four categories are distinguished: fairs and exhibitions with specific focus on latest industrial news, trends and technologies; professional magazines (including on-line papers) specialised in related fields; surveys conducted by support organisations (professional associations, chambers, statistical office) or businesses (market research firms) and scientific journals concerned with latest research results. Based on the theory-led expectations, we think that knowledge sourcing through indirect channels is less important for the firms in the printing industry, due to the fact that competitive advantages come from the applied and specialised nature of knowledge and innovation activities.

The results (Table 5) show that professional magazines can be considered as the most important secondary knowledge sources in terms of both market and technological knowledge. More than 60% of the respondents consider magazines moderately or highly important if technological knowledge is needed. If it comes to market knowledge still more than half of the firms rely on this source at least moderately. The next most important knowledge sources are fairs and exhibitions. These types are also more significant in case of technological (42.3%) than of market knowledge sourcing (34.6%). Only surveys can be considered as more important source of market knowledge compared to technological. Little

bit more than one fourth (26.9%) of the firms rely at least moderately on surveys as sources for market knowledge while the proportion is only one fifth (19.2%) in the other case. In line with the literature and our expectations scientific journals are hardly used by printing industrial firms.

According to the theory-led considerations (Martin − Moodysson 2011), it would be expected that monitoring other firms through fairs, exhibitions and magazines are the most important knowledge sources for activities relying on symbolic knowledge base due to the fact that their innovations are widespread and usually not kept in secret. It seems - given the nature of the printing activity - this assumption can be applied for the dominantly synthetic printing industry as well. These sources seem more important because specific technological and market knowledge could be obtained via them; furthermore the latter provide opportunity for face-to-face communication, especially with customers and suppliers, who have leading role in the innovation activities in case of synthetic related activities. Surveys and scientific journals are more important for analytical industries.

Table 5 Monitoring: Relative importance of indirect sources for gathering knowledge (%)

	Fairs, exhibitions		**Magazines**		**Surveys**		**Scientific journals**	
	T	M	T	M	T	M	T	M
Not at all	19.2	42.3	15.4	23.1	73.1	61.5	73.1	80.8
Low	34.6	23.1	15.4	19.2	3.9	11.5	3.9	7.7
Moderate	30.8	15.4	23.1	30.8	7.7	11.5	0.0	3.9
High	11.5	19.2	38.5	23.1	11.5	15.4	19.2	7.7
N/A	3.9	0.0	7.7	3.9	3.9	0.0	3.9	0.0
Total	100	100	100	100	100	100	100	100

Notes: T – technological knowledge, M – market knowledge
Source: own construction

Investigating further the combination of secondary sources about one tenth (11.5%) of the firms do not use any secondary source to obtain either market or technological knowledge and they did not mark any other means in the questionnaire. On the other hand same proportion of the firms draws on all the four types during market or technological knowledge acquisition. However, most commonly, firms use two sources at the same time to acquire market (34.6%) or technological knowledge (38.5%). So firms in the printing industry of Kecskemét usually draw on two secondary sources (mostly magazines and fairs, exhibitions) to acquire knowledge. But it can be observed only in case of about one third of the companies. The proportion may be higher in symbolic related industries.

Since the partly tacit nature of synthetic knowledge relatively more importance to personal contacts and collaborations is expected in terms of technological or market knowledge acquisition. Therefore, we asked the firms to indicate how much they rely on different actors if they seek to acquire market or technological knowledge. Furthermore we were also interested in the spatiality of cooperation partners to decide whether local, national or international level that really matters for knowledge sourcing. In line with the theory we expect relatively high importance of customers and suppliers as main channels of knowledge and lower importance of competitors because of the strong competition in the local industry. Higher education institutions as knowledge providers are expected to be of low importance bearing in mind that applied researches considered being important in an industry characterised by synthetic knowledge. Regarding spatiality, because of the higher tacit component of synthetic knowledge base compared to analytical one, local and national levels are expected to be decisive.

Results show that the most important direct knowledge sources are the customers followed by the suppliers (Appendix 1). Competitors have slight significance only, while firms barely rely on higher educational institutions. Only a few respondents (7.7%) do not rely on any group to access external technological knowledge while about one tenth (11.5%) of the firms neglect other actors if they require market knowledge (Table 6). Investigating the combination of different sources only 7.7% of the firms rely on one particular actor to acquire technological or market knowledge. More commonly firms in the printing industry of Kecskemét gather knowledge from several actors at the same time.

Table 6 Collaboration: Direct sources and their combination for gathering knowledge (%)

	Technological knowledge	**Market knowledge**
None	7.7	11.5
CUST	0.0	3.8
SUPP	3.8	3.8
COMP	3.8	0.0
CUST+SUPP	15.4	19.2
CUST+COMP	7.7	7.7
SUPP+COMP	3.8	3.8
CUST+SUPP+COMP	30.8	26.9
CUST+SUPP+HEI	3.8	0.0
CUST+COMP+HEI	3.8	3.8
CUST+SUPP+COMP+HEI	19.2	19.2

Notes: rows with 0 are excluded, CUST – customers, SUPP – suppliers, COMP – competitors, HEI – higher education institutions

Source: own construction

About one third of the respondents typically collect external knowledge from customers, suppliers and competitors in parallel. Interestingly higher education institutions are mentioned as potential external knowledge sources only in combination with the other three groups. Nearly 20% of the firms draw on all four groups during their knowledge sourcing activity. Firms who combine only two sources to acquire technological or market knowledge mostly rely on their customers and suppliers: 15.4% and 19.2% respectively. In this sense knowledge acquired from competitors can only be considered important if it is supplemented with knowledge from customers and suppliers.

The spatial dimension of knowledge sourcing through direct channels slightly different than it is expected (Table 7). Significant differences could not be observed between the two knowledge types. Firms acquire technological and market knowledge from nearly same spatial levels. The importance of local level on its own is very low. Only 11.5% of the firms gather knowledge exclusively from their proximity. Commonly firms source knowledge from at least two different spatial levels at the same time. 23.1% of the respondents contact local and national actors to acquire technological or market knowledge and 42.3% of them rely on actors from all - local, national and international - spatial levels. In our sample firms barely source knowledge solely from national level (7.7%). Firms who build on international sources usually complement that knowledge (either market or technological) with local or national source presumably to acquire context-specific knowledge.

Table 7 Collaboration: Spatiality of direct sources for gathering knowledge (%)

Knowledge	**None**	**L**	**N**	**I**	**L + N**	**L + I**	**N + I**	**L + N + I**
Technological	7.7	11.5	7.7	0.0	23.1	0.0	7.7	42.3
Market	11.5	11.5	7.7	0.0	23.1	0.0	3.9	42.3

Notes: L – local (county), N – national (country without the county), I – international
Source: own construction

If we consider the relative importance of direct sources the most important one is local customers (Appendix 1). More than 40% of the respondents considered them as at least moderately important in both cases. National customers are also major sources of technological (38.5%) and market (34.6%) knowledge. A slight difference could only be observed in case of international customers because they are considered more important in case of market than technological knowledge. The same stands for local suppliers: only 15.38% of the firms attributed at least moderate significance to them in the technological

knowledge sourcing process, while little more than one fourth in case of market knowledge. Regarding suppliers, national ones are the most important sources (34.6%). In terms of technological knowledge, 30.8% of the firms in the printing industry rely, at least moderately, on local competitors as main partners. Regarding market knowledge they have lesser significance (23.1%) which might originate from the stronger local competition and the bigger impact of market knowledge on short term. Firms more willingly share technological knowledge with each other than market knowledge.

All in all printing industrial firms in Kecskemét rely on several actors, mostly customers (almost two third of the firms), suppliers (between 54–57% of firms, depending on need for market and technological knowledge) and competitors (around one third of the firms), from different, at least two spatial levels at the same time. Most frequently knowledge acquired from local and national customers are supplemented with knowledge from national and international suppliers.

5. Conclusion

In this paper we investigated the printing industry of Kecskemét in Hungary presumably characterised by mainly synthetic knowledge base in order to shed light on patterns of knowledge flow. Our theoretical considerations and expectations were built upon the differentiated knowledge bases approach. Hitherto, empirical evidence supporting the differentiated knowledge base approach is mainly based on results from developed countries, so studying if the argument holds for regions and industries in transition economies like Hungary seemed a promising line of research. Therefore, our aim was to unfold and analyse the characteristics of knowledge generation, diffusion and utilisation and to explore whether the revealed pattern is in line with the theory. Three main questions were addressed during our research: what is the main geographical scene of knowledge generation, diffusion and acquisition, what are the main sources of new knowledge and who are the main partners in the process of knowledge sourcing.

To collect evidence a questionnaire based survey has been conducted which was build on three dimensions - mobility, monitoring and collaboration - to capture industrial knowledge base and the knowledge acquisition activity of firms. The first, mobility, captures the recruitment of skilled workforce as holders of new, external knowledge. Monitoring stands for the indirect way of knowledge sourcing when firms use intermediary carriers of

knowledge. Lastly, collaboration refers to knowledge exchange through direct interaction with other actors.

The results are basically in line with our theoretical-led expectations. The composition of workforce confirms the dominance of synthetic knowledge base in the industry. However, if the biggest company is excluded from the sample the proportion of employees with symbolic knowledge base is increased which could be explained by their specific focus on unique design and creative solutions. Considering knowledge acquisition through mobility surprisingly low importance is dedicated to different sources. A bit more than third of the respondents do not mark any sources as important if it comes to recruitment of highly skilled workforce. Vocational schools and higher education institutions are mostly neglected, while other printing industrial firms or firms from other industries have only slight importance, only about one third of the firms consider them as important sources of potential workforce. Possible explanation of the low importance could be that firms employ less skilled workers and perform in-house trainings.

Regarding secondary and indirect knowledge sources professional magazines can be considered as the most important ones while fairs and exhibitions also have a moderate significance. Nevertheless the low significance of scientific journals and surveys is expected. Although the relatively higher importance of the former two sources is unanticipated. The monitoring of other firms via magazines or fairs is typical for symbolic industries, where innovations are widespread and usually not kept in secret. However the results could be explained by the fact that firms in the printing industry of Kecskemét mainly dealing with unique production and design which entails such knowledge acquisition activities. Moreover, greater importance is expected in a symbolic-related industry.

Investigating collaboration, the direct knowledge sources it could be said that firms rely on several sources at the same time. Most commonly they draw on knowledge gathered from customers and suppliers. Knowledge stemming from competitors is considered important only if supplemented with knowledge from the other two actors. Higher education institutions are the least important sources of external knowledge and only used by firms who acquire knowledge from the other actors too. In terms of different knowledge types firms more willingly share technological knowledge with each other than market knowledge.

About the spatial dimension of knowledge sourcing all the spatial level seem important for the printing industrial firms of Kecskemét. In connection with recruitment local level is the most decisive, while studying collaborations with other actors local, national and international levels can all be considered important. However firms who build on

international sources usually complement that knowledge with local or national source presumably to acquire context-specific knowledge.

To sum, recent analyses has proved that printing industry is dominated by synthetic knowledge base. The impacts of the transitional economy in Hungary have not been proved, but further in-depth analysis is needed to reveal the potential effects. Investigation of the development path in the industry could lead to several other interesting conclusions.

References

Asheim, B. – Boschma, R. – Cooke, P. (2011): Constructing Regional Advantage: Platform Policies Based on Related Variety and Differentiated Knowledge Bases. *Regional Studies*, 45, 7, pp. 893–904.

Asheim, B. − Coenen, L. (2005): Knowledge bases and regional innovation systems: Comparing Nordic clusters. *Research Policy*, 34, pp. 1173–1190.

Asheim, B. – Coenen, L. – Vang, J. (2007): Face-to-face, buzz, and knowledge bases: sociospatial implications for learning, innovation, and innovation policy. *Environment and Planning C*, 25, 5, pp. 655–670.

Asheim, B. – Gertler, M. C. (2005): The Geography of Innovation: Regional Innovation Systems. In Fagerberg, J. – Mowery, D.C. – Nelson, R.R. (eds): *The Oxford Handbook of Innovation.* Oxford University Press, Oxford – New York, pp. 291–317.

Asheim, B. – Hansen, H. K. (2009): Knowledge Bases, Talents, and Contexts: On the Usefulness of the Creative Class Approach in Sweden. *Economic Geography*, 85, 4, pp. 425–442.

Camagni, R. (1991): Local 'millieu', uncertanity and innovation networks: towards a new dynamic theory of economic space. In Camagni, R. (ed): *Innovation networks: spatial perspectives.* Belhaven Press, London, pp. 122–144.

Chaminade, C. (2011): Are knowledge bases enough? A comparative study of the geography of knowledge sources in China (Great Beijing) and India (Pune). *European Planning Studies*, 19, 7, pp. 1357–1373.

Cooke, P. – Uranga, M. G. – Etxebarria, G. (1998): Regional systems of innovation: an evolutionary perspective. *Environment and Planning A*, 30, 9, pp. 1563–1584.

Dosi . G. (1988): The nature of the innovative process. In Dosi, G. – Freeman, C. – Nelson, R. – Silverberg, G. – Soete, L. (eds): *Technical Change and Economic Theory*. Pinter Publihers, London – New York, pp.221–238.

Eriksson, R. – Forslund, F. (2014): How Do Universities Contribute to Employment Growth? The Role of Human Capital and Knowledge Bases. *European Planning Studies*, 22, 12, pp. 2584–2604.

Florida, R. (1995): Toward the learning region. *Futures*, 27, 5, pp. 527–536.

Gülcan, Y. – Akgüngör, S. – Kuştepeli, Y. (2011): Knowledge generation and innovativeness in Turkish textile industry: comparison of Istanbul and Denizli. *European Planning Studies*, 19, 7, pp. 1229–1243.

Juhász, S. – Lengyel, B. (2016): Kik formálják a klasztereket? Egy helyi tudáshálózat elemzése. *Területi Statisztika,* 56, 1, 45–65. o.

Liu, J. – Chaminade, C. – Asheim, B. (2013): The geography and structure of global innovation networks: A knowledge base perspective. *European Planning Studies*, 21, 9 pp. 1456–1473.

Lundvall, B-A. (1992): National innovation system: towards a theory of innovation and interactive learning. Pinter, London.

Martin, R. (2012): Measuring Knowledge Bases in Swedish Regions. *European Planning Studies*, 20, 9, pp. 1569–1582.

Martin, R. – Moodysson, J. (2011): Comparing knowledge bases: on the geography and organization of knowledge sourcing in the regional innovation system of Scania, Sweden. *European Urban and Regional Studies*, pp. 1–18.

Plum, O. – Hassink, R. (2011): Comparing knowledge networking in different knowledge bases in Germany. *Papers in Regional Science*, 90, 2, pp. 355–371.

Zukauskaite, E. – Moodysson, J. (2013): *Multiple Paths of Development: Knowledge Bases and Institutional Characteristics of the Swedish Food Sector*. Lund University, CIRCLE-Center for Innovation, Research and Competences in the Learning Economy, No. 2013/46.

Appendix

Appendix 1 Relative importance of direct sources and their spatiality for gathering knowledge (%)

	Customer						**Supplier**						**Competitor**						**Higher education institution**					
	Local		National		International		Local		National		International		Local		National		International		Local		National		International	
	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M	T	M
Not at all	38.5	34.6	46.2	46.2	61.5	57.7	57.7	42.3	38.5	34.6	50.0	50.0	34.6	38.5	57.7	57.7	65.4	65.4	84.6	80.8	76.9	76.9	96.2	92.3
Low	19.2	19.2	15.38	15.4	11.5	3.9	26.9	26.9	23.1	23.1	11.5	11.5	30.8	30.8	26.9	15.4	7.7	3.9	11.5	11.5	11.5	11.5	3.9	3.9
Moderate	30.8	30.8	19.2	11.5	0.0	0.0	11.5	15.4	15.4	19.2	19.2	19.2	15.4	11.5	3.9	15.4	15.4	7.7	0.0	0.0	3.9	0.0	0.0	0.0
High	11.5	11.5	19.2	23.1	23.1	30.8	3.9	11.5	19.2	15.4	15.4	11.5	15.4	11.5	7.7	3.9	0.0	7.7	3.9	3.9	7.9	7.9	0.0	0.0
N/A	0.0	3.9	0. 0	3.9	3.9	7.7	0.0	3.9	3.9	7.7	3.9	7.7	3.9	7.7	3.9	7.7	11.5	15.4	0.0	3.9	0.0	3.9	0.0	3.9
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Note: T – technological knowledge, M – market knowledge
Source: own construction

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 49–62.

3. Changes and development of Hungarian national innovation system

Éva Gajzágó – Gergő Gajzágó

During the last two decades basic changes were made in the Hungarian system of institutions and also in the national innovation system (NIS). The main institutions were founded after the regime change and since then the system was continuously changing.

This recent article aims to introduce the Hungarian innovation system and its changes in the last two decades. The introduction focuses on the structures and participants of the NIS (like the organizations participating in the innovation process and the decision makers of the innovation policy). The article also aims to reveal the financing mechanism and the target groups of the NIS organizations. Highlighting of the correspondence of the NIS and the priorities of national and EU development strategies and programs was also a main goal of the research.

Keywords: national innovation system, organization, financing

1. Introduction

Our article is based on the theory which states that one of the key elements of the development of national economies is to increase the innovation potential. The long term development of a region is influenced by its innovation potential and innovation capability - ability of adaptation, number of innovative companies, knowledge transfer and creation, innovative milieu, etc. (e.g. Perroux 1955, Lasuén 1971, Schumpeter 1980, Rechnitzer 1993, Capello 2006). Governments can support the increase of this potential through the establishment and development of innovation system with several complex assets (Flanagana et al. 2011, Arocena-Sutz 2002). This development should be based on organizational cooperation and the systems of knowledge creation and transfer (Szépvölgyi 2006, Nagaoka et al. 2009).

Recent article aims to give an overview of the Hungarian innovation system and its actors - the organizations participating in the innovation process -, examining four period from the socialist era till 2015. The authors in every period are focusing on the decision making structures and participants of the system, examine the financing mechanism of the organizations and the hindering problems of innovation. The article is based on the related literature - previous secondary research results - and a complex empirical research containing three main analyses. One analyses examined the national and EU grants promoting the innovation process. The second research focused on the national and European Union

development strategies and the third one was a national level primer research questioning the intermediary organizations of the innovation process (like technology transfer offices, chambers of commerce or regional innovation agencies)[1].

The first part of the article introduces the main literature and the definition of the national innovation system and the participants of the NIS. The main part of the study contains the results of the above mentioned three researches and summarizes the development of the innovation system in Hungary by four stages: 1. the national innovation system before the regime change, 2. between 1989 and 2004, 3. between 2004 and 2010 and 4. the innovation system nowadays after 2010.

2. About the national innovation system and its actors

Since the last century several experts in economics and regional economics indicated that innovation has an important role in regional development. Schumpeter (1980) highlighted that the innovation stimulates the regional goal. Perroux (1955) wrote about development centers (poles) in which the motoric elements are the innovative sectors of knowledge creation. Lasuén (1971) emphasized the adaptation of innovation which influences the structure of the region and cities. He also adds that the economic development originates from the flow of technology change and thus the development process is due to the innovation process.

Several articles – like Freeman (1987, 1995), Filippetti and Archibugia (2011), OECD (2005) – define and describe the national innovation system. Freeman (1987) defines the NIS as the network of the public and private institutions which have a leading role in the creation and spreading inventions and innovation. According to the definition of the Oslo Manual (OECD, 2005) the NIS consist of private and non-private (public) organizations, which influence the direction and velocity of the innovation process. Filippetti and Archibugia (2011) gives an overall picture about the NIS definitions in the literature. They also confirm that the innovation processes of the companies are significantly influenced by those systems, which promote innovation partnership, patenting, financial processes and higher education.

[1] The primer research – between 2010 and 2013 - examined the intermediaries of the innovation process on several levels: on national level - by analysing statistical data, and with a questionnaire survey -, on regional level - by regional level survey which measured the cooperation of companies in the Hungarian Central-Transdanubian Region with questionnaires and in-depth interviews and on local level - with questionnaires surveying the cooperation of local companies and researchers in the Hungarian Dunaújváros sub-region.

Regarding to the Hungarian NIS several literature can be found – like Dőry (1998, 2005), Inzelt (1998), Molnár (2004), Török (2006), Buzás (2007), Smahó (2008), Lengyel and Leydesdorff (2008), Inzelt and Szerb (2003), Lux (2013) and the articles of Csizmadia, Grosz and Szépvölgyi (2002, 2004, 2008, 2011). Inzelt (1998) defines the NIS according to a narrow and a wider perspective. Buzás (2007) emphasizes the role of government in the innovation process and also explains assets which the government can use to promote innovation. Molnár (2004) and Smahó (2008) define and classify the actor of the NIS. Some of the above mentioned literature closely examines the innovation system and its participants in the regions of Hungary (e.g. the articles of Csizmadia, Grosz and Szépvölgyi (2002, 2004, 2008, 2011, Dőry 1998, Inzelt – Szerb 2003). Lux (2013) focuses on the innovation actors of three Hungarian cities. On the contrary, Hungarian literature does not contain articles about the overall changes and structure of the national NIS.

3. Innovation and R&D in Hungary before the regime change

This chapter describing the innovation system before the regime change is based on the literature (Honvári 1997, 2006, Kaposi 2004) about the economic history of Hungary and an interview with the former development director[2] of the biggest metallurgical company of Hungary, the Dunai Vasmű.

In the socialist system, Hungarian economy was excessively centralized, planned and bureaucratic. (Honvári 1997). The main institute of the economy was the National Planning Office and several other public offices (like the Economic Main Council, the Industrial Ministry, or the National Material and Price Office) influenced the management – and therefore the R&D – of companies. The system was complex, hierarchical and consisted of too many public organizations (e.g. ministries and 29 industrial directories plus 19 county affiliates of the planning offices).

The Comecon (Council for Mutual Economic Assistance, in Hungarian: KGST) also had an effect on R&D. International contracts were 'translated' to the company and manufacturing level by companies' research departments, which were also responsible for the elimination of problems and for the examination of international technology trends. Furthermore, companies also cooperated with local higher educational institutes to accomplish the plans of the Comecon and the national planning office. This partnership was

[2] Interview with Gyula Králik, former development director if the Dunai Vasmű. The interview was made in September 2007.

obligatory and legally based on the act of 1961 (act on the Hungarian educational system). Comecon agreements also forced the member states to develop only in a specific sector of industry. Therefore, some sectors (and their R&D process) which were prosperous before – like communication engineering or the manufacturing of railway carriages –, and which were not stated in the agreements, started to decay. Comecon influenced the licensing process too, as its member countries had to share their inventions without payment. Therefore until 1971 all countries shared only unremarkable licences (Honvári 2006).

During the soviet era, some organizations were founded which also played a significant role after the regime change. The National Technological Development Committee (in Hungarian: OMFB) e.g. was established in 1962 and operated until 2000. It was responsible for the international network of scientific and technological attachés and for funds for technological development.

Financing of R&D was centralized but companies could receive funds from three main funds; from the government, from public banks and from public company development funds (from 1968). In 1986 a specific fund for supporting basic research in Hungary was founded. The National Scientific Research Fund (in Hungarian: OTKA) is still available for researchers and from 1997 is legalized and supervised by a specific law[3]. The National Patent Office was established much before the socialist era in 1895 and is still functioning.

Inventions and innovation were hindered by the bureaucratic coordination, by the 'profilization' (separation of processes which were not closely connected to the manufacturing stage) and by the separation of economic sectors (Honvári 2006).

After the 1950s, Hungarian economy aimed to focus on the heavy industry[4]. Raw materials were imported from other soviet states which did not reached the required quality for the manufacturing process. This was a huge burden for the companies but interestingly increased the number of inventions. Companies and their experts had to fulfil the national plans thus regularly transformed the manufacturing process or the product itself using R&D.[5]

During this period - as in nowadays (see the recent works of Nagaoka et al. 2009, Guana − Chen, 2012, Inzelt – Szerb 2003), personal connections and networks were significant for

[3] act CXXXVI. of 1997.
[4] act II. of 1951. on the fives years plan,
[5] In the Dunai Vasmű – the largest metallurgical company in Hungary - the quality and quantity of the imported input raw material (iron ore) was low however the national plan clearly defined the quality and quantity of output – according to the Comecon the company had to produce tractors and agricultural machines. Besides, with the given manufacturing capacity the firm could not have possibility to increase or develop the quality of the manufacturing assets. These – and the aim to gain profit or decrease the loss – forced the company to invent new technologies and frequently change the manufacturing process which was only possible to accomplish by inner development.

researchers. R&D task from companies were only obtained by experts who had personal partnership with companies.

After 1960s, higher educational research stared to secede from industrial needs as researchers were rather aimed to reach higher scientific degree with research results. This tendency was so significant that it influenced the motivation of researchers after the regime change too and some of the researchers only realized the importance of industry based research later, after 2004.

The Hungarian economy started to slightly develop in the 80s due to several reforms. Public companies were reorganized and launched more development programs. However, industrial and R&D differences between the socialist and so called western countries were obvious.

4. Hungarian innovation system in the 'transition' decade after the regime change

After the regime change in 1989, the transformation and reorganization of Hungarian economic system started explosively. Public leaders emphasized the importance of R&D and changed not only the legal base and strategic documents but the institutional[6] and financial system too. Unfortunately, during this reorganization, previously established institutions and systems were not examined and the transformations of systems were not based on extensive research about the possibilities or capabilities.

The OMFB[7] was closed. Despite of its closure, the board of OMFB and the successor of the organization[8] played a significant role in the elaboration of the first national innovation strategy. The first strategy was based on the No. 1089/2003 government enactment, about R&D and technological innovation. Science and Technological Policy College also participated in the elaboration of this document.

From the late 1990s more and more strategies and plans were elaborated to develop the R&D&I in Hungary. The National Development Plan (from 2004) and the New Hungarian Development Plan (from 2007)[9] contained priorities according to the reorganization of the innovation institutional structure.

[6] e.g. Hungarian Association for Innovation responsible for the innovation process and financing was established in 1990.
[7] National Technological Development Committee
[8] the R&D vice secretariat of the Ministry of Education
[9] Both plans were elaborated for the National Reference Framework, for receiving EU funds.

In 2003 the new innovation act[10] were published. The act established the National R&D Technology Office (in Hungarian NKTH), the R&D and Technological Innovation Fund and the Research and Technological Innovation Council (in Hungarian: KuTIT). In this same year the Science and Technology Policy Counsellor Body (4T) was also founded. This organization consisted on experts from both scientific and business are and cooperated with the KuTIT.

Starting from the late 1980s, financial funds for investments and therefore for innovation were significantly decreased due to economic recession (Kaposi 2004). Companies had to decrease their R&D activities, some companies even ceased this activity. Public funding system was changed to tenders and grants.

From 2003, the innovation fund (the NKTH) was responsible for the distribution innovation allowance and government supports. The process was managed by the R&D Tender and Research Usage Office.

Nowadays research organizations and companies can receive funds from national and EU resources through project based calls. Some part of the innovation system like public research institutes is still financed directly but their share from funds is decreasing.

In this period, the elaboration of goals regarding to the national innovation system and the decision making process were directed by several organizations. Not only one ministry was responsible for the decision making - one part of the development process was supervised by the Ministry of Economy[11] and another part (e.g. the supervision of the Hungarian Science Academy (HSA)) by the Educational and Cultural Ministry. This sharing of tasks reflects the overly bureaucratic system of the socialist era. Since the millennium – up until today - in Hungary these tasks were always shared by two or three ministries[12].

Right before 2004, when Hungary joined the EU, there was an urgent need of the transformation of the national innovation system. Decision makers were obliged to meet the requirements of and close up to the European Union.

5. The innovation system after 2004

2004 was a turning-point for the development of Hungarian innovation system as the act CXXXIV of 2004 on the R&D and technological innovation was introduced. The law

[10] act XC. of 2003. on the research-development and innovation fund
[11] the Ministry of Economy and Transport from 2002
[12] the Ministry of Economy, the Educational Ministry and the National Development Ministry (from 2010)

assigned the National Research and Technological Office to be responsible for the innovation policy and strategy, for financing R&D processes through the Research and Technological Fund (in Hungarian: KTIA) and for the supervision of the TéT (scientific and technological) attaché network. The supervision of the NKTH was at ministry level in the Ministry of Economy. Other organizations and committees (e.g. HSA committees or the Higher Educational and Scientific Council) were also supporting the decision making process about the NIS but the real roles of these organizations were quite ostensible. The main decision maker was the ministry and the NKTH. The NKTH office launched several national funding programs and grants for financing the innovation process and its actors – like the National Technology Program, Mobility Grant or the Baross Gábor Program.

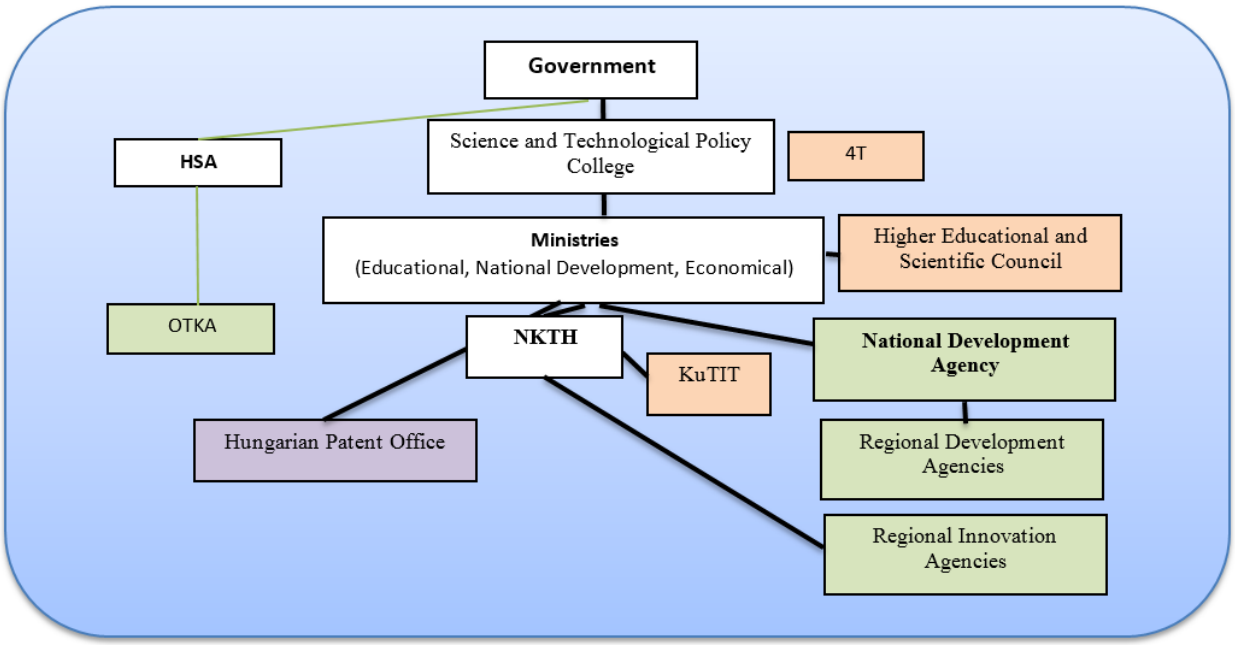
The regional distribution of EU funds for innovation development was coordinated by specific regional non-profit organizations, by the Regional Development Agencies. The agencies supervised the funded projects, but most of them could not effectively fulfil their innovation intermediary role.

In 2007 the government accepted the Middle Term Scientific, Technological and Innovation Political Strategy which aimed to establish and develop regional innovation networks and organizations – like technology transfer centres and regional innovation centres. Regarding to this program, Regional Innovation Agencies were founded in 2008. They were responsible for the management and cooperation of regional innovation networks and the collaboration of the regional actors of innovation. Innovation agencies between 2008 and 2010 were financed by the government through specific grants.

Hungarian Science Academy plays a significant and dual role in the Hungarian innovation system. In one hand, the academy influences the political and professional decision making process about innovation and participates in the elaboration of national level strategies. On the other hand, the HSA manages its own research centres and laboratories, thus participates in the innovation process as a knowledge creator.

After the regime change the Hungarian educational system was also reorganized which influenced not only the research process in the university labs, but the cooperation of institutes with business enterprises too. Regarding to the act CXXXIX of 2005 on the higher education and its modifications, higher educational institutes can establish their own enterprises to promote the marketing process of their own research results. Figure 1 summarizes the Hungarian NIS decision makers.

Figure 1 Main decision makers of the Hungarian NIS before 2010



Source: own construction based on Havas − Nyiri (2007)

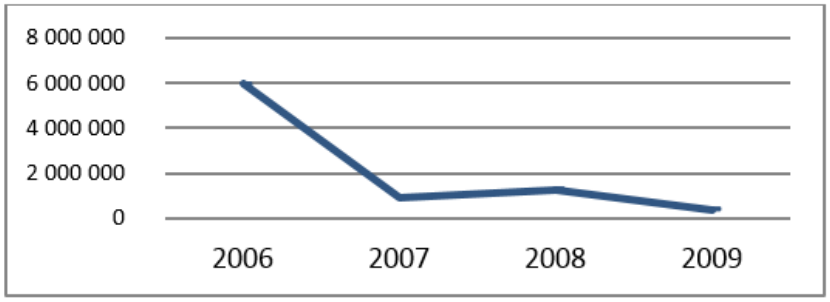
From 2007 there was some fragile initiative in the economic and innovation policy for decentralization. One of these initiatives was the so called Pólus Program aimed to increase the economic growth in seven Hungarian cities and promote the establishment and effectiveness of innovative clusters. This program clearly defined the sectors which the seven cities should emphasize and support. The program was based mainly on the 2007–2013 EU co-financed grants. Unfortunately, the Pólus Program could not reach its goals as it was not even launched due to several political and socio-economic reasons.

From the above mentioned Baross Gábor Program, actors of the innovation process received near HUF 8,5 billion between 2006 and 2009. Most of this sum – more than 70% of the total amount – was received by the organizations in the first year of the program. During the four years the support was gradually decreasing (Figure 2), in 2009 only organizations from three of the Hungarian regions could apply for funding of 363 million HUF. The gradually decreasing funds caused several management and organizational problems for the actors of the innovation network.

After 2004, when Hungary joined the European Union, further EU and national funds were accessible for the participants of the innovation process. EU funding was based on the New Hungarian Development Plan and New Széchenyi Plan. Between 2007 and 2013 the amount received by organizations from the co-financed grants exceeded HUF 91 billion. Besides, this amount also decreased gradually. Another hindering problem was – and is

nowadays -, that both EU co-financed calls and Baross Program's calls were project-based and were aiming to support specific activities.

Figure 2 Amounts received from Baross Program per year from 2006 to 2009



Source: own construction

In Hungary one of the hindering factors of innovation is the lack of trust (Inzelt − Szerb, 2003) therefore cooperation of organizations – e.g. in the above mentioned Pólus Program - failed or regional and local partnership could not work effectively. In our primary research we examined the cooperation of companies and innovation intermediary (bridge) organization in the Central-Transdanubean Region. Among the 300 respondent companies, more than 76% stated that the cooperation with public research institutes or centres would not develop their innovation process.

Other part of our research was focusing of the local level of a Hungarian region, the Dunaújváros sub-region in the Central-Transdanubean Region. The results[13] of this local research (see in Notes) also show the main hindering problems of the innovation system in this period.

[13] In this middle sized city of Hungary, after 2005 the organizations of the local innovation system were established rapidly (Gajzágó 2011). Local and sub-regional strategies were elaborated, containing goals about innovation. Local and regional decision makers founded the local innovation council. The municipality together with local companies and the local higher educational institute founded an incubator and an industrial park. The College of Dunaújváros created a new Technology Transfer Office in 2006 and a for-profit intermediary organization 2 years later. A non-profit organization (M8-Dunahíd Kft.) joining a local association (HÍD Association) launched a program financing innovative projects of the local firms. M8 Dunahíd Kft. was closely connected to the regional innovation agency as its local sub-point. This local example clearly shows how much the innovation system developed until 2010. The main strategies were elaborated, the necessary organizations were founded. Unfortunately, due to several reasons, the system was not functioning well enough. The reasons like the lack of trust and cooperation, the false positioning of the organizations, the decreasing and instable financial resources lead to sharp and inextricable problems.

6. The Hungarian innovation system in the last 5 years

In the first years of 2010s, Hungarian innovation policy slightly changed direction. While the European Union responded to the global financial and economic crisis with emphasizing the innovation in the EUROPE2020 strategy – stating the importance of the smart growth as the first priority – Hungarian decision makers seemed not to be obliged to these aims[14].

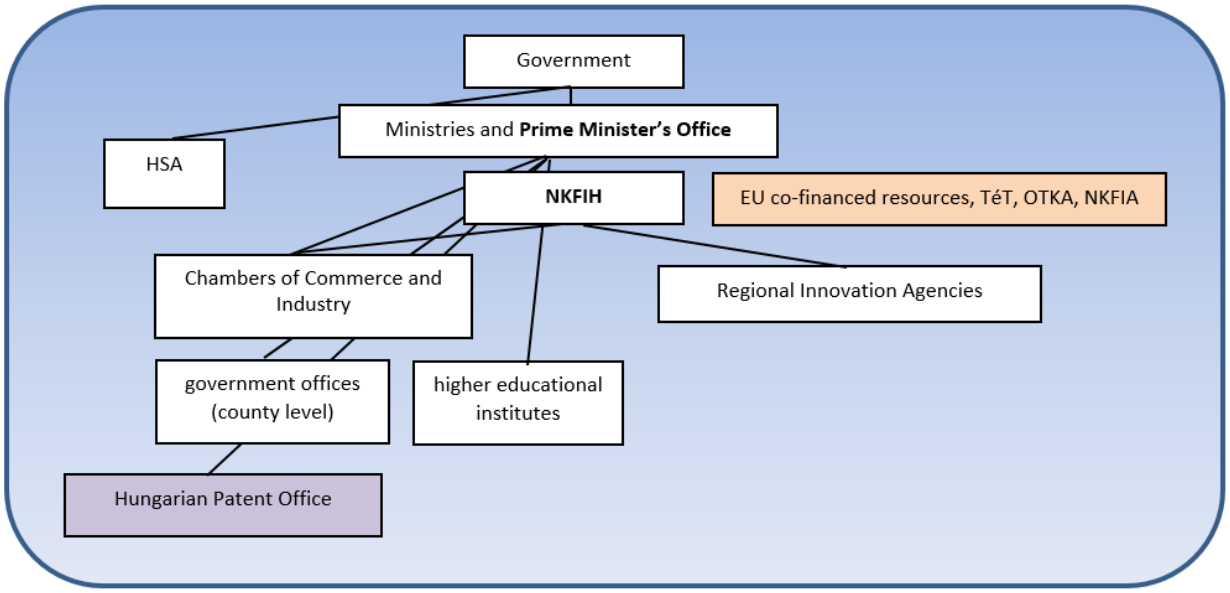
After this 'slow down' period, innovation decision makers started to follow EU priorities and innovation became an important question. Innovation policy's main goals were stated in the National R&D and Innovation Strategy published in 2013. In the strategy several goals are connected to the reform of the innovation system.

In 2014, accompanying the above mentioned strategy; the National Smart Specialization Strategy was published by the National Innovation Office. This strategy was also built on the financial support system of the EU and emphasizes the importance of EU funds. One year later, regarding to the act LXXVI. of 2014. on the scientific research and development and innovation, the National Innovation Office was transformed to National Research and Development and Innovation Office (in Hungarian: NKFIH). Not only the name of the organization was changed but due to a centralization process, more tasks – adopted from other organizations - were amalgamated in this institution. The NKFIH became responsible not only for the resources from EU innovation grants but for other Hungarian public funding – like the OTKA – too. The reorganization also concerned to other institutes. Industrial and Commercial Chambers were assigned to closely connect – with offering innovation services - to the NIS and also regional and county level institutions (e.g. government offices) and groups of experts joined the system with specific tasks. The recent structure (Figure 3) of the Hungarian organizations participating in the decision making about the NIS is the following:

Local and regional level innovation system has also changed since 2010. Many of the local and regional organizations were closed due to financial problems or strategical and political reasons. The sub-region we examined in our research has faced these problems too. The Technology Transfer Office of the local higher educational institute and the sub-point of the regional innovation agency were closed. The managing organization of this sub-point was bankrupted and closed down. The industrial park is not offering innovation services anymore and local financing of innovative firms has also terminated.

[14] On the general annual meeting of the Hungarian Association for Innovation (Garay et al. 2004), the political leaders emphasized that the government had more important issues to deal with than innovation.

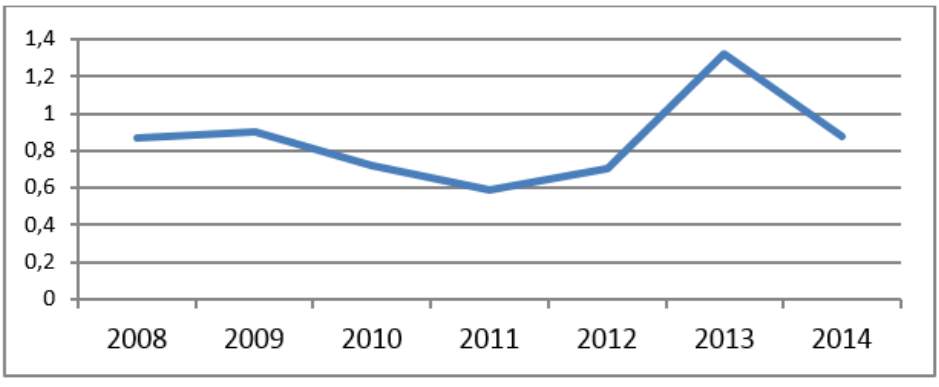
Figure 3 Main decision makers of the Hungarian NIS after 2010



Source: own construction

The Hungarian Patent Office is one of the oldest institutions of the NIS. Traditionally the legal authority of the Office was the Ministry of Economics but after 2010 the minister of justice is responsible the legitimacy of the organization. Besides, the patenting prices defined by the office are above the prices of other European countries which significantly hider the protection of Hungarian inventions. In the beginning of 2010s − from 2009 till 2012 − government budget on R&D was continuously decreasing as the below statistical data (Figure 4) shows.

Figure 4 Share of government budget appropriations or outlays on R&D



Sources: own construction by the data from EUROSTAT

EU Structural and Cohesion funds were also decreasing (as described in the previous chapter), and national grants' payments – like Baross Gábor Program grant – were delayed for

1.5 years. Therefore the participants of the NIS could not receive enough financial resources for their effective operation. After this recession, parallel with the increase of the EU financial support, government budget was also increasing.

7. Conclusions

The Hungarian innovation system between 1989 and 2010 was developed significantly. From the establishment of basic decision making and management institutions, till the structure of the founding process, the whole system was reorganized. Basic legal background of innovation was defined too. Innovation policy leaders and the leaders of organizations scrutinized the best practices of the European Union member countries. Several courses were organized e.g. where foreign experts taught Hungarian colleagues how to establish and manage technology transfer offices or incubators (Vekinis 2007). However, the reorganization was not based on the Hungarian or local best practices and previous organizations of the socialist system and only some of the institutes founded before the regime change are still functioning. The reorganized institutional system had parallel functioning organizations. Several decision making board (ministries) influenced and still influence the innovation process and the management of NIS institutions. Hungarian national innovation system after 2010 also had problems which hindered the innovation process. Decreasing commitment of political leaders, worldwide financial and economic crisis and drained financial support caused financial and management problems for the NIS organizations. Nowadays, Hungarian NIS's transformation is still in progress. Decision makers are committed to the development of the system however it became firmly centralized.

Transformation of NIS from the socialist era to the democratic system was not an easy process. During the last two decades, the legal base and the organizations of the NIS were successfully founded. To reach the goals about the increase of the innovation potential stated in the EU and national level innovation strategies, it is necessary to develop the efficiency of the system and its processes of participant organizations. In this article we tried to highlight some problems of the NIS. The solution of these problems can be based on the traditionally creative human resource or the values of the long existing R&D organizations. However, it is a difficult task to change the cultural and social milieu of the innovation. As Dahrendorf (1994) indicates, changing the political system requires 6 weeks, transformation of economy need 6 years but socio-cultural changes can only be realized in 60 years.

References

Arocena R. − Sutz J. (2002): Innovation Systems and Developing Countries. *DRUID Working Paper* No 02-05. Available: http://www3.druid.dk/wp/20020005.pdf Accessed: 14.05.2013.

Buzás N. (2007): *Innovációmenedzsment a gyakorlatban.* Akadémiai Kiadó, Budapest.

Capello, R. (2006): *Regional Economics*. Routledge, London.

Csizmadia Z. − Grosz A. (2002): Szervezet-központú hálózatok: az ipari parkok térségi-intézményi kapcsolatrendszerének és együttműködési aktivitásának szerkezeti jellemzői. *Tér és Társadalom*, 16, 2, pp. 53−80.

Csizmadia Z. − Grosz A. (2008): Innovációs folyamatok egy régióban és annak struktúrái. *Tér és Társadalom,* 22, 2, pp. 87−102.

Dahrendorf R. (1994): *A modern társadalmi konfliktus*. Gondolat Kiadó, Budapest.

Dőry T. (1998): Beszállítói kapcsolatok és az ipari együttműködés lehetséges klaszterei a Közép-Dunántúlon. *Tér és Társadalom,* 12, 3, pp. 77−92.

Dőry T. (2005): Regionális innováció-politika. In Rechnitzer J. (szerk.): *Kihívások az Európai Unióban és Magyarországon.* Dialóg Campus Kiadó, Budapest-Pécs.

Filippetti, A. – Archibugia, D. (2011): Innovation in times of crisis: National Systems of Innovation, structure, and demand. *Research Policy*, 40, 2, pp. 179−192.

Flanagana, K. – Uyarraa, E. – Laranjab, M. (2011): Reconceptualising the 'policy mix' for innovation. *Research Policy*, 40, 5, pp. 702−713.

Freeman, C. (1987): *Technology and Economic Performance: Lessons from Japan*. Pinter, London.

Freeman, C. (1995): The National System of Innovation in Historical Perspective. *Cambridge Journal of Economics*, 19, pp. 5–24.

Gajzágó É. (2011): Innováció és (Dunaúj)város. *A regionális versenyképesség innovációs tényezői az európai unióban* Konferencia, 10.06.2011. Veszprém.

Garay Tóth J. − Inzelt P.− Szabó G. (2004): A Magyar Innovációs Szövetség XXII., 2010. évi tisztújító közgyűlése. *Jegyzőkönyv*.
Available: http://innovacio.hu/evkonyv_pdf/kozgyules_22.pdf Accessed: 25.03.2016.

Grosz A. − Csizmadia Z. − Szépvölgyi Á. (2004): A regionális innovációs rendszer kínálati oldala a Közép-Dunántúlon. *Tér és Társadalom*, 3, pp. 111−149.

Guana J. − Chenc K. (2012): Modeling the relative efficiency of national innovation systems. *Research Policy*, 41, 1, pp. 102–115.

Honvári J. (2006): *XX. századi magyar gazdaságtörténet.* Aula Kiadó, Budapest.

Honvári J. (szerk.) (1997): *Magyarország gazdaságtörténete. A honfoglalástól a 20. század közepéig*. Aula Kiadó, Budapest.

Inzelt A. − Szerb L. (2003.): Az innovációs aktivitás vizsgálata ökonometriai módszerekkel. *Közgazdasági Szemle*, 50, 11, pp. 1002−1021.

Inzelt A. (1998): *Bevezetés az innovációmenedzsmentbe.* Műszaki Könyvkiadó – Magyar Minőség Társaság, Budapest.

Kaposi Z. (2004): *A 20. század gazdaságtörténete*. Dialóg Campus Kiadó, Budapest.

Lasuén, J. R. (1971): Multi-regional economic development. An open systems approach. *Lund Studies*. Series B. 37.

Lengyel, B. − Leydesdorff, L. (2008): A magyar gazdaság tudásalapú szerveződésének mérése: az innovációs rendszerek szinergiáinak térbelisége. *Közgazdasági Szemle*, 55, 6, pp. 522−547.

Lux G. (2013): Kritikus tömeg alatt: a fejlesztési együttműködés lehetőségei a kisebb nagyvárosokban, *Tér és Társadalom,* 27, 4, pp. 52−74.

Molnár I. (2004): Az Amerikai Egyesült Államok innovációs rendszerének jogi és intézményi vonásai. *Marketing menedzsment*, 38, 5, pp. 65−75.

Nagaoka S. – Kondo M. – Flamm K. – Wessner C. (2009.): *21st Century Innovation System for Japan and the United States, Comparative Innovation Policy*. The National Academic Press, Washington, D.C.

OECD (2005): *Oslo Manual, Guidelines for Collecting and Interpreting Innovation Data.* Third Edition, OECD Publishing, Paris.

Perroux, F. (1955): Note sur la notion de 'pôle de croissance'. *Économie Appliquée*, 8. pp. 307−320.

Rechnitzer J. (1993) Szétszakadás vagy felzárkózás. A térszerkezet alakító innovációk. MTA Regionális Kutatások Központja, Győr.

Schumpeter, J. (1934/1980): The Theory of Economic Development. Cambridge, Mass. Harvard University Press. A gazdasági fejlődés elmélete. (Translation: Bauer Tamás) KJK, Budapest.

Smahó M (2008): A tudás és a regionális fejlődés összefüggései. Doctoral Dissertation. Széchenyi István Egyetem, Győr.

Szépvölgyi Á. (2006): A tudásközvetítés és - felhasználás helyi hálózatai a Közép-Dunántúlon. *Tér és Társadalom*, 4, pp. 145−160.

Török Á. (2006): *Stratégiai ágazat stratégia nélkül? A magyar kutatás-fejlesztés teljesítménye és versenyképessége nemzetközi összehasonlításban*. Savaria University Press, Szombathely.

Vekinis G. (2007): *Best Practice for Technology Transfer.* RIS workshop, 30.01.2007, Greece.

PART TWO

Perspectives of economic development

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*. University of Szeged, Doctoral School in Economics, Szeged, pp. 65–86.

4. Related trade linkages, foreign firms, and employment growth in less developed regions

Zoltán Elekes – Balázs Lengyel

How does international trade of foreign-owned companies contribute to regional economic growth in less developed regions? Are there knowledge externalities at play between co-located trade activities of foreign and domestic firms? We address the above questions by analysing the impact of technological relatedness of regional import and export activities performed by foreign and domestic companies on regional employment growth in Hungary between 2000 and 2007. Results suggest that the related variety of export activities benefits regional employment growth in general, while the host economy benefits more from the technological relatedness of domestic firms' trade activities, rather than relatedness to or between foreign firms' activities. Employment of domestic firms benefits from the trade activity of co-located foreign firms only if it is in the same product class.

Keywords: related trade variety, trade similarity, foreign-owned and domestic firms, regional employment growth

1. Introduction

International trade has long been considered a decisive underlying mechanism in regional development because export is a major source of income for regions, which can be multiplied by internal input-output relations (North 1955), and also because the level of success in international trade is linked to the cumulative emergence of agglomeration economies in the region (Krugman 1991). The intensification of globalization gave rise to empirical explorations on this matter (for an overview see Brülhart 1998), and also brought the role of foreign-owned firms in regional development into the focus of interest (Beugelsdijk et al. 2010, Dicken 1994, Iammarino – McCann 2013, Young et al. 1994). This is because multinational firms are more active than other firms in the global division of labour (Greeneway – Keller 2007), because spillovers from foreign firms increase the productivity of domestic companies (Haskel et al. 2007), and also decrease the entry cost for other potential exporters (Aitken et al. 1997). However, the effect of foreign firms in less developed regions is far from being clear since local economies might differ in the ways in which they can exploit the presence of foreign firms through production links and spillovers (Görg – Greeneway 2003, Phelps 2008, Soci 2003).

The recently emerging literature of evolutionary economic geography stresses the role played by technological relatedness in local knowledge spillovers (Frenken et al. 2007),

because co-located firms might learn from each other if their technological profile is not too different, but cannot benefit from this if their knowledge bases are identical (Boschma 2005). Furthermore, the role of technological relatedness of export is decisive in the development of countries (Hidalgo et al. 2007). Based on these arguments Boschma and Iammarino (2009) established an empirical framework for analysing the role of related trade linkages in regional economic growth. They argue that technological relatedness between the import and export profiles of a region matters for growth, because import can be considered as knowledge inflow into the region. This external knowledge may create new growth potentials if it is related but is not identical to existing productive knowledge, captured by export portfolio, in the region. To put it differently; if one considers regions to be the unit of production and import to be the inputs and export to be the outputs, then those regions are expected to grow faster that combine related imports in producing the exports.

We wish to contribute to this discussion in two ways. First, we offer evidence on the effect of related variety in trade activities from a less developed economy, as empirical results so far predominantly focused on regions of more developed economies. Second, to our knowledge no previous work offered evidence on the relationship between regional growth and the technological relatedness of trade activities performed by foreign firms and the host economy. In order to do this, we rely on a panel dataset of Hungarian exporter firms containing balance sheet variables, firm location, and the value of export and import products by SITC product codes for the period between 2000 and 2007. We argue that the Hungarian case is suitable to discuss the above issue because the country has a small and open economy, which means that most of the inputs has to be imported, and also because the economy is dominated by a small set of foreign-owned firms.

In the remainder we aim to understand how knowledge externalities stemming from international trade activities lead to economic growth in regions. Thus, the following research questions will be addressed:

(1) How does the related variety of export activities affect regional employment growth?
(2) How does technological relatedness between imported and exported products influence regional employment growth?
(3) Does technological relatedness between the trade activities of foreign and domestic firms influence regional employment growth?

In the following section we describe the economic context of Hungarian import and export activities and the historically formed duality of foreign- and domestic-owned

companies. We formulate our hypotheses based on the relevant literature. Next we elaborate on our research design by describing the quatitative approach we relied on, and explaining our key variables. We report our key findings in the results section, and finish the paper by offering conclusions based on the results.

2. Context and hypotheses

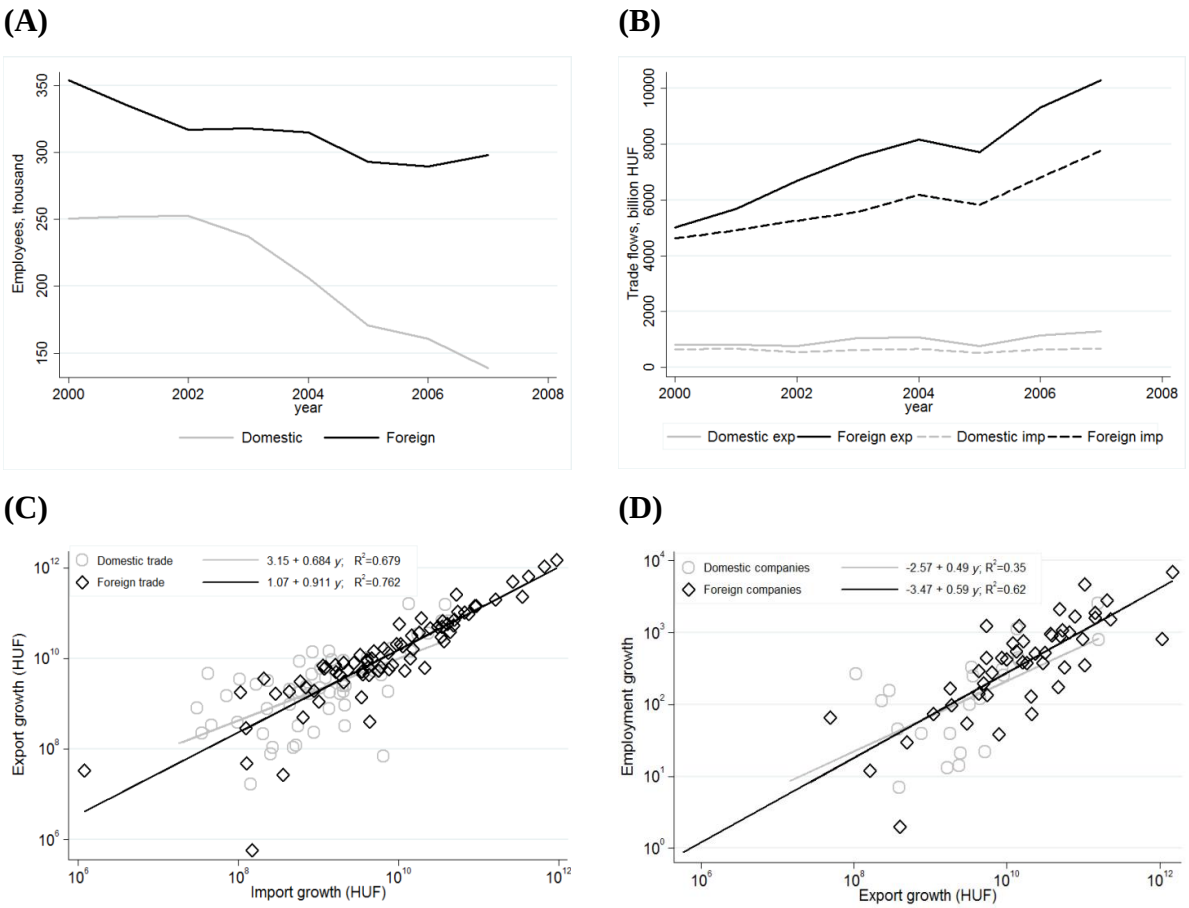
After the post-socialist transition, similarly to other countries in Central and Eastern Europe, regional economic development in Hungary was repeatedly found to be driven by investment decisions of multinational and foreign-owned companies (Lengyel – Leydesdorff 2011, 2015, Lengyel – Szakálné Kanó 2014, Radosevic 2002, Resmini 2007). Productivity spillovers have been found between foreign-owned firms and domestic companies, which decrease as geographical distance grows (Halpern – Muraközy 2007). However, the interactions between co-located foreign and domestic companies evolved slowly, and technological relatedness between them affected regional employment growth and entry-exit of domestic companies only in the 2000s (Lengyel – Szakálné Kanó 2013, Szakálné Kanó et al. 2016). These phenomena might be due to the fact that only those domestic companies could benefit from the presence of foreign-owned firms that were productive enough to absorb the positive externalities (Békés et al. 2009). Further evidence based on Hungarian data shows that foreign firms use imported inputs more effectively than domestic firms (Halpern et al. 2015), and that trading firms benefit more from agglomeration economies than non-trading firms (Békés – Harasztosi 2013).

The majority of foreign trade in Hungary can be attributed to foreign firms, especially in the case of the manufacturing industries, and they are also the drivers of export growth (Holland et al. 2000, Sass 2003). The period of our investigation is between 2000 and 2007, when the divide between foreign and domestic manufacturing export widened (Figure 1A).

The number of employees in foreign-owned manufacturing exporter firms was 350.000 in 2000, which fell to 300.000 by 2007. One can observe a much sharper decrease in the case of domestic firms: the number of employees fell from 250.000 to 150.000. However, the foreign-domestic gap is even more pronounced in terms of trade flow values; the volume of foreign export increases sharply over the period in question and exceeds import significantly, which is hardly the case for domestic companies (Figure 1B). One can also get the impression that foreign firms are more likely to combine imported inputs and re-export than domestic firms, because the growth of foreign export strongly correlates with growth in foreign import

while the correlation is weaker between domestic export and import growth (Figure 1C). Furthermore, foreign export increases foreign employment in the region more than domestic export increases domestic employment in the region (*Figure 1D*).

Figure 1 International trade and economic growth in a dual economy context, 2000–2007



Notes: (A) Total annual employment in manufacturing export (thousand employees) performed by foreign and domestic companies. (B) Total annual export and import in manufacturing (billion HUF) by foreign and domestic companies. (C) Correlation of import and export growth in foreign and domestic companies at the regional level. Grey hollow circles represent the aggregate of domestic companies and black hollow diamonds represent the aggregate of foreign companies in the region. Only growing regions are depicted. The solid lines represent a linear estimation. (D) Correlation of employment and export growth in foreign and domestic companies at the regional level. Grey hollow circles represent the aggregate of domestic companies and black hollow diamonds represent the aggregate of foreign companies in the region. Only growing regions are depicted. The solid lines represent a linear estimation.

Source: own construction

In order to answer our research questions within the previously outlined context, we first elaborate on the related variety literature recently developed in the field of evolutionary economic geography. Scholars have previously argued that firms of a region benefit from various positive externalities like localization economies (Marshall 1920), urbanization economies (McCann 2008), and Jacobs-externalities (Jacobs 1960). The relative importance of these externalities in regional growth is debated to this day (Beaudry – Schiffaeurova 2009, Glaeser et al. 1992, Henderson et al. 1995). In their influential paper Frenken et al. (2007) proposed that it is not specialization (spillovers within industries), nor the variety (spillovers between industries) of economic activities per se what matters for growth, but the extent of related variety in a region. Related variety in a region is composed of industries that are not too close in their knowledge base, so that they can learn from each other, but not too far either, so that they are able to understand each other (Boschma 2005). The variety of industries too dissimilar in their knowledge base is then considered unrelated variety. Following Frenken et al. (2007) related variety is expected to increase employment in the region due to knowledge spillovers across technologically related industries and thus the improved innovation potential. Empirical evidence so far fairly systematically shows that related variety is beneficial for regional employment growth in particular (Frenken et al. 2007, Boschma – Iammarino 2009, Boschma et al. 2012), and that these benefits are not equally available to all industries (Bishop – Gripaios 2010, Hartog et al. 2012, Mameli et al. 2012), and region sizes (Van Oort et al. 2013, Lengyel – Szakálné Kanó 2013) (see overview on the effect of related variety in Appendix 1).

The variety of export activities plays an important role in the explanation of growth based on spillovers. Saviotti and Frenken (2008) showed that long term economic growth of countries is stemming from the increase in variety (doing new things), not specialization (doing more of the same). Furthermore, Boschma and Iammarino (2009) and Boschma et al. (2012) showed a positive relationship between related variety of export products and the growth of employment in regions. Based on these findings we formulate our first hypothesis:

Hypothesis 1: Related variety of export activities has a positive effect on regional employment growth.

A further aspect to take into account in regional growth is the role of interregional trade flows, because new knowledge may reach regions from the outside as well and regional growth might depend on the re-combination of the external knowledge. Hidalgo et al. (2007)

argued that the economic development of countries is driven by their endowment of productive knowledge, which can be combined in meaningful ways into new products. This productive knowledge entails technological knowledge and production experience, industry-specific and general institutions, and scientific knowledge among others. They found that countries seldom "jump" from the production of less complex products (requiring less productive knowledge) to the most complex ones. On the regional scale, Boschma and Iammarino (2009) found that the variety of import was beneficial for growth when it was related to export activities, i.e. some elements of productive knowledge for a product were already present. Following this latter approach, we expect that relatedness between import and export industries is beneficial for growth, and state our second hypothesis:

Hypothesis 2: Related variety of export and import products has a positive effect on regional employment growth.

With this paper we would like to further improve our understanding on the local impact of foreign firms' trading activity on the domestic firms' trading activity using a related trade linkages approach. As discussed above, it is often proposed that foreign owned firms might generate knowledge spillovers to domestic companies in the form of increased human capital, management routines and new technologies. However, foreign-owned firms are usually less embedded in the local production networks than domestic firms, and in general domestic firms in Hungary are less innovative. Additionally the benefits of relatedness might be unequally available for domestic and foreign firms, as was the case with different industries, i.e. spillovers between trade activities might be structured along firm ownership. In-deed Szakálné Kanó et al. (2016) showed that the best fitting model for the Hungarian economy was the one assuming no relatedness between domestic and foreign firms, compared to the models assuming stronger proximity between ownership groups. In such a case we would expect that foreign and domestic firms interact predominantly through value-chain linkages rather than knowledge spillovers. This is also in line with the characteristics of Hungarian manufacturing export relying on low value-added assembling activities. For these reasons we state our last set of hypotheses concerning employment growth in the host economy:

Hypothesis 3a: Similarity of export by foreign and domestic firms has a positive effect on regional employment growth of domestic firms.

Hypothesis 3b: Similarity of import by foreign and export by domestic firms has a positive effect on domestic regional employment growth.

3. Research design

3.1. Data

Our empirical exercise relies on secondary data made available by the Hungarian Central Statistical Office. The dataset, collected by the Hungarian Customs Office, consists of the value of all international export and import flows in HUF by trading firm and by SITC product classes detailed at the 4-digit level. We restricted the data to the firms with double entry bookkeeping in order to match additional information including location of company seat (microregion level), the NACE class of the firms main activity (detailed at the 4-digit level), the number of employees and various balance sheet data (*e.g.* net revenue, total capital, foreign capital) from the balance sheet dataset collected by the Hungarian Tax Office. The dataset consists of data ranging from 2000 to 2007. We opted for microregions (LAU1) as the spatial unit of analysis. 175 microregions have been delineated in Hungary in accord with the EU spatial planning system, representing nodal regions.

The following efforts of data cleaning have been made before the regional variables were calculated. First, both SITC classifications changed in the time window at hand, therefore products had to be recoded from SITC rev. 4 to rev. 3 in 2006 and 2007. Second, international trade flow values were originally in current prices. Price indexes of SITC product classes, provided by the Hungarian Central Statistical Office, were used to deflate these values (2000=100%). We filled missing values of balance sheet data, if a firm was missing in the data for exactly one year (was present in the previous and the next year). For numeric values (*e.g.* number of employees, total equity capital) we filled these gaps with the average of last and next year values. For categorical values (e.g. region, NACE class), we used the value of the previous year.

In order to increase the reliability of the dataset we focused only on those firms that had at least 2 employees in every year between 2000 and 2007. Furthermore we solely focused on manufacturing firms (15-37 NACE rev 1.1 classes) for two reasons. First, we have access to company seat data that is more likely to represent the location of actual production activities in the case of manufacturing industries. Second, we are focusing on the import and export of products. For analytical purposes we consider a firm "foreign", if at least 10% the total equity capital of the firm is in foreign ownership. This limit is in accord with the OECD (2008) benchmark definition on foreign direct investment.

3.2. Estimation framework

Fixed-effect panel regression was chosen for estimation framework as this approach allows us to control for time-invariant unobserved effects such as institutions in different regions (Cameron – Trivendi 2009). Formally:

$$Y_{it} = \beta X_{it-1} + u_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is the level of the dependent variable in region i at time t, X_{it-1} is the vector of the region-specific independent variables at time $t-1$, u_i is the fixed-effect and ε_{it} is the error term. As the Hungarian spatial structure is extremely skewed, *i.e.* Budapest, the capitol holds 20–25% of total employees in export and total export volume, we apply the natural logarithm of the dependent, as well as the independent variables. We use the one period lagged values of our independent variables, because we expect that changes in the variety of the regional product mix need some time to have an effect on regional employment and export volume.

Our dependent variable is regional employment (REGEMP) that measures the increase of productive capabilities, either as a result of establishing a new firm, or the growth of incumbent ones, aggregated at the regional level. In order to estimate the effect of variety on our dependent variable, we rely on the following regional controls. We attempt to control for the effect of intra-industry spillovers and localization economies with FHHI, the Herfindahl-Hirschman concentration index of export shares of different firms in the regional portfolio. Therefore a high FHHI value would suggest higher endowment in productive knowledge specific to only a few firms. Urbanization economies or urban size is controlled for by population density (POPDENS), as it is commonly used in economic geography. We also used total capital equity per employee (CAPPERLAB), regional productivity (export per employee) (REGPROD) and the volume of gross investments (INVEST) as regional control variables, since all three had acceptable (i.e. below 0.6) levels of correlation with the other variables (see Appendix 2 for detailed description of control variables).

3.3. Indicators of related variety of the regional export product mix

To assess the impact of (related) variety of the regional export product portfolio, we opted for the entropy-based approach of measuring variety, commonly used in evolutionary economic geography. The entropy-based approach measures the observable variety in a

probability distribution (Frenken 2007). Empirical applications most commonly rely on the classification of economic activities (e.g. NACE). Alternatively the classifications of products (e.g. PRODCOM, HS or SITC) can be used (e.g. Boschma – Iammarino 2009, Boschma et al. 2012). In this paper we make use of the SITC product classification. The entropy-measure takes its maximum value, when productive activities have an equal distribution over the classification (entropy of this system is maximal), and entropy takes its minimum value when activities are concentrated in one of the classes (entropy of this system is minimal). An attractive feature of the entropy-measure is its decomposability. The total entropy of a distribution with several subclasses equals the sum of the average within class entropy and the between class entropy (Frenken 2007).

First, we measure the overall diversity of productive activities with the VARIETY variable. It is the entropy of export product volumes at the 4-digit SITC level. Formally let $i = 1, \dots, N$ be a 4-digit export product in a region. Let p_i be the share of that export product i in the regional export. Then VARIETY can be calculated as:

$$VARIETY = \sum_{i=1}^{N} p_i \log_2 \left(\frac{1}{p_i}\right) \tag{2}$$

A region with diverse export portfolio has a high value of VARIETY as compared to a region with a specialized export portfolio. The positive effect of VARIETY on regional growth would suggest the prevalence of inter-industry knowledge spillovers.

However, as it is argued in the evolutionary economic geography literature, inter-industry spillovers can be expected when said industries are technologically related, *i.e.* not too different, yet not too similar in their productive knowledge. This is captured by the decomposition of the overall variety of the regional export portfolio into related variety and unrelated variety, as first proposed by Frenken et al. (2007). The related variety of regional export products is the weighted average entropy of export products within 2-digit product classes. Formally let $g = 1, \dots, G$ be a SITC 2-digit product class, and let S_g be any SITC 2-digit class. Related variety is calculated as:

$$RELVAR = \sum_{g=1}^{G} P_g H_g \tag{3}$$

where P_g is the aggregation of the 4-digit export shares:

$$P_g = \sum_{i \in S_g} p_i \tag{4}$$

The entropy within each 2-digit product class S_g is H_g:

$$H_g = \sum_{i \in S_g} \frac{p_i}{P_g} \log_2 \left(\frac{1}{p_i / P_g} \right) \tag{5}$$

In the decomposition of the overall entropy, unrelated variety captures the variety that can be observed between export products that are considered technologically unrelated, i.e. inter-industry knowledge spillovers are less likely to occur between them. We measure unrelated variety as the entropy of 2-digit export products in a region:

$$UNRELVAR = \sum_{g=1}^{G} P_g \log_2 \left(\frac{1}{P_g} \right) \tag{6}$$

3.4. Indicators of related variety of trade linkages

For assessing the impact that extra-regional trade linkages have on regional growth, we adopted the approach taken by Boschma and Iammarino (2009). We measured the overall variety of import products by the import entropy at the 4-digit level. Formally let $i = 1, \dots, N$ be a 4-digit import product in a region, and let p_i be the share of that 4-digit import product i in the regional import volume. Then the variable can be calculated as:

$$IMPVAR = \sum_{i=1}^{N} p_i \log_2 \left(\frac{1}{p_i} \right) \tag{7}$$

However, the overall import variety may not be the strongest indicator of potential access to extra-regional knowledge, as export industries might not be able to absorb that new knowledge. Therefore a related trade variety indicator of import and export industries was proposed by Boschma and Iammarino (2009). Here we slightly modified this measure to match the available SITC product data. The related trade variety measure determines for each

4-digit import product the import entropy within the same 2-digit class, excluding the 4-digit product in question. These cases are then weighted by the relative share of the same 4-digit product in the regional export. Finally the weighted entropy values are aggregated at the regional level. Formally let $i = 1, \dots, N$ be a 4-digit export activity in a region. Let $OE_4^M(i)$ be the import entropy within the 2-digit class that activity i belongs to, but excluding activity i. Finally let $X_4(i)$ be the relative size of activity i in the overall regional export portfolio:

$$RELTRADVAR = \sum_{i=1}^{N} OE_4^M(i) * X_4(i) \tag{8}$$

Following Boschma and Iammarino (2009) we check as well whether the import of products have any effect on regional growth, if the import activity is the same, as the export activity the region is already specialized in. The similarity of trade as an indicator is determined by the product of the absolute values of regional import and export volumes for each 4-digit product, aggregated at the regional level. Formally let $X_4(i)$ be the absolute trade value of export activity i in the regional export portfolio, and let $M_4(i)$ be the absolute trade value of import activity i in the regional import portfolio:

$$TRADESIM = \log \sum_{i=1}^{N} X_4(i) * M_4(i) \tag{9}$$

3.5. Indicators of related variety in and between ownership groups

In this paper we are particularly interested in whether the impact of related variety and related trade variety on regional growth is structured by ownership, i.e. whether the dual character of the less developed economy of Hungary makes this impact different according ownership group. We applied this structuring perspective on our dependent and independent variables as well. We calculated the values of the dependent variable of regional employment in export separately for the foreign and the domestic group of firms. In the case of the variety indices, we calculated the measures separately for ownership groups, and also between them. In the former case we calculated entropy measures from equation (2) to (6) separately for export activities of domestic and foreign firms, yielding us six measures of variety and relatedness. In the latter case we relied on a slightly modified version of equations (8) and (9)

in order to establish relatedness between the ownership groups. First we calculated the average level of relatedness of export between foreign and domestic firms ($RELFDIVAR$), as well as the complementary similarity indicator ($FDISIM$). Second, we applied the same approach in the case of international trade linkages in general leaving us with two structuring dimensions (direction of trade and ownership) and a total of eight relatedness or similarity measures (Table 1). For example $RELTRADVAR^{FD}$measures the related foreign import variety around domestic export products, aggregated at the regional level (see Appendix 2 for detailed description of all indicators).

Table 1 Indicators of relatedness structured by ownership and direction of trade flow

	Export not considered	**Export by domestic firms**	**Export by foreign firms**
Import not considered		$VARIETY^D$	$VARIETY^F$
		$RELVAR^D$	$RELVAR^F$
		$UNRELVAR^D$	$UNRELVAR^F$
		$RELFDIVAR$	
		$FDISIM$	
Import by domestic firms	$IMPVAR^D$	$RELTRADVAR^{DD}$	$RELTRADVAR^{DF}$
		$TRADESIM^{DD}$	$TRADESIM^{DF}$
Import by foreign firms	$IMPVAR^F$	$RELTRADVAR^{FD}$	$RELTRADVAR^{FF}$
		$TRADESIM^{FD}$	$TRADESIM^{FF}$

Notes: single character upper indexes signify variables calculated within the domestic ("D") or foreign ("F") subset of firms; double character upper indexes signify direction of foreign trade, and ownership groups involved: the first character represents import (by foreign or domestic firms), while the second character represents export (by foreign or domestic firms).
Source: own construction

4. Results

An overall picture of the impact of relatedness in trade activities is provided in Table 2. All models are statistically significant based on the F-statistic. Among our control variables, CAPPERLAB shows consistently negative and significant effect, meaning that higher total equity capital-employee ratio leads to decrease in overall regional employment. In the first three models INVEST shows a significant positive effect on growth, suggesting that investments are followed by an increase in the utilisation of labour as an input. We introduce VARIETY in Model 1 and decompose it into RELVAR and UNRELVAR in Model 2 in order to assess the impact of relatedness within export portfolio and within the productive

knowledge agglomerated in regions on regional employment in export. Model 2 suggests that even though variety in itself has a positive and significant effect on employment, this is only due to the positive effect of related variety of export activities; while unrelated variety has no significant effect. This result suggests that employment in export activities of the region increases if the general level of technological relatedness across export products is high in the region's portfolio. The finding is in accord with our expectation based on the evolutionary economic geography literature; related variety of export activities allows for novel recombination of productive knowledge, leading to new market niches and employment growth in the context of less developed Hungarian regions as well, thus Hypothesis 1 can be accepted.

Table 2 Related trade variety and export employment growth in Hungarian microregions between 2000 and 2007

	Model (1) $(REGEMP)$	**Model (2)** $(REGEMP)$	**Model (3)** $(REGEMP)$	**Model (4)** $(REGEMP)$
$\ln FHHI_{t-1}$	0.004	–0.021	–0.019	–0.045**
	(0.0551)	(0.0516)	(0.0506)	(0.0471)
$\ln POPDENS_{t-1}$	0.447	0.365	0.340	0.409
	(0.590)	(0.602)	(0.588)	(0.537)
$\ln REGPROD_{t-1}$	0.024	0.017	0.016	–0.072**
	(0.0398)	(0.0389)	(0.0362)	(0.0461)
$\ln CAPPERLAB_{t-1}$	–0.125***	–0.118***	–0.121***	–0.114***
	(0.0451)	(0.0430)	(0.0450)	(0.0382)
$\ln INVEST_{t-1}$	0.041**	0.046**	0.041*	0.028
	(0.00939)	(0.00941)	(0.00941)	(0.00859)
$\ln VARIETY_{t-1}$	0.083**			
	(0.249)			
$\ln RELVAR_{t-1}$		0.093***		
		(0.246)		
$\ln UNRELVAR_{t-1}$		–0.002		
		(0.241)		
$\ln IMPVAR_{t-1}$			0.076***	
			(0.250)	
$\ln RELTRADVAR_{t-1}$				0.051**
				(0.168)
$TRADESIM_{t-1}$				0.198***
				(0.0341)
N	1052	1052	1051	1049
R–squared	0.082	0.104	0.093	0.142
Adj. *R*–squared	0.077	0.098	0.088	0.136
F	5.29	5.80	5.31	7.85
Sig.	0.0001***	0.0000***	0.0000***	0.0000***

Notes: standardized beta coefficients; standard errors in parentheses; * p<0.1,** p<0.05,*** p<0.01
Source: own construction

In Model 3 and 4 in Table 2 we look at the relation between the region's import and export portfolios and find significant effect of relatedness in trade flows on employment growth. First, Model 3 suggests that the variety of import flows in itself has a positive effect on employment; the more diverse imported products are combined into exported products in the region the higher growth of employment. The variety of export products might indicate the value added in the production but one can also think of these import products as they give access to a variety of productive knowledge that might not be present in the region beforehand. However following Hidalgo et al. (2007) and Boschma and Iammarino (2009), one might expect the variety of new knowledge to have an effect on growth when it is somewhat compatible with the existing productive knowledge portfolio of the region, represented in its export mix. Thus, in Model 4 we consider related and similar trade flows only (RELTRADVAR and TRADESIM, respectively)[16]. The findings seem to support the argument to some extent that import related to export activities is beneficial for employment growth, thus Hypothesis 2 might be accepted. However, similarity of import and export activities in this regard is also positive and strongly significant; and even more, TRADESIM has stronger effect on growth than RELTRADVAR. Therefore, one might think that employment grew the most in those Hungarian regions where production combines imports into exports within the same product category, thus suggesting low value added. The finding is plausible in the context of the Hungarian economy. Namely, large foreign firms are known to install only a very limited scope of their value chain into the region and the value added of their production is relatively low in less developed regions.

To get a clearer picture about the above conjecture we turn to the models structured along ownership in Table 3, in which we specifically look at employment growth in domestic-owned firms. In this step we assessed whether relatedness of trade activities within or between ownership groups matters for the growth of employment in domestic export firms. Once again our models are statistically significant based on the F-statistic. Among the controls REGPROD (export volume-employee ratio) and CAPPERLAB (equity capital-employee ratio) show consistent and significant negative effect on employment growth. This is in line with the economics literature, since the higher productivity of firms lead to more efficient use of production factors like labour. Furthermore manufacturing firms might be combining more and more capital with less and less labour due to high factor cost of the latter.

[16] Unrelated variety between import and export activities was also calculated, but was subsequently omitted from the models due to multicollinearity.

Table 3 Related trade variety and export employment growth in Hungarian microregions, structured by ownership, between 2000 and 2007

	Model (1) ($REGEMP^D$)	**Model (2)** ($REGEMP^D$)	**Model (3)** ($REGEMP^D$)	**Model (4)** ($REGEMP^D$)	**Model (5)** ($REGEMP^D$)
$\ln VARIETY^F_{t-1}$	–0.022				
	(0.220)				
$\ln VARIETY^D_{t-1}$	0.053				
	(0.275)				
$\ln RELVAR^F_{t-1}$		0.006			
		(0.299)			
$\ln RELVAR^D_{t-1}$		0.036			
		(0.252)			
$\ln UNRELVAR^F_{t-1}$		–0.027			
		(0.255)			
$\ln UNRELVAR^D_{t-1}$		0.027			
		(0.292)			
$\ln RELFDIVAR_{t-1}$		0.032			
		(0.243)			
$FDISIM_{t-1}$		0.087**			
		(0.0223)			
$\ln IMPVAR^F_{t-1}$			0.019		
			(0.187)		
$\ln IMPVAR^D_{t-1}$			0.113***		
			(0.222)		
$\ln RELTRADVAR^D_{t.}$				0.053**	
				(0.188)	
$\ln RELTRADVAR^F_{t.}$				0.026	
				(0.164)	
$TRADESIM^{DD}_{t-1}$				0.103***	
				(0.0262)	
$TRADESIM^{FD}_{t-1}$				0.105**	
				(0.0236)	
$\ln RELTRADVAR^D_{t.}$					0.019
					(0.196)
$\ln RELTRADVAR^F_{t.}$					–0.004
					(0.227)
$TRADESIM^{DF}_{t-1}$					0.146***
					(0.0171)
$TRADESIM^{FF}_{t-1}$					–0.019
					(0.0263)
CONTROLS	YES	YES	YES	YES	YES
N	925	868	923	873	864
R–squared	0.085	0.108	0.105	0.151	0.120
Adj. *R*–squared	0.078	0.096	0.098	0.142	0.111
F	6.08	7.25	6.57	9.74	7.10
Sig.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***

Notes: standardized beta coefficients; standard errors in parentheses; * p<0.1,** p<0.05,*** p<0.01
Source: own construction

Model 1 shows that variety in itself is statistically insignificant in either ownership group. Unrelated productive activities, as well as relatedness within or to the foreign subgroup have no significant effect on the employment of domestic firms. This shows on the one hand that while foreign firms have the dominant share in export employment, domestic firms benefit from foreign firms only when they export similar products, leading us to accept Hypothesis 3a. On the other hand, the host economy does not seem to receive new productive knowledge through spillovers between the ownership groups, when it comes to technological relatedness. This gives further support to the concerns regarding the existence and impact of knowledge spillovers between foreign and domestic firms in transition economies, and the technological gap between them.

In Model 3 and 4 the impact of international trade linkages along ownership are structured. $IMPVAR^{D}$ in Model 3 suggests that the variety of products imported by domestic firms in particular is benefit regional growth. Furthermore results of Model 4 show first that relatedness between import and export of domestic firms has a positive and significant effect. This means that we can expect new combinations of productive knowledge and employment growth in the host region (seen in Table 2) specifically when import of domestic firms is related to the export of those firms. This further supports the findings across Model 1 to 3 that spillovers between foreign and domestic firms are a rarity, and that the domestic firms can combine productive knowledge with other domestic firms more easily. Second, similarity of products has a stronger positive effect on domestic regional employment either when foreign or domestic firms import those products. The relative strength of the similarity indicators points towards the strong dependence of domestic firms on international value-chains and less from inter-industry knowledge spillovers, thus we accept Hypothesis 3b. Model 5 reinforces this finding showing strong significance in the case of similarity of trade between the import of domestic and the export of foreign firms.

5. Conclusions and further research

In this paper we set out to estimate (1) the impact of related variety in export activities on regional employment growth; (2) the impact of technological relatedness between import and export activities on regional employment growth; (3) the impact of technological relatedness between the trade activities of foreign and domestic firms on the employment of the host economy, to assess the role of knowledge spillovers between foreign and domestic

trade activities. To do this, we relied on a panel of Hungarian microregions between 2000 and 2007 provided by the Hungarian Central Statistical Office, and we used a fixed-effect panel regression method. Based on our results, a number of conclusions can be drawn regarding the role of foreign firms in the regional employment growth of the transition economy of Hungary.

First, our findings support the claims made in evolutionary economic geography that related variety of productive knowledge is beneficial for regional employment growth. Indeed, Hungarian regions with higher related variety of export activities had higher employment growth, and the variety in import products was also beneficial when related to the export. Second, these knowledge spillovers based on the related variety of productive knowledge are more likely to occur between trade activities of domestic firms, while these kinds of benefits do not spill over ownership groups. This seems to underline that learning between the trade activities of foreign and domestic firms are not widely available to all firms of the host economy. Fourth, the host economies of Hungarian regions depend heavily on international value-chains. It seems that in Hungary, characterized by the dominance of assembly activities in manufacturing, growth is driven by the access to these value-chains represented by foreign firms. This accentuates the vulnerability of Hungarian regions: the sources of growth are largely dependent on external factors.

Naturally there are ways in which we can continue our investigation. First, it might shed further light on our findings if relatedness is measured by other means. Proximity of products (Hidalgo et al. 2007) or revealed relatedness (Neffke – Henning 2008) are ways in which we could open the "black boxes" of regions. Second, it seems that value-chain connections are central factors in our investigation, therefore they could be controlled for by the means of regionalized input-output networks.

Acknowledgements

We thank Ron Boschma, Imre Lengyel, and Attila Varga for their suggestions. László Czaller provided further help. Useful comments have been received at the Annual Conference of Hungarian Regional Science Association and the 2nd workshop on Evolutionary Economic Geography in Central and Eastern Europe in 2015.

References

Aitken, B. – Hanson, G.H. – Harrison, A.E. (1997): Spillovers, foreign investment, and export behaviour. *Journal of International Economics*, 43, 1-2, pp. 103–132.

Beaudry, C. – Schiffauerova, A. (2009): Who's right, Marshall or Jacobs? The localization versus urbanization debate. *Research Policy*, 38, 2, pp. 318–337.

Békés G. – Harasztosi P. (2013): Agglomeration premium and trading activity of firms. *Regional Science and Urban Economics*, 43, 1. pp. 51–64.

Békés G. – Kleinert J. – Toubal F. (2009): Spillovers from multinationals to heterogeneous domestic firms: evidence from Hungary. *The World Economy*, 32, 10, pp. 1408–1433.

Beugelsdijk, S. – McCann, P. – Mudambi, R. (2010): Introduction: Place, space and organization–economic geography and the multinational enterprise. *Journal of Economic Geography*, 10, 4, pp. 485–493.

Bishop, P. – Gripaios, P. (2010): Spatial Externalities, Relatedness and Sector Employment Growth in Great Britain. *Regional Studies*, 44, 4, pp. 443–454.

Boschma, R. (2005): Proximity and Innovation: A Critical Assessment. *Regional Studies*, 39, 1, pp. 61–74.

Boschma, R. – Eriksson, R. – Lindgren, U. (2014): Labour Market Externalities and Regional Growth in Sweden: The Importance of Labour Mobility between Skill-Related Industries. *Regional Studies*, 48, 10, pp. 1669–1690.

Boschma, R. – Iammarino, S. (2009): Related Variety, Trade Linkages, and Regional Growth in Italy. *Economic Geography*, 85, 3, pp. 289–311.

Boschma, R. – Minondo, A. – Navarro, M. (2012): Related variety and regional growth in Spain. *Papers in Regional Science*, 91, 2, pp. 241–256.

Brachert, M. – Kubis, A. – Titze, M. (2013): Related Variety, Unrelated Variety and Regional Functions: A spatial panel approach. *Papers in Evolutionary Economic Gegraphy*, No. 1301. University Utrecht, Utrecht.

Brülhart, M. (1998): Economic geography, industry location and trade: the evidence. *The World Economy*, 21, 6, pp. 775–801.

Cameron, A. C. – Trivendi, P. K. (2009): *Microeconometrics Using Stata*. Stata Press, College Station, Texas.

Dicken, P. (1994): The Roepke lecture in economic geography. Global-local tensions: firms and states in the global space-economy. *Economic Geography*, 70, 2, pp. 101–128.

Frenken, K. (2007): Entropy statistics and information theory. In Hanusch. H. – Pyka, A. (eds.): *Elgar Companion to Neo-Schumpeterian Economics*. Edward Elgar, Cheltenham – Northampton, pp. 544–555.

Frenken, K. – Van Oort, F. – Verburg, T. (2007): Related Variety, Unrelated Variety and Regional Economic Growth. *Regional Studies*, 41, 5, pp. 685–697.

Glaeser, E. – Kallal, H. D. – Scheinkman, J. D. – Shleifer, A. (1992): Growth in Cities. Journal of Political Economy, 100, 6, pp. 1126–1152.

Görg, H. – Greenaway, D. (2003): Much ado about nothing? Do domestic firms really benefit from foreign direct investment? *IZA Discussion Paper No. 944*. Available: http://ssrn.com/abstract=475044.

Greeneway, D. – Keller, R. (2007): Firm heterogeneity, exporting and foreign direct investment. *The Economic Journal*, 117, 517, pp. 134–161.

Halpern L. – Muraközy B. (2007): Does distance matter in spillover? *Economics of Transition*, 15, pp. 781–805.

Halpern L. – Koren M. – Szeidl A. (2015): Imported inputs and productivity. *American Economic Review*, 105, 12, pp. 3660–3703.

Hartog, M. – Boschma, R. – Sotarauta, M. (2012): The impact of related variety on regional employment growth in Finland 1993-2006: High-tech versus medium/low-tech. *Industry and Innovation*, 19, 6, pp. 459–476.

Haskel, J.E. – Pereira, S.C. – Slaughter, M.J. (2007): Does inward foreign direct investment boost the productivity of domestic firms? *The Review of Economics and Statistics*, 89, 3, pp. 482–496.

Henderson, J. V. – Kuncoro, A. – Turner, M. (1995): Industrial Development in Cities. *Journal of Political Economy*, 103, pp. 1067–1085.

Hidalgo, C. A. – Klinger, B. – Barabási, A.-L. – Hausmann, R. (2007) The product space conditions the development of nations. *Science*, 317, pp. 482–487.

Holland, D. – Sass M. – Benacek, V. – Gronicki, M. (2000): The determinants and impact of FDI in Central and Eastern Europe: a comparison of survey and econometric evidence. *Transnational Corporations*, 9, 3, pp. 163–212.

Iammarino, S. – McCann, P. (2013): *Multinationals and economic geography*. Edward Elgar, Cheltenham – Northampton.

Jacobs, J. (1960): *The Economy of Cities*. Random House, New York.
Krugman, P. (1991): Increasing returns and economic geography. *Journal of Political Economy*, 99, 3, pp. 483–499.
Lengyel B. – Leydesdorff, L. (2011): Regional Innovation Systems in Hungary: The Failing Synergy at the National Level. *Regional Studies*, 45, 5, pp. 677–693.
Lengyel B. – Leydesdorff, L. (2015): The effects of FDI on innovation systems in Hungarian regions: where is synergy generated? *Regional Statistics*, 5, 1, pp. 3–24.
Lengyel B. – Szakálné Kanó, I. (2013) Related variety and regional growth in Hungary: towards a transition economy approach. *Regional Statistics*, 3, 6, pp. 98–116.
Lengyel, B. – Szakálné Kanó, I. (2014): Regional economic growth in Hungary 1998-2005: what does really matter in clusters? *Acta Oeconomica*, 64, 3, pp. 257–285.
Mameli, F. – Iammarino, S. – Boschma, R. (2012): Regional variety and employment growth in Italian labour market areas: services versus manufacturing industries. *Papers in Evolutionary Economic Geography*, No. 1203. Utrecht University, Utrecht.
Marshall, A. (1920): *Principles of Economics (8th ed)*. MacMillan, London.
McCann, P. (2008): Agglomeration economies. In Karlsson, C. (ed): *Handbook of Research on Cluster Theory*. Edward Elgar, Cheltenham – Northampton, pp. 23–38.
Neffke, F. – Henning, M. (2008): Revealed Relatedness: Mapping Industry Space. *Papers in Evolutionary Economic Gegraphy*, No. 0819, University Utrecht, Utrecht.
North, D.C. (1955): Location theory and regional economic growth. *Journal of Political Economy*, 63, 3, pp. 243–258.
OECD (2008): *OECD Benchmark Definition of Foreign Direct Investment*. *Fourth Edition*. OECD, Paris.
Phelps, N.A. (2008): Cluster or Capture? Manufacturing Foreign Direct Investment, External Economies and Agglomeration. *Regional Studies*, 42, pp. 457–473.
Quatraro, F. (2010): Knowledge coherence, variety and economic growth: Manufacturing evidence from Italian regions. *Research Policy*, 39, 10, pp. 1289–1302.
Quatraro, F. (2011): Knowledge Structure and Regional Economic Growth: The French case. In Hoskinson, S. – Libecap, G. (eds): *Entrepreneurship and Global Competitiveness in Regional Economies: Determinants and Policy Implications*. Emerald Goup Publishing Limited, Bingley, pp. 185–217.
Radosevic, S. (2002): Regional Innovation Systems in Central and Eastern Europe: Determinants, Organizers and Alignments. *Journal of Technology Transfer*, 27, pp. 87–96.
Resmini, L. (2007): Regional patterns of industry location in transition countries: does economic integration with the European Union matter? *Regional Studies*, 41, 6, pp. 747–764.
Sass, M. (2003): *Competitiveness and Economic Policies Related to Foreign Direct Investment. Mimeo*, Ministry of Finance of Hungarian Government, WP No. 3.
Saviotti, P. P. – Frenken, K. (2008): Export variety and the economic performance of countries. *Journal of Evolutionary Economics*, 18, pp. 201–218.
Soci, A. (2003): FDI: a difficult connection between theory and empirics. In Fingleton, B. (ed): New Directions in Economic Geography. Edward Elgar, Cheltenham – Northampton, pp. 277–314.
Szakálné Kanó I. – Lengyel B. – Elekes Z. – Lengyel I. (2016): Related variety, ownership, and firm dynamics in transition economies: the case of Hungarian city regions 1996–2012. *Papers in Evolutionary Economic Gegraphy*, No. 1612. University Utrecht, Utrecht.
Van Oort, F. (2015): Unity in variety? Agglomeration economics beyond the specialization-diversity controversy. In Karlsson, C. – Andersson, M. – Norman, T. (eds): *Handbook of Research Methods and Applications in Economic Geography*. Edward Elgar, Cheltenham – Northampton, pp. 259–271.
Van Oort, F. – De Geus, S. – Dogaru, T. (2013): Related Variety and Regional Economic Growth in a Cross-Section of European Urban Regions. *Papers in Evolutionary Economic Gegraphy*, No. 1312. University Utrecht, Utrecht.
WIXE, S. – ANDERSSON, M. (2016): Which Types of Relatedness Matter in Regional Growth? *Regional Studies*, http://dx.doi.org/10.1080/00343404.2015.1112369.
Young, S. – Hood, N. – Peters, E. (1994): Multinational Enterprises and Regional Economic Development. *Regional Studies*, 28, pp. 657–677.

Appendix

Appendix 1 Empirical findings on the effect of related variety on regional economic growth.

Study	Value-added growth	Productivity growth	Employment growth
Bishop – Gripaios (2010)			–, 0, +
Boschma – Iammarino (2009)	+	+	+
Boschma et al. (2012)	+	0	0, +
Boschma et al. (2014)		+	+
Brachert et al. (2013)			+
Frenken et al. (2007)		–	+
Hartog et al. (2012)			0, +
Lengyel – Szakálné Kanó (2013)			–, +
Mameli et al. (2012)			+
Quatraro (2010)		+	
Quatraro (2011)		+	
Van Oort et al. (2013)			+
Wixe – Andersson (2016)		–	+

Notes: „+" means positive effect, „–" means negative effect, „0" means not significant.
Source: own construction

Appendix 2 Descriptive statistics of variables.

Variable	Operationalization	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
REGEMP	Total employees in export.	1264	3385.963	10564.94	22	154701
$REGEMP^D$	Total employees in export in the foreign group.	1142	1460.801	4111.453	12	56805
CAPPERLAB	Total capital equity of export firms in a region, divided by the number of total employees.	1264	2283.78	2703.075	56.58331	18268.05
REGPROD	Export volume in a region, divided by the number of employees.	1349	3906846	7571658	10911.79	1.74e+08
FHHI	Herfindahl-Hirschman concentration index of export shares of firms.	1382	.4491339	.2597107	.0406871	1
POPDENS	Total population of a region divided by its area.	1400	1.17041	2.565051	.2272712	34.49655
INVEST	Total gross investments of export firms in a region.	1220	2362080	8945369	0	1.17e+08
VARIETY	Export variety at the 4-digit level.	1382	.7913579	.3461715	0	1.984503
RELVAR	Related variety of export.	1382	.2215595	.1703468	0	1.101889
UNRELVAR	Unrelated variety of export.	1382	.5697984	.2566	0	1.31828
IMPVAR	Import variety at the 4-digit level.	1381	1.215775	.3983954	0	2.327487
RELTRADVAR	Regional aggregate of related import variety around 4-digit export activities.	1393	.2788165	.2161586	0	1.038014
TRADESIM	Regional aggregate of the products of import and export volumes of the same 4-digit productive activity.	1331	17.85982	2.11518	9.158642	23.97404
$VARIETY^F$	Export variety at the 4-digit level within the foreign group.	1248	.6314327	.3481615	0	1.851883
$VARIETY^D$	Export variety at the 4-digit level within the domestic group.	1349	.7014436	.3627017	0	2.106802
$RELVAR^F$	Related variety of export within the foreign group.	1248	.179615	.1612395	0	1.018179
$RELVAR^D$	Related variety of export within the domestic group.	1349	.2083952	.1823647	0	1.101889
$UNRELVAR^F$	Unrelated variety of export within the foreign group.	1248	.4518177	.2612471	–5.18e-08	1.269581
$UNRELVAR^D$	Unrelated variety of export within the domestic group.	1349	.4930483	.2765822	0	1.384719

Appendix 2 Continued.

Variable	Operationalization	Number of Observations	Mean	Standard Deviation	Minimum	Maximum
$RELFDIVAR$	Regional aggregate of related export variety of foreign firms around 4-digit export activities of domestic firms.	1382	.0624881	.1154143	0	.7777508
$FDISIM$	Regional aggregate of the products of foreign and domestic firms' export volumes of the same 4-digit productive activity.	1063	16.05489	2.34662	7.89124	21.25196
$IMPVAR^F$	Import variety at the 4-digit level within the foreign group.	1253	1.107353	.3826809	0	2.234524
$IMPVAR^D$	Import variety at the 4-digit level within the domestic group.	1348	1.033011	.4551112	0	2.375059
$RELTRADVAR^{DD}$	Regional aggregate of related import variety of domestic firms around 4-digit export activities of domestic firms.	1375	.183731	.203143	0	1.056609
$RELTRADVAR^{FD}$	Regional aggregate of related import variety of foreign firms around 4-digit export activities of domestic firms.	1382	.1225798	.173071	0	.9615453
$TRADESIM^{DD}$	Regional aggregate of the products of domestic firms' import and domestic firms' export volumes of the same 4-digit productive activity.	1222	16.24803	1.912362	8.678443	21.8191
$TRADESIM^{FD}$	Regional aggregate of the products of foreign firms' import and domestic firms' export volumes of the same 4-digit productive activity.	1109	15.66478	2.206719	6.695993	21.69215
$RELTRADVAR^{DF}$	Regional aggregate of related import variety of domestic firms around 4-digit export activities of foreign firms.	1381	.0929558	.1561285	0	.9443666
$RELTRADVAR^{FF}$	Regional aggregate of related import variety of foreign firms around 4-digit export activities of foreign firms.	1273	.2637417	.2180385	0	1.039627
$TRADESIM^{DF}$	Regional aggregate of the products of domestic firms' import and foreign firms' export volumes of the same 4-digit productive activity.	1064	15.54789	2.251326	7.056135	21.49665
$TRADESIM^{FF}$	Regional aggregate of the products of foreign firms' import and foreign firms' export volumes of the same 4-digit productive activity.	1207	17.83709	2.195492	7.269616	23.97402

Source: own construction

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*. University of Szeged, Doctoral School in Economics, Szeged, pp. 87–98.

5. Republic of Moldova from East to West: challenges and economic perspectives

Speranta Olaru

Moldova declared its independence from the former Soviet Union in August 1991. During the last 2 decades, the Republic of Moldova has been aspiring for a modern and efficient market economy, in the process trying to consolidate trade facilitation and attracting (foreign) investments. However, the European Union and the Republic of Moldova recognize that the context of their relations has changed in a significant and positive way since the inception of the Eastern Partnership and, subsequently, the Parties began negotiating an Association Agreement in 2010, including since 2012, a Deep and Comprehensive Free Trade Area (DCFTA), which is an integral part of that Agreement.

In 1992 a short civil war took place in the region of Transnistria on the eastern Moldovan border. Transnistria succeeded in establishing de facto independence from Moldova but has not been internationally recognized as an independent country. Despite the pro-Russian orientation of almost half of the society, nevertheless, after 1 year of implementation, the DCFTA has led to significant results in the Republic of Moldova-European Union trade patterns

Keywords: EU, DCFTA, Moldova, Trade

1. Introduction

The Republic of Moldova is a small country with a population of roughly 4.3 million (including Transnistria), located in the South-Eastern Europe, bordering Ukraine to the north, south, and east, and Romania to the west. Moldova declared its independence from the former Soviet Union in August 1991. After independence Moldova faced the dual challenge of building its own public administration while transforming the local branches of the Soviet administration into structures adapted to the requirements of a democratic society and a market economy. The Moldovan government acknowledges that this task has still been only partially fulfilled. Institutional capacity in the public sector is still weak and government institutions often do not perform efficiently due to inconsistencies in their functional and institutional frameworks.

Transnistria (Eastern region of the Republic of Moldova), which is situated on the left bank of the Nistru river, self-proclaimed its independence in September 1990. Transnistria stands today as an unrecognized entity, within the boundaries of the Republic of Moldova.

During the last 2 decades, the Republic of Moldova has been aspiring for a modern and efficient market economy, in the process trying to consolidate trade facilitation and attracting

(foreign) investments. As already known from economic theory and international experience, the normal functioning of a market economy is conditioned by the promotion of efficient economic policies and the enforcement of adequate legislation. In this regards, over the last two decades, the Republic of Moldova has started the Dialogue with the European Union in view of promoting political, economic and cultural relations. In 1994, the Partnership and Cooperation Agreement (PCA) was signed between the Republic of Moldova and European Union, which constituted the legal basis for all EU-Moldova Relations. This Partnership Agreement was enforced on the 1st of July 1998 after a long and tedious ratification procedure.

However, the European Union and the Republic of Moldova recognize that the context of their relations has changed in a significant and positive way since the inception of the Eastern Partnership and, subsequently, the Parties began negotiating an Association Agreement in 2010, including since 2012 a Deep and Comprehensive Free Trade Area (DCFTA), which is an integral part of that Agreement (BE 2013). On 27 June 2014, Moldova signed the AA and started its provisional implementation on the 1st of September 2014. At that time, the prospects of Moldova's partnership with the EU were the most promising as ever before.

Nevertheless, despite all assistance provided to Moldova's European aspirations, given the historical trade relations with the former Soviet Union, significant parts of Moldovan exports remained oriented towards the East, i.e. Russia and CIS[1] countries. Following the Russian ban on Moldovan wines, in 2004, that was a severe shock for Moldova's key national industry, Moldovan producers, were forced to invest in new technologies and qualities to gain new markets. The scope of this article is thus to make a detailed analysis of the economic evolution of Moldova including the opportunities and challenges it faced following the signature of the AA and DCFTA.

2. Moldova – economic trends

Overall, Moldovan economy has experienced growth since 2000 and this despite considerable volatility. Indeed, periods of high growth have alternated with sharp recessions. For example, in 2009, the global financial crisis affected trade and remittances, while in 2012

[1] Community of Independent States (created after the collapse of USSR by former Soviet Republics with the exception of Baltic States)

the economy, contracted by 0.6% as a result of the Eurozone crisis and a severe drought, which crippled agricultural output.

Generally, Moldova continues to be the poorest country in Europe, with a GDP per capita of USD of only 2239 in 2013. Its small internal market combined with an economy largely dependent on remittances (about 25% of GDP in 2013) means that Moldova is highly vulnerable to regional dynamics. Furthermore, relatively high economic growth between 2000 and 2013 did not result in significant job creation, with employment to total population decreasing from 58% to about 41%. This pattern is largely explained by the constant large-scale outflow of labor to both the EU and Russia.

Moldova's economy grew by an estimated 4.6% in 2014, but the outlook has recently sharply deteriorated. Projections by the European Bank for Reconstruction and Development (EBRD) and International Monetary Fund (IMF) suggest that 2015 may witness negative growth (between –1% and –2%), before resuming positive growth in 2016 (EBRD 2014, IMF 2013a, IMF 2015). A significant depreciation (over 20%) of the country's currency (MDL) in early 2015 has led to rising inflation and to a tightened monetary policy. Remittances and exports have contracted substantially, reflecting challenges to redirect trade away from Russia to the EU. Developments in the financial sector are further exacerbating the impact of external shocks. In 2014 three banks were placed under special administration by the National Bank[2] following the detection of a series of unsecured loans which compromised their financial stability.

Moldova's economic performance over the last few years has been volatile because of climatic and global economic conditions (IMF 2012). In 2012, GDP contracted by 0.7%, as the economy was hit by a drought-induced contraction in agriculture (–22.3 percent) and the Eurozone crisis[3]. In 2013, growth rebounded, driven by a record harvest, with GDP increasing by 9.4%. Moldova's real GDP grew 4.6% in 2014, but has been slowing down since the third quarter of 2015. The economy is projected to have gone into a recession in 2015, reflecting the negative shocks from external demand, remittances and financing. The forecast for 2016 is also less optimistic, as main trading partners from the CIS are expected to recover only gradually, and trade growth with the EU is below the potential.

Consumer inflation has increased to the upper bound of the target range of the National Bank of Moldova. The current account deficit widened to 5.7% of GDP in 2014, due to a

[2] www.bnm.md
[3] www.statistica.md

sharp drop in remittances and foreign investments. Moldovan currency depreciated by over 20% against US dollar in 2014/2015, while foreign reserves declined by 25%.

The Government faces strong fiscal pressure challenges and serious problems in Moldova's financial sector pose a risk to stable economic development. Shortcomings in the banking sector came to the fore at the end of 2014 with two consecutive decisions by the National Bank of Moldova to place three major commercial banks under special administration, representing about 30% of total banking assets.

Table1 Republic of Moldova: Main macroeconomic indicators, 2012–2015

Indicator	**Unit of measurement**	**2010**	**2011**	**2012**	**2013**	**2014**[1]	**2015**[2]
GDP growth	Percent, y-o-y	7.1	6.8	–0.7	9.4	4.6	–1.0
Inflation	Percent, average	7.4	7.7	4.6	4.6	5.0	7.5
Government balance	Percent of GDP	–2.5	–2.4	–2.2	–1.8	–1.7	n.a.
Current account balance	Percent of GDP	–7.5	–11.0	–7.4	–5.0	–5.5	–4.5
Exports of goods and services	Percent of GDP	39.2	45.0	43.5	43.3	42.1	n.a.
Imports of goods and services	Percent of GDP	78.5	85.8	83.9	80.6	78.9	n.a.
Net FDI	Percent of GDP	3.5	3.8	2.1	2.5	2.5	n.a.
External debt	Percent of GDP	81.6	77.0	82.2	83.2	n.a.	n.a.
Gross reserves	Percent of GDP	29.5	28.0	34.5	35.4	n.a.	n.a.
Credit to private sector	Percent of GDP	33.3	33.6	37.9	39.7	n.a.	n.a.
Unemployment	Percent of total labor force	7.4	6.7	5.6	5.1	4.0	4.5
Nominal GDP	USD billion	5.8	7.0	7.3	8.0	7.9	6.1

Notes: [1]2014 figures on government balance and net FDI are EBRD projections. [2]2015 figures are IMF projections.
*Source:*own construction based on EBRD (2014), IMF (2015), WB (2015)

The existing macroeconomic framework is considered as problematic, due to macroeconomic risks associated with the financial sector, vulnerabilities to external and climatic shocks, institutional weaknesses and related slippages in the implementation of macroeconomic and structural reforms.

Since January, 2016 Moldova has a new Government, led by Prime Minister Pavel Filip and one of the key priorities of this new Government is to conclude a new IMF agreement, which has a direct relevance to EU's budget support programmes.

Moldova's has, however, over the last years reduced poverty and promoted shared prosperity. Despite a sharp decline in poverty, however, Moldova remains one of the poorest countries in Europe (IMF 2013b). The most vulnerable groups at risk of poverty in Moldova

remain those with low education levels, households with three or more children, those in rural areas, families relying on self-employment, the elderly, and Roma.

Additionally, the reduction in remittances can negatively impact consumption and poverty. Moldova performs well in some areas of gender equality, yet disparities persist in education, health, economic opportunity, agency and violence against women. Human trafficking is a serious problem; Moldova is a source, and to a lesser extent a transit and destination country, for both sex trafficking and forced labor.

Considering the fragile economic and political external environment the pace of reforms need to be accelerated. Key challenges include fighting corruption, improving the investment climate, removing obstacles for exporters, channeling remittances into productive investments, and developing a sound financial sector. Moldova also needs to improve the efficiency and equity of its public spending, in particular through better management of public capital investments, which are crucial for higher growth. Administrative and judicial reforms remain a challenge for improving public sector governance, which is a precondition for European integration and economic modernization.

3. Transnistria

In 1992 a short civil war took place in the region of Transnistria on the eastern Moldovan border. Transnistria succeeded in establishing de facto independence from Moldova but has not been internationally recognized as an independent country. After the ceasefire, in 1992, a security zone was established guarded by peace-keeping forces consisting mostly of Russian troops and troops from the two sides. A small number of Ukrainian military observers are also present. Additional Russian troops, ammunition and armored vehicles are also stationed in Transnistria. Since 1995, Moldova and Transnistria, assisted by three international mediators, the OSCE, Russia and the Ukraine, have been discussing a possible settlement within the so-called “five-sided mediation process”.

The breakaway Region of Transnistria nevertheless still remains a key destabilization factor for the Region as a whole and the country in particular. As such, the government of Moldova continues to offer extensive autonomy to Transnistria, while the government of Transnistria demands independence. De jure, Transnistria is internationally recognized as part of Moldova, but de facto, the Moldovan government does not exercise any control over the territory.

Within the framework of the Moldova-EU Action Plan, the Transnistrian "frozen conflict" has become one of the major issues on the agenda of the political dialogue between Moldova and the EU. In accordance with the Moldova-EU Action Plan both parties have pledged to work together for supporting a viable solution to the Transnistrian conflict. As a result, the EU has started to play an increasing role in the settlement of this regional problem. It joined the negotiations' table as an observer and appointed a Special Representative for Moldova, in charge of the Transnistrian issue. Also, at the request of the Moldovan and Ukrainian Governments, the EU, on 30 November 2005, launched its Border Assistance Mission to Moldova and Ukraine (EUBAM), having as its main objective to work with Moldova and Ukraine in harmonizing their border management standards and procedures with those prevalent in EU member states. The EUBAM's most important achievement to date has been its contribution towards the implementation of the Joint Declaration signed by the Prime Ministers of Moldova and Ukraine on 30 December 2005, which introduced a new customs' regime on the border between the two countries. Under this customs' regime, companies based in the Transnistrian region of the Republic of Moldova may only export to and via Ukraine with official Moldovan stamps. From 2006–2007, an increasing numbers of companies based in the Transnistrian region of the Republic of Moldova registered with the Moldovan authorities in order to receive customs stamps. Within this framework, in 2007, the EUBAM Mission provided technical advice to assist the Moldovan authorities with the implementation of the amendments related to Moldovan government decree No 815, which provided the same possibilities to obtain preferential trade certificates to companies registered temporarily as to those registered on a permanent basis. These changes were necessary for Moldova to comply with its international obligations in foreign trade. Nevertheless, Moldova has tried to enter into direct talks with the Russian Federation on reaching a suitable settlement for the Transnistrian "frozen conflict". Since 2006 Moldovan authorities proposed to Moscow a "package" deal that would reconcile Moldova's and Russia's interests in the Transnistrian region. Particularly, Moldova offered to Russia the possibility to ensure its permanent neutrality in turn for the complete withdrawal of the Russian military contingent (1300 soldiers) and ammunition (20 thousand tons) from its territory; international recognition of the neutrality status; wide autonomy to Transnistria though no veto power in the future united Parliament; and recognition of all Russian property in Transnistria . Until now the Russian government has not accepted the package deal drafted by the Moldovan authorities. At the same time, the semi-transparent character of the talks between Moldova and Russia has

raised some legitimate questions in EU member states over the Moldovan authorities' real objectives.

Overall, the settlement of the Transnistrian conflict has focused on the following three main components. Firstly, at a political level, Chisinau and Tiraspol, assisted by three international mediators -the OSCE, Russia and Ukraine- and the EU and the USA as observers- have been discussing a possible settlement within the so-called "5+2 format", which officially resumed in November 2011. Secondly, a technical process of post-conflict settlement and reconstruction is taking place – in the framework of the expert Working Groups- aiming at increasing confidence between the two sides. Third, sector confidence building initiatives have been implemented which contribute to cross-river cooperation on the ground. Indeed, with technical and financial support of the EU, the Moldovan Government has tried to engage the Transnistria authorities in promoting confidence building measures through the execution of common projects in several fields including economic and trade relations; infrastructure development; re-opening of the rail connection between Moldova and Transnistria ; health and social protection; education and youth issues; humanitarian assistance; agriculture; and disarmament and demilitarization.

4. EU and Moldova – key documents

As mentioned earlier, in 1994, the Partnership and Cooperation Agreement was signed in 1994 between the Republic of Moldova and European Union, and entered into force on the 1st of July, 1998 (EC 1994). This Agreement defines the legal basis for all EU- Moldova relations. The political relations are developed through the respective dialogue between the bilateral reunions of the Parliamentary Cooperation Committee and the Cooperation Council. The economic relations are consolidated through the reciprocal promotion of the trade and investments subjects of the working agenda of the Cooperation Committee and its 4 subcommittees.

In this way the Republic of Moldova has started to make first steps in legal harmonization and transition to European values. In order to support transition economies, the European Union has elaborated the TACIS (Technical Assistance for Commonwealth of Independent States) programme, the Republic of Moldova being one of the beneficiaries of this programme[4]. The main objective of the TACIS programme was to provide support

[4] http://europa.eu/rapid/press-release_MEMO-92-54_en.htm

through recommending the best practices and harmonization methods of policies and national legislation with the relevant European ones.

As the cooperation relations and political dialogue and the economic and trade relations developed well, the EU and Moldova subsequently negotiated and signed an Action Plan that was called the EU-Moldova Action Plan (EC 2005). This Action Plan foresaw reforms to be undertaken by the Moldovan side aiming at legal harmonization, insurance of an adequate market regime and a favorable business environment for investment attraction and business development. The Action Plan was also targeting reforms related to human rights, media freedom, consumer protection food safety and food security. The implementation of this action plan started in 2003 and was supposed to be finalized by 2008. The vast majority of these reforms have now been implemented and EU was closely monitoring the progress every year, through an Annual Progress report published by the European Commission.

One should mention that similar Action Plans were negotiated by EU with other countries like Ukraine, Georgia, Armenia, etc. The progress and achievements were compared between EU partners, with the Republic of Moldova being mentioned as a good promoter of EU reforms.

The Republic of Moldova thus officially joined the European Neighborhood Programme (ENP) on 22 February 2005, when it signed with the EU the Moldova-EU Action Plan. In accordance with this Action Plan both parties assumed a series of common and unilateral commitments. The implementation process of those commitments gave a new dynamic to the development of Moldova's relations with the EU, in areas such as political dialogue, democratic reforms, settlement of the Transnistrian "frozen conflict", economic reforms and bilateral trade, justice and internal affairs, people-to-people contacts etc..

Since 2005 the EU has significantly increased its political visibility and status in Moldova. The political dialogue between the Moldovan authorities and the European Commission, the EU Council and the European Parliament became more active. Even if, the PCA has continued to be the main framework of the political dialogue with the EU, the both parties have started to use more frequently the dialogue opportunities offered by regional cooperation initiatives like those from South-Eastern Europe, as well as by Moldova's bilateral relations with EU member states. The intensity of this political dialogue has been matched with an increased level of quality and substance of discussions referring to a whole list of Moldova's domestic issues like human rights, energy security, fighting corruption, illegal trafficking of human beings and the Transnistrian conflict, which before 2005 were superficially or incompletely addressed by the EU in its dialogue with the Moldovan

authorities. Additionally, the Moldova – EU Action Plan has given to the EU more concrete leverages to influence the reform process in Moldova, yet the efficiency of those leverages is still far from reaching the level of those leverages that the EU enjoyed in the case of the EU candidate countries. In the view of many local experts, the EU can and should reinforce its leverages over reform process in Moldova by strengthening the conditionality mechanism of the ENP using the model and experience of the EU Enlargement policy.

In the field of economic and trade relations, the transformation of the EU as the main trade partner of Moldova has been witnessed, thus, outflanking the CIS countries. After Romania joined the EU in 2007, Moldova's exports to the Common Market of the EU have surged from 33% percent to 55% in 2008. Looking to encourage the pace of reforms undertaken by the Moldovan Government in accordance with the Moldova – EU Action Plan, the EU has increased the openness of its internal market for Moldovan products, by providing Moldova with more advantageous trade conditions under the Generalized Scheme for Preferences (GSP) plus regime in January 2006 and the Autonomous Trade Preferences (ATP) in March 2008. In the area of facilitating mobility of Moldovan citizens and managing illegal migration flows, the EU and Moldova have started an intensified dialogue. Consequently, in 2007 Moldova succeeded to negotiate and sign with the EU two important agreements in the way of obtaining gradually a visa-free travel regime for its citizens, such as: the Agreements on facilitating visa regime and re-admission of persons illegally residing on the territories of both parties. In the same context of visas facilitation, the EU has approved the opening of the Common Visa Centre within the Hungarian Embassy in Chisinau. Also, in June 2008 the EU has offered to Moldova a Mobility Partnership that was aiming at helping Moldova to address the economic and social causes that motivate illegal migration of Moldovan citizens to the EU, as well as to create proper conditions for circular legal migration of Moldovan qualified labor force in the EU member states (EC 2008).

All these practical results have had a positive impact on how the EU is perceived by Moldovan citizens, majority of whom are favoring an eventual integration of their country into the EU. This could be explained, largely, by the fact that the EU is regarded mostly as being an economic power that has the weight, ability and capacity necessary to accelerate the economic modernization and democratization of Moldova

As a result of the Action Plan implementation and the development of the political dialogue between EU and the Republic of Moldova as well as other partners, in 2006 the European Union developed a new cooperation Instrument- ENPI (European Neighborhood Partnership Instrument) that was officially launched in 2007. The new programme offered

new possibilities for cooperation ad funding, including Budget Support programmes as well as a financial envelope of EUR 273 million for Moldova for the period 2007-2013

An EU Fact Finding mission visited Moldova at the end of May/early June 2010 with the purpose of assessing the institutional capacity of Moldova to negotiate and implement a DCFTA with the EU. On 26th October 2010, the EU issued a set of recommendations to the Moldovan Government, listing the thematic areas where additional progress would be required. These included key and additional recommendations in 13 thematic areas. In response to these key recommendations, the Moldovan Ministry of Economy prepared an Action Plan with a clear timetable for implementation and established a number of task forces to deal with the issues. This Action Plan, including quarterly progress reports, was approved by the Moldovan Government in 2010.

From the beginning, it was clear that many Moldovan institutions lacked the strength and expertise to perform their full role within the framework of the Association Agreement. As such, on the 24th November 2010, a framework for a Comprehensive Institution Building Programme (CIB) was signed by the EU and the Government of Moldova[5]. The institutions identified in the CIB framework are gathered in the following three clusters, public administration, rule of law, human rights & freedoms and preparing for the DCFTA, as the Government had made sufficient progress by 2011 for the EU to launch negotiations on the DCFTA.

Moldova's Association Agreement and DCFTA continue to define the policy roadmap for the country's economic development over the longer term[6]. The DCFTA is expected to boost exports and investment – key sources of growth in the absence of a large domestic market or sizeable natural resources.

In 2014, Moldovan exports to the EU increased by 9.6%, to reach 53% of total exports. Although total exports increased moderately over the last decade, in 2013 they fell to 44% of GDP – down from 50% in 2000. They are also concentrated in only a few sectors (wine, fruit and nuts, and textiles). The agriculture sector as a whole still represents 25% of the total export product basket. Privatization transactions and several greenfield investments increased the FDI stock seven-fold between 2000 and 2012. However, this is still below other countries in the region, such as Armenia (10 times) and Georgia (14 times).

[5] http://eeas.europa.eu/delegations/moldova/press_corner/all_news/news/2010/20101124_01_en.htm
[6] http://lex.justice.md/viewdoc.php?action=view&view=doc&id=350541&lang=1

5. Conclusions: AA/DCFTA – success for Moldova?

In the wake of the EaP Summit in Vilnius that took place on 28-29 November 2013, Moldova was considered the brightest star of the EaP (Bucataru 2013). Its merits were evident. It initialed the Association Agreement (AA) including the Deep and Comprehensive Free Trade Area (DCFTA) with the EU and successfully concluded the visa liberalization dialogue with the EU. As such, the European Commission recommended to the EU Council the lifting of visa requirements for Moldovan citizens who hold biometric passports. Five months later, on 28 April 2014, the EU had liberalized its visa regime with Moldova. Then, on 27 June 2014, Moldova signed the AA and started its provisional implementation on September 1, 2014. The prospects of Moldova's partnership with the EU were then the most promising than ever before. Eighteen months later, on the eve of the EaP Summit in Riga, Moldova is increasingly viewed as another falling star of the EaP. The parliamentary elections, which took place on 30 November 2014, were very much expected to provide Moldova with a solid pro-European parliamentarian majority and a stable Government with a convincing reform mandate essential for implementing the Association Agenda with the EU. Unfortunately, contrary to all expectations, Moldova has entered into a period of political uncertainty that could jeopardize its European integration perspectives (Chirila 2013)

Nevertheless, After 1 year of implementation, the DCFTA has led to significant results in the Republic of Moldova-European Union trade patterns (EC 2012) including but not limited to: 1.) The European Union is now Moldova's biggest trade partner with 46.4% of its trade taking place with the EU, followed by Russia (21.9%) and Ukraine (11.8%). 2.) Moldova now ranks 71 among the EU's trade partners, with a total turnover of EUR 3.51 billion in 2014, an increase of 8% since 2013. 3.) In 2014, covering the start of DCFTA application, EU exports to Moldova amounted in 2014 to EUR 2.35 billion, an increase of 3% since 2013. Key exports are machinery and appliances, mineral products, transport equipment, and chemical products. 4.) In the same period, the EU imports from Moldova also grew very dynamically. Total imports increased by 20%, to EUR 1.16 billion. Imports of agricultural goods grew particularly strong, noting a 30% increase. Among imported goods are mainly textiles and textile articles, machinery and appliances, vegetable products and other foodstuffs and beverages.

The above listed trade progress results can in no small part be attributed to the efficient and significant number of trade-related and EU-funded aid assistance programmes and projects to the Republic of Moldova from the bilateral and regional envelopes. The final

conclusions are: 1.) Economic figures are positive; 2.) Transnistria is interested in economic growth; 3.) EU is interested in promoting reforms; 4.) Moldova should take the path of EU.

References

Bucataru, V. (2013): The European Agenda of the Republic of Moldova: life after Vilnius. *Russkiivopros.com*, Issue 4.
Available : http://www.ape.md/libview.php?l=en&idc=152&id=2081

BE (2013): The Impact of the EU-Moldova DCFTA on the Transnistrian Economy: Quantitative Assessment under Three Scenarios. Berlin Economics Available: http://get-moldau.de/download/policypapers/2013/2013.06.04_DCFTA%20Transnistria_en.pdf

Chirila, V. (2013): Reintegration Policy of the Republic of Moldova. Available: http://www.ape.md/lib.php?l=ro&idc=156

EBRD (2014): *Transition Report 2014*. European Bank for Reconstruction and Development, London.

EC (2005): EU-Moldova Action Plan. European Commission, Brussels. Available: https://eeas.europa.eu/enp/pdf/pdf/action_plans/moldova_enp_ap_final_en.pdf

EC (1994): *Partnership and Cooperation Agreement*. European Commission, Brussels.

EC (2008): Joint Declaration on a Mobility Partnerships between the European Union and the Republic of Moldova. European Commission, Brussels.

EC (2012): Trade Sustainability Impact :Assessment in support of negotiations of a DCFTA between the EU and Georgia and the Republic of Moldova. European Commission, Brussels.

IMF (2012): Aide-Mémoire of the IMF Mission to the Republic of Moldova. International Monetary Fund, Washington DC.
Available: https://www.imf.org/en/News/Articles/2015/09/28/04/52/mcs112112

IMF (2013a): *World Economic Outlook*. International Monetary Fund, Washington DC.

IMF (2013b) Republic of Moldova. Poverty Redeuction Strategy Paper - Joint Staff Advisory Note. International Monetary Fund, Washington DC.

IMF (2015): *World Economic Outlook*. International Monetary Fund, Washington DC.

WB (2015): *World Development Indicators 2015*. World Bank, Washington, DC.

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 99–107.

6. Urban rehabilitation projects in Hungary in the new programming period

Anna Szilágyi

The first calls for proposals on urban rehabilitation in the new programming period are open in Hungary and some of the local governments have already prepared their Integrated Urban Development Strategies that defines not only the mid-term goals of the city, but also the projects foreseen. In this paper, I examine the experiences gained from former urban rehabilitation programmes and analyse the changes, the new era brings.

Starting in 2004, the first urban development projects mainly focused on spectacular investments without strategical background and without the involvement of the local stakeholders. With the second programming period starting in 2007, a new approach has been introduced in urban planning in Hungary: cities had to prepare mid-term urban development strategies and they had to involve locals to the planning processes. From 2014, the former approach seems to continue with the integrated approach and the involvement of the inhabitants. But at the same time, the Hungarian regulations changed in a way that the counties took over the tasks of integrated planning and project management. Even though counties are subnational actors, the whole territorial planning seems to tend towards a highly-centralised system. Therefore the real question is whether and how the cities will be able to create and realize projects reflecting their own unique needs in the new system of project planning and management.

Keywords: urban rehabilitation, urban planning, EU-funds, participation

1. Introduction

The first calls for proposals for urban rehabilitation projects in Hungary have already been launched, local governments now have the task to submit their development plans and project proposals. This gives an actuality to review the experiences from the former programming periods considering EU-supported urban development projects, and summarize the lessons learnt. It is also important to analyse the regulatory frames and approaches for 2014–2020, in order to predict, whether the new supported projects will fulfil the expectations on revitalizing the cities and provide better living standards for its inhabitants. In this paper, I am going to introduce the main features of the programming periods of 2004–06 and of 2007–13. Later, I give and overview on the new regulations for 2014–2020, highlighting the changes and trends, that can be observed. Given the complexity of urban rehabilitation projects, I will focus on three main questions and related hypotheses: 1.) Considering regulatory frames, is there a tendency that can be observed on decentralization, complexity,

integrated approach or holistic planning in Hungary? 2.) Is there a growing importance of the partnership principle in the planning process in Hungary? 3.) What changes can be observed regarded the management competences and approaches of the Hungarian local administrations?

My starting hypotheses are the following: 1.) The regulatory frames in the new programming period focus more on complexity and integrated approach, also strategic planning gains ground over time. 2.) The realization of partnership principle becoming more and more important, and actors dispose over growing experiences in this field. 3.) The evaluation of a professional management organization of local governments can be observed, especially with the establishment of professional urban development companies.

In order to validate the above mentioned hypotheses I made a literature review on the approach on urban development on EU-level and on the related Hungarian documents, as well. For the discussion part, I analysed the calls for proposals from the former and current programming period and the "Handbook on urban development" that served as canon for the related projects. The conclusions of this paper are drawn from this documentary analysis and also from the personal experiences and interviews that I collected when I personally took part in the planning, project development and management of three urban rehabilitation projects from 2007 to 2011.

2. The increasing role of urban development within the European Union

The role of cities in the European Union is constantly increasing. Given the fact, that around 70% of the EU-population lives in urban agglomeration, and that 67% of EU GDP is created in metropolitan regions (EC 2011, p.2), it is without doubt, that cities serve as engines for boosting the European economy by creating jobs and economic growth.

This growing importance can be observed also in the evolution of the European policy framework for urban development. 2000–2006 the Community Initiative Urban was dedicated to this topic exclusively, and several other urban projects could be realized under Objective 1 or 2. 2003, URBACT Programme has been launched, that supports the exchange for best practices, capacity building, transnational exchange, capitalization and dissemination amongst cities. However, at this time, regional policy focused mainly on NUTS2 or NUTS3 level regions, not on single settlements.

After several Council Meeting in Lille 2000, Rotterdam 2004, Bristol 2005, a common Urban Acquis started to take shape. The Leipzig Charter on Sustainable European Cities has

been approved in 2007. 2007–13, urban rehabilitation projects were supported both in the Convergence Regions (under Objective 1) as well as in the Regional Competitiveness Regions (under Objective 2). URBACT also kept on running, and a new programme, JESSICA has been created to provide refundable financial sources for urban rehabilitation projects.

In 2011, the Territorial Agenda of the European Union had been published (MRSPT 2011). In order to promote the realization of the EU 2020 strategy from a territorial perspective, 6 priorities have been set up. The Territorial Agenda, also known as TA 2020 can be considered as the forerunner of the new, current programming period by drawing up the new role of cities and the new priorities for them.

The new slogan for the new era is to become a "smart city". Nevertheless, there is no exact definition on what it means being a smart city, and the adequate monitoring methods are also missing. When we take a look at the "tools" used for achieving a smart city-related goal, we mostly find IT-solutions for energy-, water- or waste management, also for public transportation. The smart city therefore is always a green city. On the other hand, being smart also means to be innovative. Cities therefore have to put emphasis on promoting regional innovation by supporting innovative start-up companies, university-business cooperation, spin-offs, and local SME's. Being innovative also means to contribute to the fulfilment of the Regional Innovation Strategies for Smart Specialization, the new *"integrated, place-based economic transformation agendas"* (Foray et al. 2012, p. 8)

As for inclusive growth, the key-phrase for this programming period is social innovation. Social innovation is at the core of urban development, it underpins the importance of partnership principle when planning and implementing the projects, and also it stresses the importance of the so called "soft" or "ESF-type" elements of the rehabilitation projects where activities can reflect on the aspects and goals of social innovation.

According to the above mentioned, the European Union promotes integrated urban development in this programming era with a seemingly larger intensity, than before. On one hand, it created a framework document (MRSPT 2011) setting up the main priorities. The EU pursues to integrate regional/territorial aspects and sectorial approaches by creating the system of NIS3-RIS3-SIS3 strategies and emphasizing the joint realization of the regional and R&D policies. Also, the EU started to elaborate tools for combining available funding sources

from the European Structural and Investment Funds and from other programs[1]. But it is not just the relationship with other policies that is changed. There are shifts in the centre of gravity within the regional policy itself. The main changes of this period are

- the abolishment of the mono-fund principle, allowing Operational Programmes to combine ESF and ERDF financing,
- the general introduction of Community-led Local Development (CLLD), based on former experiences from the LEADER Programme,
- and the creation of Integrated Territorial Investments (ITI).

The importance of cities has been also earmarked by the fact that the name of the former territorial policy of the EU has changed from regional, to regional and urban policy.

3. Planning and realization of EU-supported urban rehabilitation projects in Hungary

3.1. The experiences of the first programming period 2004–2006

Since Hungary joined the EU in 2004, i.e. in the middle of the 2000–2006 programming period, the first urban development projects started in 2004 and 2005 in the frames of the Regional Development Operational Programme. Note, that URBAN Community Initiative was not available in Hungary because its goals had been integrated to the (single) Regional Operational Programme.

The appropriate call (ROP 2.2 – Rehabilitation of urban territories) was very popular amongst local governments, altogether 89 proposals had been submitted with a total demand for support of about 200–205 Mio EUR. Finally, 36 development projects were supported with a value of about 82 Mio EUR. The projects were granted 0.5–3.3 Mio EUR funding (EMIR 2015). The "Handbook on Urban Development" states the following about the impacts of these projects: *"The majority of the projects realized the necessary rehabilitation of the city centres and public spaces, without dealing with the complex solving of urban problems. A contradiction could be observed between the CLLD-driven URBAN, focusing on the needs of renovation of deprived neighbourhoods and the activities realized within these projects that*

[1] The introduction of „seal of excellence" in Horizon 2020 proposals is a good example on this combination. An excellent project might be rejected from being supported, due to financial burdens. But the seal of excellence certificate provides that the project itself is worth for funding and therefore it can be directed to other (EU or national) sources.

were – in the majority of the cases – lacking the social interventions and the integrated approach" (SSLDB 2009, p. 9)

In Hungary's first programming period after the EU-access, the urban rehabilitation projects were not part of any mid- or long-term strategy, they mostly contained only infrastructural interventions without the involvement of the local community, and the management activities were carried out by the employees of the local administrations or by external experts. Therefore, these projects failed to have a measurable impact on the urban fabric.

3.2. A new approach in the urban planning – 2007–2013

Based on the experiences from the first programming period and the changes in the EU expectations towards integrated urban development – as shown in Chapter 2 – 2007–2013, a new approach in urban planning started to gain ground. Note, that in this programming period Hungary had 7 regional operational programmes, i.e. all NUTS-2 regions had an own document. It is also important to mention, that this was the first time, the Central-Hungary Region had a special position: it was the only NUTS-2 region that felt under the "Competitiveness" Objective, while the other 6 NUTS-2 regions belonged to the "Convergence" Objective.

At first sight, the existence of 7 regional operational programmes might show a growing independence of territorial actors and a growing tendency of bottom-up planning, but in the reality those operational programmes slightly differed from each other. Considering urban planning however, the introduction of Integrated Urban Development Strategies (IUS) can be considered as a significant change in the planning approach. Those cities with more than 20.000 inhabitants had to prepare and submit IUS, which was a mid-term strategy, containing the goals of the city, its planned projects, financial resources and institutional background for the management of those projects.

The Integrated Urban Development Strategies constructed a frame for the further development efforts, and, for the first time it was required to use a holistic and integrated approach when preparing the strategy. Since it was compulsory to enforce the principle of partnership, urban development strategies had been consulted and negotiated with NGO-s, local businesses and inhabitants.

The first calls for rehabilitation projects were launched in 2007, and it was compulsory to submit IUS or a similar document. It was also required, that the project has a detailed feasibility study in the form of a so called "action area plan". Action area was the

environment directly affected by the rehabilitation project. Considering the aspects of urban rehabilitation, 2 types of calls were available: one for general (i.e. for function expansion) and one for social urban rehabilitation.

It was not only the compulsory consultation procedure that supported the involvement of locals in the realization of the projects. The so called soft elements were also compulsory parts of the rehabilitation, i.e. not only infrastructural activities had to be planned, but also civil programs, events, clubs, trainings in order to provide support and local acceptance for the project. This probably was one of the most difficult part of the cities, for several reasons. On one hand, local governments didn't have any connections, nor former experience working with NGO's. And they were afraid of involving the public and civil actors. On the other hand, these projects were amongst the largest and most complex ones, the local administration had to work with, and they considered to be too time consuming to handle a lot of civil activities within the same project, where they have to deal with a huge infrastructural investment, as well. This hardship had been recognized by the Managing Authority and therefore the later calls contained an opportunity for the local administrations, to set up an own fund for grants for the NGO's instead of managing several small projects.

The third new feature in the calls was the possibility to establish urban development companies. The managing authority supported this by allowing 4% management costs in the case of an urban development company is established instead of 2%. The goal was to create a professional background for local development and integrated planning in the cities. It was also taken into consideration that the possibility to gain non-refundable grants will cease over time, therefore the city has to prepare itself for using refundable funding (such as JESSICA) for its development. According to my experiences, establishing an urban development company was realized in most of the cases by transforming an already existing company that was appropriate for the proposal and not by the analysing and proper planning of the tasks, staff and financing of this organization. Basically, the urban management companies were created for the proposal, but not for long term. The blocking factors were again the lack of experience and the fear of losing control over the most important urban development projects.

To sum up, although there were several new and promising features in the new calls, that could ground the integrated, holistic, bottom-up planning in the cities, the mayors and employees of the local government dared to take only cautious steps forward, due to their lack of expertise and fear of losing control. Therefore the requirements of the proposals were fulfilled, but no further efforts were made.

3.3. Facing the new programming period 2014–2020

The government regulation 1600/2012 (17.12.) appoints the Hungarian counties and cities with county rights (NUTS3 level) as responsible subnational actors for territorial planning and implementation (1600/2012. (XII. 17.)). The government decision 1115/2013 (08.03.) regulates the territorial units affected by the new planning system, and prescribes, that the counties and cities with county rights have to prepare a territorial development programme for the period 2014-2020, that will serve as a basic document for their development efforts (1115/2013. (III. 8.)). In the current era, Hungary (again) has only one, single regional operational programme, the Territorial and Settlement Development Operational Programme (TOP), and there is one programme for Budapest and Pest-county, the Competitive Central Hungary Operational Programme. In TOP, there are separate chapters for the counties (and their "ordinary" settlements) and for the cities with county rights. The planning and available sources are also different: while the "ordinary" settlements have to compete for the funding, the cities with county rights have prepared an Integrated Urban Development Programme in which they allocated some provisional resources to their planned projects. Therefore, the cities with county rights can now submit their proposals for the already named projects and they have a simplified evaluation process for their application.

It is not the same regulatory framework for the capital, Budapest. In the recent years, three thematic development programmes have been created with the contribution of the districts. They are the Thematic Development Program for Social Urban Rehabilitation, for Economic Recovery, for Brownfield Rehabilitation and for the Danube (shores). This programmes give comprehensive overview on the situation of the related fields, and summarize the tools, methods and activities that districts can use while implementing their rehabilitation projects. During the elaboration of these thematic programmes, districts were also asked to identify their future projects, and some preparatory efforts have already been made before the detailed planning[2] (Budapest Municipality 2014).

At first sight, this modification of the territorial planning system can be seen, as decentralisation and better involvement of the county (i.e. territorial)-level. But taken into consideration, that there are ministerial commissioners appointed in every county responsible for regional development, this change can rather be evaluated as centralisation, serving faster proposal preparation, evaluation and implementation.

[2] For example, the identification of the eligible blocks for social rehabilitation projects.

Considering the partnership-requirements, there is no dramatic change in the level of involvement "demanded" by the promoter. The development programmes mentioned above also had a consultation process during their approval. In a formal sense, they fulfil the criteria of the partnership principle. But due to the fact, that there was no effort made on sharing practices or train civil servants on partnership and community planning, it cannot be expected that the effective involvement of the habitants will take a big step forward.

Considering the management capacities, the new Hungarian regulation on the use of Structural Funds prohibits the local governments the engagement of private companies and experts for managerial tasks (272/2014. (XI. 5.)). This means that they have to employ their own employees (civil servants) or engage their urban development companies for these tasks. The problem again is that those companies still lack the professional expertise and long-term vision on their existence.

4. Conclusion

Urban development gains an increasing importance in the European Union, as well as in Hungary. In the recent years, due to the requirements of the proposals mainly, new methods became established considering the planning, participation and implementation. Nevertheless, the time for a real breakthrough hasn't come yet.

As for urban planning methods, the hypothesis has to be modified, in order to mirror the current situation. More and more, there are integrated plans for cities and counties on how to use the EU funds in an effective way, but at the same time we experience a more centralized approach on planning and implementation. And with the constant changes of the territorial planning system, responsibilities, tasks, and strategy frameworks, it will be very complicated to monitor the effects of the investments.

As for partnership, it is still regarded as a "compulsory requirement" and therefore the efforts focus on fulfilling the minimum actions that have to be taken and documented. But even with this attitude towards involvement of local people, it is without doubt, that new methods and practice on participation is spreading amongst civil organisations, as well as amongst local governments.

Finally, considering the management competencies, the firsts steps of establishing an own professional organisation has been done by more cities in the former programming period. But it is still questionable, what future is envisaged for those urban development

companies, and if they really have the expertise and capacities for the realisation of future development projects.

Based on these, we can come to the final conclusion that the attitudes towards integrated and holistic development, bottom-up planning, participation and professional implementation of the urban rehabilitation projects seem to evolve in a slow, but continuous way in Hungary.

References

272/2014. (XI. 5.) Gov. regulation on the use of specific EU-funds in the programming period 2014–2020

1115/2013. (III. 8.) Gov. decision on frames of the territorial coordination of the funds for 2014–2020

1600/2012. (XII. 17.) Gov. decision on the actual tasks on planning and institutional background of the EU-development funds for 2014–2020

Budapest Municipality (2014): *Thematic Development Programme on Social Urban Rehabilitation*. Budapest Municipality, Budapest. Available: http://budapestfejlesztes.hu/wp-content/uploads/2014/08/Szocrehab_TFP_full_0630.pdf Accessed: 31.03.2016

EMIR (2015): *EMIR Database*. Cabinet Office of the Prime Minister, Budapest. Available: https://www.palyazat.gov.hu/fejlesztesi_informaciok Accessed: 04.01.2016

EC (2011): *Cities of tomorrow – challenges, visions, ways forward*. European Commission, Brussels. Available:http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/citiesoftomorrow/citiesoftomorrow_final.pdf Accessed: 31.03.2016

Foray, D. – Goddard, J. – Beldarrain, X.G – Landabaso, M. – McCann,P – Morgan, K. – Nauwelaers, C. – Ortega-Argilés, R. (2012): Guide on Research and Innovation Strategies for Smart Specialisation (RIS3). European Commisssion, Brussels.

MRSPT (2011): Territorial Agenda of the European Union 2020- Towards an Inclusive, Smart and Sustainable Europe of Diverse Regions. Informal Ministerial Meeting of Ministers Responsible for Spatial Planning and Territorial Development on 19th May 2011 Gödöllő. Available: http://www.nweurope.eu/media/1216/territorial_agenda_2020.pdf Accessed: 30.03.2016

SSLDB (2009): Handbook on Urban Development (Second Edition in Hungarian). State Secretariat for Local Development and Building, Budapest. Available: http://www.terport.hu/webfm_send/3989 Accessed: 30.03.2016

PART THREE

Fiscal policy and challenges in financing

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 111–127.

7. The cluster analysis of the banking sector in Europe

Harun Ercan − Saysi Sayaseng

The Cluster analysis aims to conduct an exploratory study on the European banking sector by gathering ranges of consolidated banking indicators from the European Central Bank. The study will determine the similar pattern according to banking sector ratios and changes in the cluster groups affected by the financial crisis. It aims to explore whether the foreign ownership of the banks contribute to the characteristic or clustering of these banks or it is a country specific composition. Our findings confirm that the grouping of the banking sectors based on the banking ratios show that the EU countries in similar geographic area and with higher economic partnership tend to group in the similar cluster.

Keywords: banking fragmentation; euro area; crisis; cluster analysis

1. Introduction

Cyclical financial crises have revealed the danger of systemic risk due to contagion effects given the interconnectedness of modern banking systems. Systemically it is essential identify the key and important banks, as it is one of the key objectives of systemic risk assessment and a necessary precondition for the formulation of macro prudential policy. González-Hermosillo (2008) relates the degree of vulnerability of individual financial institutions with the degree of stress in global market conditions. Their studies presented that if investors' risk appetite is low or global liquidity is tight, small shocks can have large effects on global financial markets and vice versa. The aim of Macro-prudential policy is to provide safeguard and the overall stability of the financial system, this proven that there are potential loops holes in the banking system in the wake of the recent financial crisis. Regulators have learnt the hard way that dependence of the banking sector undermines the benefits of diversification and may lead to a 'fragile' system (Brunnermeier et al. 2009). This has proven to be a major issue in the wake of the recent financial crisis. The debate on macro-prudential policies and potential warning signals of the crisis have been explored by many researchers and regulatory bodies, many of the models constructed before the crisis have proven to be ineffective and many have raised questions whether the contagious are the matter of clustering of banking system.

This study aim to fill the gap by exploring the hierarchical clustering structure of the 26 EU areas by conducting an exploratory analysis based on the consolidated banking indicators from the European Central Bank. The observation is conducted from 2008 to 2013, the country with uncommon cluster will be identified and micro level of analysis will be carried out to explore the justification to why they are in such cluster.

First, the literature review has been made in order to present previous ideas about the use cluster analysis in the banking sector. The study briefly reviews the literature using cluster analysis in the EU. Then we describe our data and methodology using hierarchical clustering analysis technique. Our model provide unique set of grouped categories or clusters by sequentially pairing variables from the selected data. Next section discusses the main results and presents the clustering of the financial banking sectors. In the final section the paper conclude the results which provide meaningful insight into the structuring and interconnectedness of the EU banking sector.

2. Literature review

There have been extensive researches about the failure in the financial institution area since late 1960s. A variety of multivariate methods and other techniques have been applied to solve bankruptcy prediction problem in banks and firms. While, some of the literature researches try to measure the movements between the EU banks. Their findings support that EU-wide macroeconomic and banking specific shocks are significant and that some risks have increased since EMU.2 for example, Chapters 6 and 7, De Nicolo and others (2005), and Brasili and Vulpes (2005). Gropp and Moerman (2003) focus on contagion to identify 12 systemically important banks in Europe. They show that significant contagious influence emanates from some smaller EU countries. Evans et. al. (2008) reports that the banking sector deregulation at the national level and the opening markets to international competition caused convergence for the banking industry's' main indicators of bank profitability or earning patterns, but not their asset-liability related ratios. Decreasing et al.(2007) mentions that financial institutions should yield better risk profiles by increasing diversification both of their internationally and across different business lines. However, if the diversification is made by institutions in the same way this can lead bigger shocks or increase fragility.

Detecting potential risks and vulnerabilities in national financial systems and resolving instabilities if and when they arise are likely to require a strong cross-border perspective. Gropp, Vesala, and Vulpes (2002) used cluster analysis for euro area banks to analyze the

banking sector fragility, and demonstrated its usefulness as a complement to traditional balance-sheet-based analysis of risks. For large, complex financial institutions of both the United States and Europe, Hawkesby, Marsh, and Stevens (2002) applied agglomerative hierarchical cluster analysis to the data in order to explore the network structure of the companies. Alam, Booth, and Thordason (2000) found that clustering algorithm and self-organizing neural networks approaches provide valuable information to identify potentially failing banks.

Cluster and Factor Analysis of Structural Economic Indicators for Selected European Countries (2009), used cluster analysis on three structural economic indicators: GDP per capita, total employment rate and comparative price levels to classify Croatia and EU 27 Member States according to the structural economic indicators. According to the results of the Ward's method and three chosen structural economic indicators Croatia was classified along with the following EU Member States: Bulgaria, Hungary, Poland, Romania, Slovakia and Malta.

Forte and Santos (2015) used hierarchical clustering method with squared Euclidean distance to examine the FDI performance of Latin American countries. The cluster with better FDI performance (Chile, Panama, Uruguay, and Costa Rica) also performs better in terms of variables such as market size, trade openness, and human capital. Dardac and Boitan (2009) used Cluster Analysis, as an exploratory technique in order to include a representative sample of Romanian credit institutions into smaller, homogenous clusters, to assess which credit institutions have similar patterns according to their risk profile and profitability.

3. Data

The sampling data in this study comprised of consolidate data from 26 countries in the European Union (EU) zone. Which covers the sampling period from 2008 to 2013 which included the following countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Italy, Lithuania, Luxembourg, Latvia, Netherlands, Poland, Portugal, Romania, Sweden, Slovenia, and Slovakia. Croatia has been exclude from the study due to the late addition to the EU as well as lack of available consolidated data. The study excluded Malta into the sampling population of the EU countries, this is due to the fact that Malta was shown as the outlier for in all the results.

The selection of variables is naturally an important factor in the composition of clusters (Table 1). When the aim of the analysis is broad enough, as is the case here, the number of candidate instruments increases. In parallel with this condition five banking indicators which are commonly used in the literature are selected to cluster the banking system. They are leverage percentage, Return on Asset, Tier 1 capital, Capital requirement percentage, Equity to asset ratios. Prior to the selection of the variables used in the analysis, test for correlation between the variables have been carried out to remove highly correlated variables, Such as Return of Asset and Return on Equity were highly correlated. The following table provides a short description of the variables used in this analysis.

Table 1 Description of the variables

Variables	Descriptions
Leverage Percentage	Percentage of bank's lending (debt) to the value of its ordinary share of equity in percentage
Return on Assets	Bank's annual earning divided by total assets, sometimes referred as return on investment
Tier 1 capital	Capital adequacy requirement of a bank, consists of primary of common stock or core capital and disclose reserves
Capital requirement percentage	Standard capital requirement for banks, which determine the liquidity and
Equity to asset ratios	Ratio of total assets of the banks in proportion to the bank's equity

Source: own construction

Unfortunately due to the lack of data, some variables which can be useful for the further research have been excluded as well. Variables are comprised of annual banking sector indices available from European Central Bank (ECB) for the sample period of six financial years (2008 to 2013). These open sources banking sectors indices are constructed by the European Central Bank, these indices are contrasted based on the domestic banks, stand-alone banks, foreign banks and controlled subsidiaries of foreign countries branches of each EU countries. Unfortunately the data set has some missing values, we have adopted the approach to solve the missing data problem using the estimated value replacement approach.

4. Methodology

Cluster analysis is a technique that identifies the complex relationships between variables, without imposing any restriction. Therefore, the input dataset doesn’t need the distinct specification of an explanatory variable (the dependent variable) and respectively, of predictor ones (independent variables). There is no difference between the level of importance

of the variables, the aim of the analysis is not to predict a certain value, but, to provide some clear view for the presence of specific patterns or correlations among variables, to include the different variables or cases into more homogenous groups (Dardac − Boitan 2009). Cluster analysis can be used to explore the hierarchical structure of a system and that does not only provides an intuitive picture of the linkages of the system, but also displays meaningful cluster. Cluster analysis which groups (clusters) so that objects from the same cluster are more similar, with respect to a given attribute, to each other than objects from different clusters is a common technique for statistical data analysis in many fields, such as machine learning, pattern recognition, and bioinformatics (Khashanah − Miao 2011).

Cluster analysis is a useful method for examining complex relationships among national characteristics and international linkages without imposing any a priori restrictions on these interrelationships. Cluster analysis became a very popular tool to analyse a large amount of complex data, such as in the analysis of the banking sector (Sørensen − Puigvert Gutiérrez 2006).

This study employs a Hierarchical Cluster Analysis to identify the clusters in EU Banking Sector. Leverage, ROA, Tier 1, Capital requirement, equity/asset ratios have been selected as the variables to observe the similarities of the countries. This analysis consists of assessing whether the crisis has promote the similarity in pattern of the banking sectors in the euro area countries. In this respect, we use a hierarchical cluster analysis by considering two sub-periods: a "pre-crisis" (1999–2007) and a "crisis" period (2008–11). Hierarchical cluster analysis provides a unique set of grouped categories or clusters by sequentially pairing variables, clusters, or variables and clusters. Starting with the correlation matrix, all clusters and uncluttered variables are tried in all possible pairs at every step. The pair with the highest average inter-correlation within the trial cluster is chosen as the new cluster. On the other hand, in the other types of cluster analysis a single set of mutually exclusive and exhaustive clusters is formed whereas hierarchical method all variables are clustered in a single group starting from a larger cluster by getting tighter in each step (Bridges 1966).

In our analysis algorithm starts by considering that each country forms its own cluster, in the following stage the countries with similar data are grouped into the same cluster. Next phase is adding a new country or forming a two-country cluster. The process continues until all the countries are the same cluster. Finally, the outcomes summarized in a cluster tree called dendrogram, which represents the different steps of agglomeration described above. Cutting branches off the dendrogram allows to determine the optimal number of clusters, and therefore the degree of heterogeneity of our sample. The first step of the analysis consists of

measuring the distance or dissimilarity between every pair of countries, defined here by the Euclidean distance:

$$d^2(i,l) = \sum_{k=1}^{K} (x_{ik} - x_{lk})^2 \tag{1}$$

Variables have been standardised to avoid the variances in scale which lead to a greater impact on the clustering of our data. The Euclidean distance is measured from the variable from each of the EU Countries. The grouping and the linkage of the cluster are formed based on the distance matrix computed. Though there are several technique to determine the linkage of the cluster, we have adopted the most commonly used method of Ward (Ward 1963), this method is computed based on the multidimensional variance, including total variance and decomposed variance:. The total variance can be decomposed into the between and within the variance:

$$\sum_{k=1}^{K}\sum_{q=1}^{Q}\sum_{i=1}^{I_q}(x_{iqk} - \bar{x}_k)^2 = \sum_{k=1}^{K}\sum_{q=1}^{Q} I_q(\bar{x}_{qk} - \bar{x}_k)^2 + \sum_{k=1}^{K}\sum_{q=1}^{Q}\sum_{i=1}^{I_q}(x_{iqk} - \bar{x}_{qk})^2 \tag{2}$$

x_{iqk} as the value of variance for the variable K for the country within the cluster q

$\bar{x}_{qk}$ the mean of the variable K for the country within the cluster q

$\bar{x}_k$ Overall mean of variable K, and Iq is the number of the countries in the cluster q

Based on this decomposition, a good agglomeration will minimize the within cluster variance and maximize the between variance. Minimal increase in variance means that the linked clusters are relatively similar. The term of Euclidean distance can be written as:

$$\Delta(p,q) = \frac{I_p I_q}{I_p + I_q} d^2(c_p, c_q) \tag{3}$$

I_p number of countries in the cluster p

I_q number of countries in the cluster q

c_p and c_q the centroid of the clusters p and q

The Ward algorithm are the linking of two clusters, the increase of ($\Delta(p,q)$) is the smallest. Repetitively, the centroid of each cluster is based on the country assigned to the cluster, hence the distance matrix is recomputed, and the algorithm is repeatedly computed until all the countries are agglomerated into a single cluster. In this case the clustering is performed for 2008-2013. For each variable, the missing value is replaced with estimated means. The results of the hierarchical clustering are discussed in the next section.

5. Results

The dendrograms for the 2008–2013 periods are providing a wide vision about the clusters of the European banking sector. In each dendrogram, the vertical axis represents countries in the EU, and the horizontal axis illustrates differences between countries. Vertical lines in the dendrogram indicate the linkage of two countries or clusters. Countries that are similar to each other are combined at low heights, whereas countries that are showing differences are combined higher up the dendrogram. Therefore, if the link between the countries are at a higher point, it means that the dissimilarity between countries or clusters is the greater.

From the dendrograms Table 1 has been created to illustrate the clusters in an easy way to be understood. According to the table each colour on each year shows a different cluster. The fact that are no perfect clustering results, especially with a bigger data set, our results have exhibit that some of the clusters are close to each other's, therefore, we place the cutting the tree at 0-10 in order to determine the most relevant grouping and a method to cluster the larger set of data.

Table 1 shows the clusters of this study. Although there are some changes in the members of groups, there are 3 clusters in all years. The cluster are shown with different colours to make it easier to realize the differences. Blue cluster is generally including south European countries and Austria. Brown cluster mostly contains bigger economies of the EU such as UK, Germany, and France. And the grey cluster includes generally Eastern European countries and Baltic countries.

The cluster in which Greece was placed has showed a change after 2010, and their ratios become similar to the blue cluster which includes biggest economies in the EU zone. But in general Western countries and Eastern countries have their own groups and the changes between these groups can hardly be seen.

The last but not the least, as we observed there is no decrease in the number of the clusters over the years. This explains that integration of the banking sector ratios in the EU is very limited. Even though there are new mergers, the heterogeneity of the banking sector stayed stable between 2008 and 2013.

Table 2 Comparison of the banking clusters from 2008 to 2013

	CLUSTER1
	CLUSTER2
	CLUSTER3

COUNTRY	2013	2012	2011	2010	2009	2008
Austria	Austria	Austria	Austria	Austria	Austria	Austria
Belgium	Cyprus	Belgium	Cyprus	Cyprus	Belgium	Cyprus
Bulgaria	Spain	Germany	Spain	Estonia	Cyprus	Spain
Cyprus	Hungary	Denmark	Hungary	Greece	Germany	Greece
Czech Republic	Italy	Spain	Italy	Hungary	Denmark	Italy
Germany	Portugal	Finland	Portugal	Italy	Spain	Portugal
Denmark	Slovenia	France	Slovenia	Lithuania	Finland	Belgium
Estonia	Belgium	UK	Belgium	Latvia	France	Germany
Spain	Germany	Italy	Germany	Portugal	UK	Denmark
Finland	Denmark	Netherlands	Denmark	Romania	Greece	Finland
France	Finland	Portugal	Finland	Slovenia	Ireland	France
UK	France	Sweden	France	Belgium	Italy	UK
Greece	UK	Slovenia	UK	Germany	Luxembourg	Ireland
Hungary	Greece	Bulgaria	Greece	Denmark	Netherlands	Luxembourg
Ireland	Ireland	Czech Republic	Ireland	Spain	Portugal	Netherlands
Italy	Luxembourg	Estonia	Luxembourg	Finland	Sweden	Sweden
Lithuania	Netherlands	Hungary	Netherlands	France	Slovenia	Bulgaria
Luxembourg	Sweden	Ireland	Sweden	UK	Bulgaria	Czech Republic
Latvia	Bulgaria	Lithuania	Bulgaria	Ireland	Czech Republic	Estonia
Netherlands	Estonia	Luxembourg	Czech Republic	Luxembourg	Hungary	Hungary
Poland	Lithuania	Latvia	Estonia	Netherlands	Poland	Lithuania
Portugal	Latvia	Poland	Lithuania	Sweden	Romania	Latvia
Romania	Poland	Romania	Latvia	Bulgaria	Slovakia	Poland
Sweden	Romania	Slovakia	Poland	Czech Republic	Estonia	Romania
Slovenia	Slovakia	Cyprus	Romania	Poland	Lithuania	Slovenia
Slovakia	Czech Republic	Greece	Slovakia	Slovakia	Latvia	Slovakia

Source: own construction

6. Conclusion

This paper analysed the EU banking sector by using a hierarchical cluster analysis. The results obtained help us to observe that there are some dissimilarities between the EU countries in terms of banking structure. Although working under the same authority and similar governing policies, the regulators hope to create the fair and competitive market for all

financial institutions. Some of the very important ratios of the EU banking system proven to be differentiated in many countries. The findings of our analysis support that the countries in the same neighbourhood and with higher economic partnership tend to stay in the same cluster. As an example Sweden and Denmark; Portugal, Spain and Italy; Cyprus and Greece; Latvia, Lithuania, Slovenia, Czech Republic and Poland; Romania, Hungary and Austria clustered in their own groups throughout 2008 to 2013. The characteristic of their banking system are therefore similar based on the financial ratios.

On the other hand, the level of development and cooperation between countries cause them to be clustered in the same group: UK, France and Germany are mostly clustered together with a few years' exceptions.

Southern European countries have had problems during and after the mortgage crisis started in the US and diffused in Europe. Especially Greece has faced serious difficulties in the aftermath of the crisis. There has been changes in the banking policies and mergers due to the problems and this can be the main reason for the cluster change.

The foreign ownership of the banks in many countries affect the clusters. Although some banks try to follow country specific policies, generally the ratios are similar to the mother country ratios.

As Decreasing et. al. (2007) stated that geographic diversification leads to different investment strategies, as some banks are heavily invested in the new member states, while others follow a worldwide or more domestically oriented strategy. Similar with the conclusion of this study, the findings of our research could be eminent for the policy makers of the current and extended EU member and for the candidate countries, suggest that being a part of the EU does not mean that all the countries show similar changes or characteristics.

References

Akinci, O. − Queralto, A. (2014): Banks, capital flows and financial crises. *FRB International Finance Discussion Paper*.

Alam, P.− Booth, D. − Lee, K. − Thordarson, T. (2000): The use of fuzzy clustering algorithm and self-organizing neural networks for identifying potentially failing banks: an experimental study. *Expert Systems with Applications*, 18, pp. 185–199.

Ayadi, R. − Arbak, E. − De Groen, W.P. − Llewellyn, D.T. (2012): Regulation of European banks and business models: towards a new paradigm? *Centre for European Policy Studies.*

Ayadi, R. − Arbak, E. − de Groen, W. P. (2014): Business models in European banking: A pre- and post-crisis screening. *Centre for European Policy Studies.*

Brasili A. − Vulpes G (2006): *Banking integration and co-movements in EU banks' fragility*. MIPRA paper, 1964.

Bridges, C. C. (1966): Hierarchical cluster analysis. *Psych. Rep.*, 18, pp. 851–854.

Brunnermeier, M. K. − Crocket, A. − Goodhart C. − Avi, P. − Hyun, S. (2009): Fundamental Principles of Financial Regulation. *11th Geneva Report on the World Economy.*

Dardac N. − Boitan A. I. (2009): A Cluster Analysis Approach for Bank's Risk Profile: The Romanian Evidence. *European Research Studies Journal*, 1, pp. 109–118.

Decreasing, J. − Faruqee, H. − Fonteyne, W. (2007): *Integrating Europe's Financial Markets.* International Monetary Fund, Washington D.C.

De Nicolò, G. − R. Corker, A. T. − Van-derVossen, J. W. (2005): European Financial Integration, Stability and Supervision. *IMF Country Report* 05/266, August, pp. 113–146.

Evans P. − Hasan, I. − Vivas, A. L. (2008): Deregulation and Convergence of Banking: The EU Experience. *Finnish Economic Association,* 21, 2, pp. 104–117.

Forte, R. − Santos N. (2015): A cluster analysis of FDI in Latin America. *Latin American Journal of Economics-formerly Cuadernos de Economía*, 52, 1, pp. 25–56.

González-Hermosillo, B. (2008): Investors' Risk Appetite and Global Financial Market Conditions. *IMF Working Paper*, WP/08/85.

Gropp, R. − Moerman, G. (2003): Measurement of contagion in banks' equity prices. *European Central Bank Working Paper Series 0297.*

Hawkesby M. I. C. − Stevens, I. (2003): Large Complex Financial Institutions: Common Influences on Asset Price Behaviour? *Bank of England Financial Stability Review,* 15, 12, pp.91–101.

Huang, X. − Zhou, H. − Zhu, H. (2009): A framework for assessing the systemic risk of major financial institutions. *Journal of Banking & Finance,* 33, pp. 2036–2049.

Khashanah, K. − Miao, L. (2011): Dynamic structure of the US financial systems. *Studies in Economics and Finance,* 28, 4 pp. 321-339.

Laeven, L. − Valencia, F. (2013): Systemic Banking Crises Database. *IMF Economic Review* 61, pp. 225–270.

Lucotte, Y. (2015): Euro area banking fragmentation in the aftermath of the crisis: a cluster analysis. *Applied Economics Letters*, 22, pp. 1046–1050.

Marinc, M. − Mrak, M. − Rant, V. (2014): Dimensions of bank capital regulation: a cross-country analysis. *Panoeconomicus*, 61, pp. 415–439.

Marinč, M. − Rant, V. (2014): A cross-country analysis of bank bankruptcy regimes. *Journal of Financial Stability,* 13, pp. 134–150.

Mileris, R. (2012): The effects of macroeconomic conditions on loan portfolio credit risk and banking system interest income. *Ekonomika,* 91.

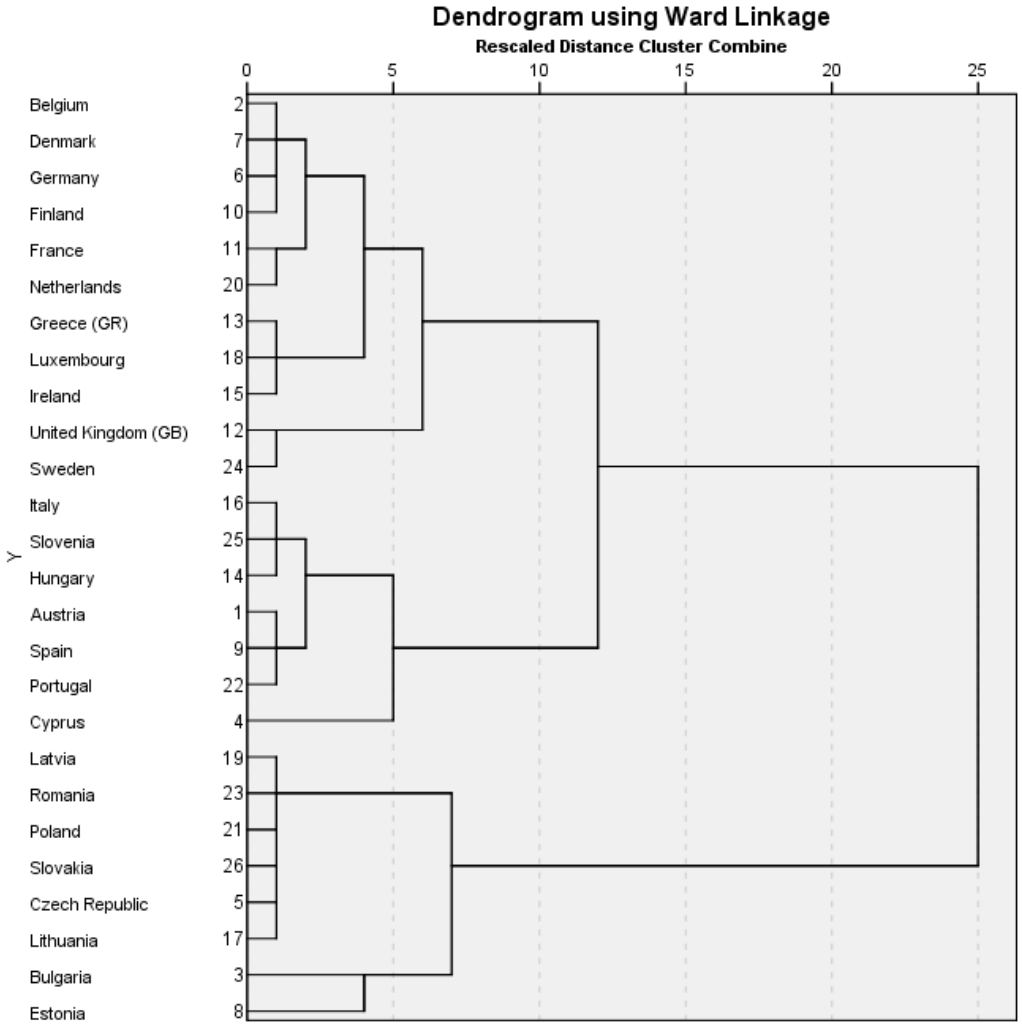
Sørensen, C.K. − Puigvert Gutiérrez, J.M. (2006): Euro Area Banking Sector Integration using Hierarchical Cluster Analysis Techniques. *ECB Working paper series*, No. 627.

Schwaab, B. − Koopman S.J. − Lucas, A. (2011): Systemic Risk Diagnostics Coincident Indicators and Early Warning Signals, Macroprudential Research Network, *Working Paper Series* No. 1327.

Vagizova, V.I. − Lurie, K.M. − Ivasiv, I.B. (2014): Clustering of Russian banks: business models of interaction of the banking sector and the real economy. *Problems and Perspectives in Management* 12, pp. 83–93.

Appendix

Appendix 1 Cluster dendrogram and memberships (2013)

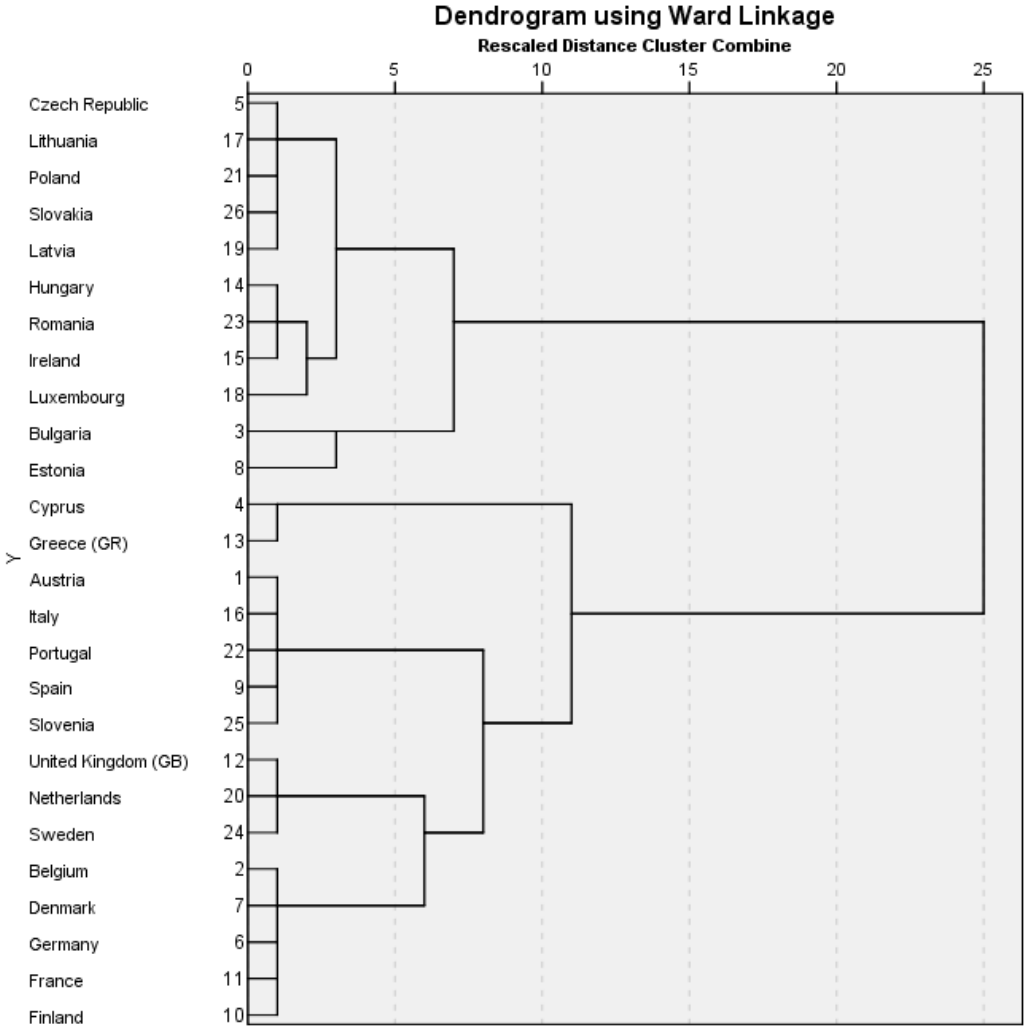


Cluster Membership

Case	3 Clusters
1:Austria	1
2:Belgium	2
3:Bulgaria	3
4:Cyprus	1
5:Czech Republic	3
6:Germany	2
7:Denmark	2
8:Estonia	3
9:Spain	1
10:Finland	2
11:France	2
12:United Kingdom (GB)	2
13:Greece (GR)	2
14:Hungary	1
15:Ireland	2
16:Italy	1
17:Lithuania	3
18:Luxembourg	2
19:Latvia	3
20:Netherlands	2
21:Poland	3
22:Portugal	1
23:Romania	3
24:Sweden	2
25:Slovenia	1
26:Slovakia	3

Source: own construction

Appendix 2 Cluster dendrogram and memberships (2012)

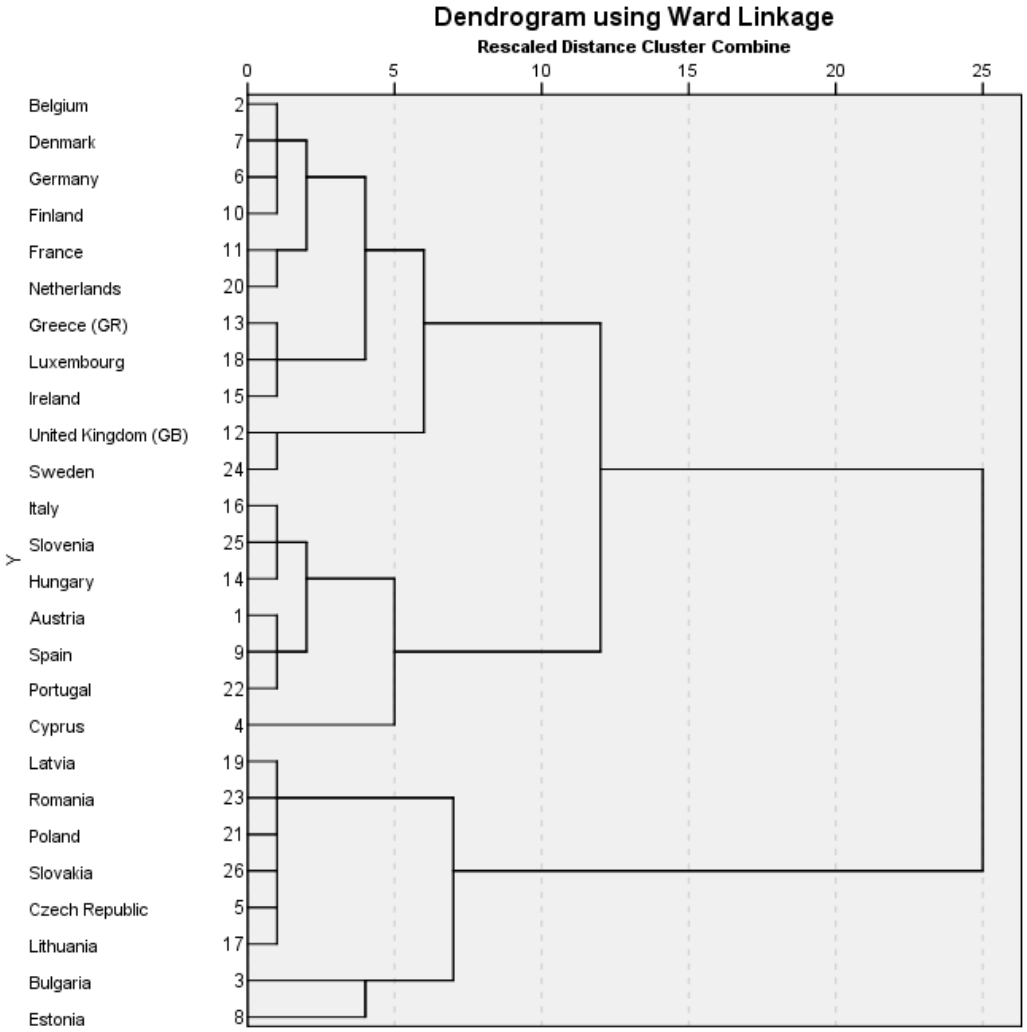


Cluster Membership

Case	3 Clusters
1:Austria	1
2:Belgium	1
3:Bulgaria	2
4:Cyprus	3
5:Czech Republic	2
6:Germany	1
7:Denmark	1
8:Estonia	2
9:Spain	1
10:Finland	1
11:France	1
12:United Kingdom (GB)	1
13:Greece (GR)	3
14:Hungary	2
15:Ireland	2
16:Italy	1
17:Lithuania	2
18:Luxembourg	2
19:Latvia	2
20:Netherlands	1
21:Poland	2
22:Portugal	1
23:Romania	2
24:Sweden	1
25:Slovenia	1
26:Slovakia	2

Source: own construction

Appendix 3 Cluster dendrogram and memberships (2011)

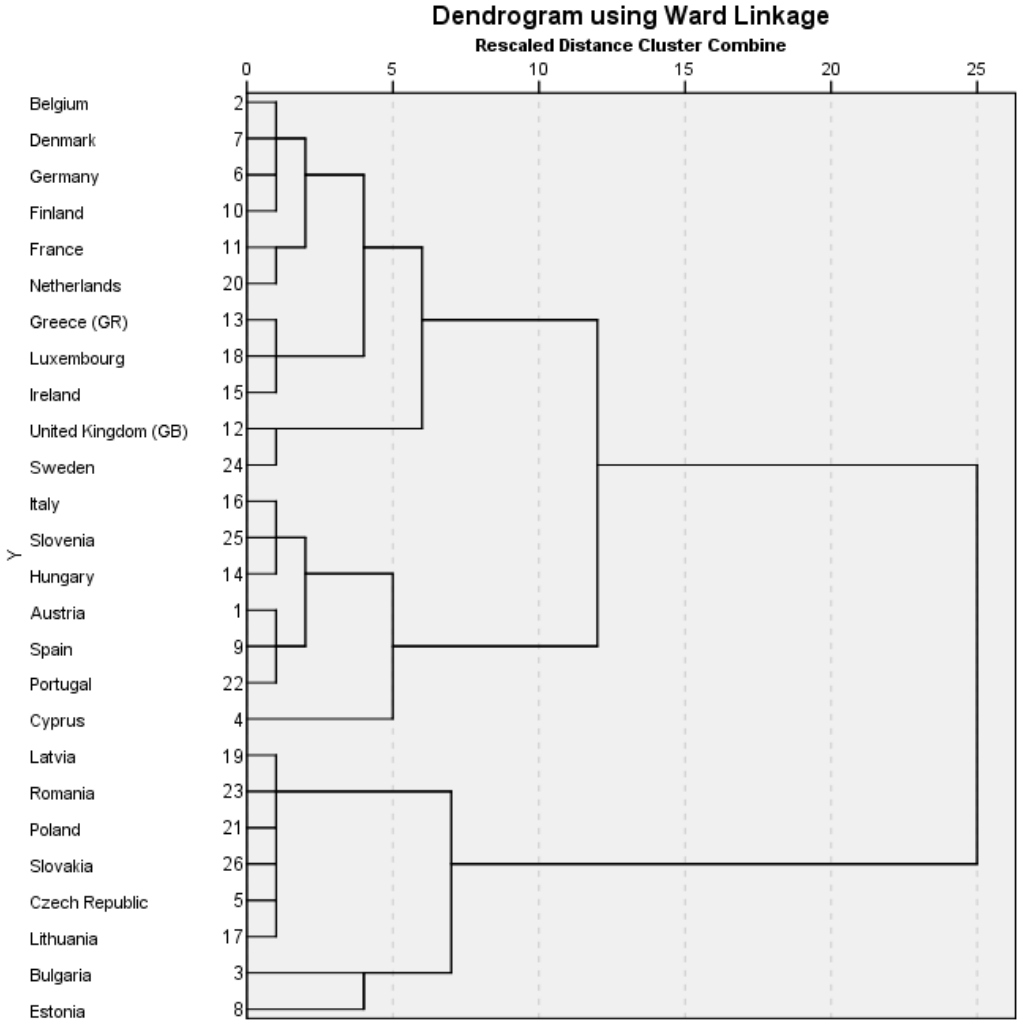


Cluster Membership

Case	3 Clusters
1:Austria	1
2:Belgium	2
3:Bulgaria	3
4:Cyprus	1
5:Czech Republic	3
6:Germany	2
7:Denmark	2
8:Estonia	3
9:Spain	1
10:Finland	2
11:France	2
12:United Kingdom (GB)	2
13:Greece (GR)	2
14:Hungary	1
15:Ireland	2
16:Italy	1
17:Lithuania	3
18:Luxembourg	2
19:Latvia	3
20:Netherlands	2
21:Poland	3
22:Portugal	1
23:Romania	3
24:Sweden	2
25:Slovenia	1
26:Slovakia	3

Source: own construction

Appendix 4 Cluster dendrogram and memberships (2010)

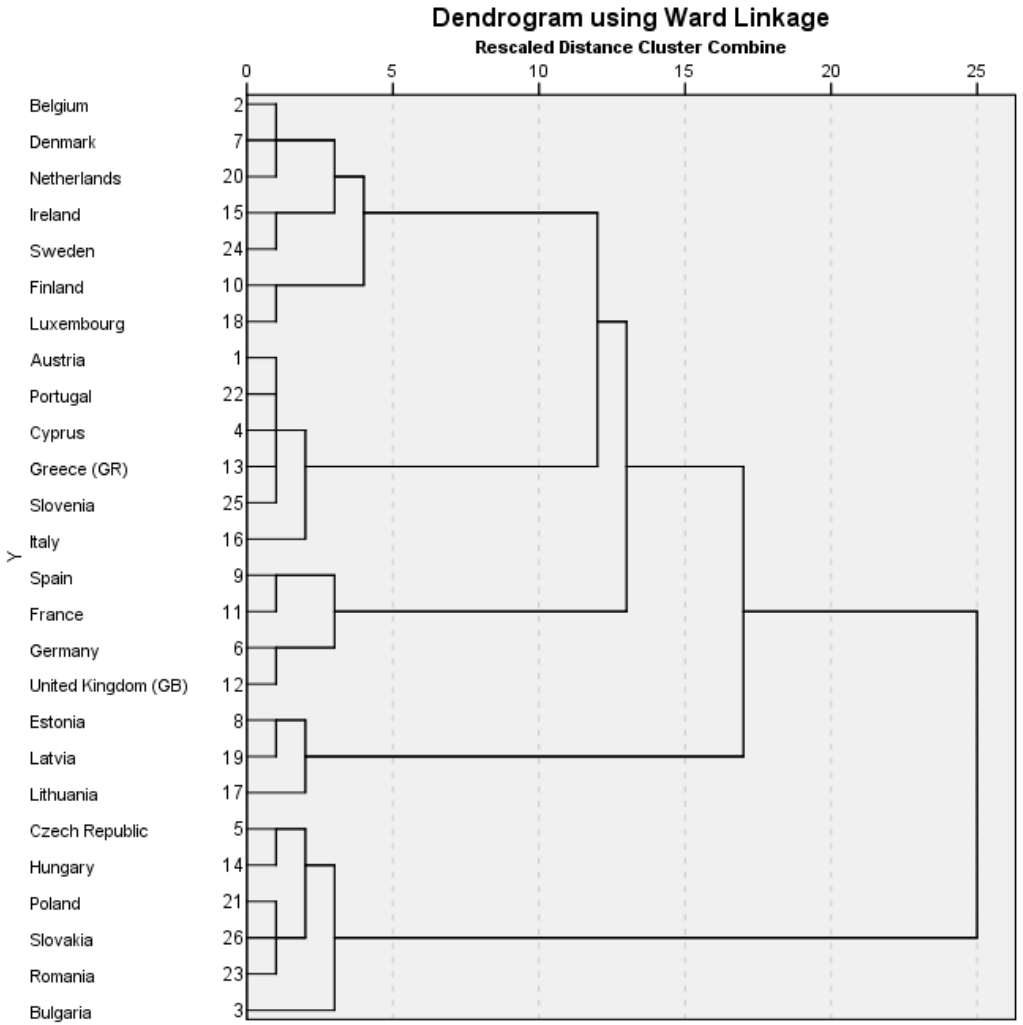


Cluster Membership

Case	3 Clusters
1:Austria	1
2:Belgium	2
3:Bulgaria	3
4:Cyprus	1
5:Czech Republic	3
6:Germany	2
7:Denmark	2
8:Estonia	1
9:Spain	2
10:Finland	2
11:France	2
12:United Kingdom (GB)	2
13:Greece (GR)	1
14:Hungary	1
15:Ireland	2
16:Italy	1
17:Lithuania	1
18:Luxembourg	2
19:Latvia	1
20:Netherlands	2
21:Poland	3
22:Portugal	1
23:Romania	1
24:Sweden	2
25:Slovenia	1
26:Slovakia	3

Source: own construction

Appendix 5 Cluster dendrogram and memberships (2009)

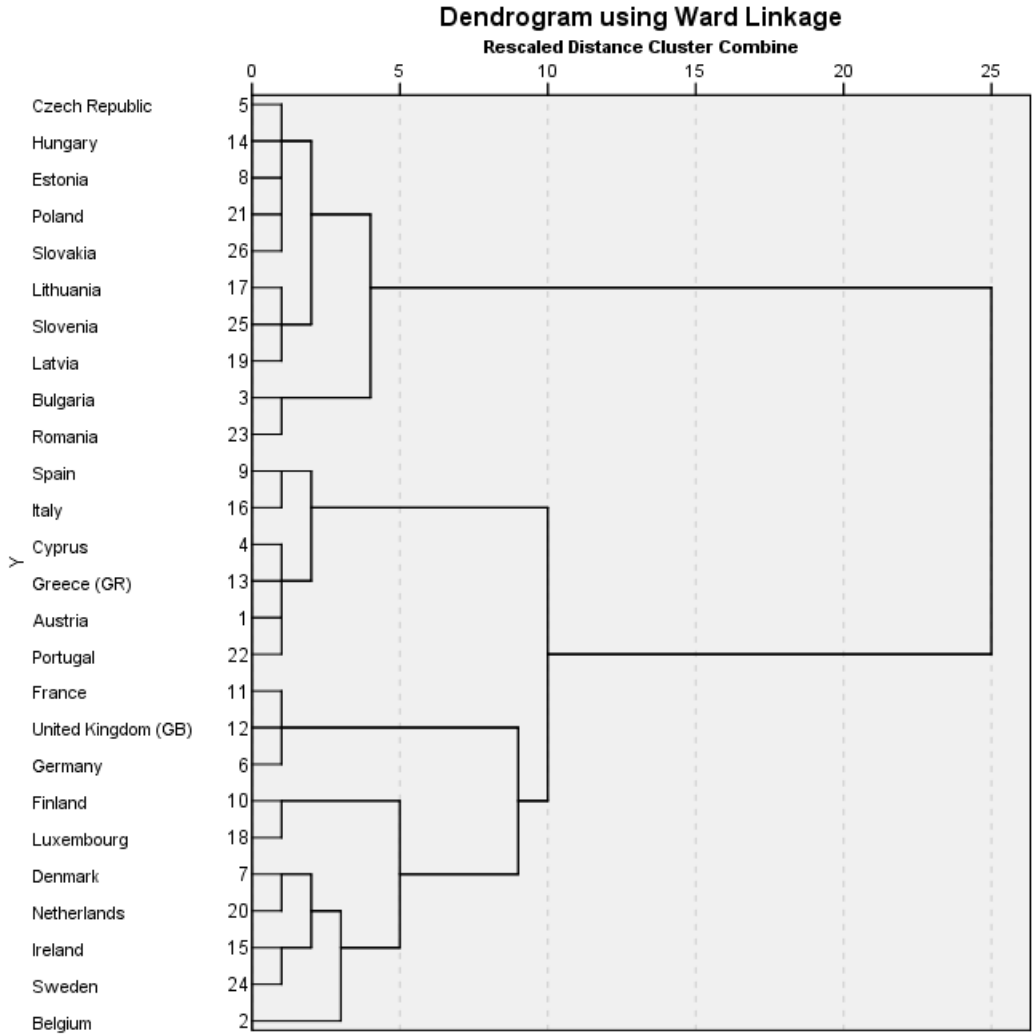


Cluster Membership

Case	3 Clusters
1:Austria	1
2:Belgium	1
3:Bulgaria	2
4:Cyprus	1
5:Czech Republic	2
6:Germany	1
7:Denmark	1
8:Estonia	3
9:Spain	1
10:Finland	1
11:France	1
12:United Kingdom (GB)	1
13:Greece (GR)	1
14:Hungary	2
15:Ireland	1
16:Italy	1
17:Lithuania	3
18:Luxembourg	1
19:Latvia	3
20:Netherlands	1
21:Poland	2
22:Portugal	1
23:Romania	2
24:Sweden	1
25:Slovenia	1
26:Slovakia	2

Source: own construction

Appendix 6 Cluster dendrogram and memberships (2008)



Cluster Membership

Case	3 Clusters
1:Austria	1
2:Belgium	2
3:Bulgaria	3
4:Cyprus	1
5:Czech Republic	3
6:Germany	2
7:Denmark	2
8:Estonia	3
9:Spain	1
10:Finland	2
11:France	2
12:United Kingdom (GB)	2
13:Greece (GR)	1
14:Hungary	3
15:Ireland	2
16:Italy	1
17:Lithuania	3
18:Luxembourg	2
19:Latvia	3
20:Netherlands	2
21:Poland	3
22:Portugal	1
23:Romania	3
24:Sweden	2
25:Slovenia	3
26:Slovakia	3

Source: own construction

Appendix 7 Changes in cluster memberships

2012

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	13	.1	50.0	50.0
	2	11	.1	42.3	92.3
	3	2	.0	7.7	100.0
	Total	26	.2	100.0	
Missing	System	16355	99.8		
Total		16381	100.0		

2013

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	.0	26.9	26.9
	2	11	.1	42.3	69.2
	3	8	.0	30.8	100.0
	Total	26	.2	100.0	
Missing	System	16355	99.8		
Total		16381	100.0		

2011

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	.0	26.9	26.9
	2	11	.1	42.3	69.2
	3	8	.0	30.8	100.0
	Total	26	.2	100.0	
Missing	System	16355	99.8		
Total		16381	100.0		

2010

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	.1	42.3	42.3
	2	11	.1	42.3	84.6
	3	4	.0	15.4	100.0
	Total	26	.2	100.0	
Missing	System	16355	99.8		
Total		16381	100.0		

2009

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	17	.1	65.4	65.4
	2	6	.0	23.1	88.5
	3	3	.0	11.5	100.0
	Total	26	.2	100.0	
Missing	System	16355	99.8		
Total		16381	100.0		

2008

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	.0	23.1	23.1
	2	10	.1	38.5	61.5
	3	10	.1	38.5	100.0
	Total	26	.2	100.0	
Missing	System	16355	99.8		
Total		16381	100.0		

Source: own construction

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 128−142.

8. Short and medium term fiscal sustainability in Poland in comparison with the V4 Group

Marianna Sávai

Nowadays, sustainability and sustainable growth are an often mentioned concept. In connection with the financial crisis, the budget and fiscal policy sustainability has been the forefront of research. This study took its advice and follows a simple intertemporal budget constraint and calculate primary gap in some selected years (2004, 2009, 2014) and testing assumptions for short-term and medium term selected periods (2000–2004, 2005–2009, 2010–2014) in Poland in comparison with the Visegrad Group Countries.

Result of examination is fiscal stance of V4 countries was varied. Based on most of estimated results the short-term fiscal policy stances of V4 seem to be unsustainable, but in medium-term seem to be sustainable particularly in Poland. Poland has good results thanks to continuous economic growth, stable and renewable fiscal policy and large domestic market.

Keywords: fiscal sustainability, fiscal debt, fiscal gap, Poland

1. Introduction

Nowadays, sustainability and sustainable growth are an often mentioned together. In connection with the financial crisis, the budgetary and fiscal policy sustainability has been the forefront of research. Based on the definition of fiscal sustainability is very difficult to understand. The study used a boarder scope in understanding this concept: *"concept of fiscal sustainability relates to a government's ability to indefinitely maintain the same set of policies while remaining solvent"* (Burnstein 2005, p. 10).

Poland is a member of the Visegrad Group (V4). Visegrad Group Countries means Czech Republic, Hungary, Poland, and Slovakia. Declaration on Cooperation between the Czech and Slovak Federal Republic, the Republic of Poland and the Republic of Hungary in Striving for European Integration signed in Visegrad on 15 February 1991. Visegrad Group is more homogenous group than European Union. V4 have been sharing traditional and intellectual values and common roots, so they are good benchmark of public finance sustainability too.

Aristovnik and Berčič (2007) examined transition economies with a specific intertemporal budget constraint, whereas their results indicate that fiscal sustainability seems to be a problem in many transition countries, for example Poland. The study follows this methodology with some modifications. Present paper revolves around the specialties of

intertemporal budget constraint and underlines the most important elements of long run fiscal sustainability in terms of pension payment obligations and health care outlays for the elderly which are consequences of the aging population and the lower fertility rate (Orban − Szapary 2004, McHugh et al. 2011).

The paper is organized as follows: chapter 2 gives a theoretical background where literature about fiscal sustainability is summarized and examine some macroeconomic connection factors in Poland with comparison in Visegrad Group Countries are examined. Chapter 3 deals with the methods of the empirical examination of the current study. Chapter 4 includes data and results by empirical examination and the last chapter 5 constitutes the conclusion.

2. Theoretical background

The literature defining to the concept of fiscal sustainability multiple point of view. The first approach for fiscal sustainability threshold defining by Buitler (1985) or Blanchard (1990). They said that the fiscal policy is sustainable if debt to GDP ratio is stable. Stable means long run stability. The following summarize that some author's claim on the subject.

2.1. General about fiscal sustainability

Barro (1979) examines empirical data for the U.S, and finds that a positive effect on debt issue of temporary increases in government spending (as in wartime) and a countercyclical response of debt to temporary income movements, and a one-to-one effect of expected inflation on nominal debt growth.

Bohn (1998) defined a new intertemporal budget constraint in U.S. fiscal data, and shows that an estimated positive response of primary surpluses to the debt/GDP ratio. Demonstrated that the frequent primary budget deficits do not provide convincing evidence against sustainability, because at low interest rates, a variety of sustainable policies will display primary deficits on average and potentially for long periods.

According to the European Commission's Fiscal Sustainability Report *"sustainability of fiscal policies is the ability to continue now and in the future, current policies without change regarding public services and taxation, without causing the debt to rise continuously as a share to GDP"* (EC 2012, p. 17). In Euro Zone, fiscal sustainability threshold is defined debt to GDP ratio of 60% by Stability and Growth Pact (SGP), but after the financial crisis the

average of debt ratio is much higher than 60% and continued the growth, 92.1% in 2014 based on Eurostat (2016).

Menguy (2008) draws attention the fact on the disadvantages of SGP due to its nature that it focuses on a uniform short-term criterion for the budgetary situation of the European countries (i.e. the current budgetary deficit) rather than on the long run solvability of aforementioned countries. So he suggests a new budgetary rule, that taking into account the long run sustainability of the public indebtedness and encouraging EU countries to lead healthy budgetary policies in good times in order to secure more leeway in bad times, instead of inefficient and pro-cyclical policies.

According to Cottarreli and Moghadam (2011) the anchor for fiscal policy of 60 percent of GDP is relatively close to the most recent estimates of long-run debt levels for both advanced economies and emerging economies. However, they declares that it should not be stick to this reference value, researchers should look at a variety of special circumstances and based on their information to assess the fiscal sustainability of a country.

2.2. Macroeconomic background in V4

V4 countries defined transition economies[1] too, became independent in 1989/1990 for Soviet Union and begun a long transition process what means liberalization, macroeconomic stabilization, restructuring and privatization and legal and institutional reforms (IMF 2000). Their deep changes are much more difficult and time-consuming because they involved structural reforms and require a major modification of attitudes, incentives, and relationships (Tanzi 1999). Advantages of post socialist economic change in V4 have greater independence from political control, the enhanced well-being of consumers through better-quality and easier access to goods and services.

Disadvantages of transition have decline in the sense of economic security, the end of full employment and increased social inequalities (Domański 2003). Policymakers must face large fiscal deficits and macroeconomic problem, theirs became a more fundamental problem when governments to renege on their legal contracts by sequestering or freezing payments across the board (Tanzi 1999). Social safety net in helping overcome political constraints is

[1] Transition economies in Europe and the former Soviet Union: Albania, Bulgaria, Croatia, Czech Republic, FYR Macedonia, Hungary, Poland, Romania, Slovak Republic, Slovenia, Estonia, Latvia, Lithuania, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Transition economies in Asia: Cambodia, China, Laos, and Vietnam (IMF 2000).

quiet clear and has helped mitigate negative effect of income inequality in Poland and the Czech Republic (Roland 2002).

Transition meant a unique opportunity for these countries to put down an anchor in Western Europe (Roland 2002). Aspirations of the V4 countries that adopted tight fiscal policies were more successful with their inflation stabilization programs, have experienced a faster recovery of growth, and did not experience a steeper decline in output. Countries floated their exchange rate, but there were both floating and peg arrangements among the successful stabilizers (Budina – Van Wijnbergen 1997). V4 joined to European Union in 2004.

Visegrad countries in the first decade of EU membership were divided into three parts by Vida (2015). The post-accession and pre-crisis years (2004–2008) when macroeconomic trends improved mostly but diverging degrees except Hungary where deteriorated. The crisis years (2009–2013) meant stagnation or low growth, recession, gradual recovery and slow consolidation. Hungarian public finances were became extremely vulnerable because of crisis and previously misguided fiscal policy, thus Hungary had to start fiscal stabilization earlier than the other three countries. Finally the post-crisis years (2014 and beyond) characterized by harmonious converging trends to each other and EU averages.

The stabilizing public finance trends are coupled with stabilizing monetary trends too. Thanks to a mix of measures aiming at spreading the burdens across all the actors of the economy, Hungary could be released from the excessive deficit procedure in 2013, the Czech Republic and Slovakia followed it in 2014 and Poland in 2015 (EC 2016). In all four countries seem to keep budget deficits under 3% also in the medium run. Simultaneously, public debts are slowly declining in high-rate Hungary while are kept below 60% of GDP in the other three Visegrad countries (Vida 2015).

Despite the success of the transition process some differences between old and new members of European Union remained the same. Orban – Szapary (2004) focus on new members[2] and SGP criterions and emphasize that there are large differences in the starting fiscal positions of the new members.

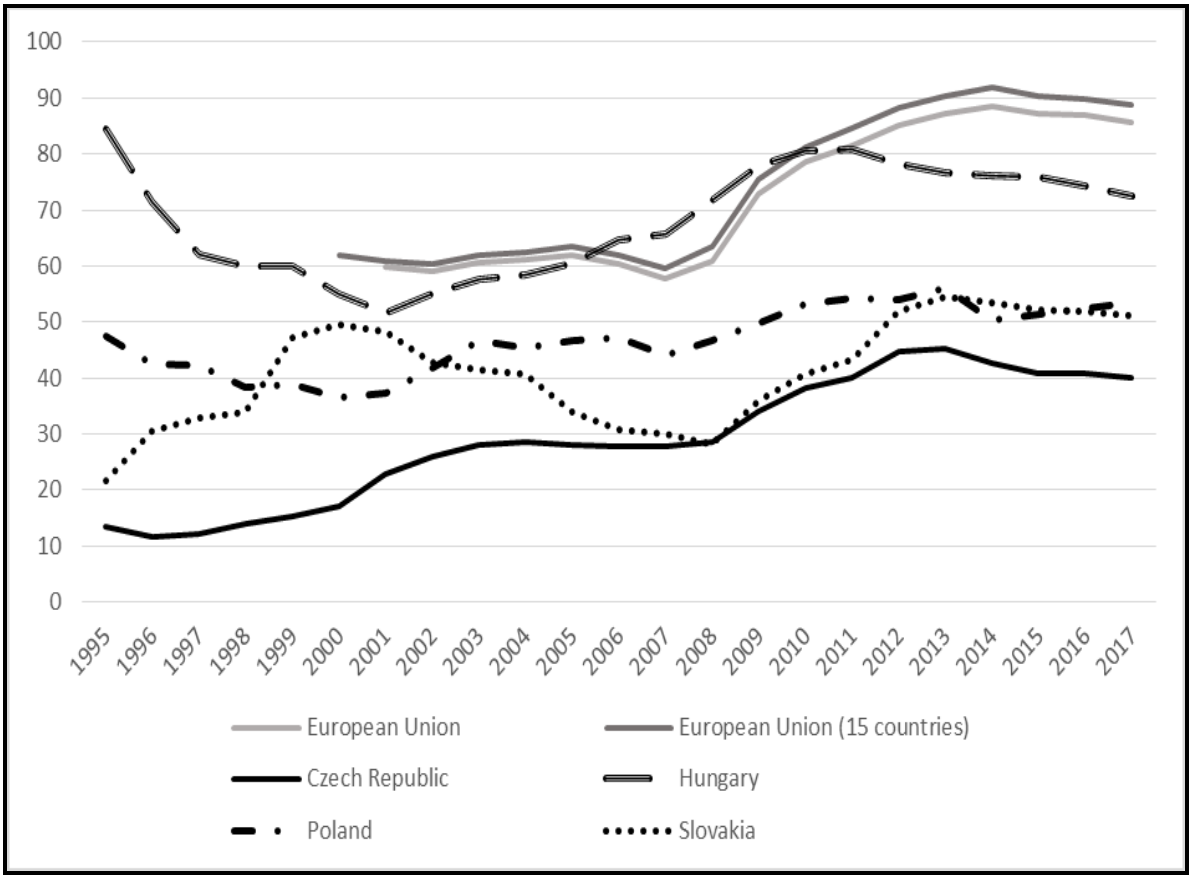
Figure 1 shows government debt data in V4 countries and European Union and European Union (EU) 15 countries[3] (EU-15) averages. No more difference between two EU averages, all EU averages are a little bit lower than EU-15 averages, data available until 2000.

[2] New members means countries who joined to European Union in 2004: Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovenia, and Slovakia.

[3] EU 15 countries means Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

The highest data have for Hungary from V4 countries, but in period 2000–2005, debt of V4 countries were under the EU averages, this during this period, transition economies' convergence became stronger (Veugelers – Mrak 2009). After crisis trends of debt was increased and reach a peak in 2010 in Hungary and in 2013 in other V4 countries. In EU was not stopped increase of debt until 2014.

Figure 1 General government consolidated gross debt in V4 countries and European Union, 1996-2017 (Percentage of GDP)



Source: AMECO (2016)

In this paper the focus is especially on intertemporal budget constraint in short and medium term, but also underlines the most important elements of long run fiscal sustainability, which are pension payment obligations and health care outlays for the elderly due to population ageing and the current fertility rate (Orban – Szapary 2004, McHugh et al. 2011). Furthermore, fiscal policies have been driven by political factors, this connection is examined for example by Roubini and Sachs (1989), Alesina et al. (1996), Wyplosz (2007),

Mauro et al. (2015). During the last decade fiscal councils[4] were established in some countries, for example in Hungary and in Slovakia, but due to space limitations, we do not deal with this in the current study.

2.3. Macroeconomic background in Poland

Poland's transition path is named "success stories". This partly thanks to have powerful social networks, including the Catholic Church and the Solidarity trade union. At the beginning of transition real GDP was fallen of about 20 percent in the two years after price liberalization started in 1989, but recovered growth rather quickly and exceeded its pretransition real GDP level after six or seven years of transition (Roland 2002).

In 1990s has been a dark side of transition that regional differentiation has deepened: opportunities are not equal for everyone and do not emerge everywhere. There is a variety of historically rooted regional and local trajectories within the country. Indicates the extensive spread of growth within broad metropolitan areas. GDP per capita represented about 22 percent for the EU average (at purchasing-power standards) in 1990, and 10 years later no more than 40 percent. Poland's share in world exports remains low and the trade balance negative (Domanski 2003). If we show data of economic growth for the past 20 years, conclude continuous lifting what thanks to increasing labor productivity and inflow FDI.

Poland has attained living standards never seen before. (Zimny 2015).

When Poland entered the European Union deficit was higher than reference value of 3% of GDP, therefore European Commission recommended the Council launch the excessive deficit procedure. The government has done everything to reduce the deficit, the efforts proved successful, deficit was 6.3% in 2003 and decreased to 2% in 2007. Economic growth was slowed by crisis. In 2009 the deficit exceeded threshold (Kawecka-Wyrzykowska 2015). In 2015 July Council abolished excessive deficit process (EC 2016).

Poland was the only EU country to avoid recession in 2009 and to record relatively good economic indicators (relatively good economic management, inflow of EU funds, flexible domestic currency and a large domestic market) and fiscal stability excluded deficit, which was in contrast to other EU members' deep instability. Government introduced reform

[4] Fiscal council *"stands for such a new, smaller or bigger body (consisting of a minimum of three members but could incorporate as many as two dozen) the members of which are people of high professional prestige who are independent from the government or the national assembly, operating with a background of analytical capacities that enable them to prepare alternative evaluations, forecasts or technical projections versus the macroeconomic calculations and forecasts of the government and, thanks to their respect, are also able to assert their opinions"* (Kovacs 2014, p. 338)

pack, established Open Pension Funds (OFE), which will result in a substantial one-off improvement (surplus) in the Polish budget in 2014. Another new element is a proposal for a Tax Council which contributes to maintaining fiscal stability. The government joint to European Semesters, the Euro-Plus Pact and the Fiscal Compact, so that strengthen economic governance and reduce the risk of a future crisis (Kawecka-Wyrzykowska 2015).

Wójtowicz (2015) draw attention the local budgets became dependent on external transfers from the state budget and this connection may be a menace to the fiscal sustainability of local authorities. System of state grants and subsidies are not flexible and react very strongly to economic fluctuations. Local authorities have very limited fiscal autonomy which constrict their instruments to stimulate future economic growth. This problems have to improve in the future that no jeopardy fiscal stability.

3. Methods

According to Wyplosz (2007) we could not apply sophisticated forecasting methods, because sustainability depend on the future so we could not draft a statement with high security about primary surpluses. Solvency, and therefore sustainability as it builds upon solvency, is entirely forward-looking. There are future balances that matter, not the past and not just the current debt level. Based on the difficult and sophisticated models' needs huge data demands so the paper to focus on clear and simple indices, what easily interpreted, suggested by Blanchard et al. (1990) and Cruz-Rodríguez (2014).

Indicators for measuring fiscal sustainability are very different. One of the traditional indicators is debt to GDP ratio, it has been used Buiter (1985) and Blanchard (1990), Fatas and Mihov (2008), and nowadays D'Erasmo (2015). Blanchard calculates the "tax gap", which is the change in the tax ratio that would be necessary to stabilize the current debt-to-GDP ratio. Barta (2015) emphasizes that 'tax gap' is not equal to a primary gap, because primary gap given the current interest and growth rates might still threaten solvency if interest rates rise and/or growth rates drop. Primary gap indicators provide a diagnosis that is easy to interpret, because they show how painful the adjustment would need to be to stabilize the debt today.

Spaventa's (1987) primary gap indicators impose a condition that is neither necessary nor sufficient for the sustainability of fiscal policies. A country will have a sustainable fiscal regime if current and future primary balances, interest rates, and growth rates, are such that the government's intertemporal budget constraint is satisfied (Drudi – Pratti 2000).

The tax gaps indices, are based on a comparison of the current debt-GDP ratio and that n periods ahead with given fixed values of the deficit and discount rate (Polito – Wickens 2012).

More recently, the European Commission (2006) has formulated two fiscal indicators: S1 and S2. Both are based on official projections of government expenditure what include the effects of population ageing. The S1 indicator comprise just the Maastricht condition what maximum debt should be 60% of GDP, while the S2 indicator requires that the government inter-temporal budget constraint be satisfied over an infinite horizon. European Commission (2009, 2012) modified S1 and S2 indicators methods, that to further promote sustainability measurement.

Aristovnik and Berčič (2007) examined transition economies with a specific intertemporal budget constraint. The study follow this methodology with some modification. The reason for changes that my paper not examine long-term sustainability, because there are too many uncertain factors in this time horizon and their enumeration exceeds length limit.

Criterion is related to so called fiscal primary gap, which is the difference between the actual fiscal primary balance and the primary balance required to stabilize the debt to GDP ratio. Simple accounting identity helps shed light on the fiscal sustainability issue (Aristovnik – Berčič 2007).

According to Geithner (2002) solvency is only necessary not sufficient assumption fiscal sustainability but a non-increasing government debt to GDP ratio is seen as a practical sufficient condition for sustainability, because a government is likely to remain solvent as long as the ratio is not growing. Hemming and MacKenzie (1991) the (short-term) budget constraint is:

$$\Delta D_t/Y_t = (r_t - g_t)\, D_{t-1}/Y_t + B_t/Y_t + R_t/Y_t \qquad (1)$$

where D_t is total public debt, Y_t nominal GDP, r_t represents the real interest rate and g_t the real economic growth rate, B_t is nominal primary (negative) balance of the public sector, in study empirical means the gap between non-interest expenditure and total revenue and R_t residual factor. When $r_t > g_t$ this indicated upward pressure on the debt/GDP ratio, while $r_t < g_t$ indicates downward pressure. The remaining part of the right-hand area indicates non-interest flows of government. If it is negative, government runs a primary surplus, implying downward pressure on the debt/GDP ratio. If it is positive, government runs a primary deficit, putting upward pressure on the debt/GDP ratio (Aristovnik – Berčič 2007, p. 6).

If the debt/GDP ratio depends on the relationship between the interest rate (r), and the economic growth rate (g), we can use (2) and (3) formula.
First can be presented as if g > r:

$$D_t/Y_t = -b\left(\frac{1+g}{g-r}\right) \tag{2}$$

Second as if r > g:

$$D_t/Y_t = -b\left(\frac{1+g}{g-r}\right)\left(\frac{1+r}{g+r}\right)^t + b\left(\frac{1+g}{g-r}\right) + \left(\frac{1+r}{g+r}\right)^t D_0/Y_0 \tag{3}$$

where $b=B_t/Y_t$ is primary deficit a constant ratio of GDP, the overall public deficit ratio is not constant.
The sustainable primary surplus, which can be presented as

$$\left|-b\left(\frac{1+g}{g-r}\right)\right| > |D_0/Y_0| \tag{4}$$

Sustainable primary surplus, which can be presented as

$$-B_t/Y_t = (r_t - g_t)\, D_{t-1}/Y_t \tag{5}$$

Although this study did not calculate, but can measure the long-term tax gaps (Blanchard, 1990) and the sustainable conventional public balance needs alternative indicator, which sustainable budget deficit (GOVBt) is derived from equation (5) and equals the growth rate multiplied by the debt ratio:

$$-GOVB_t/Y_t = (r_t - g_t)\, D_{t-1}/Y_t - rD_{t-1}/Y_t = -gD_{t-1}/Y_t \tag{6}$$

As alternative the medium-term tax gap (t*n – t) can be taken, where the real interest rate, real economic growth rate and the projected path of no-interest expenditure are taken as given. In this respect, the required tax rate necessary to stabilize the debt/GDP ratio is as follows (Blanchard, 1990):

$$t_t^* = \sum(\exp + trf)/n + (r-g)\, D_0/Y_0 \tag{7}$$

where exp, trf and n state for government expenditure, transfers (both as a ratio to GDP), and the numbers of years over which govexp and trf are incurred, respectively. However, equation (7) holds if the values of n and (r – g) are not large.

4. Data and results

First, we estimate public finance sustainability for V4 economies, Czech Republic (CZE), Hungary (HUN), Poland (POL), and Slovakia (SVK). For short-term examination for the chosen three years: 2004, 2009, and 2014 for medium-term used the average of 5 years (2000–2004, 2005–2009, 2010–2014). Source all of data were from the AMECO (2016) database. Examination was built on the following key variables:

- the equilibrium level of public debt (D/Y) with nominal data, alternatively, it is assumed for all sampled economies that governments are comfortable tolerating a debt ratio of 60 percent (D/Y*);
- for short-term used the nominal interest rate (i) and nominal (g_n) growth;
- for medium-term used the real interest rate (r) and public debt (D/Y) and growth rate of real GDP (g).

The results of examination summarize below (Table 1 and Table 2).

Table 1 Short-term fiscal sustainability in V4 countries, 2004, 2009, 2014 (Percentage)

				Calculated (short-term) primary public balance $((i-g_n)/(1+g_n))*(D/Y)$				
	Public Debt (D/Y)	**Growth rate of nominal GDP (g_n)**	**Nominal interest rate (i)**	**Actual public debt assumption**	**Targeted public debt assumption (60%)**	**Actual primary public balance (-b)**	**Diff. (actual-calculated (actual public debt assumption)**	**Diff. (actual-calculated (targeted public debt assumption)**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2004								
CZE	28.5	9.2	4.8	–1.1	–2.4	–1.6	–0.5	0.7
HUN	58.5	10.2	8.2	–1.1	–1.1	–2.0	–0.9	–0.9
POL	45.3	9.6	6.9	–1.1	–1.5	–2.4	–1.3	–0.9
SVK	40.6	11.3	5.0	–2.3	–3.4	–0.2	2.1	3.2
2009								
CZE	34.1	–2.3	4.8	2.5	4.4	–4.3	–6.8	–8.7
HUN	78.0	–2.9	9.1	9.6	7.4	–0.1	–9.7	–7.5
POL	49.8	6.6	6.1	–0.2	–0.3	–4.8	–4.6	–4.6
SVK	36.0	–6.6	4.7	4.4	7.3	–6.4	–10.8	–13.7
2014								
CZE	42.7	4.5	1.6	–1.2	–1.7	–0.6	0.6	1.1
HUN	76.2	7.0	4.8	–1.6	–1.2	1.5	3.1	2.7
POL	50.4	3.8	3.5	–0.1	–0.2	–1.4	–1.3	–1.2
SVK	53.5	2.3	2.1	–0.1	–0.2	–0.9	–0.8	–0.8

Source: own construction

In Table 1, the first three columns (1-3) show the relevant magnitudes (public debt/GDP ratio, nominal rate of growth, and nominal interest rate for V4) for the calculation of sustainable level of primary public balance. Thus, column 4 and 5 show the computation of equation (2). Columns 7 and 8 show the gap between the corresponding calculated (columns 4 and 5) and actual primary fiscal balance (column 6). Since each year's deficit goes to increase the outstanding public debt, the higher is the (positive) gap between actual fiscal deficit and hypothetical fiscal deficit, the higher the speed at which the public debt decreases (Aristovnik – Berčič 2007).

In 2004 actual and calculated sustainable fiscal levels seem to be the same in Hungary and Poland. On the other hand, if we take into considerations the targeted public debt (60 percent of GDP), the calculated (permitted) average fiscal deficit is relatively higher and the gap between the actual and the calculated deficit amounts to 0,9 percentage points in Poland and Hungary, but we can see that Czech Republic's and Slovakia's results in actual primary public balance is lower than targeted. The short-term fiscal policy stances of Hungary and Poland seem to be unsustainable.

In 2009, one year after the global financial crises, nominal (and real) GDP growth of V4 became negative, except for Poland, because it has a large domestic market. If we show real GDP growth rate data in Poland, it is increasing with 2.6% (AMECO 2016). Actual and the calculated public debt difference is high and the message that the countries engaged in unsustainable fiscal policies, but we expected similar outcome. If we show time series of real and nominal GDP growth, 2009 was the worst year.

In 2014, five years after the global financial crises, nominal (and real too) GDP growth of V4 became positive. Public debt was high in Hungary, but the threshold (60 percent of GDP) was not crossed by the Czech Republic, Poland and Slovakia. In this year the short-term fiscal policy stances of Poland and Slovakia seem to be unsustainable.

Table 2 shows results of medium term. In Table 2, first three columns (1-3) show the relevant magnitudes (public debt/GDP ratio, real rate of growth, and real interest rate for V4) for the calculation of sustainable level of primary public balance (Columns 4-7). Column 8 show the public debt forecast after five years and we could be in comparison with real data Column 9 shows real public debt after five years. And column 10 is shows public debt calculations by Aristovnik – Berčič (2007).

Table 2 Medium-term fiscal sustainability in V4 countries, 2000-2014 (Percentage)

				Calculated (medium-term) primary public balance ((r-g)/(1+g))*(D/Y)						
	Public Debt (D/Y)	**Growth rate of real GDP (g)**	**Real interest rate (r)**	**Actual public debt assump-tion**	**Targeted public debt assump-tion**	**Actual primary public balance**	**Diff. (actual-calc. (actual public debt assump-tion)**	**Public debt (D/Y) after 5 years calc.**	**Public debt (D/Y) after 5 years real**	**Public debt (D/Y) after 5 years calc. by Aristov-nik – Berčič (2007)**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2000-2004										
CZE	24.5	3.5	1.8	–0.4	–1.0	–3.8	–3.4	51.2	34.1	43.7
HUN	55.6	4.3	–0.2	–2.4	–2.6	–1.7	0.7	78.5	78.0	61.3
POL	41.5	3.3	5.1	0.7	1.1	–1.9	–2.6	59.1	49.8	55.1
SVK	44.6	3.9	0.7	–1.4	–1.9	–2.8	–1.4	45.4	36.0	52.8
2005-2009										
CZE	29.3	3.3	2.4	–0.3	–0.6	–1.7	–1.4	49.7	42.7	–
HUN	68.1	0.6	3.4	1.9	1.7	–1.8	–3.8	90.6	76.2	–
POL	46.9	4.7	2.4	–1.0	–1.3	–1.9	–0.8	57.3	50.4	–
SVK	31.8	5.2	2.7	–0.7	–1.4	–2.3	–1.6	52.5	53.5	–
2010-2014										
CZE	42.1	1.0	2.1	0.5	0.7	–1.5	–2.0	46.3	–	–
HUN	78.5	1.3	3.7	1.9	1.5	0.9	–1.0	78.0	–	–
POL	53.6	3.0	3.0	0.0	0.0	–2.2	–2.2	52.5	–	–
SVK	48.8	2.7	2.9	0.1	0.1	–2.5	–2.6	60.7	–	–

Source: own construction based on Aristovnik and Berčič (2007)

Based on 2000–2004 averages the five years forecasts of debt (Column 8) are higher than real data (Column 9) in Czech Republic, Slovakia and Poland. Estimated values by Aristovnik – Berčič (2007) are higher than real values, too. Own calculation debt similar real debt in Hungary, Aristovnik – Berčič (2007) underestimated public debt in Hungary.

Based on 2005–2009 averages the five years predictions of debt (Column 8) are underestimated real data (Column 9) in Czech Republic, Hungary and Poland. Estimation of Aristovnik – Berčič (2007) was finished in 2004 and not concerned this period so could not comprised results.

Based on 2009–2014 averages the five years estimations of debt (Column 8) are prognostic decrease in Poland, increase in Czech Republic and Slovakia. The deficit values became positive in this period. Results shows sustainable medium-term fiscal policy stance for V4.

5. Conclusion

In last years the financial crisis placed budgetary and fiscal policy sustainability on centre stage of researches, but defining of the fiscal sustainability is hard yet, because it depends on the horizon and many difference indicators. Researchers made and used more difficult models for examination of fiscal sustainability year by year, but newest studies according to the simplest models work best and give accurate forecasting results. This study took this advice and followed a simple intertemporal budget constraint and calculated primary gap in the selected years and periods and testing assumptions for short-term and analysed public debt at medium-term. Examination based on Poland and in comparison on three European countries: Czech Republic, Hungary and Slovakia, who namely together Visegrad Group.

Results of the examination shows that fiscal stance of V4 countries were varied. In short-term results Poland and Hungary seem to be unsustainable fiscal policy in 2004. In period 2000–2004, own calculation to debt similar real debt in Hungary, while Aristovnik and Berčič (2007) underestimated public debt in Hungary.

In 2009, the effects to the global financial crisis in Czech Republic, Hungary and Slovakia too seem to be unsustainable, but Poland kept fiscal sustainability, thanks to its large internal market. In 2014, the threshold of public debt went under 60% of GDP in V4 countries except Hungary, but the short-term fiscal policy stance of Poland and Slovakia seem to be unsustainable. Based on results of medium-term sustainable medium-term fiscal policy stance in examined countries but Poland has best positions in comparison others.

Acknowledgement

This is paper has been prepared under financial support of Pallas Athéné Domus Scientiae Foundation, which author gratefully acknowledge. The author would like to thank Árpád Kovács, Gábor Dávid Kiss, Balázs Kotosz and Anita Kéri for their most useful comments and suggestions.

References

Alesina, A. – Özler, S. – Roubini, N. – Swagel, P. (1996): Political instability and economic growth. *Journal of Economic growth*, 2, pp. 189–211.

AMECO (2016): AMECO Database. Available: http://ec.europa.eu/economy_finance/ameco/user/serie/SelectSerie.cfm Accessed: 20.02.2016.

Aristovnik, A. – Berčič, B. (2007): *Fiscal sustainability in selected transition countries*. Personal RePEc Archive, Munich. Available: https://core.ac.uk/download/files/432/12011586.pdf Accessed: 20.02.2016.

Barro, R. J. (1979): On the determination of the public debt. *The Journal of Political Economy*, 5, pp. 940–971.

Barta, Zs. (2015): Fiscal sustainability and the welfare state in Europe. *ACRN Journal of Finance and Risk Perspectives Special Issue of Social and Sustainable Finance*, 3, pp. 135–147.

Blanchard, O. – Chouraqui, J. C. – Hagemann, R. P. – Sartor, N. (1990): The sustainability of fiscal policy. New answers to an old question. *OECD Economic Studies*, 15, pp. 7–37.

Blanchard, O. J. (1990): Suggestions for a new set of fiscal indicators. *OECD Economics Department Working Papers*, 79.

Bohn, H. (1998): The behavior of U.S. public debt and deficits. *Quarterly Journal of Economics*, 3, pp. 949–963.

Budina, N. – Van Wijnbergen, S. (1997): Fiscal policies in Eastern Europe. *Oxford Review of Economic Policy*, 2, pp. 47–64.

Buiter, W. H. (1985): A guide to public sector debt and deficits. *Economic policy*, 1, pp. 13–61.

Burnside, C. (2005): *Fiscal sustainability in theory and practice: a handbook*. World Bank Publications, Washington D.C.

Cottarreli, C. – Moghadam, R. (2011): *Modernizing the framework for fiscal policy and public debt sustainability analysis*. International Monetary Fund, New York.

Cruz-Rodríguez, A. (2014): Assessing fiscal sustainability in some selected countries. *Theoretical & Applied Economics*, 6, pp. 7–22.

D'Erasmo, P. – Mendoza, E. G. – Zhang, J. (2015): What is a sustainable public debt? *NBER Working Paper*, 21574.

Domański, B. (2003): Industrial change and foreign direct investment in the postsocialist economy. The case of Poland. *European Urban and Regional Studies*, 2, pp. 99–118.

Drudi, F. – Prati, A. (2000): Signaling fiscal regime sustainability. *European Economic Review*, 10, pp. 1897–1930.

EC (2006): The long-term sustainability of public finances in the European Union. European Commission, *European Economy*, 4.

EC (2009): Sustainability report. European Commission, *European Economy*, 9.

EC (2012): Fiscal sustainability report. European Commission, *European Economy*, 8.

EC (2016): *Economic an financial affairs*. European Commission, Brussels. Available: http://ec.europa.eu/economy_finance/economic_governance/sgp/deficit/countries/poland_en.htm Accessed: 31.03.2016.

Eurostat (2016): Debt by currency of issue. Available: http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do Accessed: 31 March 2016.

Fatas, A. – Mihov, I. (2009): The euro and fiscal policy. *National Bureau of Economic Research Working Paper*, 14722.

Geitner, T. (2002): *Assessing sustainability*. International Monetary Fund, Washington D.C.

Hemming, R. – MacKenzie, G.A. (1991): Public expenditure and sustainable fiscal policy. In Chu, K. – Hemming, R. (eds): *Public expenditure handbook.* International Monetary Fund, New York, pp. 7–13.

IMF (2000): Transition Economies: An IMF Perspective on Progress and Prospects. International Monetary Fund, International Monetary Fund, Washington D.C. Available: https://www.imf.org/external/np/exr/ib/2000/110300.htm Accessed: 20.02.2016.

Kawecka-Wyrzykowska, E. (2015): Poland's position on EU governance trends. In Túry, G. (ed): *Prospects of the Visegrad Cooperation: Indentifying Converging and Diverging Factors*. Institute of World Economics, Budapes, pp. 31–60.

Kenourgios, D. – Samitas, A. (2007): Financial development and economic growth in a transition economy: evidence for Poland. *Journal of Financial Decision Making*, 1, pp. 35–48.

Kovács Á. (2014): Fiscal councils in the countries of Eastern-Central Europe. *Public Finance Quarterly*, 3, pp. 326–345.

Mauro, P. – Romeu, R. – Binder, A. – Zaman, A. (2015): A modern history of fiscal prudence and profligacy. *Journal of Monetary Economics*, 76, pp. 55–70.

McHugh, M. J. – Petrova, I. – Baldacci, M. E. (2011): Measuring fiscal vulnerability and fiscal stress: a proposed set of indicators. *International Monetary Fund Working Paper*, 11/94.

Menguy, S. (2008): A dynamic rule applied to the threshold imposed on the European budgetary deficits. *Journal of Policy Modeling*, 6, pp. 1093–1105.

Orban, G. – Szapary, Gy. (2004): The Stability and Growth Pact from the perspective of the new member states. *Journal of Policy Modeling*, 7, pp. 839–864.

Polito, V. – Wickens, M. (2012): A model-based indicator of the fiscal stance. *European Economic Review*, 3, pp. 526–551.

Roland, G. (2002): The political economy of transition. *The Journal of Economic Perspectives*, 1, pp. 29–50.

Roubini, N. – Sachs, J. D. (1989): Government spending and budget deficits in the industrialized countries. *Economic Policy*, 8, pp. 99–132.

Spaventa, L. (1987): The growth of public debt: Sustainability, fiscal rules, and monetary rules. *IMF Staff Papers*, 2, pp. 374–399.

Tanzi, V. (1999): Transition and the changing role of government. *Finance and Development*, 2, pp. 20–23.

Veugelers, R. – Mrak, M. (2009): The knowledge economy and catching-up member states of the European Union. *Report prepared for Commissioner's Potocnik's Expert Group "Knowledge for Growth"*. European Commission, Brussels, 49.

Vida, K. (2015): Past, present and future macroeceonomic trends of the Visegrad Countries: Heading towards more convergence. In Túry, G. (ed): *Prospects of the Visegrad Cooperation: Indentifying Converging and Diverging Factors*. Institute of World Economics, Budapest. pp. 143–168.

Wójtowicz, K. (2015): Major trends in the financing of sub-central governments between 1999-2013 and their impact on fiscal sustainability. *The Poznan School of Banking Research Journal*, 1, pp. 79–94.

Wyplosz, C. (2007): Debt sustainability assessment the IMF approach and alternatives. Graduate Institute of International Studies, *HEI Working Paper*, 3.

Zimny, Z. (2015): Inward FDI-Related Challenges to Poland's Further Economic Progress. *Journal of US-China Public Administration*, 11, pp. 845–875.

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*. University of Szeged, Doctoral School in Economics, Szeged, pp. 143–154.

9. Assessing the impact of the credit guarantee fund for SMEs in the field of agriculture - The case of Hungary

Thai Binh Dang

Credit guarantee has an important role in promoting the development of small and medium sized enterprises (SMEs). Especially many countries including Hungary applied the credit guarantee fund to promote SMEs in the field of agriculture and rural. This study aims to assess the impact of credit guarantee foundation through the case of Rural Credit Guarantee Foundation of Hungary for SMEs in the agricultural sector. In this study, the author used quantitative method to evaluate the impact of Rural Credit Guarantee Foundation for SMEs in reducing financial cost, increasing sales, increasing investment etc.

Keywords: SMEs, credit guarantee foundation, finance

1. Introduction

SMEs are an important part of the economy and the driving force for development of each country. However, in the process of development, SMEs face many difficulties and challenges, such as technology, management skills, problem of information asymmetry, quality workforce, competition, market, economic and financial crisis, etc. Among them one of the major difficulties of SMEs is accessing capital from banks and credit institutions. To solve this problem, the countries around the world have used different financial tools to help SMEs easily access finance. One of the effective financial instruments applied by more countries in the world is credit guarantee.

Credit guarantee institutions have played an essential role in the financial framework of the European economy (Leone et al. 2012). In some European countries, credit guarantee works fairly well, for instance Italy, Portugal and Hungary. In Europe and in the world, the credit guarantee system of Hungary is one of the largest credit guarantee systems with well-structured and long tradition. Besides, the credit guarantee system in Hungary is a model successfully applied in credit guarantee activities. The credit guarantee system of Hungary includes 3 major credit guarantee institutions: Garantiqa Creditguarantee Co. Ltd, Rural Credit Guarantee Foundation (AVHGA) and Venture Finance Hungary Private Limited Company. In particular, AVHGA was established by Ministry of Agriculture in 1991 with the aim of supporting farmer, SMEs in the agricultural sector easier access to finance and promote rural development.

2. Literature review

According to research by Levitsky (1997) credit guarantee scheme began appearing in the Philippines as far back as 1952, then appeared in Indonesia, Malaysia, Pakistan, Korea, etc in the 1970's; and Chile, Columbia, India and Thailand in the 1980's. And the first credit guarantee schemes were established in Europe in the 1840s (Deelen − Molenaar 2004). Until 2003, there were 2250 credit guarantee schemes existing and operated in 100 countries in the world (Green 2003). In particular, many countries chose the credit guarantee as a financial instrument to deal with the financial crisis in 2008. 19 of the 23 OECD countries used credit guarantee schemes as a support for SMEs to easily access finance and overcome financial crisis (Uesugi et al. 2010). Thus, it can be said that credit guarantee scheme has become a trend and it is applied in most of the countries around the world. So what is the reason for the rise of credit guarantee schemes in the world?

More researchers have shown that credit guarantee schemes were set up to help SMEs to resolve the difficulties in accessing finance from banks. The difficulties of SMEs in accessing finance from bank are due to the following reasons: (1) Lack of collateral, (2) Problem of information asymmetry, (3) High cost of lending to SMEs and (4) High risk in the process of lending to SMEs.

Although SMEs were recognized as an important sector that helps in creating jobs and are the driving force of economic development, but the process of developing SMEs face many obstacles, especially the limited access to finance. A research by the European Commission (2013) pointed out that one third of the SMEs survey did not manage to get the full financing they had planned for during 2013 and 15% of survey respondents saw access to finance as a significant problem for their companies. One of the main reasons for the access to finance from banks is the lack of collateral and this is a particularly important problem for start-ups and young SMEs.

Most start-up and SMEs when starting to do businesses tend to use their own resources, from family and friends and also from the other external funding sources such as banks. Therefore in order to develop, expand production and business, SMEs looks to external sources and mainly access bank financing. On the other hand, banks before lending to SMEs they often follow the precautionary principle and risk prevention. One of the requirements of banks when making lending to SMEs is to have collateral. Effective collateral will help SMEs to easily borrow money from the bank by reducing the risks and losses of the banks when providing loan based on good collateral (OECD 2013). However SMEs are

characterized by small scale, lack of capital, poor technical equipment, weak management capabilities and marketing etc. Therefore a lot of SMEs cannot access funds from banks because they do not meet the conditions for collateral. Moreover, banks are often restricted in the types of collateral that they accept (Deelen − Molenaar 2004). Many central banks in many countries have the regulations for the type of collateral and they do not accept some kind of collateral such as stocks, receivables, etc. Especially during the financial crisis, many countries collateral requirement increased significantly, and it affected the ability of SMEs to access credit. Thus it can be said that collateral is great challenge and obstacle for SMEs in process of accessing finance.

Beside the difficulty in meeting the requirements on collateral during accessing financing banks, SMEs still have trouble in getting loans from banks due to the problem of information asymmetry. Research by the European Bank Coordination Initiative (EBCI 2014) indicated that SMEs are more affected by credit rationing than larger companies, since the information asymmetry is more pronounced for SMEs. Information asymmetry is a big and serious problem that exists between SMEs and credit institutions. The existence of information asymmetry which affects the decisions of bank when lending to SMEs is due to the fact that the banks cannot assess creditworthiness of SMEs, as well as SMEs lack of relevant information, lack of financial records, credit history, etc. In addition, for SMEs evolving in the formal sector, the absence of accounting standards or, on the contrary, the excessive level of accounting information (Lifilleur 2009) also results to information asymmetry. The lack of information affects the decision of banks and credit institutions in the process of lending to SMEs. According to Stiglitz and Weiss (1981), asymmetric information can lead to adverse selection moral hazard.

The adverse selection occurs when information relating to borrowers, such as the effectiveness of the project, project risk, project plans and so on which are known more by the borrower rather than credit institutions. Therefore, the lenders who are in the relatively disadvantaged position are only able to raise interest rate to reduce potential risk of credit losses. The research by Stiglitz and Weiss (1981) pointed out that in order to protect them and to avoid adverse selection banks often raise the cost of bank debt or limit credit for SMEs when SMEs are not ready to get funds at higher price. In particular, for the SMEs with weak operations, increasing interest rate makes it difficult for them in accessing finance and they are not willing to pay higher interest rate. On the other hand, most of banks choose higher interest rates to avoid the risk of loans or rejecting loan demand of SMEs. Because of the relative weakness of SMEs compared with larger enterprises, banks often choose and prefer

to lend to larger enterprises. It is understandable that SMEs become the main targets to which "credit rationing" is administered. Many SMEs have been eliminated from market because of lack of access to loans. Thus, asymmetric information leads to adverse selection which makes it difficult for SMEs to access finance.

Besides, information asymmetry also leads to moral hazard because the banks cannot monitor the entire time of the borrower, business activity of the borrower and what purpose the borrower uses the loan for, etc. In addition, banks can not completely know and control whether the borrowers are willing to repay the loan or not? Thus, moral hazard leads to bad debt for banks and financial institutions making loans, especially loans for SMEs difficult. In order to reduce risk in the lending process and get profit, banks and credit institutions have implemented limited credit policy for SMEs. This policy reduces lending to SMEs to avoid moral hazard or banks can reduce lending thresholds for SMEs and collateral requirements from SMEs during the lending process. SMEs also have difficulty to come up with satisfying mortgages to the financial institution. Therefore, financial institutions may not dare to lend any loans to SMEs. In conclusion, asymmetric information leads to moral hazard, which would further exacerbate the financing difficulties of SMEs.

Due to the effects of information asymmetry, banks and credit institution spend more time and resources in monitoring SMEs than large enterprises. Banks need to supervise and monitor the actual situation of the borrower to ensure the safety and effectiveness of the loan as well as the prevention of fraud from borrowers. Therefore the bank desire to achieve much information about the borrowers as much as possible but the information related to the borrower will not be easy to achieve. In addition, information relating to borrowers is also very diverse such as financial statements, credit history, cash flows, business operations etc. In particular when borrowers are SMEs, it will be very difficult for the bank to obtain full information about them and also there are difficulties during routine monitoring. Most SMEs have weak accounting systems and non-standard, non-transparency rules, no distinction between company and personal assets etc. By contrast, large companies have more advantage in aspects such as the credit rating, valuable mortgage, etc. Also, they have relative transparency and accessibility of information. These advantages can effectively translate to total cost reduction in searching for information relating to a transaction object as well as supervision by banks. When the comparison of the cost, benefit and risk between large companies and SMEs, banks prefer lending to large enterprises, which reduces the loan to SMEs and aggravate the financing difficulty facing SMEs.

3. Methods

This study focuses on assessing the impacts of Rural Credit Guarantee Foundation for SMEs. Based on the purpose of the research, hypotheses are formulated at the beginning of the research and tested in the research. It is described by the following Table 1.

Table 1 Hypotheses of the research

Hypothesis	Description
H1	H0: There is no significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA HA: There is a significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA
H2	H0: There is no empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA HA: There is empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA
H3	H0: There is not a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA HA: There is a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA

Notes: (H0 = Null Hypothesis and HA = Alternate Hypothesis)
Source: own construction

I presented the hypotheses of my research as well as the methods that were applied to test the hypotheses. Also, it is used to analyze the impact of Rural Credit Guarantee Foundation for SMEs. From identifying hypotheses and methods as well as the content of the impact of Rural Credit Guarantee Foundation, the author started to do deep and detailed research on methods. The data needed were collected and compliance with the research.

In this research, the author use main econometric test methods will ensure better evaluation and its results are strong evidence, meaningful. To test the hypotheses, the author needs to determine what kind of methods suitable for applying. Because the data was collected from 50 companies during the 3 years from 2012 to 2014 so the data is panel data.

Therefore, Fixed effects model[1] or Random effects model[2] are appropriate methodology for testing. These hypotheses were tested with 0, 05 level of significance and were done by EVIEW. All hypotheses are tested and evaluated specific results which are presented in section 4.

4. Research results

4.1. Testing hypothesis 1.

H0: There is no significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA.

HA: There is a significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA.

In order to determine whether there is a strong positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA, a Fixed effects model was applied using EVIEW.

First, the author needs to check the Hausman ratio to choose which model (Fixed effects model or Random effects model) will be used. From the Table 2, we can observe that the Hausman ratio is 0.0000 < 0.05 therefore Fixed effects model was selected to test hypothesis.

Table 2 Hausman test for hypothesis 1

Hausman Test	
Chi-Sq. Statistic	22.560417
Chi-Sq. d.f	1
Prob	0.0000

Source: own construction

[1] In statistics, a fixed effects model is a statistical model that represents the observed quantities in terms of explanatory variables that are treated as if the quantities were non-random. In panel data analysis, the term fixed effects estimator (also known as the within estimator) is used to refer to an estimator for the coefficients in the regression model. If we assume fixed effects, we impose time independent effects for each entity that are possibly correlated with the regressors.

[2] In statistics, a random effects model, also called a variance components model, is a kind of hierarchical linear model. It assumes that the data being analyzed is drawn from a hierarchy of different populations whose differences relate to that hierarchy. In econometrics, random effects models are used in the analysis of hierarchical or panel data when one assumes no fixed effects. The random effects model is a special case of the fixed effects model.

From the Table 3. we can observe that R-squared is 0.996506 and its corresponding P value is 0.0002 < 0.05. Due to P value less than 5% we reject hypothesis H0 and accept hypothesis HA: There is a significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA.

Table 3 Test Hypothesis 1 by using Fixed effects model

Fixed effects model	
R-squared	0.996506
Coefficient	–0.007716
Prob (F-statistic)	0.0002

Notes: There is a significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA
Source: own construction

4.2. Testing hypothesis 2

H0: There is no empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA.

HA: There is empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA.

In order to determine whether there is empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from credit guarantee institutions in Hungary, a Fixed effects model was applied using EVIEW.

First, the author needs to check Hausman ratio to choose which model (Fixed effects model or Random effects model) will be used. From the Table 4. we can observe that the Hausman ratio is 0.0042 < 0.05 therefore Fixed effects model was selected to test hypothesis 2.

Table 4 Hausman test for hypothesis 2

Hausman Test	
Chi-Sq. Statistic	8.182772
Chi-Sq. d.f.	1
Prob.	0.0042

Source: own construction

From the Table 5. we can observe that R-squared is 0.926926 and its corresponding P value is 0.000000 < 0.05. Due to P value less than 5% we reject hypothesis H0 and accept

hypothesis HA: There is empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA.

Table 5 Test hypothesis 2 by using Fixed effect model

Fixed effect model	
R-squared	0.926926
Coefficient	0.000693
Prob (F-statistic)	0.000000

Notes: There is empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA.
Source: own construction

4.3. Testing hypothesis 3

H0: There is not a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA.

HA: There is a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA.

In order to determine whether there is a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from credit guarantee institutions in Hungary, a Fixed effects model was applied using EVIEW.

First, the author needs to check Hausman ratio to choose which model (Fixed effects model or Random effects model) will be used. From the Table 6. we can observe that the Hausman ratio is 0.0326 < 0.05 therefore Fixed effects model was selected to test hypothesis 3.

Table 6 Hausman test for hypothesis 3

Hausman Test	
Chi-Sq.	4.567985
Chi-Sq. d.f	1
Prob	0.0326

Source: own construction

From the Table 7. we can observe that R-squared is 0.940442 and its corresponding P value is 0.0062 < 0.05. Due to P value less than 5% we reject hypothesis H0 and accept hypothesis HA: There is a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA.

Table 7 Test Hypothesis 3 by using Fixed effects model

Fixed effects model	
R-squared	0.940442
Coefficient	–2.49E-07
Prob (F-statistic)	0.0062

Notes: There is a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA
Source: own construction

5. Conclusion

The main contribution of this research is to evaluating the impact of the Rural Credit Guarantee Foundation for SMEs in agriculture sector. Through the above analysis, this paper shows that AVHGA has significant impact in bringing many benefits to SMEs in agriculture sector such as reducing financial cost, increasing sales, and increasing investment. To achieve the objectives of this research, a quantitative research method was applied. By using quantitative research methods combined with the actual evidence, it will ensure that the result of this research is credible and valuable for utilization. Based on the literature review, data analysis and hypotheses testing, the following are the results of the finding and research:

Thesis 1.: There is a significant positive correlation between guarantee loans and sales of SMEs which received guarantee loans from AVHGA.

Thesis 2.: There is empirical evidence point out that guarantee loans can reduce financial cost of SMEs which received guarantee loans from AVHGA.

Thesis 3.: There is a strong positive correlation between guarantee loans and investment of SMEs which received guarantee loans from AVHGA.

References

Deelen L. − Molenaar K. (2004): G*uarantee Funds for Small Enterprises. A manual for guarantee fund managers*. International Labour Organisation, Geneva.

EBCI (2014): *Credit Guarantee Schemes for SME lending in Central, Eastern and South-Eastern Europe*. A report by the Vienna Initiative Working Group on Credit Guarantee Schemes. European Bank Coordination Initiative, Luxembourg.

EC (2013). *Report on the Access to Finance of Small and Medium-sized Enterprises (SAFE) in 2013*. European Commission, Brussels.

Green, A. (2003): *Credit Guarantee Schemes for Small Enterprises: An effective Instrument to Promote Private Sector-led Growth?* SME Technical Working Paper Series, UNIDO, Vienna.

Lifilleur, J. (2009): Financing SMEs in a context of strong information asymmetry. *Proparco's magezin*, 1.

Levitsky, J. (1997): Credit guarantee schemes for SMEs–an international review. *Small Enterprise Development*, 8, 2, pp. 4−17.

OECD (2013): *SME and Entrepreneurship Financing: The Role of Credit Guarantee Schemes and Mutual Guarantee Societies in supporting finance for small and medium-sized enterprises.* Center for Entrepreneurship, SMEs and local development, Organisation for Economic Co-operation and Development, Paris.

Leone, P. − Vebto, G. A. (eds) (2012): Credit guarantee Institutions and SME Finance. Palgrave Macmillan, New York.

Stiglitz, J. E. − Weiss, A. (1981): Credit Rationing in Markets with Imperfect Information. *The American Economic Review*, 71, 3, pp. 393−410

Uesugi, I. − Sakai K. − Yamashiro, G. M. (2010): The Effectiveness of the Public Credit Guarantees in the Japanese Loan Market. *Journal of the Japanese and International Economies,* 24, pp. 457−480.

http://www.avhga.hu/ (Rural Credit Guarantee Foundation)

Appendix

Appendix 1 Testing Hausman ratio of hypothesis 1

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	22.560417	1	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
Guaranteed loans	-0.007716	-0.005389	0.000000	0.0000

Cross-section random effects test equation:
Dependent Variable: Net sales
Method: Panel Least Squares
Date: 03/30/16 Time: 10:09
Sample: 2012 2014
Periods included: 3
Cross-sections included: 50
Total panel (balanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	987774.9	52179.90	18.93018	0.0000
Guaranteed loans	-0.007716	0.001985	-3.886609	0.0002

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.996506	Mean dependent var	792262.4
Adjusted R-squared	0.994741	S.D. dependent var	2341623.
S.E. of regression	169810.3	Akaike info criterion	27.18724
Sum squared resid	2.85E+12	Schwarz criterion	28.21085
Log likelihood	-1988.043	Hannan-Quinn criter.	27.60310
F-statistic	564.6796	Durbin-Watson stat	2.849358
Prob(F-statistic)	0.000000		

Source: own construction

Appendix 2 Testing Hausman ratio for hypothesis 2

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	8.182772	1	0.0042

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
Guranteed loans	0.000693	0.000476	0.000000	0.0042

Cross-section random effects test equation:
Dependent Variable: Interest paid
Method: Panel Least Squares
Date: 03/30/16 Time: 10:28
Sample: 2012 2014
Periods included: 3
Cross-sections included: 50
Total panel (balanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7010.908	2525.094	-2.776494	0.0066
Guaranteed loans	0.000693	9.61E-05	7.214740	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.926926	Mean dependent var	10552.09
Adjusted R-squared	0.890019	S.D. dependent var	24778.79
S.E. of regression	8217.472	Akaike info criterion	21.13040
Sum squared resid	6.69E+09	Schwarz criterion	22.15401
Log likelihood	-1533.780	Hannan-Quinn criter.	21.54626
F-statistic	25.11567	Durbin-Watson stat	1.784201
Prob(F-statistic)	0.000000		

Source: own construction

Appendix 3 Testing Hausman ratio of hypothesis 3

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	4.567985	1	0.0326

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
Guranteed loans	-0.000000	-0.000000	0.000000	0.0326

Cross-section random effects test equation:
Dependent Variable: Fixed tangible asset ratio
Method: Panel Least Squares
Date: 03/30/16 Time: 11:16
Sample: 2012 2014
Periods included: 3
Cross-sections included: 50
Total panel (balanced) observations: 150

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	53.84628	2.338145	23.02949	0.0000
Guranteed loans	-2.49E-07	8.90E-08	-2.796220	0.0062

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.940442	Mean dependent var	47.54334
Adjusted R-squared	0.910362	S.D. dependent var	25.41482
S.E. of regression	7.609080	Akaike info criterion	7.161046
Sum squared resid	5731.912	Schwarz criterion	8.184662
Log likelihood	-486.0785	Hannan-Quinn criter.	7.576909
F-statistic	31.26498	Durbin-Watson stat	2.145162
Prob(F-statistic)	0.000000		

Source: own construction

PART FOUR

Principles and Practices in Marketing

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 157–166.

10. Revolutionising marketing research? A critical view on the promising neuromarketing

Sándor Huszár – Katalin Pap

The aim of this paper is to provide a brief overview about benefits and disadvantages of possible application of neuromarketing research methods, in which we show that what kind of barriers should neuromarketing overcome to be more acceptable in the marketing area. The paper is considered critically examining neuroscientific methods relating to consumer behavior. Along with some authors, we also argue for that neuromarketing cannot revolutionise researches focusing on consumer behavior, however it can help in the reinterpretation of existing theories. As a consequence, consumer behavior reserches can rise to a multidisciplinary level in the future, in which marketing-oriented research groups will be supplemented with representatives of life sciences.

Keywords: neuromarketing, research method, consumer behavior

1. Introduction

Over the past decade significant development in cortical neuro sciences has undergone. In the field of psychology and life sciences researchers began to apply new empirical findings, which has achieved great results in the understanding of the relationship between neural activity and perception. Despite of the widespread adoption of neuroscientific results, economists and marketers discovered the benefits and possible application areas of neuroimaging procedures with delay (Lee et al. 2007). The new discipline called „neuromarketing" has attracted a huge attention of marketing experts who strongly believe that the new methods will revolutionise marketing researches and yield more reliable and valid research results.

Although, neuromarketing research requires a cooperation among representatives of various disciplines (like marketing, psychology and life sciences, etc.), our study aims to discuss the relevant topics from the marketing perspective and take attempt to demonstrate the disadvantages that might be not obvious for marketing experts. We hope that this summary will help marketers for better understanding the scope and possible application areas of neuromarketing researches, while our intent is not to undermine the benefits of applying neuroimaging devices in marketing researches but to emphasise its constraints that should be taken into consideration.

The paper is structured as follows: firstly, we give a brief overview about the scope of neuromarketing and main challenges. Secondly, we highlight some concerns that are relating to the application of medical devices into marketing research. Finally, we summarize the main benefits and disadvantages of neuromarketing.

2. From neoroscience to neuromarketing

There are three large groups relating to our topic: the neurosciences, neuroeconomics and neuromarkering. According to Plassmann et al (2012), neurosciences examine the nervous system, which aims to learn about biological basis of human behavior. According to some views, the neuroeconomics is not a separate discipline, because neuroeconomics use the tools of neurosciences to understand the brain processes due to the economic processes, therefore it is part of neurosciences (Rustichini 2005). For determining the role of neuromarketing we should overview briefly the traditional marketing.

In traditional marketing consumers are usually asked about their needs, so the products / service or sales strategies are established based on the responses collected from potential consumers (Lee et al. 2007). But today's consumers often are not aware of their needs and cannot describe them properly, thus companies tend to create needs that are not exist and align their products and services to their target group in order to attract their attention. Neuromarketing can contribute to better understand these unconscious needs of consumers. Since the consumers are unable to determine or express their need accurately, new techniques (like neuromarketing) should be used for the investigation of physiological changes (Ariely − Berns 2010).

Neuromarketing assumes that individuals' (buying) decision-making, not as much conscious as we supposed (consumers' decisions depend in 80% on unconscious behavior), so the model of "homo economicus" seems already outdated. This is the reason, why neuromarketing is often called the science of human decision-making. According to a narrower interpretation, neuromarketing is a market research tool which uses medical devices, while according to a strict interpretation, it is the integration of the brain researches results in the theory and practice of economics. For the first impression, it might seems strange the combination of these two scientific disciplines: neurology and marketing. But if we take a closer inspection, neuromarketing is a very exciting area where medicine meets with the art of marketing in order to investigate ongoing subconscious processes of human brain (Roth 2013).

In sum, neuromarketing is nothing else than the subdiscipline of the neuroeconomics and neurosciences, which track changes in the brain's neural activity to investigate the impact of marketing activities (Huber 2010).

Despite of the widespread positive acceptance of neuromarketing, there are challenges that should be overcome for implementation of neuromarketing into the marketing science. Hubert (2010) investigated the challenges and opportunities of applying neuromarketing into consumer researches and management sciences. These challenges have been summarized into 10 theses (Table 1). In our investigation we go further and evaluate these theses according to their role in the acceptance of neuromarketing, thus, we distinguish task-, contribution- and challenge-related theses.

Table 1 Ten theses discussing the status quo, the further development and essential challenges of neuromarketing

	Theses	**Evaluation by the authors**
Thesis 1	A central challenge for neuroeconomics and consumer neuroscience is to further expand and validate the obtained results.	Task
Thesis 2	Within the next few years, neuroeconomic research will realign. In recent years, mainly inductive studies were conducted (''context of discovery''), but there will be more deductive experimental setups in future.	Task
Thesis 3	The essential challenge of neuroeconomics and consumer neuroscience will be to verify the empiric matter of existing theories, to reject, to modify, and/or to further develop them (''theory testing'').	Challenge
Thesis 4	Findings of neuroeconomics and consumer neuroscience show that boundaries between psychological (e.g., price information) and physiological categories (e.g., product qualities) are arbitrary.	Contribution
Thesis 5	In the classical literature, the concept of emotion was often used in a 'fuzzy' and primarily psychological way. In neuroeconomics and consumer neuroscience, emotions have gained importance and have become an essential focus of research. Future economic research will adopt some findings of neuroeconomics and consumer neuroscience and integrate emotions into theories in order to explain economic behavior.	Contribution
Thesis 6	The conceptual revision posits that the physiological measuring methods will become (more) important in economic research. Consequently, the research will probably become (more) interdisciplinary and specific.	Challenge
Thesis 7	A primary challenge of neuroeconomics and consumer neuroscience will be to guide the translation of the obtained findings through companies (or media) into corporate practice. It will be important to avoid disappointments that could result from (over-)simplification.	Challenge
Thesis 8	The future acceptance of neuroeconomics and consumer neuroscience within the scientific community will mainly depend on the success of the (new) neurophysiological description of classical theories and constructs.	Challenge
Thesis 9	The integration of neuroscientific methods and findings will not lead to a revolution of economic and consumer research, but will be carried out evolutionarily.	-
Thesis 10	By facing the challenges of the future, neuroeconomics and consumer neuroscience will become an integrated and accepted branch of economic and consumer research.	-

Source: Hubert (2010)

In our opinion, the task-related theses depict what neuromarketing researches have to do in order to broaden our knowledge, but the advancement depends on the effort spend on conducting various neuromarketing researches and there are no significant barriers that could undermine the status quo of neuromarketing (Thesis 1 and Thesis 2). Tahomi et al. (2011) also argue for more neuromarketing researches are needed in order to broaden our knowledge and to increase the acceptance and validity of such research results. The contribution-related theses emphasize those advantages of neuromarketing which can lead to a better understanding of existing marketing-related topics and can supplement our knowledge in those areas (Thesis 4 and Thesis 5). Although the previous theses are important (Thesis 1, 2, 4, 5), we believe that there are significant barriers hindering the challenge-related theses which can fundamentally affect the status quo of neuromarketing researches.

Thesis 3 posits that an essential challenge of neuromarketing is to test existing theories and, reject, modify, and/or to further develop them while Thesis 8 focuses on the description of classical theories and constructs with neurophysiological methods. In our interpretation the success of these challenges highly depends on how much of the frequently studied topics can be investigated with such methods. Taking into consideration that there are important topics in marketing which are difficult to be measured by neuroscientific methods, neuromarketing can contribute to only a small proportion of marketing topics. For instance, there are survey methods for the investigation of buying intention or loyalty which were developed in the social sciences but it is difficult to interpret how neuroscience can describe these constructs. Consumer loyalty usually measured with rebuying intention, consumers' recommendation, price sensitivity and/or cross-buying intention of other products/services. Since the neuroscientific methods can observe neural brain activity and capturing feelings and emotions, the traditional perception of loyalty may change in the neuromarketing context because the previous mentioned variables cannot be measured with these medical devices. Furthermore, especially in consumer researches, marketers have developed numerous models for describing consumer behavior in various fields in order to investigate the relationship and the effects among the constructs developed in the recent decades. Investigating the complex structres of these constructs may be difficult or even impossible according to our knowledge.

According to Thesis 6, physiological measuring methods will become (more) important in economic research which requires interdisciplinary research groups. From this point of view, the spread of neuromarketing researches will highly depend on how marketing scholars can establish relationship with researchers of life sciences and psychology. It is difficult to find researchers who are inherently focusing on life sciences and tend to take part in

investigating consumer behavior. From this perspective neuromarketing should be accepted not only in the field of marketing but on the scientific community in other disciplines, like in life sciences as well.

Thesis 7 emphasizes the role of neuromarketing to guide the translation of the obtained findings through companies into corporate practice. Since neuromarketing researches requires interdisciplinary expertise, representatives of various disciplines and special medical equipments, it is difficult to find market research companies that could conduct such researches. The universities where the necessary disciplines are represented and such special medical devices are available can be proper research partner for neuromarketing research. But these institutions are fragmented and due to the existing norms of academia (including teaching duties, norms of open science, etc.) and the lack of experience interacting with the industry, research results might be too exploratory or scientific which might have high scientific value, but such results are difficult to be applied into practice.

As we have seen, there are various challenges that should be overcome in order to achieve higher acceptance in the scientific community. The above mentioned challenges will be implemented at the end of the overview into the concerns relating to the application of neuromarketing.

3. Replacing questionnaires with high-tech clinical equipments

The most frequently used clinical equipments for neuromarketing researches are Positron emission tomography (PET), Magnetoencephalography (MEG), Functional magnetic resonance imaging (fMRI) and Electroencephalography (EEG). These imaging devices were inherently developed for medical purposes, but since these equipments are able to investigate neural activity of human body, are also suited for observing neural reactions for marketing stimulus.

The aim of this short review is to highlight that the application of such medical equipments requires certain conditions which are usually not obvious for marketing experts and may have impact on the evaluation and reliability of the research results or even could deter potential research participants from attendance.

We distinguish two different groups of reasons which can hinder neuromarketing researches: factors influencing participation and special environmental conditions. In certain investigations (like positron emission tomography) radioactive isotopes should be intravenously ingested into the body to mark specific molecules which may deter participants

from taking part in the research due to the radioactive elements (even if it's safe from medical perspective) and cause injury for the participant. Furthermore, in some cases participants have to take off clothes and accessories which is also unpleasant and strange during marketing research. All of these factors may lower participants willingness to take part in neuromarketing researches.

Regarding the special environmental conditions, in some cases participants should be relaxed during the investigation otherwise the research results will be distorted, participants should wait 1–2 hours between the preparation and investigation, or should be starved and deprived of drinking in order to conduct the research. This kind of circumstances may not influence participants' intention towards participation but can have impact on the research investigation. For instance, nutrition (food and drinks) related researches cannot studied properly, because actual hunger and thirst may influence biological processes. In addition, waiting for 1–2 hours may cause frustration for some participants and may influence their responses and opinions about investigated topic.

Table 2 Summarizing the advantages and disadvantages of medical devices applied for neuromarketing researches

	Measurement	Advantages	Disadvantages
Positron emission tomography (PET)	Measures the blood flow and metabolism of the participant.	Applicable on any body parts.	(1) The injected materials are marked with radioactive isotopes (2) All clothes, jewelries and accessories should be removed. (3) The investigation begins after 1–2 hours.
Magnetoencephalography (MEG)	Measures the activity of the brain surface (5mm).	The injection of radioactive isotopes and application of X-rays are unnecessary.	(1) Cooling is required for use which makes its operation expensive. (2) It is not able to observe deep brain structures.
Functional magnetic resonance imaging (fMRI)	Measures cerebral blood flow and oxygen levels wich relates to neural activity of the brain.	No radioactive and non-invasive method.	
Electroencephalography (EEG)	Measures bioelectric signals accompanying brain function.	(1) Do not emit electrical signal, captures only the bioelectricl signals of the brain. (2) Non-invasive method.	(1) Electrodes are placed on the scalp. (2) Participant should be relaxed otherwise any activity can make changes in the results. (3) Takes 1–2 hours the investigation and placing the electrodes.

Source: own construction

Comparing the above discussed conditional requirements to the nowadays widely used quantitative (questionnaires) and qualitative (interviews) research methods, no doubt that neuromarketing researches requires a high degree of preparation. Table 2 summarizes the main advantages and disadvantages of medical devices which are typically used for neuromarketing researches.

4. Summarizing the advantages and disadvantages

Neuromarketing provides various methods for the investigation of consumer behavior as we demonstrated in previous sections, but there are skeptics who are still questioning its grounding and justification. In this section we summarizes the main benefits and disadvantages of neurmarketing.

Other disciplines often criticize marketing because its research methodology is not well-grounded and the reliability of results cannot be compared to the methodology of natural sciences which is partly due to the characteristics of social sciences. But the application of neuroscientific methods in consumer behavior researches may result in a wider scientific acceptance of marketing. Furthermore, it also contribute to the variety of methodologies in marketing researches. Neuroscientific methods can also contribute to a better understanding of consumer needs since it can observe and investigate those information which cannot be or difficult to be captured by traditional research methods, like measuring feelings with questionnaires or interviews. The application of neuromarketing in the product development will yield to products which can better suit consumer needs (Wilson et al. 2008). Neuromarketing also able to measure the feelings and emotions during advertising that helps practitioners to adjust their advertisement to their target group (Butler 2008), which may achieve higher consumer interest. Summarizing these benefits we can conclude that the main benefits of neuromarketing is a wider acceptance of marketing in other disciplines and the measurement of feelings and emotions that was difficult earlier.

Relationship of neuromarketing with marketing: As we discussed in previous sections, neuromarketing is expected to test existing theories and describe constructs widely used in marketing researches. However, some constructs and models are difficult to investigate with neuroscientifc methods since these abstract concepts gain meaning only in the existing theories and scientific context. In addition, although the development of neuroscientific methods was remarkable in recent decades, there are still numerous questions remaining unanswered in brain research. It also suggests that the interpretation of empirical findings

gained nowadays may change in the future due to the development of neuroscience which is still evolving.

Lack of resources: One of the main barrier of widespread application of neuromarketing methods in consumer research is relating to the financial expenditures of neuromarketing researches. The cost per hours of an average neuromarketing research can reach 500 USD (Ariely − Berns 2010) that is quite high compared to questionnaire surveys which can provide relatively accurate and reliable information from the research perspective at affordable costs (Wilson et al 2008). Furthermore, the availability of medical devices for marketers may also hinder the widespread application of neuromarketing researches.

Lack of expertise: Neuromarketing research requires representatives of various disciplines, like marketing, psychology, life sciences, etc. which makes the organization of such interdisciplinary researches difficult. Without the contribution of these disciplines marketers cannot conduct these researches itself due to the lack of expertise, because the education programs in the field of marketing (or business administration) do not prepare students for such researches and the necessary competences cannot be acquired. Thus, marketing practitioners do not possess skills for conducting neuromarketing researches and evaluating such results.

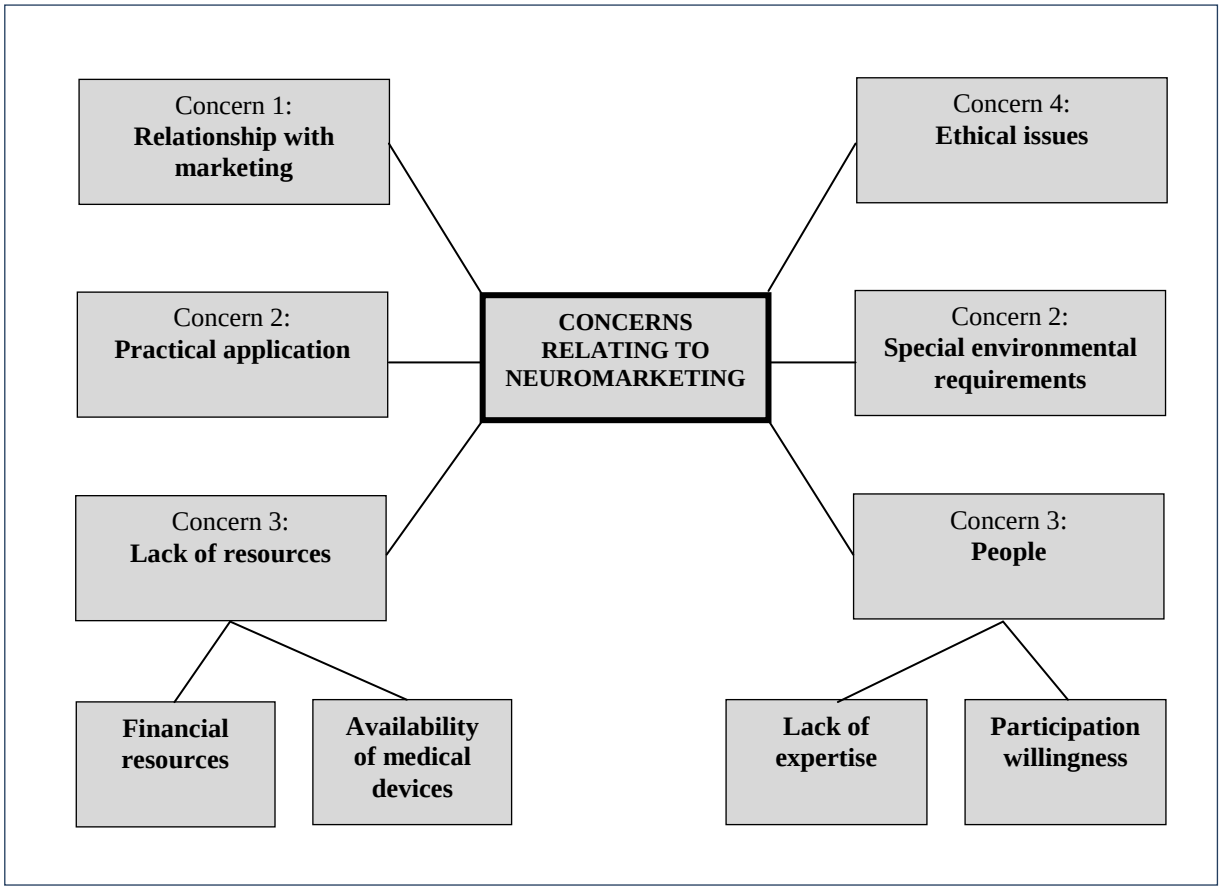
Environmental conditions: In contrary to traditional marketing researches, investigation with medical devices requires specific environmental conditions which may be strange for participants and makes the research procedure more difficult than in traditional marketing research. On one hand it can influence participants' willingness in taking part in the investigation and on the other hand can have impact on the research results due to the unpleasant circumstances, especially if the respondents associate the environment with bad feelings relating to medical examination. Furthermore the environmental requirements and procedures have other limitations as well, for instance claustrophobic people and pregnant women cannot take part in certain investigations.

Ethical issues: One of the biggest disadvantages of neuromarketing is the ethical dimension. As several authors argues for, information captured by neuromarketing should be ignored and the use in marketing campaigns have to be prohibited. According to Lee et al. (2007), these techniques are unacceptable, because they enter into the consumers' opinion. While in the case of a survey with questions of a personal nature, this is an option to refuse to answer the questions, during the brain test it is not possible. The problem is, researchers capture more information from the test than it is required by the research purpose. The ethical issues deserve special attention, because during the investigation researchers capture such

information that are not part of the research, which may lead to the violation of privacy, for instance, if researchers detect medical disorders (eg. a brain tumor) in the participants brain. In one hand, the researchers cannot determine whether the "patch" is a malicious tumor or not, but it seems clearly an anomaly while on the other hand researchers are not likely to have been trained and do not have experience how to communicate these information with the studied person. Thus, we also list this issue among the concerns relating to neuromarketing.

Figure 1 summarizes the above discussed neuromarketing related concerns which are important from the marketers perspective.

Figure 1 Summary of the neuromarketing related concerns



Source: own construction

5. Conclusion

The primary goal of this paper was to give a brief review about the concerns relating to the application of neuromarketing methods in the field of marketing. Since neuromarketing have gained an increasing attention among scientific community, there are still lack of studies

that could contribute to the evolution of neuromarketing, as a „discipline", and there are also misunderstandings about its scope.

We took attemption to demonstrate the main concerns that can hinder the widespread application of neuromarketing. We argue for, despite of the increasing popularity and interest surrounding this exciting topic, neuromarketing will not revolutionize marketing researches, or at least not in that way as still most of marketers expect. Our goal was not to undermine the benefits offered by neuromarketing, that we also acknowledge, but to highlight the disadvantages and emphasize its constraints. We hope that our paper could draw attention of marketers and indicates discussion among scholars of various scientific fields.

References

Ariely D. – Berns G. S. (2010): Neuromarketing: the hope and hype of neuroimaging in business. *Nature Reviews Neuroscience*, 11, 4, pp. 284–292.

Butler M. J. (2008): Neuromarketing and the perception of knowledge. *Journal of Consumer Behaviour*, 7, 4-5, pp. 415–419.

Hubert M. (2010): Does neuroeconomics give new inputs to economic and consumer research? *Journal of Economic Psychology*, 31, 5, pp. 812–817.

Lee N. B. – Broderick, A. J. – Chamberlain L. (2007): What is 'neuromarketing'? A discussion and agenda for furture research. *International Journal of Psychophysiology*, 63,2, pp. 199–204.

Plassmann, H. – Ramsoy T. Z. – Milosavlijevic, M. (2012): Branding the brain: A critical review and outlook. *Journal of Consumer Psychology*, 22, 1, pp. 18–36.

Roth V. A. (2013): *The potential of neuromarketing as a marketing tool*. 1st IBA Bachelor Thesis Conference, Enschede.

Rustichini, A. (2005): Neuroeconomics: present and future. *Games and Economic Behavior*, 52, pp. 201–212.

Schüll (2008): Decision and preference in Neuromarketing. Neuroscience and Society.

Wilson R. – Gaines J. – Hill R. P. (2008): Neuromarketing and consumer free will. *Journal of consumer affairs*, 42, 3, pp. 389–410.

Lengyel I. – Vas Zs. (eds) 2016: *Economics and Management of Global Value Chains*.
University of Szeged, Doctoral School in Economics, Szeged, pp. 167–177.

11. Internationalization and the effects of retail development in the Republic of Serbia

Tanja Tekić

Internationalization and its development effects have been typical trends on the global retail market in the past few years. The trade development, trade revolution and changes in marketing channel have influenced the expansion of large, global retail systems. These systems enter the markets of developing countries and change their structure and the manner of doing business. In the last decade and a half, Serbia has been in transition process; consequently, the changes that have occurred in this period are numerous. From the trade perspective, there were changes in structure and relationships in the marketing channel, retailers have better position in it, they grow, concentrate, expand worldwide, etc. Retailers in Serbia will have to adapt to those changes, because that is the only way to stay competitive with international competitors. Development trend will be more intense, competition and concentration will reach a higher level and only the best retailers will remain on the market. So what is the level of retail development in Serbia right now? Can we compare it to other countries? Of course we can, that is the main aim of this paper. Comparison of retailers in Serbia and the surrounding countries, in the Balkans and other European countries is the main issue in this paper.

Key words: internationalization, marketing channels, retail, Serbia

1. Introduction

Marketing concept is the base of today's business in which consumers are creators of future offer. In addition to this, the marketing channel is changing, new technologies, globalization, internationalization of business, strengthening the position of retailers, etc. Nowadays, modern retailers are the leaders of the channel because they are in daily interaction with consumers. Innovations, globalization and internationalization are the basis of business of big retailers which operate worldwide. Today, big, international retailer is operating in several countries; its own e-shops, m-shops and a lot of different channels for communication with consumers, investments in new technologies and development are the main bases of their business and all this because of profit. Main questions of this paper are: 1.) Are retailers in Serbia leaders of marketing channel? 2.) At what level of development is retailing in Serbia compared to other European countries? 3.) What are positive and what are negative aspects of retail internationalization?

For research and preparation of this paper, there are a lot of papers from different sources, but this one will be unique because quantitative research and comparison with others

will be used. Paper will be organized into four main parts, the first one is theoretical framework of retailers and their position, the second one is going to be introduction to methods and methodology, third part is about problems and results and the fourth, the most important one, is going to be the conclusion. The results will be based on previously presented data, theoretical and quantitative survey of Serbian retailers' position and the future development trends.

2. Literature review

Global availability, internationalization and trade development are the main features of market development in recent decades. A long time ago offer has exceeded demand and because of that, retailer has to think how to beat the competition and be closer to the modern consumer. Consumers' integration with the marketing channel in the long run is one of the basic and unavoidable tasks of the retail (Ristic 2008). Because of this concept, the retailer communicates with consumers, which is essential for the future development. And through the years, they become the leaders of the marketing channel. Retailing is the last stage in a channel of distribution – all of the business and people involved in the physical movement and transfer of ownership of goods and services from producers to consumer (Berman − Evans 2010). Retailers dictate the conditions in the channel and assume the primary role, which leads to the formation of large systems, concentration, cooperation, strong competition and the needs for expansion and integration. Retailing is the key stage of the process of social reproduction of consumer products (Koncar 2015). The position of retail in the marketing channel and its strengthening have been affected by numerous factors which have common denominator in the intense market competition in this sector, as well as quick changes of the information technology; all this has contributed to development of the sophisticated solutions in the field of modern commercial management and marketing (Stankovic 2014). The management of the retail enterprises must think globally, using new strategies and channels for the product placement to the consumer. For now, we will concentrate on the following environmental elements: the behaviour of consumers, the behaviour of competition, the behaviour of supply members (the manufacturers and wholesalers that the retailer buys from), the legal system, the stage of technology, and the socioeconomic nature of society (Dunne − Lusch 2005). The big, international retailers are increasingly taking over smaller ones; they are also taking over other participants in the supply chain. All this has affected the major differences which are present between the developed and underdeveloped retailers, formats,

ways of doing business and the trade development between the countries. Traditional and small retailers are disappearing, and number of retail stores is decreasing each year. Both academic and trade sources suggest that the following elements of retail offer are important in how customers judge one retailer`s offer over another (Varley 2014):

- price;
- product assortment;
- convenient to use/visit;
- service quality.

Consumers are creators of the offer; retailers create business strategy based on their needs and wishes. Price is often considered a surrogate indicator of quality and the consumer often makes judgment on products or indeed on the store as a result of his or her response to the price of merchandise (Cox − Brittain 2000). The development of new electronic channels of communication and placement of products to consumers has an increasingly important impact on the retail development in recent years. Internationalization may not always involve the introduction of state-of-the-art technology, but generally will involve employing technology that is relatively advanced (Gilbert 2003). All big retailers today have at least two channels, the Internet and physical store; they have multichannel retailing concept.

As we have already mentioned, retailers are leaders of the marketing channel. Retail developments in the world and the degree of internationalization are presented in Table 1, where you can observe a clear difference between the income and development between regions. There is a noticeable difference between the developed and developing regions/countries. Thus, in Europe and North America there are more than 70% of retailers from the top 250. It is the same with the revenue: the revenue share of European and American chains exceeds 80% of the total revenue of 250 surveyed companies. But when it comes to internationalization and revenue outside the country, that leading retailers are from Europe, Africa and Latin America. North American companies have less than 15% of the revenues outside the country of domicile, and it is explained by the size of their domestic markets. It's different with European companies, their markets are geographically limited and internationalization is the only way to develop and expand. Targeted countries of these companies are in the process of development and transition, such as Serbia.

Table 1 Profiles and level of globalization by region/country in 2013

	# companies	Average retail revenue (US $ mil)	Share of Top 250 companies	Share of Top 250 revenue	% retail revenue from foreign operations
Top 250	250	17.418$	100.00%	100.00%	24.2%
Africa/Middle East	7	6.384$	2.8%	1.0%	25.1%
Asia/Pacific	55	11.121$	22.0%	14.0%	14.0%
Japan	31	9.835$	12.4%	7.0%	9.4%
Other Asia/Pacific	24	12.782$	9.6%	7.0%	18.9%
Europe	90	18.840$	36.0%	38.9%	38.6%
France	14	29.279$	5.6%	9.4%	43.6%
Germany	17	27.060$	6.8%	10.6%	45.4%
U.K.	14	19.391$	5.6%	6.2%	21.5%
Other Europe	45	12.316$	18.0%	12.7%	-
Latin America	10	7.757$	4.0%	1.8%	22.9%
North America	88	21.108$	35.2%	44.2%	14.7%
U.S.	79	23.108$	31.6%	41.9%	15.4%
Canada	9	11.052$	3.6%	2.3%	-

Source: Deloitte (2014)

Today, we speak about changes in the structure of retail formats - traditional systems are slowly losing importance, and instead new channels are constantly emerging. Traditional formats in 2009 included 42% of facilities in the world, and in 2014, after only 6 years, these formats were represented by only 35%, in line with this, modern formats growth was 7%, so in the past year they accounted for 65% in the total structure (Euromonitor 2015a). With a steady revenue growth, technological innovation, multichannel trade, changes in the structure of the format, the differences in the development of the markets and the internationalization are the main characteristics of market development and improvement.

3. Methods

In order to solve the main problem of this paper, retail position in Serbia, different quantitative and qualitative data and methods are going to be used, mainly based on comparison method. Situation nowadays is not great (when we compare Serbia with western countries), but it is changing everyday and international companies have already brought new ways of business and market competition based on consumers. So comparisons and different overviews of Serbian retail development will give correct result about development stage and necessary future steps.

4. Results

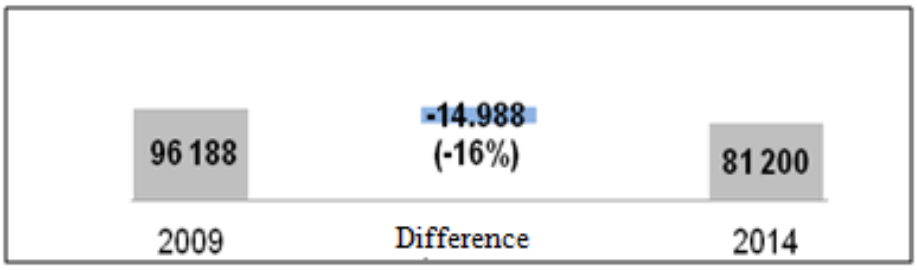
Transitional process and reforms taking place in Serbia did not come overnight; the current situation is the result of years of change and development process. In the last decade of the 20th century in Serbia, numerous and divergent flows had fully reflected the depth of the economic crisis and unresolved problems in the economic system (Lovreta et al. 2013). Trade is one of the activities that were privatized firstly, activity which first started the process of modernization and reform, but the current trends are not satisfactory and did not approximate those in the world. The development of the economy since 2000 is the result of the opening of state borders, privatization of retailers, gradual spill-over of world trends and policies in operations of these market participants. This has resulted in the growth of trade volume. If we concentrate on retail, the retailers have recorded positive revenue growth trend year after year (Figure 1).

Figure 1 Retail revenue in the Republic of Serbia in period 2009–2014 (billion of RSD)

Source: own construction based on http://webrzs.stat.gov.rs

Retailers' revenue has increased by 123 billion dinars, or 11%, and there is a positive trend of development and growth. This is significant due to the fact that turbulence and crisis at the global level did not affect the change of this trend. What is worrying is the extremely marked difference between the retail turnover in the south and in the north of Serbia; in 2014, the north has greater income. The reason for this difference is the issue of decentralization that exists in our country, difference between Belgrade and the rest of the country. We have already noted that one of the basic features of internationalization and development is concentration of the retailers; they are expanding, taking over competitors and other participants in the marketing channel. In our market, there is a positive trend of development. In the period from 2009 to 2014, there was a decrease in the number of retail stores by 16%, or exactly 14,988 (Figure 2).

Figure 2 Number of retail stores in the Republic of Serbia in period 2009–2014



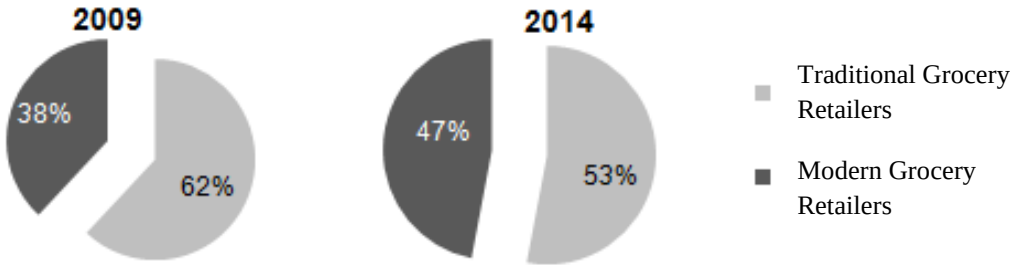
Source: own construction based on http://webrzs.stat.gov.rs

Despite the reduction in the number of facilities and concentration on the market, wholesalers are still leaders of the channels and the ones who dictate the terms in it. The share of retail trade revenue in the Republic of Serbia for 2014 amounts to 32.34%, while wholesale has a stake of 66.98%, thereby expressing its dominant position in relation to retailers, which in developed countries is not the case[1]. Until those facts change, we cannot talk about achieved global trends and level of developed retail. Traditional retailers with small shops which sell basic products are steadily losing its position in most OECD countries (Lovreta 2009). Techniques and technology are progressing and retail development is happening within the store and outside. These changes are the result of developments in technology and trade, as well as changes in consumer behaviour. International retailers entered the Serbian market a few years ago and as a result of that the structure of formats is changing and development is the way to beat the competitors.

There is still a domination of traditional compared to the modern retailers in Serbia (Figure 3). The share of traditional formats in the presented 6-year period has decreased by 9% in favour of modern ones, all as a result of internationalization, concentration, competition and the emergence of multichannel trade in our market. If we recall the relationship of traditional and modern retailers globally, which was 65% in favour of the modern, we can conclude that in our country there is a different trend. In Serbia the ratio is 53% : 47% in favour of the traditional retail formats, but there is a positive downward trend which will continue.

[1] http://webrzs.stat.gov.rs

Figure 3 Modern vs. traditional grocery retailers in Serbia, in period 2009–2014



Source: own construction based on Euromonitor (2015b)

Another indicator of (non) development retailing in Serbia is the concentration level and the share of the leading retailers on the market. Concentration is highly expressed in the world - the leading retailers in the most countries hold more than half of the market. The share of the top 10 retailers in Serbia rises from 2009 to 2014 by 18%, reflecting the increase in the share of large international chains (Table 2). The entry of Delhaize and acquisition of Delta Maxi is the largest merger of a foreign and domestic retail chain. Meanwhile, Agrokor took over Slovenia's Mercator and became a leader in Serbia and the whole Balkans. In the past few years, the investments and expansion of domestic retail chains such as DIS, Univerexport and Gomex are highly important. The foreign systems and their internationalization have forced the aforementioned national chains to invest in their business in order to survive in the market and retain their existing positions. Almost all of the top 10 retailers invest a lot of money in e-commerce and the development. New, even more powerful foreign retailers will enter the Serbian market (entering of Carrefour and IKEA has been announced, while Lidl has already started building of the retail stores).

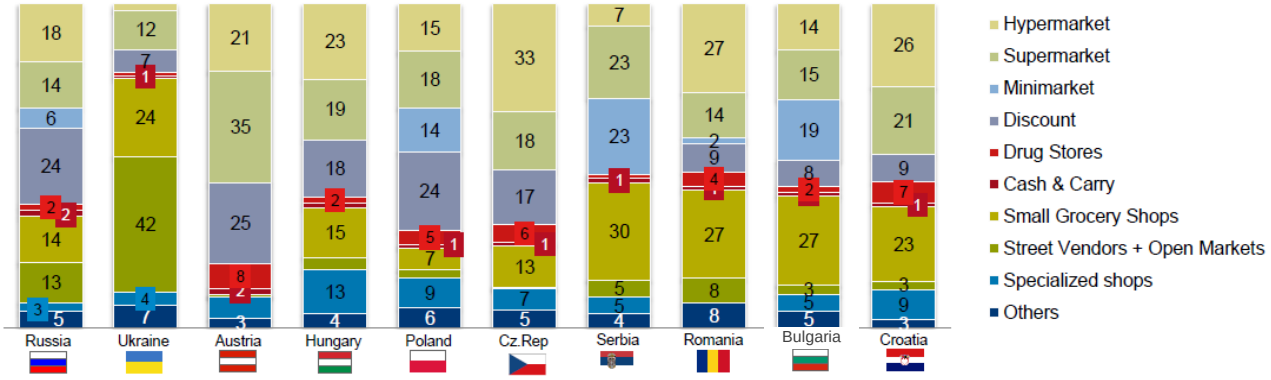
Table 2 Top 10 Serbian retailers share

	2009	**2010**	**2011**	**2012**	**2013**	**2014**
Agrokor d.d.	2.8%	3.5%	4.3%	5.0%	4.9%	11.2%
Delhaize Group SA	-	-	8.0%	7.9%	7.8%	7.9%
DIS d.o.o.	-	2.1%	2.4%	2.4%	2.5%	2.7%
Apotekarska ustanova	2.2%	2.4%	2.5%	2.3%	2.2%	2.2%
Univerexport d.o.o.	1.9%	1.6%	1.7%	1.8%	1.7%	1.8%
Tehnomanija d.o.o.	0.3%	0.4%	0.6%	0.6%	0.6%	0.6%
Gomex d.o.o.	0.3%	0.4%	0.5%	0.5%	0.6%	0.6%
ITM Enterprises SA	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Lilly Drogerie d.o.o.	0.3%	0.4%	0.4%	0.4%	0.5%	0.5%
Veropoulos Bros SA	0.9%	0.4%	0.4%	0.4%	0.4%	0.4%
Top 10 retailers	**9.2%**	**11.7%**	**21.3%**	**21.8%**	**21.7%**	**28.4%**

Source: Euromonitor (2015b)

The retail situation in Serbia is still far from the global one and according to all indicators the market is still developing. Number of retail stores is decreasing; there is a concentration and expansion of the existing chains, the entry of new, growth of retail revenues etc. But there are still negative trends: importance of the wholesalers, the relationship between traditional and modern retailers in favour of traditional retailers and low concentration of the top 10 retailers on the market. The second part of the result section will be based on comparison between Serbian retail development and the development of other countries. Firstly, comparison of retail formats, as presented Figure 4.

Figure 4 Value share of main outlet types in 2015

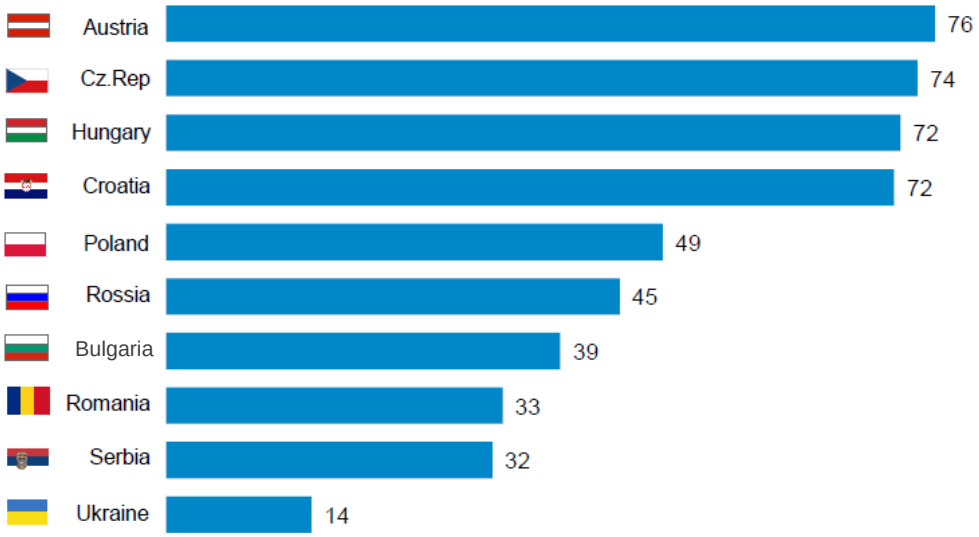


Source: Gfk (2015, p. 24)

Small grocery stores are still the prevailing retail format in Serbia, hyper/supermarkets have only 30% of the share. If we summarize traditional and modern retailers, Ukraine is the country with undeveloped retail market, but Serbia is right after and that is not a good indicator of development. In comparison with countries like Hungary, Romania, Bulgaria, Croatia (Serbian border countries), it is far behind them and it still needs a lot of time and investments to achieve that level of development.

When we compare the share of top 10 retailers in the same countries, it is noticeable that Serbia and Ukraine are the countries which are at the back of the queue (Figure 5). If we compare Gfk share for 2015 with Euromonitor International share for 2014, there is a positive trend of growth; the share of top 10 retailers on Serbian market grows by almost 4%. But this is not enough, we cannot compare retail development in Serbia with countries such as Hungary, Austria, Croatia etc. Countries with similar share are Romania and Bulgaria, but both of them have bigger share of modern vs. traditional retailers.

Figure 5 Value share of top 10 retailers in 2015



Source: Gfk (2015, p. 26)

The situation in Serbia is far from ideal and far from the one on the global level, but in order to improve it, it is necessary to analyze the current situation, spot the problems and eliminate them. The progress that has been made by entering of the international retailers in the past few years is extremely important and the entry of new, large systems will certainly mean a dizzying new period of development.

It is important to notice that retail internationalization and development have a lot of negative effects on domestic retail system and economy. All international retailers bring with them their own ways of doing business, policies, experience, and most importantly, international products and own suppliers. Certainly this is a very serious problem and a threat to domestic economy. With adequate state policy and development strategies for domestic retailers, these negative aspects of internationalization might be mitigated, but not completely stopped. So it is really interesting to see what will be the next steps of the Serbian government, how are they going to protect the domestic market players? There are different ways and every one of them is based on protection policies for domestic retailers and manufactures (taxes policy, subsidies etc.). However, they are ethical issues, international retailers bring own organization, culture and ways of doing business, which are usually not accepted and employees are suffering the most. All border countries (for example: Hungary, Bulgaria, Slovenia) have developed retail systems and retailer is a leader, owning the whole channel, but they have problems with domestic manufacturers, retailers and employees' conditions. So the logical question is whether the Serbian, slower way, is better or not? On the

one hand, from consumers' perspective, it is not. But on the other hand, from perspective of domestic retailers and manufacturers, it is better - Serbia still has domestic retailers, and it has a chance to protect and to learn from mistakes that other countries have made.

5. Conclusions

The market integration, the flow of goods, the development of technology, the Internet, global accessibility and communication are the basis of trade revolution. The creation of the aforementioned relationship between the retailer and the consumer is essential for retailer to become the leader of the marketing channel. Retailing in Serbia is still lagging behind other markets and it is still undeveloped. The changes that have happened are just the beginning and we should expect faster development in the future. Entering of two foreign retailers (Delhaize and Agrokor) is very important because they brought their experience, technology, ways of doing business and capital. Superiority in strength and capital allowed them to occupy the leading positions on the market. It is necessary that retailers take over the leading role from the wholesalers, that new international systems enter the market and that the existing ones expand. This will result in concentration, merging, reduction in the number of stores, change in the structure of retail formats, disappearance of a large number of small stores, increase in the quality of products and services, investments in equipment and technology, and real competitive struggle on the market. The number of electronic and mobile stores is constantly increasing, but revenues and the importance that these channels achieved are still at a very low level compared with the global results. All this is necessary because now Serbia is far behind the developed countries (wholesalers are the leaders of the channel, share of top 10 retailers is small, number of retail stores is big, traditional retailers are still dominant etc.). Before entering of new chains and further retail development, we should protect domestic economy, domestic retailers and manufacturers. That is a task for Serbian government; they must consider negative effects of internationalization and adopt new laws and policies to protect domestic players. What will happen in the future is hard to tell, but it is important to consider both positive and negative effects of retail internationalization and development.

References

Berman, B. − Evans, J. R. (2010): *Retail Management: A Strategic Approach – eleventh edition.* Prentice Hall, New Jersey

Cox, R. − Brittain, P. (2000): *Retail Management - Fourth Edition.* Prentice Hall, Harlow.

Deloitte. (2014): *Global Powers of Retailing 2015 - Embracing innovation.* Deloitte, London.

Dunne, P. − Lusch, R. (2005): *Retailing - Fifth Edition.* South-Western Thomson Corporation, Versailles.

Euromonitor (2015a). *Retailing in Serbia.* Available: http://www.portal.euromonitor.com/, Accessed: 29.03. 2016.

Euromonitor (2015b): *Grocery Retailers in Serbia.* Available: http://www.portal.euromonitor.com/, Accessed: 29.03. 2016.

Gfk (2015): *FMCG Market Searching for Growth.* Available: http://www.gfk.com/industries/retail, Accessed: 25.03. 2016.

Gilbert, D. (2003): *Retail Marketing Management.* Prentice Hall, London.

Koncar, J. (2015): *Menadžment maloprodaje.* University of Novi Sad, Subotica.

Lovreta, S. (2009): *Strategija razvoja trgovine Republike Srbije.* University of Belgrade and Ministry of Trade and Services, Belgrade.

Lovreta, S. − Koncar, J. − Petkovic, G. (2013): *Kanali marketinga: trgovina i ostali kanali.* University of Belgrade and University of Novi Sad, Belgrade and Novi Sad.

Ristic, M. (2008): *Stratesko pozicioniranje maloprodaje: liderska uloga u kanalima marketinga.* University of Belgrade, Beograd.

Stankovic, Lj. (2014): *Trgovinska revolucija: novi odnosi snaga u kanalima marketinga.* Cigoja stampa, Belgrade

Varley, R. (2014): *Retail Product Management: Buying and Merchandising - Third Edition.* Routledge - Taylor & Francis Group, London.