Master's Thesis

Cluster-based approach to the enhancement of competitiveness:

Analysis of automotive cluster in Slovakia

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Declaration of authenticity

I hereby declare that this Master's thesis is my own work, or fully and specifically acknowledged wherever adapted from other sources. This work has not been published or submitted elsewhere for the requirement of a degree programme.

Prague, Czech Republic, 28th August 2013 ………………………….

Petra Brlayová

Acknowledgement

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Abstract

The presented Master's thesis is intended to serve as a complex material that deals deeply with the topic of cluster, cluster-based approach to the economic development and competitiveness. The paper consists of theoretical part and empirical case study about particular cluster – Automotive cluster in Slovakia. The primordial objective is to determine the factors for success and impediments of growth of the automotive cluster in Slovakia. A personal goal is to create more awareness about clusters. More light is shed on the concept of competitiveness and its link to clusters. Several models and methods to identify and assess clusters are introduced. The practical part provides firstly a snapshot of industrial background from global as well as from local (Slovak) perspective. In order to provide as complex picture as possible, the economic development and general cluster development in Slovakia are described. The Automotive cluster of West Slovakia is examined by applying Porter´s Diamond and Cluster Dynamics Model.

Key words:

Clusters, competitiveness, regional development, innovation, cluster-based, automotive

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Introduction

Automotive industry is the major engine of economic growth in Slovakia. In 2012 a record number of 926 555 cars was produced and it is predicted that the production will be even outnumbered by the end of 2013. The share of cars and other transportation vehicles accounts for 21,9 % of the overall export of Slovakia (SARIO, 2012).

The Slovak Republic enjoyed popularity of being a key bet in the CEE region for automotive FDIs during the last two decades. Lot of effort was focused mainly on the enhancement of attraction of Slovakia in the eyes of foreign-based carmakers and suppliers by using tax advantages or subsidization. Generous investment incentives and low labour costs were undoubtedly the crucial reasons for foreign investors to select Slovakia. This in fact contributed significantly to the improvement of Slovak economy. Slovakia was labelled an economic tiger of Europe and it was the automotive industry that was responsible for this acronym. The arrival of big car players such as Volkswagen, PSA, and Kia Motors generated new jobs. Slovakia remains to be a car powerhouse. But the automotive supplier network is still not very dense and domestic suppliers have not developed strong ties to OEMs so far (Emerging automotive cluster in Vienna-Bratislava region, 2007).

While there is a little dispute about the positive impact the automotive industry has on the regions in terms of jobs and export, a considerable concern can be heard when it comes to the future prospects of this industry. It´s a clear-cut fact that Slovak economy is dependent on the export and its open economy makes its position strong in good times but vulnerable in today´s turbulent times. As for now, Slovakia continues to be a "car factory state". With decreasing R&D investments, lack of innovation, flawed business environment and lack of highly skilled workforce in the automotive area, it will be soon an arduous task to maintain the current position when things are going relatively well in this industry.

There are two crucial tasks for economy development through FDIs. The first task - attract FDIs, was done successfully. Car manufacturers produce increasing amount of vehicles, what consequently leads to the creation of job positions and to boosted-up profits of some of the Slovak suppliers. Only little has been done to work on the second task dealing with thornier issues. This task is about the sustainability and development of automotive network. How to increase the competitiveness of the automotive industry? How to enhance the competitiveness of the whole region? Cluster-based economic development is an improvement model for microeconomic foundations of competitiveness and prosperity in a specific region. In the previous traditional approach to the competition – theory of comparative advantage, the improvement of competitiveness was considered to be fully in hands of government and its ability to create a stable macroeconomic context. In the new competition approach – theory of competitive advantage, Porter tackles global competition by reflecting the development stage of a country that is primarily driven by microeconomic conditions.

This transition in understanding competition mirrors the shift from the top-down to the bottom-up approach. Porter addresses clusters rather than economy-wide sectors as was typical for the old competition model. The competitive advantages emerge from firm collaboration and positive externalities, which can be best leveraged by networks and clusters. We can therefore look at clusters as an engine, as an important part of a car that helps trigger the improvement of competitiveness of a region. Porter distinguishes between top-down and bottom-up approach of cluster emergence. Cluster emergence through top-down approach was driven by deliberate government efforts (strategy of winner picking), whereas clusters that emerged naturally through bottom-up approach were driven by co-located business entities and their interactions (Porter, 2008). Porter is clearly against such policies aimed at cluster construction in a top-down way.

This diploma thesis firstly synthesises clusters theories. It provides an overview of the cluster definitions, cluster theory development, types of cluster, cluster life cycle, cluster-based approach, advantages and limitations of clusters. The first part aims to **create cluster awareness**. It links the role of clusters to the competitiveness. The thesis includes the concept of competitiveness and its main drivers as well as some tools to assess cluster performance.

The linchpin of this thesis is the **analysis of the drivers and barriers for the automotive cluster in West Slovakia**. The choice of this particular cluster emerged from these rational reasons - automotive industry thrives and contributes extensively to economic growth; the cluster presented in case study is active, both in Slovakia and abroad; there is enough information to collect and present as a case study.

To capture the complexity, the level of automotive industry maturity and the economic situation in Slovakia are put under scrutiny. A considerable attention is dedicated to the assessment of national competitiveness compared to other CEE states. It is also essential to examine clustering tendencies and support for clusters in Slovakia. Only after aligning the cluster theory and broadly explaining the backdrop of Slovak economy and automotive industry, the thesis will analyze the automotive cluster by employing chosen frameworks.

Personal Motivation

My motivation to devote effort and time to this topic was triggered mainly by the university course *Microeconomics of Competitiveness* taught by *Prof. Luiz Carlos di Serio* that I took during my exchange stay in Brazil. Throughout the highly interactive lectures, case studies and fruitful discussions with more experienced MBA students, I gained useful insights into the topic of clustering. Although the subject was more dedicated to large clusters and practical projects were focused on Brazil, the whole cluster phenomenon has awakened my curiosity. I decided to partly leverage on this course and to write my thesis about a cluster.

As a Slovak citizen who has not lived in Slovakia for a longer time, but who follows the economic development of this small country from the "outside", I felt a need to dive more into the problematic of Slovak competitiveness and future prospects of its economy. Slovakia

is enormously dependant on export, mainly of cars as the automotive industry plays an imperative role in its economy. Few years ago, Slovakia was coined as a "Detroit of Europe". It all started with a few international car makers that came to Slovakia (and other CEE countries) mainly because of cost reasons and cheaper labour pool. Yet the future prospects of automotive industry may not be so bright as there are many other competitors worldwide, especially in emerging countries with lower-wage labour force.

It is however questionable how will the further development of this industry in Slovak environment look like. Is Slovakia going to be only a robotic car manufacturer or are the small and medium companies operating in the automotive industry agile and innovative enough to add more value and thus, increase the competitiveness of a region, or even of the whole country? How can a cluster-based approach help enhance the competitiveness of automotive industry? How does the first Slovak automotive cluster function? These were the essential questions sparking my interest in searching for their answers.

1   Research methodology

1.1   Objectives and research question

The primordial objective of this thesis is *to determine the factors for success and impediments of growth of the automotive cluster in Slovakia*. The purpose is to identify and investigate the elements influencing cluster´s competitiveness. The analysis will be thus focused on the **assessment of the cluster performance as agglomeration** and also on the **assessment of the cluster organization**.

A careful examination of one particular cluster endeavours to provide useful **insights into the specifics of cluster development under incumbent conditions in Slovakia**. Subsequently, these outcomes should enable to identify possible weighty issues that may lie ahead for other clusters and cluster initiatives as well.

In light of all the challenges that the automotive cluster faces, the research question is posed:

"What are the drivers and barriers for cluster performance improvement?"

In order to provide answers for this complex question, the following breakdown of sub-goals needs to be addressed:

- To assess the overall environment for facilitation of cluster development in Slovakia
- To describe the characteristics of this cluster and to update a cluster map
- To assess the ability to sustain and increase competitiveness of cluster
- To assess the stage of cluster development

In addition to that, my personal goal is to **create more awareness about clusters and cluster-based approach** within a broader context for the public as well as for the business executives. In combining these goals, **suggestions for the improvement of cluster and cluster organization** will be presented at the end of the thesis.

1.2   Suggested propositions facilitating cluster assessment

Proposition 1: Cluster initiatives in Slovakia in the post-communism context started to emerge only after the establishment of the first cluster organization in 2004 (SIEA, 2010). Such a late start of institutionalized clusters had its root cause in the lack of information and knowledge about clusters among policymakers and officers (Stejskal, 2011). The general awareness about clusters continues to be low even today. There is a reason for an assumption that companies, academia and government are reluctant to embrace the concept of more intense collaboration within networks.

→ This proposition can be verified through interviews with cluster practitioners**.**

Proposition 2: Michael Porter views clusters as groups of closely interlinked and proximate (geographically, culturally, institutionally) firms and related or complementary entities that operate in a certain field in a certain region. Automotive cluster located in West part of Slovakia is consistent with Porter´s understanding of cluster due to its sufficient level of concentration (measured by share of employment) that is higher in West Slovakia than elsewhere in the state. This notion of cluster does not take into account boundaries set by the location of members belonging to the cluster organization Automotive cluster West Slovakia – ACWS, but it is derived from the official location of counties that create the region of West Slovakia.

→ This proposition can be verified by calculating Location Quotient (LQ) for the automotive cluster. LQ is one of the most used method serving for cluster identification.

Proposition 3: Clustering in Slovakia, Czech Republic and Hungary was mostly driven by the influx of FDIs (particularly in automotive industry) with local companies concentrated around the big multinational investors. In these post-socialist countries, co-operation is seen as an improvement area for the business environment in order to promote the competitiveness of an industry sector. In 2005, OECD recommended "strengthening of social capital" as one of the primary goals for cluster organizations to stimulate companies in the CEE region to compete and to co-operate at the same time (OECD, 2005). Social capital is characterised as element facilitating co-operation through stronger networks and shared values, what can consequently lead to cluster upkeep (OECD, 2001). Moreover, the report Innovation Union Scoreboard 2012 revealed that Slovakia has a very low share of innovative collaborating SMEs (8,3%). Although Automotive cluster in West Slovakia offers a variety of activities aimed at co-operation and takes an active role in cluster promotion, there is a propensity to assume that the **performance in inter-firm cooperation is still weak**. Inter-firm cooperation refers to the ability and possibility to work together, for instance in conducting research, sharing the same facilities etc. It can be measured by models enabling deeper understanding of mutual linkages within a cluster.

→ This proposition can be tested by using the Dynamic Loops method to evaluate linkages within the cluster organisation and Porter´s Diamond to assess the cluster as agglomeration.

Proposition 4: Automotive cluster and cluster organization ACWS cluster provides a thriving and stimulating environment that enables to spur innovations and effective usage of R&D.

→ The proposition 4 can be verified or refuted through interviews with cluster management and through secondary data (statistical data, website, presentations, project plans).

1.3 Methodology

To be able to solve the research question, a **deductive method** will be used. Deductive method means using an existing theory, testing it and interpreting the data (Saunders, et al., 2007). A complex evaluation of this cluster and its performance entails a qualitative and partly quantitative analytical approach.

The **heuristic phase** of the thesis provides a literature review about clusters, competitiveness and tools for cluster assessment. After this, data and insights about the state of competitiveness and cluster development in Slovakia are collected.

The Automotive cluster in West Slovakia will be exposed in the form of **case study**, what can be considered as a research strategy. An empirical case study is appropriate for investigating a contemporary phenomenon in its context (Yin, 2003). More emphasize will be put on the qualitative analysis. The reason is that the sample of data about this cluster is rather small and therefore it would not make much sense to deliver an in-depth statistical research. A statistical research would be useful in order to quantify the impact a cluster has on the prosperity of West Slovakia region, but as this cluster is small in its size and young, the results would not be reliable. It will be also argued whether the automotive cluster (in Porter´s understanding of natural clusters as agglomerations) fulfils the description of what cluster actually is by calculating the location quotient (LQ).

Primary data about this cluster are derived mainly from four **interviews** with cluster administrators and cluster experts. Such interviews can offer a better causal understanding of cluster functionalities and strategy and enable to get insights about the cluster-specific issues that would not be gained through an external analysis of the cluster. Consultations and interviews will be carried out on two levels.

1. Expertise level interviews:
Interviews with person(s) involved in the topic of clustering will be conducted with the purpose to assess the overall cluster development and cluster policy in Slovakia. In this way, a general picture on Slovak clusters will be painted. Additionally, cluster experts can provide insights about how they perceive the performance of Automotive cluster. Agencies such as SARIO (Slovak Investment and Trade Development Agency), SIEA (Slovak Innovation and Energy Agency) and Union of Clusters will be approached due to the fact that their agendas contain projects dedicated to clusters.

2. Cluster level management:
The aim is to understand the structure of the value chain, threats and opportunities for the Automotive cluster as well as its future plans. In-depth consultations will be carried out in order to search for the underlying factors of cluster competitiveness. In other words, the whole cluster organization´s dynamics will be put under scrutiny. Therefore, both directors of Automotive cluster, the incumbent one – Roman Bíro and the former one – Štefan Chudoba

will be contacted. Hence, a full overview about the cluster emergence, present performance and future challenges can be compiled. Leveraging on these interviews, models enabling assessment of cluster organization will be then employed.

The Automotive cluster in West Slovakia will be thoroughly analysed from the **Porter´s Diamond perspective**. This tool is widely used to demonstrate and clarify how a specific cluster works in practice. Nevertheless, the performance of a cluster depends also on the intensity of interactions among constituents. For this purpose, an adapted version of **Cluster Dynamics model** developed by Scottish Enterprise will be employed**.** This method enables to analyse the behaviour and interactions within a cluster. Cluster is understood as an organization. This means that the boundaries of a cluster as agglomeration type will be set and only the dynamics within a cluster organization will be examined.

Project Plan
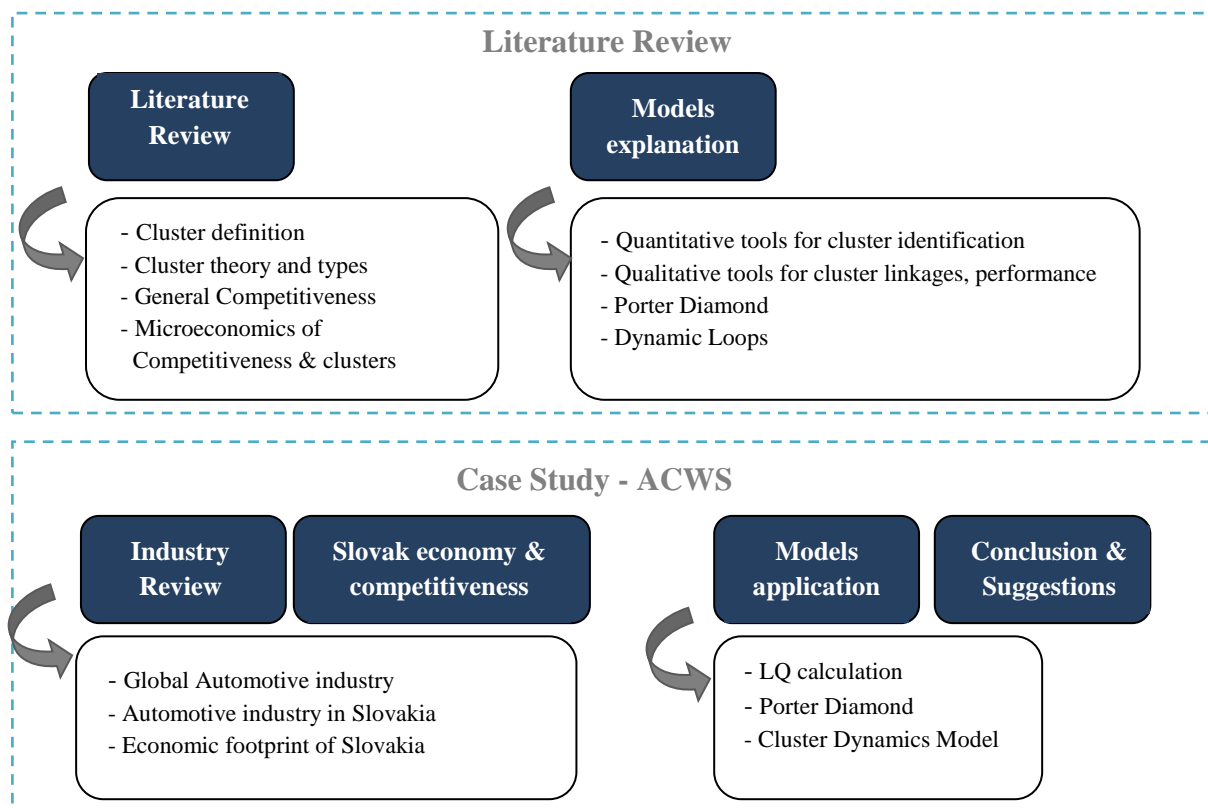
Literature Review

2   Cluster phenomenon

Switzerland and watches, Silicon Valley and IT, Hollywood and movies, Bangalore and IT, Northern Italy and footwear, Paris and fashion, California and wine – all these places coupled with their main flagship features are home for the same type of products or services, where competition as well as cooperation thrives. The first impetus among academicians to write about such concentrations of enterprises in the same or related industries was provided in the chapter headed: *"The concentration of specialised industries in particular localities"* of the book written by (Marshall, 1890). Since then, the debate around clusters has grown in academic, management as well as in political fields.

The notion "international competitiveness" enjoyed a lot of exposure throughout the last decade. It is a complex economic category, requiring taking stock of nation or region through macro as well as microeconomic perspective. But paradoxically, the national competitiveness lies in local things (Porter, 2008).

Globalisation, creation of huge tycoon companies and tremendous competition in business sphere require a certain shift of thoughts to new ways of assuring a high level of company competitiveness. Especially small and medium enterprises (SMEs) need to conduct very agile and strategic struggle in order to increase their competitiveness. No matter what is the level of economic maturity of a country, the development of SMEs is generally believed to be the main factor of economic development. One of the possibilities how to enable SMEs to grow, is to support a mutual cooperation (Pavelková, 2009). Assembling the companies within a cluster can help achieve this objective.

The thesis paper offers an overview of the theory of "microeconomics of competitiveness" and "clustering". It is set on three premises:

- Only competitive businesses can create jobs, rise income and wealth
- Nations compete to offer the most productive environment for business
- Cluster is an alternative way of organizing the value-chain that promotes competition and cooperation

The term cluster is now proliferated across the economy literature. Some cluster proponents believe that clusters could be the next big thing fostering the regional/national development. Other scholars raise challenging questions about their functionality.

Therefore, it is worth examining the origins of cluster notion by doing a short historical excursion into the cluster theory development. The following part of paper is then concerned with giving explanations on:

- what kind of "spatial industrial organization" a cluster actually represents
- what is a cluster-based approach to competitiveness
- what are the cluster benefits and limitations

2.1 Cluster definitions

Terms such as "spatial economic agglomeration", "local industrial specializations", "regional development", "industrial districts", and "industrial clusters" coexist and describe basically the same concentration of economic actors in an industry. Although certain types of clusters have existed already for centuries (for instance shoe industry in Italy), they owe their frequent academic and empirical analyses mainly to **Michael Porter (1990)** who put forward the topic of cluster. Porter´s definition does not consider cluster to be a specific project or type of organization. Cluster exists even when a society is not aware of its actual existence. Therefore clusters defined by Porter are often understood as natural ones (or "Porterian"). Porter popularized clusters and promoted them as a tool that can lift the competitiveness of regions. He characterizes clusters as:

"... geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example universities, standards agencies, and trade associations) in particular fields that compete but also cooperate" (Porter, 1998)

Rosenfeld (1997), Swann and Prevezer (1996) shared a more or less similar attitude towards clusters, which can be best described by Rosenfeld´s description of cluster being *"a geographically bounded concentration of similar, related or complementary businesses, with active channels for business transactions, communications and dialogue that share specialized infrastructure, labour markets and services, and that are faced with common opportunities and threats"*. Nevertheless, the most used definitions are stated by organization such as OECD and European Commission.

OECD defines cluster as *"networks of production of strongly interdependent firms (including specialized suppliers), knowledge producing agents (universities, research institutes, engineering companies), bridging institutions (brokers, consultants) and customers, linked to each other in a value-adding production chain."* (OECD, 1999). A special **LEED Programme** (Local Employment and Economic Development) run by OECD during the cluster mapping of chosen post-socialist countries (Slovakia took part in this research as well), came up with this core cluster characterisation: *"a cluster is an agglomeration of vertically and/or horizontally linked firms operating in the same line of business in conjunction with supporting institutions."*

The importance of linkages and interdependencies among cluster constituents are accentuated in the work of **Roelandt and Hertog**. They concentrated on increasing cluster competitiveness mainly in the areas of R&D, joint projects and consumer preferences. They characterize clusters as: *"networks of production of strongly interdependent firms (including*

specialized suppliers) linked to each other in a value adding production chain. In some cases, clusters also encompass strategic alliances with universities, research institutions, knowledge intensive business services, bridging institutions (brokers, consultants) and consumers." (Roelandt, et al., 1999).

European Commission (2005) is highly inspired by the Porter´s cluster definition with few added information. This definition was used as a starting tool for an Expert Group on enterprise clusters and networks in Europe:

"Clusters are groups of independent companies and associated institutions that are:
- *collaborating and competing;*
- *geographically concentrated in one or several regions, even though the cluster may have global extensions;*
- *specialised in a particular field, linked by common technologies and skills;*
- *either science-based or traditional;*
- *clusters can be either institutionalised (they have a proper cluster manager) or non-institutionalised."*

Many cluster initiatives and policies are supported by **UNIDO** – UN agency promoting industrial development and international cooperation. UNIDO´s approach is based on the assumption that *"clustering among enterprises promotes enterprise competitiveness"*. The official definition of cluster says: *"A cluster is a sectoral and geographical concentration of small/medium enterprises facing common opportunities and threats"* (UNIDO).

Some scholars claim, that in fact, it is not really possible to define a cluster. It is important to modify and adjust the definition of a cluster to the purpose of cluster analysis (Cortright, 2006). Due to the different cluster characteristics in different regions, it is better to use a more complex cluster concept than an exact terminology.

Overall, it can be noted that the definition of cluster lies upon three pillars – geography, value creation and business environment:

- *Geography* pillar refers to the proximity and clusters are concentrations within a region, nation or even town.
- *Value Creation* pillar explains that companies in a cluster are related to each other in the production and services.
- *Business environment* pillar promotes an understanding that cluster-specific business environment conditions have a strong influence on clusters. These conditions result from individual activities and also from the cooperation between companies, government institutions, academic sector and other entities in the innovation system. (Lundvall, 1988; Freeman, 1995; Cooke, 2000). On top of that, clusters are essential elements for the strong business environments (Ketels, et al., 2008).

As the popularity of clusters grows, so does the amount of so called cluster initiatives that are being launched as a useful plan for the regional economic development. Both terms – clusters and cluster initiatives are often used almost interchangeably, albeit the term **"cluster initiative"** describes *"the organised efforts to increase growth and competitiveness of clusters within a region, involving cluster firms, government and/or the research community"* (Sölvell, et al., 2003).

Cluster initiatives are thus understood as catalysts for the development of cluster and they are conditioned by the involvement of at least one party from the triangle - "industry-government-academia" and companies. These initiatives pose a new way for regional policy that is aimed to support clusters. A well-functioning cluster initiative can create better conditions for business environment within a cluster and strengthen ties among its constituents.

A reader should be also informed about a **few distinguishing factors between cluster, cluster organization and network.** Cluster is an agglomeration of production platform, in which a certain level of specialisation is achieved (Welfens, 2011). This synergy among actors can be achieved by evolutionary forces automatically. A popular way to accelerate and consciously stimulate the dynamism of cluster is to construct a cluster organization. Very often, cluster initiatives are initiated by business enterprises with a bottom-up approach. There are approximately more than 1000 of cluster organizations in Europe only (Sölvell, 2008). They have their own cluster facilitator (manager), website, and offices. Well-designed cluster organizations and initiatives can considerably improve the performance of a cluster.

The table below illustrates the key attributes of cluster, cluster organization and network. All three elements share common characteristics. Firms operating in both networks and clusters have certain linkages among each other. But despite many similarities, it is essential to draw a visible line between these concepts. **Clusters** encompass co-located actors engaged in business activities within related industries a linked to each other through externalities or other factors. Collaboration does not have to always take place. **Cluster organizations** are collaborative platforms, to which members voluntarily decided to belong. These organizations are focused on a concrete geographical region. Cluster activities are offered in line with the cluster´s objective to raise competitiveness. Inherently, networks and cluster organization are very alike. **Networks**, though, are constructed specifically for the purpose to perform very active collaboration, whose objective is usually rather narrow. Such collaboration is not limited to a defined geographic area or industry. However, externalities in case of networks that would stretch even outside of regions are not so apparent (European Commission, 2012).

Cluster	Cluster Organization	Network
- Colocation - Automatic participation - Not automatic collaboration	- Platform for collaboration - Members opt in - Scope of members given by underlying cluster (specific geography, specific industries) - Broad objective to raise competitiveness of the cluster drives choice of activities	- Platform for collaboration - Members opt in - Scope of members given by objective (specific or industry focus possible but does not necessarily match regional clusters) - Often narrow objective for the collaboration

Source: Adapted from European Commission 2012 - Reaping the benefits of globalisation

2.2   Development of cluster theories

The contribution of Porter to cluster concept has triggered dissemination of many other works related to cluster theory although most of them are based on the Porterian cluster characterisation. However, cluster concept is "evolutionary in nature" (The birth and the rise of the cluster concept, 2012). The research around cluster concept is based mainly on the notion of "firm´s agglomerations".

There are four observations made about **agglomerations of firms**:
- the world or national industrial/economic areas are concentrated in only a few regions
- there is a tendency of some entities operating in a certain scope to find their location in common areas
- organizations that stay long in an economic agglomeration have empirically longer life expectancy than isolated organizations
- in a cluster, innovations and innovative processes are more emphasized

Cluster theory evolution is set upon three basic cornerstones – starting with traditional economic sciences, maturing with regional economy and economic geography and finally leading to social/ political sciences (Kiese, 2012). The very first impetus for the further development of cluster theory was given within the classical agglomeration theory.

Agglomeration theory
The main cluster features are rooted in **Marshall**´s economic analysis and his interpretation of external economies. Marshall examined local concentrations existing in the British industry and he found out that the external economies such as knowledge or technological spillovers, economies of scale or labour pooling are inclined to lead to the clustering of some economic activity. The concentration and strong linkages of business enterprises attract suppliers of production inputs or specialized services. Marshall is quoted as saying about industrial districts – a term he used for today´s more popular name of cluster: *"Some of the advantages of division of labour can be obtained only in very large factories, but many of them ..., can be secured by small factories and workshops, provided there are a very great number of them in*

the same trade" (Marshall, 1919)*. His work on industrial districts and agglomeration economy can be considered as starting point for the emergence of (industrial) cluster theory.

For Marshall, there existed a factory system, where all the manufacturing processes were condensed in one place with a high degree of vertical integration (Becattini, 2001). The transaction costs could be kept down because the intensive exchange relationships among the main actors enabled suppliers to gain economies of scale (Bathelt, et al., 2004). Thus, he came out with the so called **"Marshall´s trinity"** concept that refers to three reasons why firms located in proximity reach higher efficiency than those firms that are distant from each other. The reasons for firms to locate in proximity:

- workforce basis
- supplier specialisation
- knowledge transfer

Concentration of related firms attracted a qualified labour force. These industrial districts provided suppliers with better conditions enabling them to achieve higher specialisation of their offers. However, observing the inter-relations among cluster members was not Marshall´s objective (Boja, 2011). Only the next agglomeration scholars devoted more thoughts to industrial linkages and network dynamics (Bekele, et al., 2006). In the 20th century, theorists tended to pay less attention to the production context that was described by Marshall. With the new production and work processes (mass production of Ford cars, Taylor´s organisation of labour), the internalization of markets accelerated and this new trend led to globalisation. Perroux (1950) came up with a concept of "growth poles", which was based mainly on externalities (such as economies of scale during a post-Ford phase of economy) and linkages.

Rebirth of regions - Italian clusters (First, Second and Third Italy)

In 80s, Becattini and later other (mainly) Italian economists brought in a concept of industrial districts after making observations in the rich northern Italy ("first Italy"), poor South ("second Italy") and emerging, thriving centre and Northeast of Italy ("third Italy") (Becattini, 1987). The first two regions were in stagnation and recession. By contrast, the third Italy was accommodated by strong concentration of firms that were clustered according to specific industrial sectors. The Northeast Italy region evidently outperformed other regions in the ability of its firms to innovate the production processes and product quality. Firms in the Third Italy were namely clustered in specific locations and were focused on specific industry. Becattini underlined the significant value of place-based economic development and social capital geography (Europe INNOVA, 2008).

Another dimension for examining cluster was added by Sforzi who analysed the reasons for a tremendous success of Emilia Romagna region in rural area of Italy. He concluded that the region had benefited mainly from social interactions. The governmental support or the shape of Porter´s diamond was not the decisive factor. It was the social capital that enabled to build a necessary trust between cluster constituents in Italy (Sforzi, 2002). Additionally, Bagnasco postulated that the Emilia Romagna region witnessed the emergence of new form of

capitalism distinguished through strong collaboration between employees and owners based on networks of SMEs or in other words, on industrial districts. Firms cooperated rather than competed and the processes were more skill-intensive.

Paradoxically, globalisation enabled to expand the development of clusters. With more and more globalised markets, the companies were pouring their resources into more attractive regions what only strengthened the role and specialisation of regional clusters. Since the 80´s the **"renaissance of regions"** can be observed. The importance of regions has been gaining more relevance for increasing enterprise competitiveness (Kiese, 2012). The success of these regions (such as Northern Italy) was attributed to the existence of concentration of specialized SMEs. The key of their success lied in the cooperation within a network.

Flexible specialization and New Industrial Districts (NID)
Following the economic interest in the success of the Third Italy, the academic focus was directed on the role of SMEs and notably on the power of inter-firm networking, flexible structures and collaboration. Storper and Scott reckoned that some clustering firms have an ability to move from one product or process to another while still keeping pace with the overall industrial change. In Saxenian work on New Industrial Spaces, she highlights the role of social networks and community-fortifying. These are the crucial ingredients for flexible production systems.

Flexible specialization was a term coined by Piore and Sabel (1984, 1989) that was set upon an argument that global economy for which mass production was typical was shifting to a post-Fordism era. Fordism is described as "organisational and technological principles characteristic of the modern large-scale economy". The post-Fordism era refers to the emergence of flexible specialization characterised by skilled labour force, customized goods and multipurpose machines. Flexible specialization theory is to a considerable extent derived from the concept of industrial districts – in which firms are co-located and cooperate. Marshall's work on industrial districts thus underwent a socio-economic re-conceptualization, that brought new insights into the role of cooperation as a vehicle to reduce risk and form a successful industrial district (Asheim, et al., 2006). Industrial districts were seen not only as economic but also as socio-cultural entities.

Flexibly specialized districts and the term **New industrial districts** (NIDs) are often used interchangeably. NIDs consisted of small, innovative enterprises located in a region. Such embedding within a cooperative system enabled them to thrive despite globalisation tendencies (Markusen, 1996). The NIDs were thoroughly analyzed by Markusen who studied specific features such as vertical and horizontal industrial linkages, innovative capabilities, firm networks. The concept of NIDs will be explained more in depth in the subchapter about types of clusters.

New economic geography
The 90´s are marked with efforts to add more dimensions to previous observations made for example in Italy. The successful evolution of enterprise network is linked to the government

and institutions facilitating the creation of stronger linkages. This approach is presented as **New economic geography** that raised a question about "where" firms decide to produce. This interesting economic concept has considerable implications *"to innovation hubs and industry clusters"* (Smith, 2012). Its chief architect and laureate of Nobel Prize Krugman argued that: *"clusters are not seen as fixed flows of goods and services, but rather as dynamic arrangements based on knowledge creation, increasing returns and innovation in a broad sense"* (Krugman, 1991). Krugman adhered to core-periphery model, in which interplay of transportation costs and economies of scale was highlighted (Benner, 2009). Krugman draws a line between centrifugal effect – that pushes economic activities into sprawling out (decentralization or disagglomerations) and centripetal effect – that on the other hand promotes concentration of economic activities (agglomerations) (Krugman, 2008). Economic space is thus understood as continuous. As a result of the interaction between both centripetal (agglomeration) and centrifugal (disagglomerations) forces, an economic space naturally arranges itself into industrial zones. New economic geography explains the emergence and development of an agglomeration spurred by centripetal forces that act in form of more intense linkages of firms and raising economies of scale. This has much greater impact than an access to some sort of source of natural capital (Krugman, 1991).

Porter´s cluster contribution

Michael Porter is undoubtedly the most widely-known person promoting clusters and their role in competitiveness. However, he did not bring to the world a breakthrough theory on cluster. As a matter of fact, he integrated all the existing theories and "translated" them to a common language. Porter benefited from the Schumpeterian view on innovation and entrepreneurship, then from a classic economic theory of location (Vernon, Hirschman), from Marshall´s externalities and also from Dahmén (1950) who dealt with the relevance of clusters (in his rendition development block for a certain industry) to the Swedish economy (Asheim, et al., 2006). Porter noticed that the very successful companies are usually co-located in a few locations and he systemically developed his cluster theory extending his previous works on company strategy (Ketels, 2011). Naturally, clusters became popular among business managers, corporate strategists, and state and municipality policy-makers.

Leveraging on the previous perspectives, Michael Porter (1990) showed in his masterpiece "Comparative advantage of nations" that the economic success depends on the interaction of several factors, which he later grouped in the so-called "Diamond framework" – an illustrative tool similar to the Five Forces framework. The factors which define the economic success of a region/country are:

- availability of resources
- access to information what facilitates the decision-making of companies to take some action by employing available resources
- company´s goals
- pressurizing firms to innovate and invest (Porter, 2012)

Porter added two dimensions to cluster theory – proximity and knowledge spillovers (Huggins, et al., 2011). Porter sees the role of regions as *the most important units for competitiveness*" (Porter, 2012). Industries are linked closely through vertical and horizontal relationships. The concept of clusters depicts these commonalities, spillovers and complementaries among industries. The geographical as well as value-creation proximity (proximity referring to activities creating value for customers) within a cluster, reinforces interconnections among companies and facilitates open communication. Closeness of cluster constituents has an impact on economic performance. The source of competitive advantage is cooperation. The key ingredient for the innovation within a cluster is the exchange of information that leads to knowledge spillovers. This creates a room for cluster innovativeness.

Porter´s model encompasses the role of business environment conditions that form a salient basis for further cluster development. (Huggins, et al., 2011). Clusters as agglomerations come to an existence because of specific business environment conditions that are responsive to the market events and that enable firms to exploit these conditions (Ketels, 2011).

2.3 Cluster Models and Types

There are different models explaining supply chains and relations between enterprises. Certain characteristics of a cluster make its notion less vague. As was already accentuated by Marshall, specific economic activities are inclined to be concentrated in certain places.

Cluster as economic agglomeration
We can look at cluster as one of the four types of economic agglomerations. The main differences between a cluster model and other economic agglomerations are depicted in the typology presented in this matrix (Malmberg, Sölvell, Zander, 1996). Agglomerations can be boiled down into **metropolises/cities, industrial districts, creative regions and (industry) clusters**. The scheme differentiates between agglomerations taking into account these grouped perspectives – advantages stemming from efficiency and flexibility (e.g.: economies of scale) vs. advantages from innovations and diverse agglomeration activities in general vs. concentration of technically related activities.

	Diverse agglomeration activities	Technologically related activities
Efficiency & Flexibility	**Cities** Main theorists: Hirschner, Myrdal	**Industrial Districts** Main theorists: Markusen, Piore& Torper
Innovation	**Creative Regions** Main theorists: Andersson,Johannisson	**Clusters** Main theorists: Porter

Source: Malmberg, Sölvell (1996)

The first type refers to urbanization economies. Low transportation costs and efficient extensive operations facilitate the appearance of **metropolitan region**. The cities are appealing to big corporations and major industry centres. The second type encompasses enterprises conducting similar/the same business activities that form flexible production systems or **industrial districts**. Linkages among constituents induce economies of scale and scope and eventually specialized labour pools. The stronger the links, the lower the costs (or the higher the revenues) for firms participating in the local exchange.

Generally speaking, the first two agglomeration types can be marked with words "efficiency and flexibility". For the other two types, words as "centres of knowledge creation" and "innovation" are applicable. An agglomeration type - **cluster** has a dynamic environment and it is based on knowledge creation, rising returns and innovation. Particularly innovation focus is understood as a reason for further sustainability of this type of agglomeration, because firms in clusters execute activities in the same scope and innovations breed competition. Clusters are enhanced through exchange of business insights and technical know-how. It is interesting to note that technological and knowledge spillovers were emphasized by Marshall almost a century ago, then became dormant in other theories and finally were reborn in Krugman´s and Porter´s papers. The fourth type of agglomeration – **creative regions** deals with the formation of knowledge and creativity within region that doesn´t have sector boundaries. Such region witnesses to an unplanned exchange of information and interaction among actors with various specializations. The presence of related constituents is highlighted in cluster; however, in case of creative regions unexpected products or services may emerge.

Cluster or New Industrial Districts defined by Markusen

Although clusters share many underlying similarities, they can vary significantly across regions and countries in its characteristics, structure or synergies. According to (Markusen, 1996), the then existing cluster theory did not fully revealed why and how certain locations evoked and sustained their attractiveness for investors (OECD, 2005). Therefore, in her work she tried to uncover the reasons why some places stimulated a growth of some specific productive activity. She spoke about *"New Industrial Districts (NED)"* that can provide better explanation on cluster typology. In her work, Markusen adds the role of government on national and regional level that was previously underestimated.

There are four spatial types that can be considered as cluster types. Their main traits are further described in terms of business structure, cooperation and linkages among district constituents and external players, district´s labour force and role of government.[1]


A. Marshallian Industrial District

1.   The well-known **Marshallian "New Industrial District"** is characterised by flexible participation of small specialized and locally owned firms. The firms, however, are rather passive in these interrelations. The economy of scale is

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[1] Legend to images: □ - branch office, plant; o - small, local firms; O – large locally headquartered firms

usually low, main investments are made locally and linkages with enterprises outside of the district are weak. Therefore, Markusen upgraded Marshall´s theory and highlights an Italianate variety. Italianate districts demonstrate more intensive cooperation among the firms (even competitors) and more frequent exchanges between customers and suppliers. Firms share risks, innovations and work together towards a more stable market. Shared infrastructure in terms of marketing, trainings, and financial help is accessible through strong trade associations. Workers are committed to the district as a whole, much more than to the companies. The local government enhances the industry by its promotion and regulation.

B. Hub-and-Spoke District
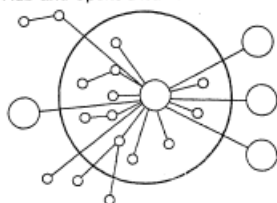
2.   In the **"Hub-and-Spoke District"**, an economic activity is cultivated around several large locally headquartered business enterprises that are surrounded by smaller firms /suppliers. These small and large firms do co-operate extensively but cooperation among competitors (to share risk, innovations) is rare. Major firms and suppliers have often long-term contracts. Consequently, the long-term prospects for success of such district depend on the strategy of dominant players and the overall projection of industry growth. Linkages to external suppliers and competitors are strong and the economy of scale is fairly high. Workers are primordially committed to large firms, only then to district and eventually to small firms. Relatively high involvement of government is common for this type of industrial district, although strong trade associations providing shared infrastructure (as was the case in the previous type) are absent.

C. Satellite Platform District
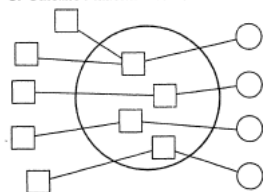
3.   "**Satellite Platform District**" consists of large and independent plants owned and based externally. The level of cooperation and linkages, mainly with a parent company are high, but spinoffs hardly occur. Oppositely, the cooperation among competitors within a district is very low. Economies of scale are higher than in previous types. Workers are more committed to firm and not to the district. Financial resources, technical know-how and services are not provided locally, but through external firm. There are also no trade associations supporting shared infrastructure and the local government gives support for instance in form of tax breaks.

4.   **"State-anchored industry districts"** are ruled mainly by one or a few large governmental entities (e.g.: military base) surrounded by service firms, suppliers and customers. This form resembles hub-and-spoke type of cluster, with the difference that the dominant player is not under control of private sector. Economies of scale in this model, mainly in public sector, are fairly high. Cooperation and linkages to external enterprises are relatively intensive, but on the other hand, cooperation among firms from a private sector in terms of sharing risk and innovations is rather low. The infrastructure is to greatest extent provided by public institutions, but local government has typically weak engagement in promoting an industry. Workers are committed to institutions first, then to district and only after that to small companies.

Enright´s cluster typology based on dimensions

The utter relevance to the thesis topic is shown in case of cluster agglomeration. Each cluster is different in size, power, stage of development, scope. Understandably, we can distinguish between various classifications of a cluster.

Enright employed several dimensions, in which clusters differ from each other. In his theory on cluster typology, based on the dimension "Geographical scope" he identifies *local, regional, sub-regional, multiregional, national* and *transnational* clusters. "Density" dimension relates to the number of firms and their economic weights. "Breadth" refers to the horizontal scopes of firms within a cluster. On the other hand, "Depth" dimension refers to the vertical scopes. "Activity Base" includes the core of activities performed within the value chain. "Innovation Capacity" explains the ability of cluster to create key innovations with a relevant competitive advantage that is in the interest of the cluster. "Stage of development" can be *embryonic, growing* and *mature*. Clusters can be then viewed as *growing, stagnating or declining*. "Power of competitive position" enables to label a world leading cluster, a leading cluster within a supranational region, a leading cluster within a national region. The dimension "Technological activities in cluster" makes possible to differ between clusters in the role of technology generators, adaptors and users (Enright, 2003).

Apart from setting up cluster typology according to the abovementioned dimensions, Enright makes a distinction between clusters following their level of activity and self-realization (Enright, 2003).

Working clusters have already been identified and members have high cluster awareness. It is however necessary, to steadily ensure the arrival of new entrants, to question internalization and to be aware of possible failure scenarios.

Latent clusters pose opportunities in the future that have not yet been exploited. It is recommended to increase existing interactions, to foster new linkages (also outside contacts) and to identify leadership.

Potential clusters fulfil several key conditions for their existence, but lack critical mass of certain factors. Optimal solutions could be to identify gaps in infrastructure or education, to bring together participants and to build from base points.

Policy-driven clusters are those that have been chosen by government because otherwise they would not reach critical amount of members or to develop themselves under unfavourable conditions naturally.

"Wishful thinking" clusters are politically-led clusters. These clusters lack sufficient amount of firms and they are not endowed with any other special source of advantage that would enable natural emergence and development of cluster. It is highly important to understand factors impeding a successful development so that an appropriate policy to support a cluster could be targeted (Pavelková, 2009).

Based on the way in which cluster´s participants are linked and arranged into a certain economic patterns, a basic distinction divides clusters into horizontal, vertical and lateral (side) clusters. **Horizontal cluster** is comprised of suppliers and manufactures in the same

orientation. They are characterised by their width because of the whole range of producers. On the other hand, **vertical clusters** are characterised by their depth. The whole supply chain, usually around big manufacturers, creates such clusters. Another type of clusters that is typical particularly for automotive industry is a **lateral cluster.** Such cluster emerges in a location where many firms modify, complement or assembly standard products of big corporations. Smaller firms are more flexible in detailed processes and they have capabilities to refine a standardized mass product to slightly different version (Pavelková, 2009).

2.3.1 Cluster´s key actors

The most straightforward way to explain the interconnectedness between various actors in a cluster is the **Triple Helix model** developed by Etzkowitz & Leydesdorf. Three factors are of utter importance for successful development of cluster – business/industry, education and government. However, the arrangements of these three main constituents are subject to a certain evolution process. The first version of Triple Helix model (*etatistic model*) refers to an arrangement, in which academia sector is controlled by state and innovations are suppressed. In the second version of model (*laissez-faire model*), the power of state is diminished. The three key players function as separate units and there is no overlap in their relations.

The final version of Triple Helix model (*tri-lateral networks and hybrid organizations*) can be seen as the most appropriate arrangement of the **university-industry-government relations**. These prominent components overlap in their roles of innovation and knowledge generators (Etzkowitz, et al., 2000). The university-industry-government trio is based on very close cooperation, interaction and role equality. Academia, consisting of universities and research centres take part in projects financed by industry (private sector). It is common that new business in form of spin-offs emerges as an outcome of fruitful collaboration. Business environment supports further entrepreneurial efforts of private sector. Government may finance some projects or/and facilitate the conditions for the development of interconnected triple-helix model (Boja, 2011).

Image 1: The Triple Helix model
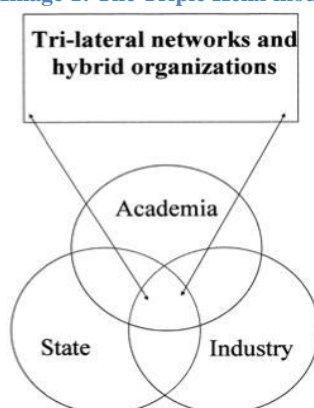
Source: Etzkowitz, Leydesdorff, 2000

The Cluster Policies Whitebook classifies five groups of actors presented in a cluster. A cluster consists of *"companies, governments, the research community, financial institutions and institutions for collaboration"* (Anderson, et al., 2004).
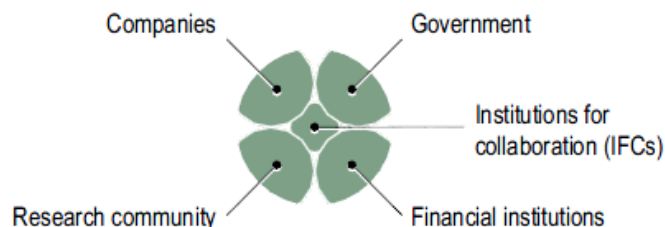
Source: The Cluster Initiative Greenbook, 2003

Firms are the logical building blocks of a cluster. In most cases, clusters consist mainly of SMEs. However, companies in a cluster do not have to be necessarily grouped under an institution to strengthen their collaboration. Cluster benefits may arise solely as a result of co-location of firms (Ketels, et al., 2008). Higher collaboration can be achieved through specific organisations named "institutions for collaboration" (IFCs). IFCs connect parts of microeconomic environment. The actors involved in the component of IFCs form either formal or informal networks that promote cluster initiatives. These arrangements can be represented by a newly-formed cluster organization or by established entities promoting better business environment and innovations such as trade associations, chambers of commerce, think tanks, industry associations etc.

Individual actors are integrated into a cluster initiative by various incentives. At the beginning, some countries put more emphasize on the role of public sector. In others, private sector will be the dominating factor to entice new actors. In countries such as Germany, India, and North American area, it´s common that regions or provinces are more active in the creation of clusters. More centralized approach is typical for Nordic countries, France and UK and some transition countries.

Over time, universities and research centres have started to play a more significant role. They have possibility to function as a bridge in the science-industry exchange. In some countries, however, the knowledge generated on an academic soil is not always practically used, because spillovers effects are still weak.

The figure on the next page nicely illustrates examples and functions of each actor. It is adapted from Sölvell who identified six types of **main cluster actors**: *industry (companies), public bodies, universities and organizations for collaboration and media* (Sölvell, 2008).

Upstream and downstream companies within a cluster are comprised of large companies and SMEs. Industry consists of suppliers, buyers, services (business, legal, consulting services) and also firms from related industries. Public entities include ministries, agencies dealing with development policies, innovations, entrepreneurship, trade, investments, incubators; regional

institutions and local communities. Finance sector includes banking system as well as venture capitalists and other investors. University or academia incorporates higher education system, research centres, science and innovation parks. The term "organizations for collaboration" refers private or public-private institutions enhancing the collaboration (chambers of commerce, official network platforms, cluster organization). Media take care of exposure of clusters to the public and contribute thus to building a cluster brand (Sölvell, 2008).

Image 3: Cluster actors
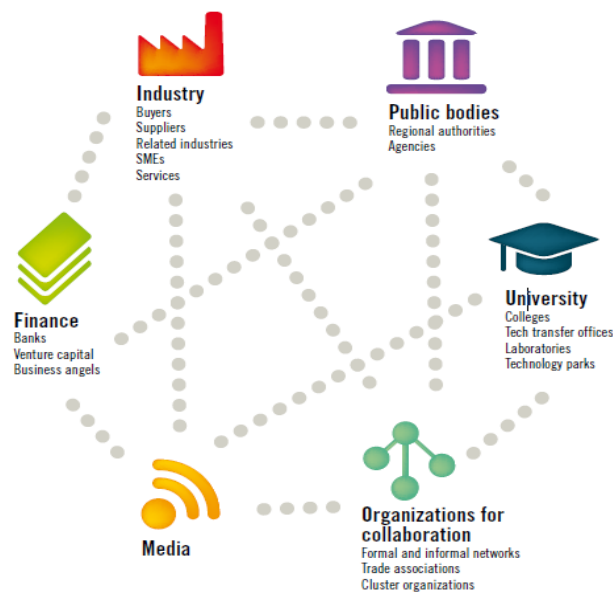
Source: Sölvell, 2009

2.4 Cluster concept – new accelerator for regional development or misleading idea?

How comes that some regions flourish more than others? How comes that some regions climb and other decline? And how comes that some companies are able to expand their business in such ferocious global competition? One possible answer could be: *clusters*.

Clusters are understood as a key to achieve higher competitiveness. Clusters are able to spur more intense cooperation even among rivals – this trait is often described as "co-opetition". Apart from that, they have potential to serve as "social glue" joining universities, business and public sector (Europe INNOVA, 2008). Also, clusters foster innovations.

Cluster concept entered into the forefront in policy making, but many times policy-makers misunderstood the main attributes of cluster concept. Clusters in the Porterian sense occur naturally, as a result of the pursuit of competitive advantage of a certain location. On the other hand, clusters as forms of networking are intentional efforts with the objective to reinforce the linkages among cluster players and create synergies.

In praxis however, institutionalized clusters are sometimes seen as lobbyist groups using targeted protective measures for the well-doing of a chosen industry. The objective of firms agglomerating into a cluster organization should not be primordially motivated by better access to public sources based on the conviction that cluster could be a good vehicle how to achieve this. In such case, a vicious circle can be created. Companies become members of cluster to get easier access to finances, but after the end of the influx of public money they find out they are not able to continue with projects without public support so they ask for financial support again. Clusters are namely about learning how to fruitfully cooperate.

In addition to previous separation of Porter´s clusters and cluster organizations as networks, it is needed to have a closer look on the difference between cluster-based approach to the development and sectoral approach (OECD, 2005).

Image 4: Difference between traditional sectoral and cluster-based approach

Sectoral approach	Cluster-based approach
Groups with similar network positions	Strategic groups with mostly complementary and dissimilar network positions
Focus on end-product industries	Include customers, suppliers, service providers and specialised institutions
Focus on direct and indirect competitors	Incorporates the array of interrelated industries sharing common technology, skills, information, inputs, customers and channels
Hesitancy to co-operate with rivals	Most participants are not direct competitors but share common needs and constraints
Dialogue with government often gravitates towards subsidies, protection and limiting rivalry	Wide scope for improvements in areas of common concern that will improve productivity and increase competition A forum for more constructive and efficient business-government dialogue
Search for diversity in existing trajectories	Search for synergies and new combinations

Source: OECD 1999, Boosting Innovation- the cluster approach

Opposed to other networking groups from the traditional sectoral perspective, cluster actors are interlinked in a value chain, creating both vertical and horizontal relationships. Whereby sectoral approach focuses only on the horizontal relationships (direct competitors producing the same product and conducting similar activities,), cluster-based approach emphasizes vertical relationships between different companies. Clusters are rather cross-sectoral groups consisting of complementary firms, dissimilar suppliers, specialized institutions. Interaction is highly important (OECD, 1999).

Cluster-based approach can have positive implications on the country performance. The level of cluster development positively influences the GDP per capita growth in Europe – a hypothesis that was corroborated by Mrs. Pavelková and her team in 2007.

$$y = 79,137x^{3,965}$$
$$R^2 = 0,5711$$
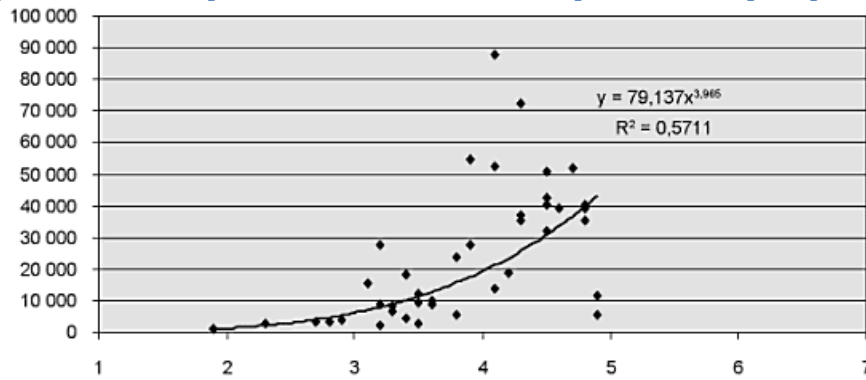
Source: Pavelková, 2007

There are several implications of cluster-based approach to economic development.

Clusters Increase Productivity / Efficiency

Clusters provide efficient access to specialized resources, services, labour force, institutions, programs, and other "public goods". They make the transactions across companies easier. Best practices are spread around faster. As competitors are co-located, they can compare their performances and have strong incentives to execute strategies to differentiate (Porter, 2008).

Clusters Stimulate and Enable Innovations

A cluster-based approach may enable to increase the "absorptive potential" of the region and also create a better strategic framework for local actors to improve innovation capacities in the region (Lagendijk, et al., 1999). It is in fact more likely to perceive innovation opportunities in cluster. Defenders of cluster approach recognize the ability of clusters to foster innovations. According to (Moreno, et al., 2005), firms in clusters achieve higher level of innovation activities as a result of bigger pressure on companies within a cluster to update.

Clusters as knowledge creators

Clusters spur knowledge creation and transmission between companies located there. Clusters function as information and communication ecosystem with a certain "buzz" embedded in it. This buzz refers to face-to-face contacts, regular information updates, and repeated meetings that altogether create mechanism for information exchange. Information and news are spread by cluster actors who contribute to the knowledge diffusion by simply "being there". High-quality local buzz develop trust (Bathelt, et al., 2004). The growth of knowledge leads to new economic activities what then results in economic progress.

Clusters Facilitate Commercialization and New Business Formation

Within a cluster, it is more obvious which and where new opportunities for creating new firms and new lines of existing businesses. The existence of business relationships and concentrated demand triggers creation of spinoffs and start-ups. It is easier to set up a new company because of the availability of suppliers and specialized workforce.

2.4.1 Advantages of clustering for firms

The benefits that a cluster has potential to offer are understood as the main reasons contributing to explain why firms in a cluster (and thus also the whole cluster) outperform the remaining industry (Spencer et al., 2009).

There are three main groups of advantages that an active participation in cluster (or in cluster organization) brings along – access to innovation, knowledge and know-how. When firms embark on clustering, they can get information relevant to their industry faster; for instance information about consumer preferences in other markets abroad, recent advances in technologies, and changes in supply chain. Advantages can be split into soft and hard benefits (Rosenfeld, 2002):

- **Hard benefits** of clustering are shown in form more efficient business transactions, more appropriate investments, and lower expenditures. Benefits arise from sharing, benchmarking, best practices, knowledge spreading that altogether lead to innovations, imitations and upgrading. The presence of specialized workforce causes higher productivity, local supply chains take care of efficiencies, and range of firms can promise good network opportunities.
- **Soft benefits** of clustering are intangible and they are not clearly leading to a profit, but have probably even greater consequences. The formal as well informal interactions with suppliers, customers and firms; the trust present in a cluster, mobile workforce, cluster as an association of crucial constituents; all these aspects carry advantages in form of inter-firm collaboration out of which innovations, acquirement of tacit knowledge emerge (Rosenfeld, 2002).

Benefits of clustering can be well elucidated thanks to a toolbox of mechanisms that shape cluster efficiency and that are highly relevant for the cluster development. It is not always the case that a cluster contains all the mentioned mechanism, though.

Table 2: Hard and Soft benefits of clustering

Mechanism	Interpretation
Recruitment of competent new labour among alumni of universities	Availability of alumni enhances the local pool of labour; knowledge transfer
Mobility of work force among firms and between academic and corporate sector	Possibility to diminish the effects of business cycle, knowledge transfer
Spin-offs	Knowledge transfer to the spin-off
Venture capital, angel investors	Saving transaction costs, uncertainty reduction for other actors
Cooperation of academic (universities, research centres and corporate sector)	Universities´ labs used by firms, contract research
Horizontal cooperation (firms)	Joint representation, trainings, joint projects
Vertical cooperation (firms)	Input-output linkages lowering transaction costs, continuous input-output relations can lead to more trust and more interactive

	learning process
Intensive local competition	Spatial proximity makes corporate strategies comparable and provides thus an incentive for competitors to innovate
Competition in the local social hierarchy	Intensified local competition due to prospects of firms/employees to advance in the local social ranking
Cafeteria effects	Workers in a cluster can exchange knowledge
Social networks	Building networks thanks to labour mobility and education in local universities

Source: Adapted from Benner, M. 2009.

The mutual cooperation of firms and institutions enables building up competitive advantage on the market compared to isolated competitors. Firms can thus focus on their major competencies and use the rest of the services from the specialized companies in their proximity (SIEA, 2009). Therefore, for business enterprises, these can be the determining advantages of embarking on clustering (Pavelková, 2009):

- **Economies of scale, sharing of costs**

Cluster can initiate common projects to achieve synergy and cost-saving effects. Joint initiatives, such as purchasing, marketing, research, logistics, HR training can create opportunities to increase the productivity of firms. Such an environment can entice foreign investor, who becomes a more demanding user of local companies 'services what creates a certain pressure to perform better.

- **Access to more specialized inputs and labour force**

A greater amount of specialized suppliers concentrated in cluster enables to deliver the goods and services faster, what also puts the transaction costs lower. In such a concentrated place there is usually a more qualified work force at disposal. Moreover, firms organized in clusters can have bigger influence on the curriculum taught at universities so that it is more consistent with what the market actually needs.

- **Optimization of supply chain**

A cluster is comprised of companies of various sizes. Smaller firms can specialize, what enables them to better compete with larger, vertically linked companies.

- **Access to new customers and new market opportunities**

Being part of a cluster brings companies more opportunities to get new orders, what would otherwise be more difficult for a single company. Cooperation with cluster in related industries is also another cluster advantage.

- **Internalization and increase of export**

Cluster can work in the role of facilitator of international contacts and provide access to information about market possibilities abroad. Companies are spurred to export and can create more efficient market-entry strategy to other countries. Cluster can promote itself and its members through internalization, what improves cluster´s brand, image of companies and creation of international partnerships.

- **Better company image and promotion**

Formation of common identity of companies in a cluster makes this cluster more valued. Other firms may feel attracted by the positive reputation of cluster and willing to co-operate. Cluster can organize various promotion events and promote its members at fairs, exhibitions, business events.

- **Access to industry information**

Cluster provides information about new technologies or upcoming trends in consumer behaviour. A faster information pipeline enables companies to be more agile. The proximity of cluster constituents allows learning from each other.

- **Increase of innovation potential**

The mutual rivalry within a cluster spurs innovations. Cluster supports the development of products with added-value. More firms can join together to work on the development of such products, technologies or processes. They can leverage on the academic and laboratory resources at universities or research centres. Thanks to the cooperation and mutual inspiration, "*spillover*" effects take place. In this way, cluster members increase their abilities to explore market niches, what causes either their deeper specialization or creation of *spin-offs* [2] companies.

- **More powerful voice when organized in a group**

Cluster management of an established cluster organization cooperates with regional and also national institutions and can create a whole array of supporting activities in favour of cluster development. Cluster as a group can give suggestions to the government regarding improvements in infrastructure, services or access to grants. Even smaller firms can thus have an influence on fostering the change in business environment.

2.4.2 The role of Cluster Organizations in the cluster-based approach

Cluster initiatives and from them developed cluster-based institutions for collaboration (cluster organizations understood as one type of IFCs) are predominant approaches for the development of clusters and innovation policy. It is generally agreed that they should be highly perceptive to local circumstances (Sölvell, et al., 2003). Cluster initiatives take a crucial role in increasing the regional competitiveness by upgrading companies' sophistication and strengthening networks, however they do not compensate for a weak cluster with unfavourable business environment (Ketels, 2007). Cluster initiatives have a role of catalysts to "policy reform and development of private sector" (Shakya, 2009).

According to the established network of chosen regions - Cluster Linked Over Europe (CLOE, 2006), the management of a cluster initiative has at least five key fields of activities that should to be offered to cluster members.

1. **Information and Communication** – Cluster organization should be equipped with a detailed database about its cluster members, customer base, suppliers. Maintaining a

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[2] Definition of spinoff: "A new independent company created from an existing company or organization" <http://www.spinoffprofiles.com/definition-of-spinoff>

good Internet page, sending out regular newsletters, organizing events and company study tours are activities that reinforce the collaboration.

2. **Training and Qualification** – Cluster organization should provide its members with relevant HR activities – workshops, seminars, inter-firm learning. Performing analysis of educational requirements of the industry and also of other cluster supporting industries is valuable in order to contribute to the improvement of labour pool.

3. **Co-operation enhancement** – Projects boosting cooperation are essential for improving cluster competitiveness. Cluster organization should enable its members to get better access to potential business partners or to projects spurring firms to cooperate in R&D and to raise innovativeness.

4. **Marketing and PR** – Cluster organization should strive for fortifying of the regional identity and cluster brand. This can be managed by participating at various industry-related fairs, presentations and advertising activities. Cluster organization can take an active role in lobbying for changes in certain areas vital for further cluster development (e.g.: curriculum at universities, less bureaucracy procedures in some projects)

5. **Internalisation** – In a globalized world, to have an access to foreign partners and customers is a must in corporate strategies especially of SMEs that are more inclined to lack knowledge and resource to enter foreign markets. Companies should find enough support in their cluster organization (CLOE, 2006).

Clusters differ from each other and so do the cluster initiatives and cluster organizations. Therefore, the abovementioned groups of activities are only broad illustrative suggestions.

2.4.3 The Role of Public Sector

Public sector is an inevitable part of cluster development. Government should be engaged, especially as clusters have regional as well as national impact. Government should be most active during the initial stage of cluster emergence and perform activities such as cluster mapping, creation of support programmes, provision of information (Shakya, 2009).

Porter´s approach shows only limited approval for government involvement. Government can influence, but not control clusters. Clusters should be subjected to market-driven process. Clusters are an appropriate way to improve competitiveness and to serve as tool for policy analysis and design. But clusters should not be deliberately created by governmental efforts (Ketels, 2011). Porter assigns five tasks to the role of public policy– assessment of local economy and analysis/identification of clusters; assessment of economic policies strengthening business environment that are helpful for a natural emergence of clusters; elimination of policies that work against cluster emergence; leverage clusters as an economic policy tool to improve competitiveness; and encouragement of the creation of cluster organizations that enhance the interactions and spillovers in the cluster.

In terms of the last task, Porter understands cluster initiatives as a certain type of "Institutions for Collaboration – IFCs" that can increase interactions between companies and serve as

platforms for joint actions among private and public sector. However, Porter highlights the private-sector leadership in cluster initiatives. Public-sector leadership is acceptable only in case of cluster mobilization and only when the private sector takes responsibility for the action agenda of the cluster initiative (Sölvell, et al., 2003).

2.4.4 Criticism of clusters

Clusters and cluster-based approach to the enhancement of competitiveness and to economic development became increasingly popular. Simultaneously, the concept of clusters has been exposed to criticism. The most repeated critiques can be distilled into these keywords: *fuzzy concept*, *lack of geographical or industrial boundaries, creation of power asymmetries by focusing too much on cooperation, fashionable over-creation of clusters everywhere*.

It is argued that the wide-spread popularity of cluster does not have to be necessarily a signal of the profundity of cluster concept (Martin, et al., 2003). However, popularity is not a conceptual weakness and at least it is an indication of strong relevance (Ketels, 2011). Porter´s cluster theory is accused of being merely a "way of thinking" about the economy, serving as a superficial "template" to deconstruct the economy into industrial co-located groupings (Martin, et al., 2003). Such model is then hard to be tested and measured. Porter is clearly in favour of assessing clusters on a case-to-case basis. However, his theory aims to help practitioners to comprehend the complex reality of a specific location in order to make actionable and better targeted decisions (Ketels, 2011).

It is difficult to construct clear cluster boundaries (geographical and industrial) and diffuse cluster definitions only reinforce this issue. An open question remains which industries, companies; activities should be included in the defined cluster? How to determine the linkages between companies that are strong enough to form cluster? Porter´s suggestion is to use the "strength of spillovers" and their relevance to productivity and innovation in order to set cluster boundaries (Porter, 1998). Productivity and competitiveness are used interchangeably in Porter´s theory, what raises a typical hen-and-egg type of dilemma. Is the regional location competitive because business there is more productive or business is more productive because the region is more competitive? The crux of Porter´s understanding is that region´s prosperity depends on the economic productivity that is determined by the firm productivity (Martin, et al., 2011). Competitiveness is thus productivity. Clusters reinforce both productivity and competitiveness by improving business environment and promoting competitive advantages of firms.

The cluster concept has been often misunderstood and misapplied (Malecki, 2011). There are allegedly a few clusters in Czech Republic, in which firms stayed only in order to be informed about the strategies and activities of their competitors (Stejskal, 2011). Clusters were sometimes perceived as free associations of companies that enabled better access to public financial resources. These were so called "quasi-clusters" and are typical examples of failure to understand properly the cluster concept. In praxis, this happens when a cluster as

organisation does not lead to synergy effects in innovations, knowledge and information sharing and usage of high-technologies (Stejskal, 2011).

Cluster-based economic approach is certainly not the remedy for economic development and it is definitely no panacea despite being so popular elsewhere in the world. Some academicians argue that clusters can in fact help only to a few "chosen ones" in chosen areas (OECD, 2005). This may be a valid point, however, for firms in many regions it is primarily important to be in an environment where they have opportunities to learn how to co-operate in the right way. Cluster-based approach attempts to build bridges across various disciplines and facilitate the adoption of more strategic and analytical approaches to policy.

2.5 Cluster lifecycle

Clusters have a developing nature. They do not appear and die within a day and moreover, they do not come into existence randomly in whatever location. Two ways of their creation can be observed.

- The "natural" clusters emerge in a **bottom-up** process
  Such clusters surge spontaneously because of the natural pressure of market forces. A certain economic activity is agglomerated in a certain place, in which firms start to get more and more engaged in similar business activities. Government intervention may help with the development of healthier business environment in order to strengthen the efficiency of clusters (Pavelková, 2009).

- The "constructed" clusters emerge in a **top-down** process
  There is an initial and deliberate public effort to construct a cluster or cluster organization almost from a scratch. Business enterprises are enticed to become a member of a cluster thanks to a national cluster program or other direct cluster support. Top-down approach is employed at the very beginning with the aim to a "kick-off" the emergence of a cluster (Pavelková, 2009).

Cluster should not be considered as a homogenous entity, but as an organization form set upon dynamic interactions that occur between heterogeneous actors that differ according to a stage of cluster life cycle (Menzel, et al., 2007). There is a strong analogy of cluster life cycle to the industry life cycle. Clusters behave in the same way as firms do, they undergo a process of *emergence, growth, sustainment/maturity* and eventually a *decline* (Sölvell, 2008).

Image 5: Stages of development
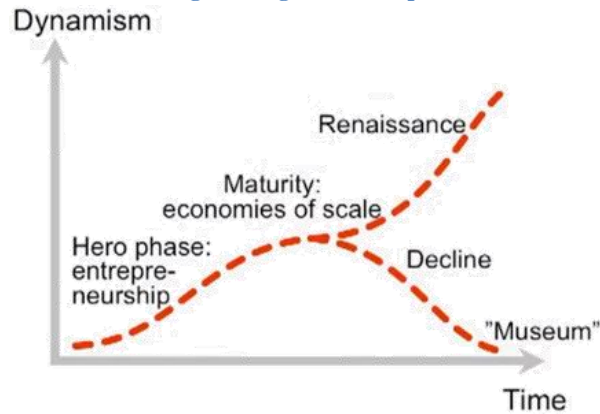
Source: Sölvell, 2008

In the very first stage (**cluster emergence**), the dynamism of a cluster is usually feeble, but intensifies rather quickly. Very often, the natural ''seeds'' of cluster (natural advantages, specific skills embedded in a region) flourish thanks to a critical person who stimulates the cluster further growth (**hero phase**).

Rising clusters become gradually part of international competition. The more successful a cluster is, the more intense dynamic can be observed. As a result of internal rivalry, co-operation, new business formation and attraction, a cluster can leverage on new superior strategies - economies of scale (**maturity phase**). As a cluster finalizes the maturity stage, it stands at a crossroad. A cluster can either enter a new process during a **renaissance** cycle through new technologies, new firms, and new specialization. Or it can go downward and reach **museum stage** (Sölvell, 2008).

The life cycle approach towards clusters is driven by microeconomic dynamics. In order to avoid the confusion of terms clusters and networks, clusters should be looked at by following their development in the past. The life cycle theory of its main protagonists **Mezel and Fornahl** is set upon a premise that clustered firms should gradually outperform the non-clustered firms.

"Emergent clusters" exhibit a strong potential to outperform the remaining industry. Only a few firms and employers are present in such cluster and there is a limited amount of common activities. **"Growing clusters"** are typical for an increasing employment and gradual creation of collective activities among cluster actors as well as building up cluster institution. As a group, cluster becomes more focused and more productive. **"Sustaining clusters"** little by little reduce speed of their dynamics but they still reach higher productivity than non-clustered firms. These clusters actually form regions, in which they are located. Clusters can leverage on benefits stemming from synergies and external cooperation with other clusters is common as well. Internalization is also an usual step forward. In case of **"declining clusters"**, firms´ performance is under averaged. In many cases, sustaining clusters manage to adapt and stay focused as matured clusters. Some clusters handle new challenges by renewing their focus

and they move back to the growth stage. Other clusters completely transform their scope and enter into new areas (Cluster life cycles: towards a research agenda, 2012).

Image 6: Cluster Life Cycle
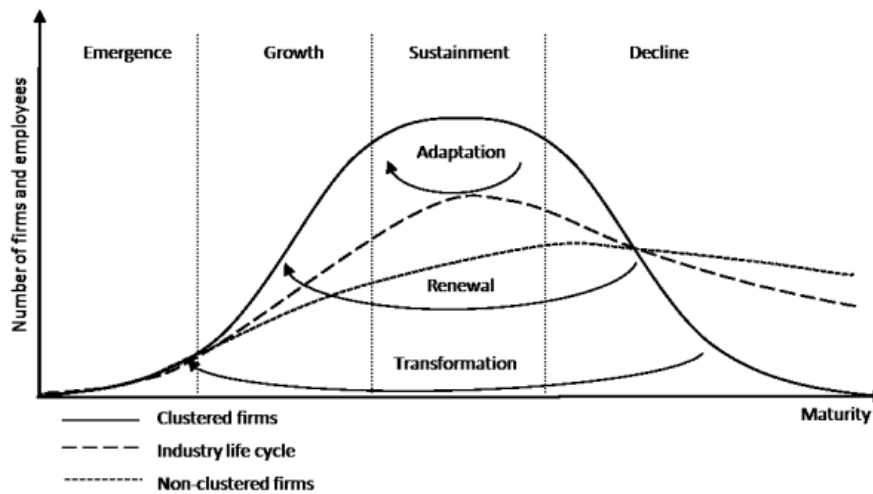
Source: Menzel and Fornahl, 2012

For each stage of cluster development during its life cycle, different set of action steps is needed in order to exploit cluster´s potential to the fullest and move to the next stage. For the embryonic or emergent clusters, the role of government and facilitators may be instrumental. In case of sustaining/mature and declining clusters, it is inevitable to pay attention to the enhancement of innovations and openness of clusters (Pavelková, 2009).

2.5.1 Process of cluster formation

The creation of cluster covers a transition from non-existing collaboration among companies to an existing and well-working cooperation. Cluster formation results from on-going collaboration between companies. Such interactions generate relationships, transactional and relational proximity and favourable basis for further better cooperation (Karlsson, 2008).

According to **Atherton**, five steps of cluster formation process can be appointed. The shift from one stage to next stage depends on the emergence of greater levels *"mutual commitment to cooperation, and hence to increased levels of group interaction"* (Atherton, et al., 2008).

Table 3: Cluster formation process

Stage 1 Identification of a common issue or a problem The starting point is an alignment of firms in the recognition that they face challenges which they couldn´t overcome themselves without a cluster formation. An issue or a problem is shared by future cluster members and the combination of resources and abilities of the whole group poses an appropriate solution. The potential of collaboration is not fully perceived, though. At this stage, firms have not agreed to work together yet.	Potential cluster
Stage 2 Recognition of a need or opportunity to cooperate Later on, firms feel an urge to collaborate with similar businesses and the potential to work together from the first stage shifts to the actual active	Emerging cluster

cooperation. There is thus a strong pressure to find a solution to a shared problem and to get more engaged into fruitful interaction. While in the first stage, recognition of a shared issue was the cornerstone, in the second stage, the recognition of opportunities coming up from mutual cooperation and collaboration is the bottom line. Firms recognize the possible benefits arising from direct collaboration.	
Stage 3 Development of an initial collaborative project After recognizing the importance of shared problems and collaboration as a mean to implement solutions, the next action is to agree upon the form, scale and nature of cooperation. Set of shared activities is established. Firms gradually develop trust in working relationships. Initial and various "test" projects are proposed. Consequently, such pilot projects enable to create shared rules for further cooperation of firms.	Emerging cluster
Stage 4 Emergence of on-going group collaboration through multiple projects Once a pilot project terminates, creation and activation of next multiple projects takes place. Thanks to on-going collaboration, cooperating firms are becoming mutually more dependant in a positive sense. The "rules" of collaboration (explicit or tacit) that are formulated through these initial projects, shape the character of next activities. The reciprocal interplay involved within this collaborative mechanism works similarly as barter agreements.	Emerging/ Established cluster
Stage 5 Formalization of the group and its collaborative activities Through multiple projects involvement, a more formalized way of collaboration can be achieved. The final stage of cluster formation process is settled upon a mutual recognition of the importance of cooperation that is tangibly realized via exchanges of agreements and contracts. Such deals can later on transform into more explicit forms of cross-investment and cross-ownership. At this stage, the previously rather informal linkages move to formalized commitment of the participating firms to the cluster.	Established cluster

Source: Atherton, 2008

A cluster is evidently a dynamic system that undergoes an evolutionary process. The development agency Scottish Enterprise identifies three levels of building up the dynamic system of a cluster. It all starts as only a **collection** of companies performing in the context of additive economy, in which the inherent dynamism is rather low.

Companies interact in two ways – they are either driven by competition and innovation or they recognize common challenges and cooperate. For a successful cluster, both elements – competition and cooperation are needed. Gradually, cluster constituents interact more intensively what is demonstrated by a shift towards **network**.

Networks are characterised by deeper level of collaboration. Cluster becomes more attractive to investors, other business, scholars, and workforce. Underpinning all these stages is trust. As the dynamism of a system becomes reinforced, a synergic economy is observed. This is the environment, in which the **cluster** is finally thriving (Smith, 2009). Cluster participants not only work together on common challenges, but different perspectives of their solutions come together in such an interactive community as cluster undoubtedly is (or should be).

Source: Scottish Enterprise presentation, 2007
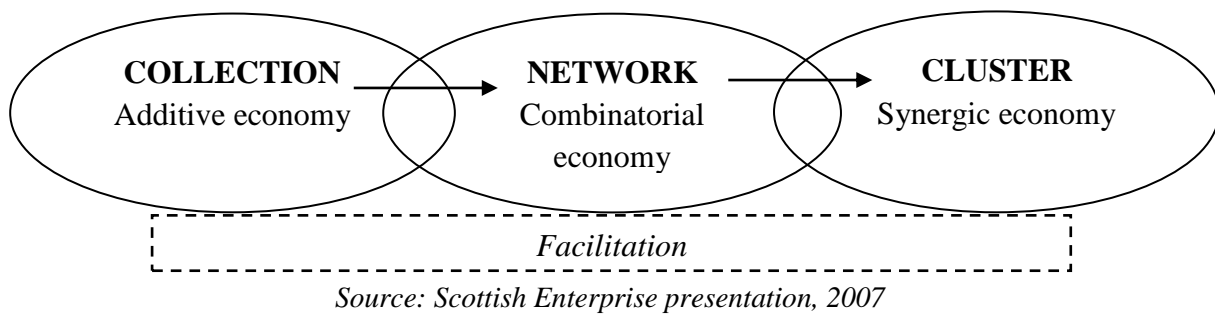
3   The meaning of competitiveness

The notion of competitiveness has been discussed extensively over the last decades. Globalisation and higher requirements on nations and companies are the main reasons for such increased interest in the topic of competitiveness.

A short answer to a philosophical question about the reasons why do nations actually compete is that countries aim to increase their living standards. An early endeavour to crack this question was provided by Ricardo and his famous theory on comparative advantage based on labour costs. In his times, the competitiveness was evaluated by taking into account factors of production, such as land, capital and labour (Ricardo, 1817). Later on, some academics believed that it´s not nations that compete, but rather their enterprises. Schumpeter attributed the key role of development to the entrepreneurship and he adhered to the theory of innovation-based growth instead of resource-driven growth (Fagerberg, 2003). Porter, a guru on competitiveness, links the competitiveness with productivity that companies are able to achieve (Porter, 2008).

It comes as no surprise that there is not one common definition of competitiveness and there are many interpretations and corresponding assessment tools. OECD uses a working definition of competitiveness that refers to "*the ability of companies, industries, regions, nations or supranational regions to generate, while being and remaining exposed to international competition, relatively high factor income and factor employment levels on a sustainable basis*" (Hatzichronoglou, 1996). World Economic Forum comes up with another general definition concerning a national competitiveness -"*Competitive economies are those that are able to provide high and rising living standards, allowing all members of a society to contribute to and benefit from these levels of prosperity*" (World Economic Forum, 2012) .

The key difficulties in finding a common explanation of competitiveness lie in the fact that the objectives of firms and nations (to which the notion of competitiveness refers) are different. A nation´s objective is to improve the standards of living, whereas a firm aims to make profits and increase its market shares (Hatzichronoglou, 1996). The controversy embedded in the definition of competitiveness was tackled by Krugman, who criticized the understanding of competitiveness in a macroeconomic context and was emphasizing the

microeconomic perspective as the foundation for building up country´s competitiveness. He argued that it is more problematic to define a national competitiveness than a corporate one. The bottom line for a corporation is its performance (ability to pay wages, invoices, and debts), if the performance is gloomy, the company leaves the market. However, "a country is not business" and cannot simply go out. For some academics, a sign of strong competitive country is trade surplus – the ability to sell more than to buy. Looking back on Mexico in 80´s when it ran tremendous trade surpluses and at the same time was fighting with debt crisis, such belief would be doubtful. Krugman moreover stated that the omnipresent obsession with competitiveness of nations may be even dangerous, because it can lead to bad economic policies just in order to "do something about the competitiveness".

All in all, there are two main approaches to explain competitiveness:

- <u>Market-share based approach</u>: tied to the ability to sell on international markets and thus, aiming to improve or sustain the overall external balance. However, export does not directly hint at the prosperity or productivity, because it depends on the real exchange rate. This approach is partly derived from the OECD view.
- <u>Productivity-based approach</u>: the main proponent of this theory is Michael Porter, for whom productivity determines the level of prosperity that a location is able to sustain. He is quoted as saying that *"the ability of a nation to produce a high and rising standard of living depends on the productivity with which a nation ´s labour and capital are employed"*. For Porter, productivity is *"the output produced by a unit of labour or capital"* (Porter, 1990). Only when the economy continues advancing, the productivity growth can be sustained. A new approach to the competitiveness should be based on innovations and dynamism. More space will be devoted to the Porter´s theory in the next subchapter.

National competitiveness, however, is subject to dynamism. Porter talks about four stages of the development of national competitiveness – factor, investment, innovation and wealth-driven stages. The first three phases refer to the period, when the economy is upgrading its competitive advantages and the prosperity is rising (Cho, et al., 2000). The last one, lead ultimately to the decline.

<u>1. stage: Economy is driven by the exploitation of production factors</u>
Companies operating in this type of economy are competing with other country´s companies only through prices. Domestic companies are working for other firms and do not have direct linkages with the end consumers. The ability to compete is restricted.
<u>2. stage: Economy is driven by investments in order to achieve higher effectiveness</u>
Companies are building the production infrastructure based on modern technologies.
<u>3.stage: Economy, where the competitiveness is based on innovations</u>
Companies are more internationally oriented with developed global strategies and their processes are highly optimized. They create new products or services.
<u>4.stage: Economy, where the competitiveness is based on increasing the quality of lives</u>
The key development pillars are services that aim to achieve the highest level of living standards. Tertiary areas (services) increase the competitiveness of country´s economy.

3.1 Measuring competitiveness

The most used measures of competitiveness were launched by the World Economic Forum (Global Competitiveness Report) and Institute for Management Development (World Competitiveness Yearbook).

World Economic Forum measures microeconomic and macroeconomic foundations of competitiveness with the help of a special tool called **Global Competitiveness Index**. Competitiveness is understood via a productivity-based approach. The level of productivity and competitiveness is driven by many determinants. The index is comprised of 110 indicators, 70% of which stems from the survey made among business executives. These indicators are then divided into a narrower group of components including different weighted averages. These components are clustered in 12 groups – or pillars. Countries are split into three primary groups based on their development stage of economy – factors, efficiency or innovations-driven stage (Schwab, 2013).

They compete on different drivers of competitiveness accordingly. Countries that are in the first stage of development compete on factor endowments (natural resources, low-skilled and cheap workforce) and local companies sell only basic commodities or products. These first stage economies can sustain their competitiveness through well-functioning institutions (pillar 1), developed infrastructure (pillar 2), enduring macroeconomic conditions (pillar 3) and labour market with people equipped with minimum primary education (pillar 4).

Moving up the competitiveness ladder, a country enters into the efficiency-driven development stage and the requirements to maintain competitiveness are more advanced. Firms produce with higher quality and more sophisticated processes and the wages rise. The competitiveness of such economy is driven by better educated workforce (pillar 5) and more developed labour markets (pillar 7). Goods markets (pillar 6) and financial markets (pillar 8) are working efficiently. There are no serious impediments for business environment (discriminatory taxes, subsidies, government intervention), firms are customer-oriented and buyers' power is more elevated. This can spur the innovativeness of companies. The banking sector should be healthy and trustworthy. A country in this stage of developed competes also on technical readiness (pillar 9) and adopts technologies to successfully improve the productivity (e.g.: country has capacities to leverage on well-functioning ICT system and companies have access to technologies). An economy is able to reap the benefits of large domestic or access to foreign markets (pillar 10).

As wages gradually rise and the correspondent standards of living as well, a country moves into the innovation-driven stage. Companies are expected to compete with better products, services or processes. The quality of business environment, firms' operational and strategic abilities (pillar 11) and innovation (pillar 12) are the key words in this stage of development. Companies compete by building up efficiently working business networks and establishing more intelligent production processes. The overall economic conditions are conducive to

innovativeness, what is proved by R&D investments, cooperation between firms and universities in research or existence of quality research centres.

The main message from the Global Competitiveness Index analysis is that the best way to improve a competitiveness of a country X is not the best way for a country Y, if these countries are in different stage of development. The key requirements for enhancing the country´s competitiveness change and different importance is attributed to a particular sub-index depending on the stage the country is positioned in.
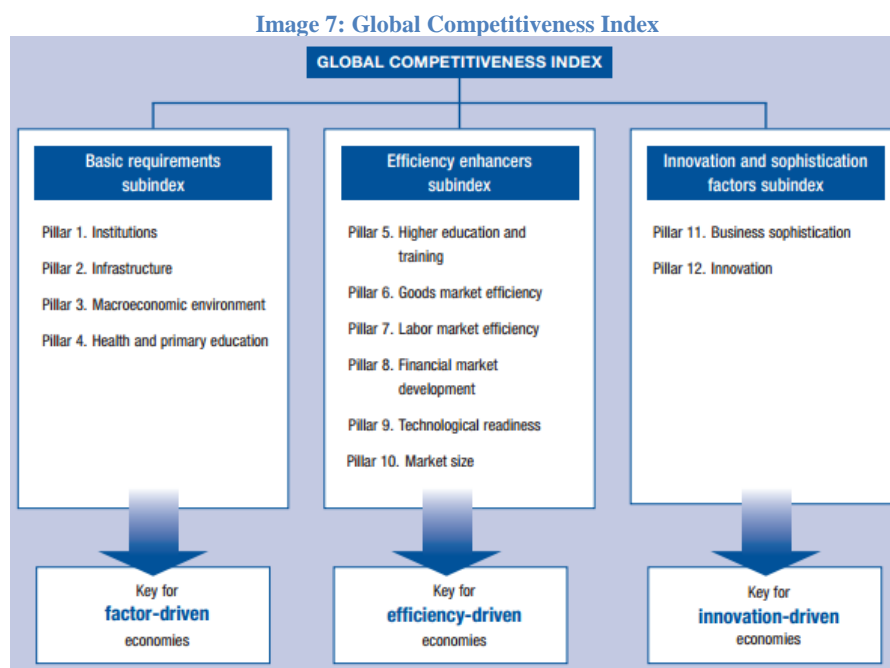
Source: Global Competitiveness Report 2012-2013

If a country entered the last stage, the level of clusters development is influenced by the 11th pillar of competitiveness (business sophistication). At the same time, the business efficiency is strengthened and more opportunities to innovations emerge when companies are interconnected in clusters. Hence, **cluster-based approach to the enhancement of competitiveness plays a fundamental role when an economy advances to the innovation-driven stage.**

A less broad in scope is the **World Competitiveness Yearbook** that assesses country´s ability to sustain the competitiveness of business sector and to increase the prosperity. More than 300 variables are grouped in four competitiveness factors that consist of more sub-factors (Innova, 2010). This measure is set upon a premise that country´s competitiveness does not only depend on GDP and productivity, but also on social, cultural and political conditions.

Economic Performance	Government Efficiency	Business Efficiency	Infrastructure
Domestic Economy	Public Finance	Productivity	Basic Infrastructure
International Trade	Fiscal Policy	Labour Market	Technological Infrastructure
International Investment	Institutional Framework	Finance	Scientific Infrastructure
Employment	Business Legislation	Management Practices	Health & Environment
Prices	Societal Framework	Attitudes & Values	Education

Source: World Competitiveness Yearbook, Methodology and Principles

WEF uses a definition of national competitiveness based on the productivity concept and its results heavily rely on exhaustive survey as well. By contrast, European Commission is more concerned with the regional competitiveness and the benefits that a competitive region offers to its citizens. Nevertheless, the **Regional Competitiveness Index** (Djikstra, et al., 2010) is from a great extent derived from the Global Competitiveness Index. The main differences lie in the exclusion of two pillars (Goods market efficiency, Financial market development) and the calculation of index, which is based on hard data only.

All in all, it can be clearly observed that all these three tools measuring the competitiveness put a lot of emphasize on the importance of enterprises and competitive business environment.

3.2 Microeconomics of Competitiveness and Clusters

In his works, Porter distinguishes two dimensions of competitiveness – macroeconomic and microeconomic. Prior to Porter, the significance of the microeconomic determinants of competitiveness was neglected among other scholars. As the graphic below indicates, Porter shifted the analytical focus from macroeconomic level in the context of national perspective to microeconomic level in the context of national or local context (Lengyel, 2009).

Image 8: Traditional model and Porter´s new model to the competition
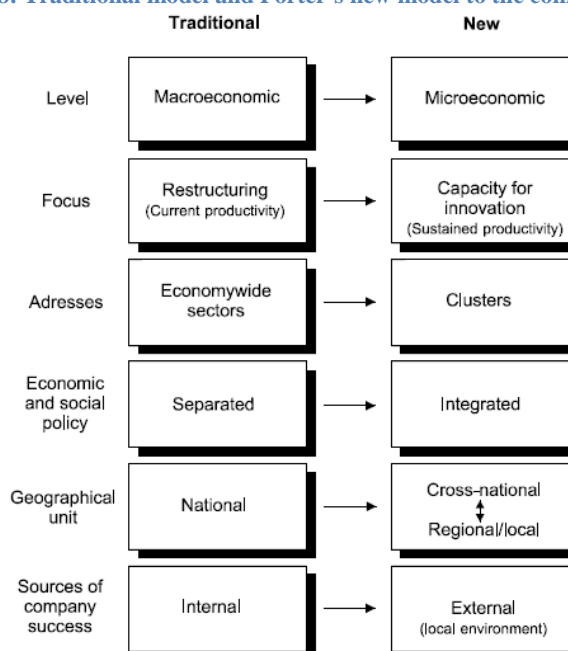
Source: Lengyel, 2009

Porter was convinced that parallel with macroeconomic reforms, the microeconomic improvements had to materialize as well. If this didn´t happen, macroeconomic policies would not result in sustainable and higher prosperity (Michael Porter's Competitiveness Framework—Recent Learnings and New Research Priorities, 2006).

Porter claims that *"a nation or region is competitive to the extent that firms operating there are able to compete successfully in the global economy while supporting rising wages"*. Herewith, Porter linked competitiveness to the productivity that firms concentrated in a location could achieve. Countries are competing with other countries in terms of offering a more productive environment for business.[3]
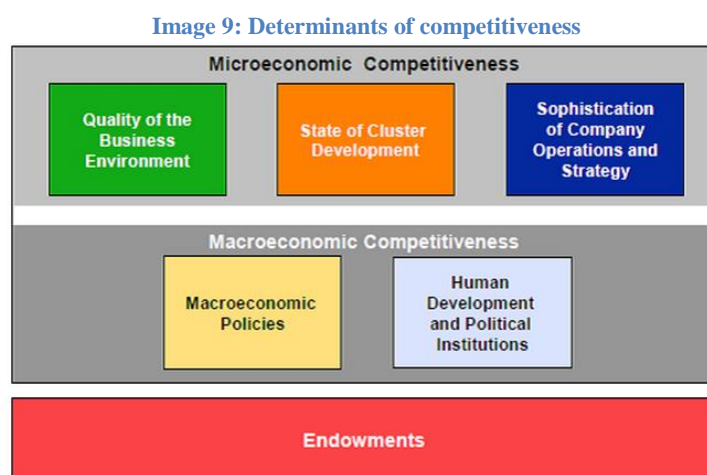
The graphic illustrates the elements that drive the competitiveness. Porter´s concept of competitiveness resides on two key words – *productivity* and *prosperity*. The prosperity depends on the rising productivity with which factors are used and employed in determined location. Moreover, Porter differentiates between an inherited and created prosperity.

Source: Porter 2011, presentation for the course Microeconomics of Competitiveness

The inherited prosperity can be driven by natural **endowments** the country owns. The natural resources (e.g.: oil), size and location of a country are fundamental for the national prosperity, but they do not reflect the true underlying competitiveness. The true prosperity comes from the productivity with which these endowments are being used. It is the **macroeconomic competitiveness** that poses a playground to achieve higher productivity. To exemplify his thesis - when two oil-rich countries, Nigeria and Norway are compared, it is the economically more stable Norway that is more competitive, more productive and thus, has better ability to create the true prosperity.

However, to have a country endowed with natural resources or advantageous geographical location and launched effective macroeconomic policies, does not enable to reach the sufficient productivity. Ultimately, higher productivity is in line with the improvement of **microeconomic capability** of the economy. Porter puts under scrutiny the state of cluster

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[3] Presentations of Prof. Luiz Carlos di Serio used during the lectures at FGV, copyright M. Porter

development as well as the sophistication of local competitiveness. Under state of cluster development, a critical mass of enterprises and institutions in one field with ability to reap the benefits across related industries is understood. Company operations are working properly when internal capabilities and sophisticated process are in place.

Here again, it is thus the microeconomic competitiveness that Porter highlights as the accelerator of local development. Porter accentuates the role of **location** that is cardinal for both competition and competitiveness and that has been almost disconsidered or even doomed by other academics. His theory attributes to the distinction of local clusters. The presence of clusters suggests that a good part of competitive advantage lies outside and not within a certain company or sector. It is inherent in the location of businesses. Just to give an example - there is statistically higher chance to establish world-class automotive companies in South Germany or shoe firms processing leather in Italy than in other locations (Porter, 2008). The proximity of cluster participants enhances their mutual interaction: *"Competitive advantage is created and sustained through a highly localised process"* (Porter, 1990).

Distilling all the above mentioned aspects of microeconomics of competiveness and clusters, it can be concluded that clusters influence competitiveness in three broad areas through: increase of productivity of business or component sector, strengthening the innovation capacity and stimulation of creation of new enterprises that enlarge the cluster (Porter, 2008).

4   Tools to measure the performance and effectiveness of clusters

How to define and consequently measure performance of a thriving cluster and/or cluster initiative? Is a top performing cluster the one that contributes visibly to the economic improvement and competitiveness of a region; the one that is able to organize critical mass of joint projects for its members, the one whose members are better off while being assembled in an organized cluster?

(Stejskal, 2011) states that well-working and efficient cluster is only the dynamic one. Typical features of such successful cluster are characterised by a very intense local rivalry and arrival of new entrants that has spurred the ambitions of companies to progress faster and perform better. At the same time, firms have better access to specialized input factors, to research centres and universities what propels a more intense cooperation. Links to related industries are fortified and the talent pools as well as technological progress are shared variables. The demand is shaped by more sophisticated customers. However, clusters can never work as subjects of imperfect competition! Member should be taught to understand the right principles of mutual cooperation, cluster shall never be considered as a consortium of entrepreneurs whose main objective is to lobby in favour of their interests within a strong group (Stejskal, 2011). The concept of cluster is successful if synergic effects are achieved. There are numerous methods to verify whether a cluster is in the situation of creating synergy or it is at least on the right track to do so.

As in every kind of analysis, there are quantitative, qualitative and combinational methods of examinations. The biggest complication with all these analytical methodologies is that there are too diffuse and too many, with each of them serving for different purpose. The notion of cluster theory is rather eclectic as is no universal theory. Equally so, a widely-agreed and recognized method for identification and performance measuring of clusters is missing. Thus, different scholars apply different data or methodologies when analyzing clusters.

Before presenting a few chosen methods, it is important to delineate the difference in analysing cluster in the sense of location - natural cluster as a system that exist without any intervention or organization (Ketels, et al., 2006) and cluster in the sense of cluster organization - cluster initiative whose aim is to foster the development of cluster by having an impact on the interrelations of cluster participants.

4.1 Quantitative and qualitative methods for identification and assessment of a cluster

Firstly, it is necessary to identify the existence of clusters. Some of the agglomerations may resemble clusters, but in fact they do not reach a critical size, dynamism, strengths of linkages or employment. Hence the cluster potential for a particular sector can be too weak and there can be only a small probability that a real cluster could be established (Stejskal, 2011). The proper analysis of cluster identification can reveal strong concentration of businesses. The following quantitative tools can be put in practice:

Location Quotient
The Location Quotient (LQ) method is one of the most used tool to search for a prospective cluster. LQ enables to find out which segment is at the spotlight of a region. This quotient detects how many times is the share of industry on regional employment higher than the national average (Pavelková, 2009).

It is calculated in a relatively easy way. Usually, the variable of employment in a chosen industry segment on regional and national level is employed. However, location quotients can be calculated for numbers of companies, gross value-added created per each firm or per each employee by industries.

$$LQ = (x/X)/(y/Y)$$

x – amount of employees in a sector in a region
X – overall amount of employees in a region
y – amount of employees per whole sector
Y – amount of employees per country (Pavelková, 2009)

If the value is higher than 1, it is an indication that the particular industry sector is the most represented one in the region. If the value is higher than 1,2, industry sector can be labelled as regional specialization. The higher the result, the better we can identify activities as leading regional industries. The values above 1 can of course vary according to the nature of an

industry, in some cases only the LQs higher than 1,5 indicate that it should be enough to create the core of a potential cluster. In 2005, OECD mapped and identified clusters in Slovakia. Here, only manufacturing industries reaching LQ of more than 1 and employment of 2000 were acknowledged as potential *"regional industry clusters"*.

The disadvantage of this method is mainly the lack of access to relevant or updated data (e.g.: on employment, revenues) and the fact that the tool does not permit to conduct a deeper examination of interrelations. Although a potential cluster can be found, it does not automatically mean that the identified spatial concentrations equals to a genuine notion of cluster. That depends on the fact whether input-output linkages are working (OECD, 2005).

Shift-share analysis

The analysis is able to identify a sector that undergoes the most intense development. An indicator for such booming sector is the number of employees mounting. This tool is most suitable for confirmation of hypothesis about the potential emergence of clusters in a chosen sector. The core of this method lies in the identification of three types of increase/decrease of overall employment in a region during a specific timeframe. The increase/decrease of employment is derived from increase/decrease of national factors, from particular sectors or from the competitiveness of local business enterprises. It is thus useful for making an assessment of the importance of certain industry in a region.

Input-Output analysis

This method is quite heavy in data analysis and calculations. It´s objective is to find out the inter-sectoral linkages of examined sector to other sectors in the region. Such analysis is conducted both on the supply side as well as on the demand side. The method is designed to track the economic performance of a region from a long-term perspective, hence is used solely as ex-post analysis. Although the method is very useful in terms of how sectors in a region are interconnected, its ability to find out the potential sector for cluster formation is close to zero.

Other quantitative measurements

Apart from the mentioned tools, there is a whole range of others. *Maurel-Sédill inde* and *Ellison-Glaeser concentration index* aim to determine the highly agglomerated region that is suitable for the emergence of industrial clusters. *Gini coefficient of agglomeration* was originally introduced by Krugman to examine spatial agglomerations in the U.S industry and the coefficient gives information about the concentration level of a chosen sector (Guillan, et al., 2006).

Limitations of quantitative methods

As with all the analytical methods, quantitative measures have a few limitations embedded in them. The key one is that is difficult to determine the criteria sufficient to claim that a certain agglomeration can be named a potential cluster. Moreover, data needed to execute these analyses are many times obsolete or do not cover the whole segment that is evaluated.

Qualitative measurements and combinations of methods

Qualitative methods are represented by case studies, interviews and surveys. Respondents are independent experts, academicians, scientists, researchers or people with a direct interest in a cluster – cluster management, directors of companies and organizations.

However, in most cases, a combination of various methods is implemented at the same time to identify cluster and/or to evaluate its performance. It is also important to clarify what kind of dimension of evaluation will be scrutinized. It is possible 1. to assess the performance of individual subjects involved in cluster activities; 2. to assess performance of cluster as a whole, 3. to assess effectiveness of cluster activities, 4. to assess effectiveness & performance of cluster initiative, 5. to assess the impact of regional/national cluster policy.

The clusters´ performance can be assessed through various tools. To evaluate the performance of cluster initiative (CI), The Cluster Initiative Green Book describes a new framework to analyze CIs – Cluster Initiative Performance model **(CIPM)**. It is based on four pillars that consist of various factors. The CI is driven by three drivers – social, political and economic setting. The second pillar refers to the CI objectives, the third to the process by which the CI emerged and it all has impact on the last pillar – performance (Sölvell, et al., 2003).

Image 10: Cluster Initiative Performance model

Objectives
- Research and networking
- Policy action
- Commercial co-operation
- Education and training
- Innovation and technology
- Cluster expansion

Setting
- Business environment
- Policy
- Cluster strength

Performance
- Competitiveness
- Growth
- Goal fulfilment

Process
- Initiation and planning
- Governance and financing
- Scope of membership
- Resources and facilitators
- Framework and consensus
- Momentum

Source: The Cluster Initiative Greenbook, 2003

Organization Cluster Linked Over Europe (CLOE) promotes benchmarking of cluster initiatives and compares a few chosen indicators such as number of organized events, share of SMEs, number of common projects, financial power of cluster etc. National Research Council of Canada came up with their own concept that is inspired by Porter´s Diamond but it´s based on the cluster life cycle. Critical factors such as networks & partnerships; innovations & research; HR are diligently measured in the approach developed by British Department of trade and industry. Economic value added, cash flows, financial ratios are all used to analyse

the impact of cluster on the economic performance of its members. Balanced Scorecard provides information about the benefits of clusters for its members by plugging in financial, customer, learning and internal processes perspective (Pavelková, 2009). Different tool can be opted for a different dimension. In this work, three methods are chosen – quantitative location quotient (LQ) and two qualitative models, Porter´s Diamond Model and Dynamic Loops.

4.2 The Porter´s Diamond Model

Porter made the topic of clusters closer to broader audience when he designed a comprehensive tool to examine clusters and to determine those elements that influence the productivity and innovation capacities (Porter, 2001). It must be accentuated that cluster performance is contingent upon the quality of business environment in which it operates. As business environment is a complex term, Porter came up with an analytical framework to put an order in this complexity. Diamond explains how four groups of factors influencing cluster and companies, interact (The Development of the cluster concept - present experiences and further developments, 2003).

Image 11: Porter´s Diamond model for clusters
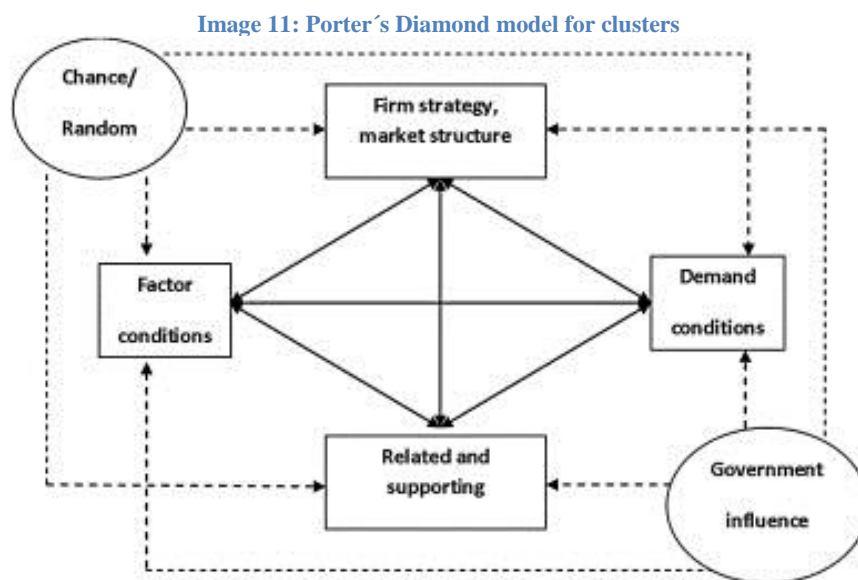
Source: Porter, 1990

The Diamond evaluated cluster´s competitiveness in regards to four interrelated elements – quality of factor and demand conditions, existence of related and supporting industries, context for firm strategy and rivalry. The interplay of these factors is also influenced by government activities and chance events (crisis, new technologies, etc.)

Factor conditions: Certain factors are necessary in order to step up to higher level of productivity and innovation. Factor conditions refer to quantitative and qualitative availability of industry inputs, natural, human, capital resources, information and administrative infrastructure. Stronger competitive advantage of the region can be achieved through highly specialized factor conditions (Kiese, 2012). To evaluate the quality of inputs available for companies in a cluster, it is useful to determine *to what extent depends the cluster´s*

competitive advantage on basic (climate, location, labour costs...) and to what extent on advanced factor conditions (transport, science, technologies, information...).

Demand conditions: Sophisticated customer base and the uncommon local demands and needs of demanding customers drive companies to improve their products and services. This in turn enhances their competitiveness and innovativeness (Kiese, 2012). The factor gains in the strength depending on *how directly is the cluster exposed to the most sophisticated consumers*, on the *ability of consumers to anticipate trends in global market*, on *the existence of section of the local market that provide feedback signals*.

Context for firm strategy and rivalry: The concept highlights the importance of intense competition. The structure of companies and the level of domestic rivalry encourage investments, upgrading and foster the growth of firm productivity. This factor is determined by the extent to which *firms are investing in R&D, innovation and new knowledge*; by the extent to which *firms are shielded from outside competition*; by the extent to which *competition among companies leads to upgrading process*.

Related and supporting industries: The fourth factor encompasses not only supporting industries that are interlinked in the value chain, but also related industries that use the same distribution channels, customer base or produce complementary products (Kiese, 2012). Suppliers can improve productivity, and enhance innovation thanks to a quicker and less costly communication. The power of this factor is determined by the *presence of competitive and high quality suppliers*, by *constituents that coordinate inter-firm activities in the cluster*, by *strong ties with research institutions and by the quality of education*.

The competitiveness of cluster depends also on the stage of competition of companies. The cluster´s competitiveness improves when firms move from competing only on inherited or basic endowments (e.g.: natural resources) to competing on competitive advantages that emanate from efficient processes and products/services with added value. This move requires simultaneous changes in the overall business environment what depends on the engagement of other private and public actors, institutions, partnerships among productive groups (suppliers, buyers, providers) (Shakya, 2009).

4.3 The Cluster Dynamics Model by Scottish Enterprise

Many tools analysing clusters serve only as a general snapshot illustrating how a cluster works, but they does don´t provide more detailed picture about the interactions driving the cluster. The existing methodologies neglected **analyses of interrelations and dynamics** within a cluster even though these two aspects are salient for successful development of cluster. Likewise, social capital inherent in a cluster has been only poorly captured.

Scottish Enterprise[4] has therefore aimed to fill this gap and developed a **five stage Cluster Dynamics model** that allows for better explanation about the way, in which a successful cluster has evolved and about the changes of behaviour and linkages observable at a particular

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[4] Public body of the Scottish government focused on promoting economic development, innovation and investment in business

stage of cluster development. This tool is opted especially **for cluster managers to help them evaluate the stage of development** in which a cluster organisation currently is, as well as areas of improvements (TCI Network, 2007). The model was firstly adopted only in Scotland. Later on, this type of assessment focusing on cluster interrelations and dynamics was applied also outside Scotland.

Cluster Dynamics Tool permits to take a stock of a cluster through the prism of an agile organization that has specific behavioural traits and dynamism. The core of a cluster is created of *"businesses in the same sector within a geographical concentration"*. Business enterprises are supposed to be better performing when located in an environment that facilitates their growth and offers opportunities to exploit. Moreover, the creators of this tool argue that clusters cannot be started from the scratch. Clusters must be built based on reality and not on a wishful thinking approach or by taking subsidies for a primary accelerator of cluster development. The method is thus developed in line with the way how clusters emerge according to Scottish Enterprise - *"collection-cooperation-collaboration-network cluster"* (Pavelková, 2009).

The bottom line of Cluster Dynamic Tool resides in the conviction that it is essential for a cluster to **focus predominantly on the good traits** the cluster is endowed with.

The tool is based on the **loop-oriented approach** that shows the dynamic nature of clusters.[5] This approach is challenged in five sections (loops) by addressing the development of each loop in the system. The below illustration makes it clear that multiple interrelations take place in a cluster. In fact, these five loops follow the process of building up a successful cluster. Cluster works as an ecosystem that needs to be adjusted to new challenges (e.g.: more demanding customers, technological progress...) a competition in a global extent brings along. The way how companies respond to the pressure inherent in global competition and overall market is tackled mainly in the Loop 1 and Loop 2.

Loop 1 – Inter-firm rivalry points out that competition and innovation is what drives the companies in a cluster. Firms want to win over each other by means of bigger market share, new products, new processes, more orders. The urge to perform better than other peers in the same industry is positive for the overall performance of firms.
Loop 2 – Inter-firm co-operation deals with the other option of response to the global competition that firms can exploit. Firms simply start working together as soon as they identify certain common challenges. The outcomes can be demonstrated by creating common identity for the group or by establishing common approach to their suppliers to increase buying power. Here again we stumble upon a term "co-opetition", an acronym for the balance between co-operation and rivalry.
Loop 3 – Collaborative Advantage is based on trust that gradually "glues" together both elements of cooperation and competition. Firms are willing not only to cooperate but also to share critical knowledge. The collaboration is deeper especially in those areas closer to the

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[5] It is possible to come across only the term „Loop" used as a shorthand for the Cluster Development Model

core to the business. Collaborative advantage can be evidenced by joint projects dealing with the development of new processes or products or sharing and trading some assets (purchasing a commodity for the group).

Loop 4 – Venture Attractiveness is enhanced when cluster´s attributes are able to entice investors and venture capitalists. When the speed of change in the sector, in which cluster operates, is faster than the ability to learn, innovation is a solution. Clusters that embark on innovations are more attractive for new firms, new investments, and new talents. Cluster can make the industry "the place to be" (Smith, 2008).

Loop 5 – Distinctiveness Generation refers to the ability of cluster to anticipate future opportunities and possible breakthroughs that may lie ahead if the cluster focused on particular chosen activities. This means that the prerequisites for becoming a distinctive cluster are collaboration and regular research.

Image 12: Cluster Dynamics Model - loops
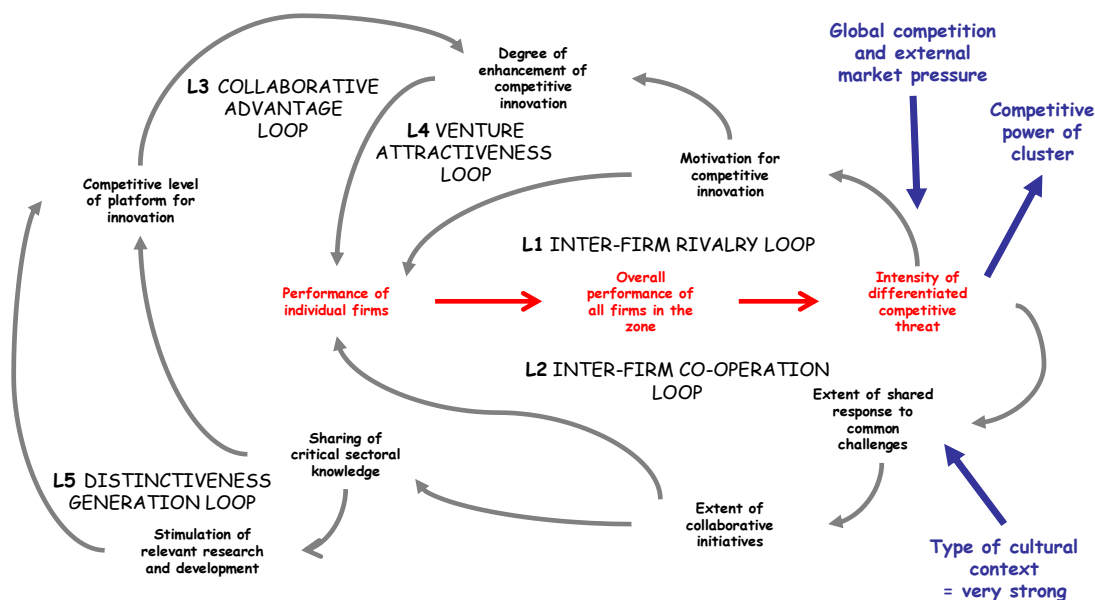
Source: Smith, 2008

A specific cluster is then analysed through a structured questionnaire aimed at the assessment of the stage of development at which cluster currently is. The questionnaire consists of six sections. The purpose of its first five parts is to provide observations on cluster behaviour in every loop of the model. The sixth part serves more or less as a check on the previous analysis. The questions are rated on a five point scale, ranging from "absent" to "very strong". The higher the score, the stronger the loop and consequently, the better the cluster performance is. Lower scores indicate areas for improvement or immaturity of a cluster in this area. It must be added, however, that the questions are based on personal standpoints of cluster management team and they serve thus as a self-assessment tool about how does a cluster perform. Practical example of how this model can be implemented in a concrete cluster is presented in the case study about Automotive Cluster West Slovakia.

Throughout the existence and evolution of a cluster, there are many signals to be listened to in order to improve or at least sustain the performance level of cluster. Cluster´s constituents should be willing to learn from each other. No matter what are the results of the "Loop analysis", it is always important to bear in mind that the best way to encourage learning processes in a cluster is to *"start with pilot projects close to businesses, get different perspectives involved, and work with a multidisciplinary and creative team. And listen more to businesses, because they are the drivers of innovation!"*

5 Industry Review

5.1 Automotive industry globally

Throughout the last two centuries, automotive industry has undergone a dramatic progress and growth. After Henry Ford´s popularized Model T, cars became a natural part of almost every household located in a more developed part of the world. A car turned to be a mass-market object and this fact has nurtured the global demand.

Nowadays, there are many voices heard that fear this industry is losing its momentum. The Earth is already overwhelmed by so many motor vehicles on the roads. During the last couple of year, we could see the automotive industry jeopardized by sluggish economy, coupled with low sales and low customer trust. Yet, the rather positive report on automotive industry prepared by The Economist suggests quite bright scenario for the upcoming decades. For the year 2013, the magazine assigns positive prospects for the automotive industry. The American´s motor industry will rebound and together with China, both regions are supposed to account for 60% of worldwide growth in car sales.

Taken as a whole, global sales are expected to increase by 5% in 2013. According to a consulting firm AlixPartners, the global market for light motor vehicles is forecasted to grow from 80m units to 107m units by 2020. China´s voracious appetite for cars will be significantly influencing this continued growth. Moreover, many of the emerging populous countries are still undersupplied with cars.

The biggest car players remain to be Germany, Japan, U.S, Russia, Brazil, China and India. Emerging markets are bound to take a leading position in car production. The rapid growth in developing markets is the key automotive industry trend. In fact, a convergence of emerging and developed market is expected by 2025 due to the shift of car production to low cost regions and change of consumer behaviour (KPMG, 2013).

5.1.1 New areas of trends in global automotive industry

The major trends identified by managers across the whole global automotive segment describe the following scenarios that are expected to take place by 2025:

Graph 2: Major trend in automotive industry by 2025
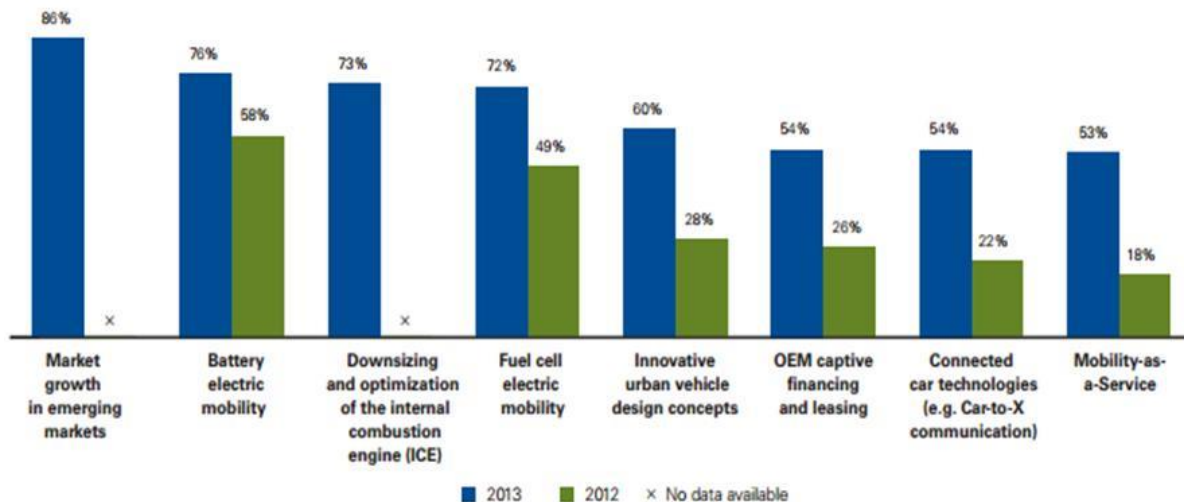
Source: KPMG, 2013

The suggested tendencies for the future development of automotive industry will certainly have implications on the customer base, design of cars, supply chain and production processes. As a matter of fact, cars are still a long way from being a mature technology.

- **Different car customers looming**

In the aftermath of the economic crisis and with the much easier access to information, the consumer base has become more cost conscious, more demanding. At the same time, emerging markets offer a whole array of yet to be explored opportunities due to the enlarging middle class and new customers with new demands. Car producers will pay more attention to regional demand of value-oriented customers.

Consumers will enjoy a new era in their favour. As the ferocious competition will push prices down, cars will be cheaper and equipped with more technologies. This however implies that the car production will be more expensive. Cars will be soon able to park and even drive themselves. Improved production system, broader range of new models and exploration of niche segments will expose the automotive industry to new challenges and dynamism (Special Report: Cars, 2013). Luckily enough, the demand for cars is predicted to be rising and the time of "peak cars" has not yet arrived. On the contrary, demand for cars will be soon very much influenced by the growing ageing population, what will result in design changes and higher safety features as well. People tend to buy cars later but they will drive longer than the previous generations. The higher level of urbanisation will probably change the preferred type of cars to smaller and fuel-efficient ones (Deloitte Touche Tohmatsu, 2009).

- **Changes in global supply chain**

It can come in handy to firstly briefly show the types of companies operating in the automotive industry. The usual supply chain in automotive industry consists of large

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carmakers (OEMs), suppliers, professional and manufacturing services, as the illustration demonstrates. The 1-Tier suppliers supply directly to the OEMs. They conduct high-level R&D and have big impact on the product development. The 2nd Tier suppliers supply components to the 1-Tier companies or provide support to their services. The 3rd Tier suppliers provide raw materials and components such as mechanical tools, castings, rubber or plastics (Hülsemann, 2004). The formation of these traditional types of companies, however, is expected to change to accompany the recent trends in automotive industry.

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Image 13: Companies in automotive industry
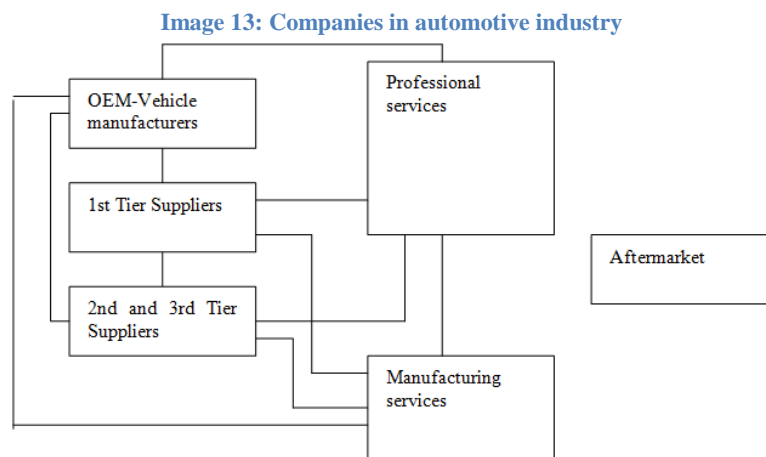
Source: JAKLIC, M. 2004. Specific responses to universal pressures in the industry –
Comparing European automotive clusters

Thriving supplier networks will play a more influencing role. In the Deloitte 2020 report, the automotive leaders predict that only a few OEMs (original manufacturers) will be based in approximately 6 markets, but they will produce 90% of global sales (Deloitte Touche Tohmatsu, 2009). Other changes in supply chain lie ahead. The automotive design and development tend to shift from OEMs to suppliers.

The transformation of supply chain and the response of companies to overcapacities and increasing competition globally are nicely depicted in the graphic below. The overall product cycle has shortened. Carmakers shift most of the tasks to the 1-Tier and 2-Tier suppliers. Because of this shift, vertical range of manufacture declines. This change has large implications on the development or strengthening of clusters in the automotive sector. Transnational clustering in the European automotive industry will play significant role and this trend will improve the competitiveness of this industry sector (Stratmann, et al., 2005).

Image 14: Change of automotive supply chain
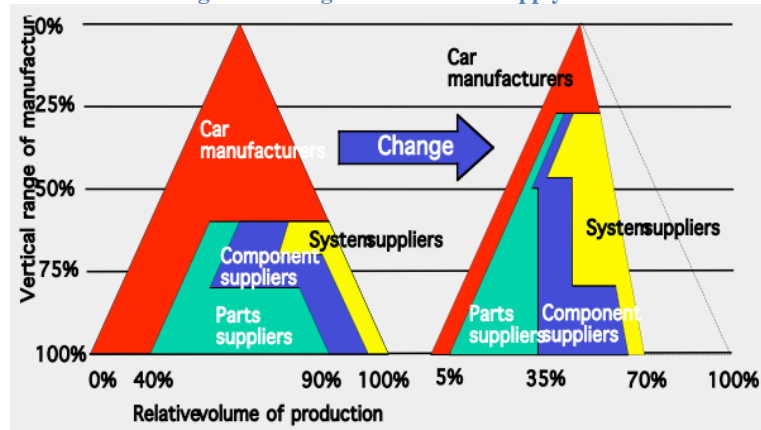
Source: Stratmann, 2005

Cooperation will be the key term. Carmakers are already looking for new ways to develop expensive technologies. The fact is that cars are becoming similar to smart phones – costly to produce but cheaper when assembled in large amount and in different variations. Carmakers will therefore share the costs of developing these new technologies. Many of these high-tech components in a car are developed by smaller independent suppliers. They will now have a wider range of possibilities to enter new segments and markets where large carmakers are located. Carmakers will need to learn to work in partnerships not only with their competitors but also with other players – producers of components, academic sector and government. As cars are becoming more electronically-focused, with a plethora of software applications and electronic systems, cooperation with related industries will take place (Special Report: Cars, 2013). In fact, new business models, such as new forms of alliances with other players from other industries will emerge.

5.1.2 Action Plan Cars 2020 for Europe

Automotive industry creates 12 million related jobs in Europe and is therefore imperative for the EU to plan how to maintain or increase its prosperity and competitiveness. The Action plan that is to be fulfilled by 2020 lies upon four pillars (European Commission, 2012).

- **Investment in advanced technologies and innovation** – suggestions are related to the proposal of the European Green Vehicles Initiative and tackle energy-efficiency and alternative powertrains, creation of CO_2 targets for cars and van, measurement of pollution and fuel consumption, technologies for improving road safety. Also the pillar covers the importance of boosting up investment in R&D into automotive projects, such as alternative fuels, biofuels blending rates, infrastructure for electric vehicles.
- **Stronger internal market** – refers to the creation of transparent framework to promote innovation by encouraging stakeholders to set up "vertical agreements on the distribution of new cars". Competitiveness proofing exercise is to be carried out for policy initiatives influencing the automotive industry.
- **International harmonisation of vehicle regulation** – the pillar aims to support and promote industry in accessing global markets due to the fact that by 2020, 70% of the

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overall growth of all industries, including automotive will take place in emerging countries. Reciprocal recognition of an entire vehicle is to be imposed as until now, every component of car needs to be approved separately when exporting.

- **Anticipating adaptation and softening the social impacts of industrial adjustments –** the pillar aims to boost investment in skills and trainings to match with industrial changes and with the needs of automotive segment regarding employment.

5.2 Automotive industry in Slovakia

Automotive industry in Slovakia is perceived as an engine of economic growth. Assembly plants of the three biggest global carmakers – Volkswagen, PSA and KIA are profitable and they are still expanding their production capacities. According to the **Revealed Comparative Advantage** index (RCA) in manufacturing industries in 2010 that was calculated by the European Commission, it is the **production of motor vehicles** that is praised to be the most competitive sector of Slovakia (Erste Group, 2013). In this particular sector, the country exports more than it imports also when compared to the export and import ratio in the economy as whole. Slovakia´s good export performance was achieved in more technology-intensive industries.

Graph 3: Revealed Comparative Advantage - CEE
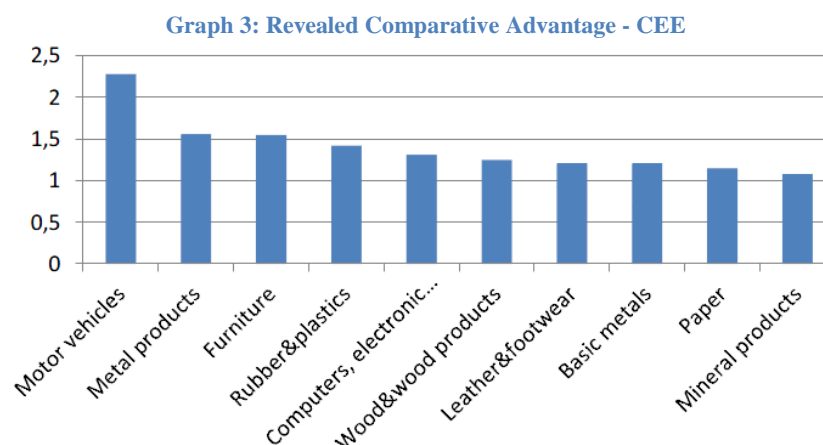
Source: Erste Bank, CEE Special Report 2013

In addition to that, automotive industry is one of those sectors that employ most employees in Slovakia. Automotive industry provides employment directly to more than 56000 people (Statistical Office of Slovak Republic, 2012) and indirectly, by taking into consideration also other industry-related firms operating in supply chain, this number rises to more than 70000 (Tatra Banka, 2012). A recent study from the University of Economics in Bratislava argues that automotive industry employs another 81000 people working for various sub-suppliers. Automotive industry thus generates 9% of the overall Slovak employment (Pravda, 2013). Hence Slovakia holds a European record in the number of cars produced per 1000 inhabitants.

These facts that are underpinning the importance of automotive sector only add to the reasons to analyse the very first cluster established in automotive industry in Slovak area. Nevertheless, for the purpose of cluster analysis it is essential to tackle a few questions. What

is the story behind the evolution of automotive sector, why were the foreign carmakers attracted to invest in Slovakia and how could the future of automotive industry look like?

5.2.1 From gloom to bloom

Early in 90´s, Slovakia was considered to be a regional laggard in terms of industrial development and transition to market economy compared to other CEE countries (Jakubiak, et al., 2005). Almost two decades later, thanks mainly to large investments, Slovakia was regarded as a Detroit of Central Europe.[6]

In general, the machinery industry has a long tradition in Slovakia. Personal cars have been produced since 1895 during the existence of Czechoslovakia, but the production concentrated mostly in the Czech part. Slovakia was more concentrated on the production of guns, which was abolished in 90´s. Before the 1989, companies such as Tatra (producer of vans since 1968), TAZ (Trnavské automobilové závody - vans and trucks producers) and BAZ (Bratislavské automobilové závody - products licensed for Škoda), had put the very first impetus to the development of Slovak car industry.

The first foreign car producer that founded a car assembly in Slovakia was **Volkswagen** (in 1991) and continued to be the only carmaker for the next 12 years. In line with the arrival of VW, the whole supply chain around this company was growing robustly. Later on, after a contest between Renault, GM, and other global players, Volkswagen could finally buy 80% stake in BAZ and majority in Škoda.[7] It refurbished the previous BAZ´s production facilities and buildings close to Bratislava and invested heavily into new technologies.

Initially, VW focused only on Passat model and afterwards expanded its production portfolio to assemble Golf Syncro, Bora, Polo and Touareg – the first sport car. Touareg was thought as being a "truly Slovak car" as more than half of its value was driven by local suppliers. Later on, Audi Q7 was introduced. Seat and Škoda brands introduced their Ibiza and Octavia models. Bratislava was the first plant among VW global group that started to manufacture a hybrid car (VW Touareg Hybrid) (Volkswagen Slovakia, 2011). In 2005, Bratislava plant became one of the most modern factories of VW Group. The more intense car-making activities spurred an establishment of another factory in Martin - specialized in the production of transmission parts and in Košice - specialized in preparation of cars destined for Russian market. VW has become one of the biggest employers as well as one of the biggest exporters in Slovakia (Volkswagen Slovakia, 2012).

The years 2003 and 2004 are marked by the arrival of two global carmakers – **PSA Peugeot Citroen** and **Kia Motors.** The second wave of the growth of automotive industry was successfully initiated. Both companies entered the market through greenfield investments.

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[6] This analogy may now sound a little deterrent due to the recent announcement of bankruptcy of the city of Detroit and hopefully, Slovakia will paradoxically never become a real Detroit. However, before turning into a „ghost town", Detroit used to be a great car power during the period of many decades.
[7] Later in 1990´s, VW received a full ownership of Škoda

Within a short time, Slovakia was listed among the top 20 world carmakers (SARIO, 2012). Furthermore, these investments accelerated the international trade. 99% of the car production was designed for export. In 2011, the big three car companies – VW, PSA and KIA employed 14 511 employees in total (SARIO, 2012).

5.2.2 Car destination Slovakia

There are several factors that could explain how Slovakia has managed to become a **magnet for foreign automotive FDIs.** At the very beginning during the transition era, VW´s primordial reasons were cost-driven. By all means, considerably educated workforce in manufacturing was another appealing aspect. People used to work in heavy industries (arms, steel producers, automobiles BAZ and TAZ) and were thus well-skilled for automotive industry as well. Moreover, companies were not jeopardized by labour strikes or lockouts at all and the average wage was lower than in other CEE states (Jakubiak, et al., 2005). In 2000, more than 20% of university students were enrolled in manufacturing and engineering study programmes. The hourly cost of labour was in then times the lowest among Visegrad peers - 4,23 Euros in 2004.

It was only after another expansion of VW, when the government decided to grant more incentives for other automotive FDIs mainly in form of tax allowances. VW was granted tax incentives (for instance tax breaks) and this step attracted more companies – foreign suppliers such as Johnson Controls, Lear Corporation, SAS Automotive, Bridgestone, Continental AG, Miba, Yazaki Wiring Technologies, Sinter, GGB, Visteon and others. The newly-built supply chain drew attention of other car players as well.

The arrival of **PSA** in 2003 was partly influenced by the successful story of VW and its qualified local workforce. Apart from that, the proposed site for the PSA factory in Slovakia was much better prepared and endowed with adequate infrastructure than other candidates´ sites for investment in Poland or Czech Republic. The main reasons for PSA are stated to be the geographical location close to larger markets, tradition in car making and skilled labour force. It´s worth noting though, that before the EU entry, the government´s investment incentives for foreign companies were indeed rather generous. After becoming a member of EU in 2004, the government incentive packages had to be curbed in order to comply with the rules of European Commission.[8] Overall, the PSA investment was considered to be of utter importance for Slovakia, because it would show off Slovakia as the main destination for foreign investors choosing to invest in CEE region. The government put lot of effort to persuade PSA management and to prepare an attractive site location. The PSA investment enabled to increase a Slovak confidence in automotive sector, which was from then on regarded as the biggest growth segment of Slovak industry (SME, 2003).

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[8] The maximum of incentives that could be granted to a foreign automotive investor was 15% of the investment value. Slovakia was the last country in CEE to formulate an investment scheme in 2005 The financial aid granted to PSA was more than 160 mil. EUR.

After the expansion of **Kia Motors** in Europe, the company decided to penetrate into CEE region as well. Logically, all of Visegrad countries were in the game. At the beginning, Slovakia was excluded. However, the Slovak government offered highly attractive incentives package with a minimum of obligations that Kia should fulfil. Overall, the whole selection process between Slovakia and Poland was very hazy and reminded a competition in the sense of which country could come up with higher incentive, although both candidates were supposed to comply with the EU ceiling on state aid for foreign investors (Jakubiak, et al., 2005). Investment promises consisted of direct state assistance and of additional aid in highway construction, houses for Korean management, hospital and others. On the contrary to PSA investment, the media and public generally criticized the weak, non-transparent and immensely generous agreement between KIA and the government. There is a tendency to think that Slovakia won the selection process, because other candidates *"did not cross the threshold of decency towards their own citizens and dignity of the state"* (Zachar, 2005). According to some experts, the state financial resources should have been used strategically to decrease taxes and to improve general business environment, what would in turn stimulate domestic as well as foreign investments from a long-term perspective and would not make only one player and one region more advantageous (Jakubiak, et al., 2005).

So all in all, it can be concluded that the greatest motivation factor for Kia (and also for other strategic investors) to enter Slovakia lied primarily in investment stimuli packages.

Image 15: Location of automotive sites of VW, KIA and PSA

Source: SARIO, 2012

5.2.3   Automotive industry today and then

The year of 2012 was especially fruitful. As a result, Slovakia occupies now the first place in the car production per 1000 inhabitants, which is calculated to be 171 cars per 1000 inhabitants (ZAP SR, 2012). Slovak export is considerably dependant on the automotive industry. Therefore it comes as no surprise that the two biggest exporters are Volkswagen and Kia Slovakia. Both corporations export more than 98% of their production abroad (99,7% and 98,7% respectively).

The share of automotive industry on overall industry has increased to 39% in 2011 (ZAP SR, 2012). There is a notable tendency for the automotive industry to be increasing its share on

GDP year by year. In 2012, almost 30% of GDP was driven by this sector (TASR, 2012). From the overall 2% growth of Slovak economy in 2012, automotive industry comprised 0,8% of the growth increase (Toma, 2013).

In terms of sales, automotive industry was responsible for roughly 30% of the total sales in the whole industry (SARIO, 2012). [9] Revenues of households generated by automotive industry accounted for 4 billion €. This number can be translated into 10% that represents the share of automotive industry on the household consumption (ZAP SR, 2013).

In June 2013, economic magazine TREND published a study exploring the year on year change of corporate revenues in Slovakia. The report represents Top 200 companies with highest revenues (TREND, 2012). Its results revealed that firms in automotive industry accounted for the fastest growth. 7 automotive companies occupied the first places in the ranking. To exemplify the extent of this increase, Volkswagen Slovakia defended its first position from the last year (2012) with its total revenues of 6 587 443k €.

Table 5: Companies with highest revenues

Company	Change in revenues	Total revenues gained
Volkwagen Slovakia	1 394 507	6 587 443
Slovenské elektrárne	624 371	3 473 047
Kia Motors Slovakia	590 743	3 919 123
Samsung Electronics	495 149	3 647 912
PCA Slovakia	293 782	1 936 214

Source: TREND, 2012

When it comes to car production, the year 2013 is estimated to reach more or less the same level of production as in year 2012. In the previous period, a sharp increase in production between 2011 and 2012 can be observed - the growth attributable mainly to the enlargement of capacities and new car models.

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[9] The share of sales from automotive industry was 27% in 2011, in numerical explanations – 17bn euros.
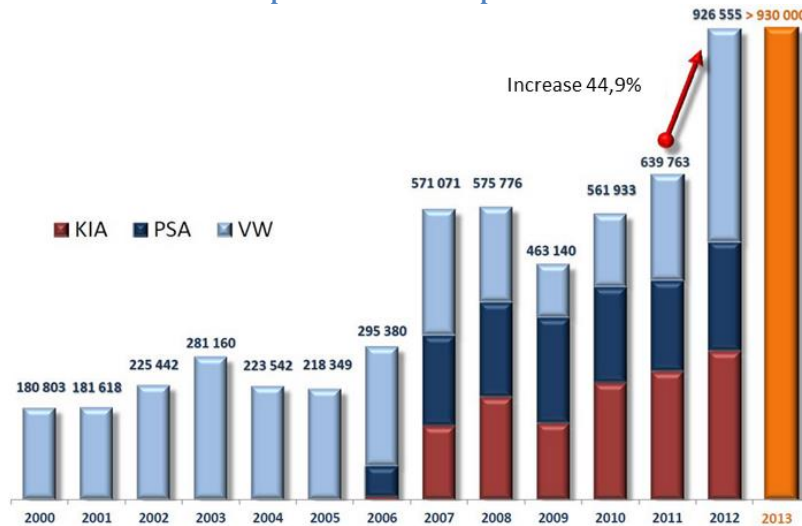
Source: ZAP (Association of Automotive Industry) Slovakia, 2013

In 2012, *"automotive industry generated directly and indirectly 200 000 job positions"* as claimed by prof. Mikuláš Luptáčik from University of Economics in Bratislava. According to Jozef Holeček from the Automotive Industry Association, Slovakia should see another additional 2000 jobs created in this industry by the end of 2013. A moderate growth thus, despite gloom prospects elsewhere in Europe, is predicted for the car sector (EU Business, 2013).

Based on the predictions made by the company PwC, Slovakia is expected to dominate in the amount of cars produced within Europe. The estimated increase between the year 2011 and 2016 is to be more than 55%. Only Russia should outpace Slovakia (PwC, 2012).

The future of automotive industry could lie in the specific joint R&D projects by levering on the cooperation between companies and universities. Allegedly, within 5 years timeframe, another two foreign car factories should emerge in Slovakia (Czechcars, 2012). Chinese car company JAC Motors that produces personal cars, vans, buses and trucks eyes car assembly plant in Slovakia (BusinessInfo, 2012). This Chinese car maker plans to produce 200.000 cars per year designed for Turkish, Romanian or Moldavian market. Another Asian company in the game is the Indian producer Reva Electric Car Company. Reva thinks about the production of an electric model NXR, which is popular in Great Britain (Czechcars, 2012). In July 2013, Kia Slovakia, currently the only Kia factory in Europe, announced its strategic objective to extend the car production capacities from 300.000 to 400.000 automobiles produced per year (Jamrichová, 2013). This step will probably require construction of new assembly hall.

It can be argued that Slovakia is a lucky country because of the presence of three successful global car producers that produce types of cars affordable for customers even in harsher times after the crisis. In fact, Volkswagen, Hyundai-Kia and PSA belong to the 10 largest car--making groups in 2012 (IHS Automotive, 2012). Moreover, in many countries the factories

run at 50% or 60% of their production capacities, however, in Slovakia assembly halls reach almost their full capacities (Sladkovská, 2013). This is a crucial observation. According to The Economist, assembly factories are most profitable only if they use more than 75% of production capacity approximately with two shifts per day (Special Report: Cars, 2013). In this view, Slovak automotive industry remains competitive, a fact owed mainly to the cheap, productive and so far sufficiently qualified workforce.

5.2.4 Science and innovations in automotive sector

Carmakers and automotive supply chain members have gradually embarked on the path of R&D driven activities. Automotive industry is credited as the main economic pillar, therefore the support of innovation and continuous research is inevitable in order not be perceived as only a manual car producer country but a high-skilled innovative location. The following graph depicts the share of R&D in motor industry. Throughout the last five years, there has been a visible increase of the R&D, which was also driven by curricula changes in some technology universities and creation of closer relationships between universities, production organisations and institutions (such as Slovak Academy of Sciences) (Sladkovská, 2013). In 2011, the share of R&D in manufacture of motor vehicles accounted for 6,2 % of the overall R&D investments made in all industries (Statistical Office of the Slovak Republic, 2012).

Graph 5: R&D in automotive production
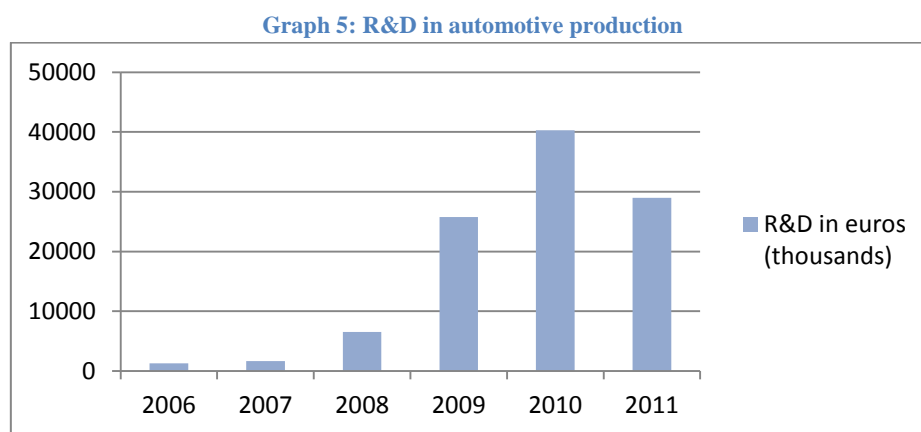
Source: Yearbook of Science and Technology 2012

Although the automotive industry is now undoubtedly one of the largest, strongest and promising industries in Slovakia and there has been an increase of R&D, the sector is stumbling upon an issue related to human resources. The three present large global players have already started to face a **shortage of experienced and quality labour force.** The jobs in automotive industry have been requiring more and more technical skills and the education system has not been in consistence with the needs of companies. Moreover, the Slovak workers are not really keen on migrating within the country (Paci, 2007). The threat of lack of quality work force has its roots mainly in the feeble secondary schools. Only 10% of high-school students opt for technical universities. As automotive expert Mr. Lešinský from the Automotive Industry Association reports, the further development of automotive industry globally is going to require more qualified work opportunities and therefore, the young people should study more (TASR, 2012).

The first efforts to put these discrepancies on labour market aside were driven by the "Slovak Big 3" (VW, PSA and KIA). VW supports various universities as well as student programmes, such as "Automotive production" at the Slovak Technical University in Bratislava, IngA programme (engineering in automotive industry) offered at more collaborating universities, project Edison of University of Zilina focused on the production of electric cars and other initiatives. Kia Motors grants scholarship for students of University of Zilina (Kia Motors´s location) and supports the study field "Automotive industry" at a technical high school in Zilina region. PSA focuses on Trnava region and provides technical high schools with more modern technical facilities and application related to automotive industry. PSA opened also a new study field "Mechanic of automobile lines" (SME, 2012).

All these big carmakers have been cooperating relatively actively with Slovak universities and technical high schools mainly through the creation of new learning facilities, labs, research centres, preparation of study programmes simulating the real production environment. Numerous "pilot centres" were created in order to increase the presence of automotive specializations in high schools and to make the graduate students better qualified. In total, 14 such centres have been created (SARIO, 2012).

Overall, the greatest attention enjoyed research projects conducted by universities in the area of e-mobility and manufacture of new car part at lower costs.

5.2.5 Supply Chain

As the map displays, the majority of car suppliers for the largest carmakers is concentrated in the West part of Slovakia, in which the automotive cluster emerged. In 2012, there were 274 enterprises operating in automotive industry across the country (ZAP SR, 2012). The supply chain is represented by the range of Tier 1, Tier 2 and Tier 3 suppliers that are then divided according to their specializations.

Image 16: Supply chain
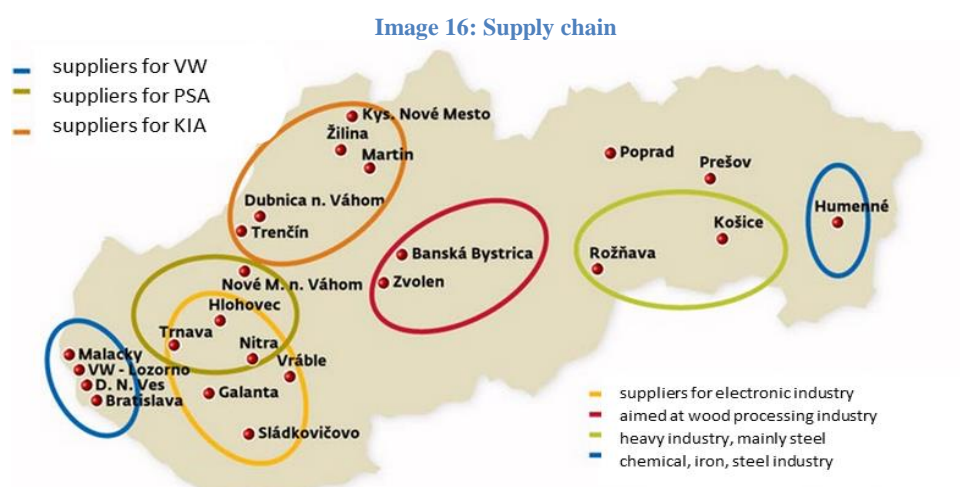
Source: Sabadka, 2008

6 SLOVAK REPUBLIC – ECONOMIC AND POLITICAL FOOTPRINT

In order to comprehend the complexity of clusters and competitiveness, it is necessary to grasp the full overview of economic and politic background of Slovakia as well. To be able to "connect the dots" and to understand the development of this country and its industrial advantages, this chapter will firstly briefly describe the main characteristics of Slovakia and then provide a closer look into the reform era and into the first decade of 21st century. Nevertheless, more light will be shed on the current situation and the future prospects in terms of economic growth, competitiveness, R&D, science and innovation.

## 6.1 How Slovakia became a Tatra tiger

Slovakia is a small landlocked country in Central Europe with only 5 million population. Having been reborn after the Velvet Revolution as an independent state on the January 1st 1993, the country passed from its turbulent teenage wild years in 90´s and through the booming and successful adolescence to an adult state with free market economy and many challenges ahead.

In the late 1990´s, Slovakia was considered to be only an economic backwater. It was the worst-performing economy in Central Europe (Tupý, 2010). The reputation of Slovakia can be described by the words of Madeleine K. Albright, quoted as saying that Slovakia is a *"black hole in the middle of Europe"* (The Economist, 2010) in the reaction to anti EU and anti-NATO direction of the politics. In this murky era, the privatization of big state companies ran under very mysterious conditions and firms were sold for cents. Consequently, the investors were reluctant to pour in money, the economy was stalled and the unemployment rate plummeted to almost 20%.

In 1998, Slovakia embarked on a reformist strategy, what later resulted in Slovakia being dubbed the Tatra Tiger, inspired by Irish Tiger due to the resemblance of economic success between Slovakia and Ireland´s growth 20 years ago (Reynolds, 2004). Further radical economic reforms run by the central-right government during the years 2002-2007 spurred the growth immensely and Slovakia had top-charted the EU countries with the highest GDP growth in years 2007, 2008 and 2010 (The Economist, 2013). The period of 2002-2007 is remembered as *"the most rapid and relatively sustainable development of the Slovak economy from the birth of the independent state in 1993"* (Jungmann, et al., 2011). The government consisted of pro-European and reform-oriented parties that aimed to increase the competitiveness of the Slovak economy. Understandably, these reforms had also paved the way towards the euro zone. In January 2009, Slovakia became a member of euro zone, what had a positive impact on the competitiveness (Bertelsmann Stiftung, 2012). Slovakia has namely one of the most open economies in the world (Bertelsmann Stiftung, 2012) and it's thus significantly dependant on foreign trade. Today, the export of goods accounts for almost 90% of GDP (The World Bank, 2012).

6.2 Faltering legacy of FDI

According to the World Bank, Slovakia scored in the ranking of the top reformers and had the world´s fastest transforming business environment in 2004 (The World Bank, 2005). The 19% flat tax imposed on both corporate and individual groups, simplified labour code enabling companies to fire and hire more easily, low labour costs and high labour productivity, political stability made Slovakia to be one of the most attractive economies in Europe. All these factors together with special incentives lurked in many foreign investors. The biggest investments in Slovakia have been injected mainly to the automotive industry. Car assemblies for companies such as Volkswagen, Kia and PSA have boosted their exports. The GDP grew substantially until the breakthrough year of 2009. In 2007, the GDP growth accounted for 10,5%. (Statistical Office of the Slovak Republic, 2013). However, the country didn´t stay thoroughly untouched from the financial crisis and later on, from the euro zone crisis. The image below depicts the real GDP growth of Slovakia and Eurozone and contains a forecast for the years ahead.

Graph 6: Real GDP growth
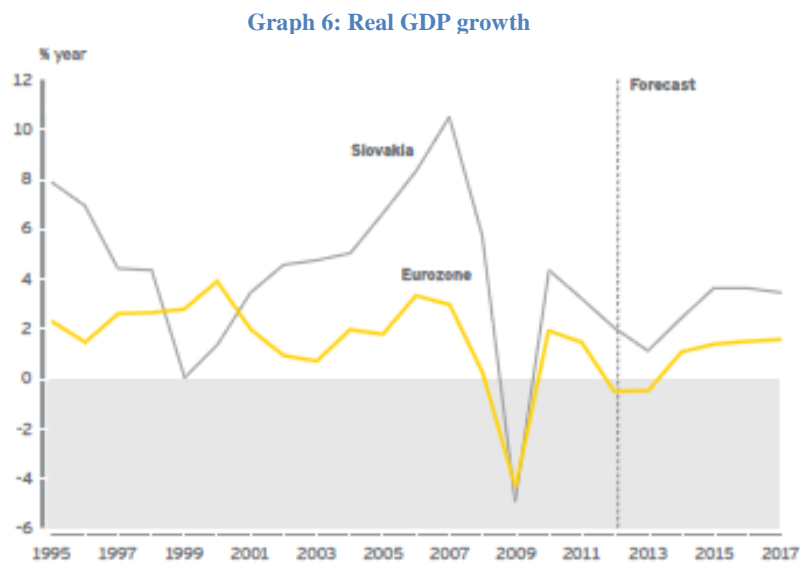
Source: Ernst & Young, Eurozone Forecast - Spring edition March 2013

The recession hit the small and open economy that is mainly specialized in the globalized automotive and electro-technology industry. However, it managed to recover quite swiftly and in 2012 belonged to the most growing countries in the OECD club (Ministry of Finance Slovakia, 2012). The annual growth rate of Slovak GDP was 2,6% (OECD, 2012) and was driven mainly by **one-off increases in automotive exports** as a consequence of the introduction of new car models (Ernst&Young, 2013). It is estimated that half of the last year´s GPD growth was generated by the increased exports of cars (Government of SR, 2012). This successful growth and quick recovery occurred as positive aftermath of the previous FDI projects that provided the country with new technologies, processes and machineries and enabled to boost the exports. The economic growth in 2013 and 2014 is forecasted to reach 2% and 3,4% respectively (OECD, 2012). However, considering Slovakia´s reliance on exports, dependence on trade partners such as Germany or Czech

Republic and unpredictable Eurozone, the projected growth that is in a considerable extent conditioned by the growth in partner economies, may stay only on a paper. And with only skin-deep reforms or short-term strategies, Slovakia may worsen its future prospects as the current reality already implies. High unemployment (in 2012 estimated to reach a record number 14%) (Liptáková, 2013), lack of sustainable domestic growth drivers, unfavourable conditions for business environment are caveats requiring taking some action.

The few years of fame (period of 2002-2006) since the country was coined the world´s leading reformer were over and by 2010, Slovakia fell from 18th to 42nd place in the World Bank´s **"Doing Business"** report (Tupý, 2010). The report examines the regulations that improve business environment or oppositely, constrain it. As this paper attempts to link the role of clusters to the competitiveness, the Doing Business report is useful to delve more into the microeconomics of competitiveness. Nowadays, the Government´s ambition is to bring Slovakia into the Top-15 in Doing Business by 2020 (Ministry of Finance of the Slovak Republic, 2011). Currently, Slovakia occupies the 46th position (The World Bank, 2013).

Based on the survey run in 2012 as a part of the Global Competitiveness Report, the most critical factors impeding the business environment are as follows:

Image 17: The most problematic factors for doing business in Slovakia

Factor	Percent
Inefficient government bureaucracy	21.0
Corruption	19.1
Policy instability	13.5
Inadequate supply of infrastructure	8.7
Restrictive labor regulations	6.4
Tax rates	5.6
Tax regulations	5.5
Inadequately educated workforce	5.2
Insufficient capacity to innovate	4.4
Access to financing	3.5
Poor work ethic in national labor force	2.5
Inflation	1.6
Crime and theft	1.1
Government instability/coups	0.9
Foreign currency regulations	0.5
Poor public health	0.4

Percent of responses

Source: Global Competitiveness Report, 2012-2013

Although some processes were streamlined, considerably heavy is the **administrative burden** that the companies need to carry. The famous flat tax that was an important reason enabling to lure FDI and to create a transparent and non-distortive tax system, is no longer flat (Hodge, 2011). In 2012, the government´s austerity plan envisioning to reduce fiscal deficit counted mostly on higher taxation. The flat tax system was replaced by progressive one (personal and corporate income tax) and became thus a maze full of loopholes again. This can impair the recovery of domestic consumption and investment spending can be sluggish due to the low demand (Ernst&Young, 2013).

Moreover, these governmental interventions are apparently worsening the business environment and especially SMEs face challenges when it comes to their competitiveness. In 2011, the then incumbent government attempted to reduce the administrative burden by 25% (Ministry of Economy of the Slovak Republic, 2011) through the Project Singapur in 2011[10], however the project got a red light after new election. The business environment continues to be lethargic.

The Slovakian "roaring tiger" is nowadays a bit sleepy as it´s slowly but surely losing all the gains originated from the inflows of FDIs, which are now gradually petering out. In the past, the main source of productivity increase were technology imports, however the strategy of today about how to increase the competitiveness, lies in other direction.

6.3   Analysis of Slovak competitiveness from a global perspective

"The future of Slovakia's competitiveness as well as that of the whole European Union (EU) rests in particular in the knowledge economy." This was the statement made by the European Commission (EC) Chairman, José Manuel Barroso (Barroso, 2006).

The following passage will direct the attention to the status-quo analysis of the competitiveness of Slovak economy, which will be assessed through the results derived from the Global Competitiveness Report 2012 and through the prism of knowledge-based competitive advantage of Slovak economy. Overall, Slovakia is still perceived as a rather processing economy than a knowledge economy. This claim can be corroborated by the results derived from different reports.

A complex tool measuring the microeconomic and macroeconomic foundations of national competitiveness poses the **Global Competitiveness Index (GCI)** developed by the World Economic Forum (WEF)**.** As mentioned already in previous chapter elaborating on the notion of competitiveness, the GCI includes the weighted average of many components measuring various aspects of competitiveness that are grouped into 12 pillars. However, the relative importance of each pillar depends on a country´s stage of development. The most developed countries are those that managed to move into the innovation-driven stage. In these economies*, "the companies must compete by producing new and different goods through new technologies (pillar 12) and/or the most sophisticated production processes or business models (pillar 11)"* (Schwab, 2013).

Slovakia is for the first time positioned in the group of countries that are in the innovation-driven stage of development. However, it is ranked 71th (out of 144 states) in the period of 2012/2013, a drop of 2 notches. The fact that this is indeed a rather low place can be reinforced by knowing the rank of other members of Visegrad Four (V4). The rank of Czech Republic, Poland and Hungary was 39, 41 and 60 respectively. To add another woeful

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[10] The main goal was to create a new Singapur from Slovakia and cut down administrative burden resting on firms. Allegedly, the overall administrative burden accounted for 3% of GDP.

observation, Slovakia´s competitiveness level is only slightly better than the one of Ukraine or Montenegro.

The indicators in the table are derived from the World Economic Forum´s Executive Opinion Survey conducted among business executives. Admittedly, the results are rather subjective and may reflect some biases or sentiment of respondents, but there is no doubt that these results point out the crucial concerns related to the national competitiveness. An examination of the table below uncovers a worrying trend, which from a long-term perspective may cause a failure to move up the economic-development ladder. The biggest setbacks of Slovakia are the inability to improve the innovation and business sophistication factors and one of the worst performances of institutions worldwide. Moreover, these indices worsened in comparison with the last year´s results.

Table 6: Key competitiveness indicators and pillars

Basic Requirements		Pillars							
		Institutions		**Infrastructure**		**Macroeconomic environment**		**Health & Primary Education**	
Rank	*Score*	*Rank*	*Score*	*Rank*	*Score*	*Rank*	*Score*	*Rank*	*Score*
62	4,6	104	3,4	56	4,2	54	4,9	42	6,0
Efficiency Enhancers		**Higher education & training**		**Goods market efficiency**		**Labour market efficiency**		**Financial market development**	
Rank	*Score*	*Rank*	*Score*	*Rank*	*Score*	*Rank*	*Score*	*Rank*	*Score*
51	4,3	54	4,5	54	4,4	86	4,2	48	4,4
		Technological readiness		**Market size**		-			
		45	4,5	59	4,0				
Innovation & Sophistication Factors		**Business sophistication**		**Innovation**		-			
Rank	*Score*	*Rank*	*Score*	*Rank*	*Score*				
74	3,5	61	4,0	89	3,0				

Source: Elaborated by author based on data from Global Competitiveness Report 2011-2012

6.3.1 Innovation performance and clustering assessment

Especially the last two pillars – **Business Sophistication** and **Innovation** are of the highest relevance for the scope of this paper which intends to promote the microeconomic foundations of competitiveness and to shift to cluster thinking. A closer look under the hood reveals the following fundamental determinants on the competitiveness that are critical to the microeconomic context. Besides, these two pillars are comprised of the most relevant key drivers of competitiveness in a country that is in an innovation-driven stage of development.

11th pillar: Business sophistication			11th pillar: Business sophistication		
Local supplier quantity	4.8	68	Local supplier quantity	5.0	**48**
Local supplier quality	4.9	**40**	Local supplier quality	4.8	51
State of cluster development	3.8	67	State of cluster development	3.6	62
Nature of competitive advantage	2.8	115	Nature of competitive advantage	2.8	113
Value chain breadth	3.8	58	Value chain breadth	3.6	63
Control of international distribution	3.3	126	Control of international distribution	3.4	120
Production process sophistication	4.5	**34**	Production process sophistication	4.4	**37**
Extent of marketing	4.6	**38**	Extent of marketing	4.6	**42**
Willingness to delegate authority	3.6	80	Willingness to delegate authority	3.6	80

| 12th pillar: Innovation			12th pillar: Innovation		
Capacity for innovation	2.9	88	Capacity for innovation	2.8	84
Quality of scientific research institutions	3.4	90	Quality of scientific research institutions	3.2	97
Company spending on R&D	2.9	85	Company spending on R&D	2.8	89
University-industry collaboration in R&D	3.2	100	University-industry collaboration in R&D	3.2	104
Gov't procurement of advanced tech products	2.8	127	Gov't procurement of advanced tech products	2.8	129
Availability of scientists and engineers	3.9	79	Availability of scientists and engineers	4.0	74
PCT patents, applications/million pop.*	6.1	**40**	Utility patents granted/million pop.*	3.1	**38**

Source: Global Competitiveness Report 2012-2013 and 2011-2012 respectively

There is a strikingly negative perception of the *"nature of competitive advantage*", in other words, the companies´ competitive advantage in international markets is rather based upon low-cost or natural resources than on unique products and processes. Faced with the question how prevalent are well-developed and deep clusters, the answer is somewhere in the middle, supposedly such clusters do exist but are rare.

The component *"capacity for innovation"* refers to the way how do companies obtain technology, what in Slovakia is done more by imitating foreign companies or buying licenses than by conducting own research. Speaking of research, the *"quality of scientific research institutions"* is assessed as under-averaged. The private sector doesn´t spend very heavily on R&D neither. Considerable room for improvement is perceived in the "university-industry collaboration in R&D". The government procurement decisions are not very effective in fostering technological innovation.

In case of innovation system, Slovakia comes off much worse than the EU average as the table shows. This is a puzzling observation considering the fact that innovation policy has been claimed to be one of the highest priorities stated by the government in 2005 (Ministry of Economy, 2005).

Graph 7: Innovation Union Scoreboard (0= worst performance, 1=best performance)
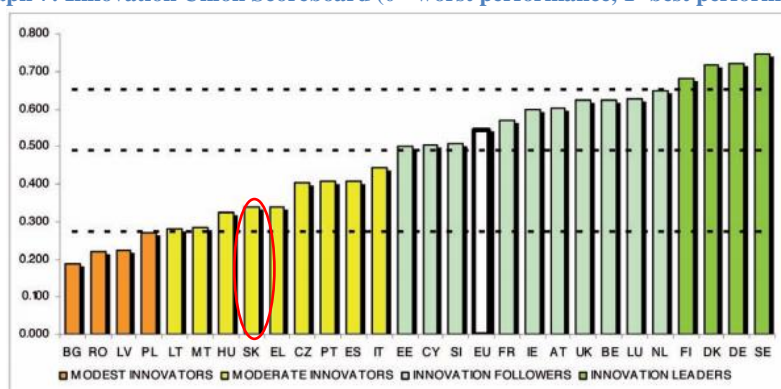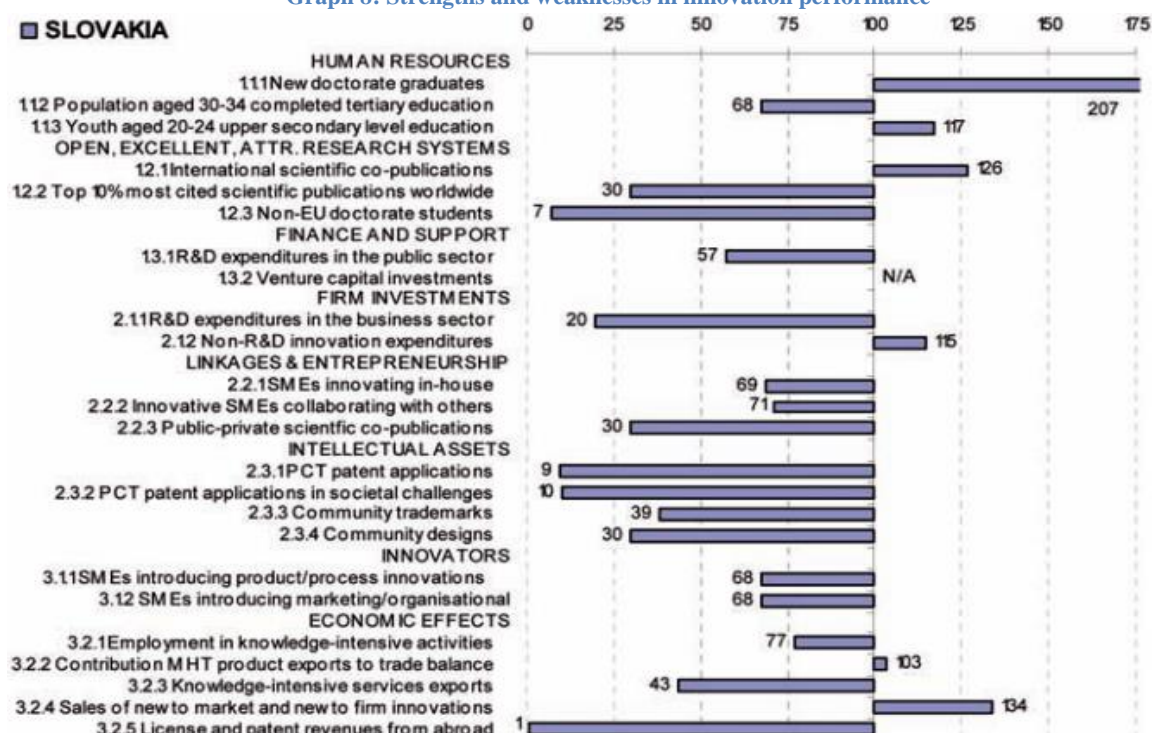

Source: Innovation Union Scoreboard 2013, data taken in 2011

On the whole, Slovakia is regarded as a **moderate innovator** and the most innovative region is Bratislava County. The other regions are modest innovators with West Slovakia being a modest-medium innovator (Hollanders, et al., 2012). The Innovation Union Scoreboard (IUS) monitors the innovation performance of the EU members by capturing 25 innovation indicators that are grouped into 3 main categories – Enablers, Firm activities and Outputs. These categories are then subdivided into 8 dimensions. (to see the whole break-down of categories and Slovakia´s performance in every variable, please move to Annex). Although overall, Slovakia is graded as below average performer, it performs highly above average only in Human Resources thanks to its strong performance in new doctorate graduates and youth with upper secondary education. On the other hand, it is ranked low in terms of attractive and excellent research system, firm investments, and intellectual assets.

Graph 8: Strengths and weaknesses in innovation performance

*Source: Innovation Union Scoreboard 2013, data from 2011*

A good indicator for **assessing the level of clustering** poses the dimension "Linkages & Entrepreneurship". Slovakia is underperforming due to its low share of "innovative SMEs collaborating with others". In 2012/2013, the share of innovative collaborating SMEs is only 8,3% out of all SMEs in Slovakia and therefore occupies 22nd place out of 33 countries measured in this indicator (Innovation Union Scoreboard , 2013).

6.3.2 Positive forces for building up national competitiveness

The snapshot of factors impeding the improvement of national competitiveness is comprised of many positive forces as well that the country could build upon.

A positive economic factor is the considerably high labour productivity in the course of last decade. Productivity is the foundation of long-term economic welfare and economic growth. "Labour productivity per person"[11] is a main indicator of competitiveness used in EU. As Eurostat defines: *"Output can be raised through more labour input or more output per unit of labour input (labour productivity), which is driven by capital and technology. Raising labour productivity is particularly important for sustaining growth during a period of ageing populations"* (Eurostat, 2010). However, it must be noted that according to Porter, there is a difference between individual productivity (equal to labour productivity and calculated as the level of GDP generated by every person) and economy-wide productivity (GDP produced for each unit of factor input available for an economic activity). Individual productivity is not understood as a complete measure of the impact on prosperity. Yet, it may at least hint at the positive prospects for prosperity. In Slovakia, the high labour productivity has been mainly driven by the inflows of FDI and modern technologies.

Graph 9: Labour productivity per person employed
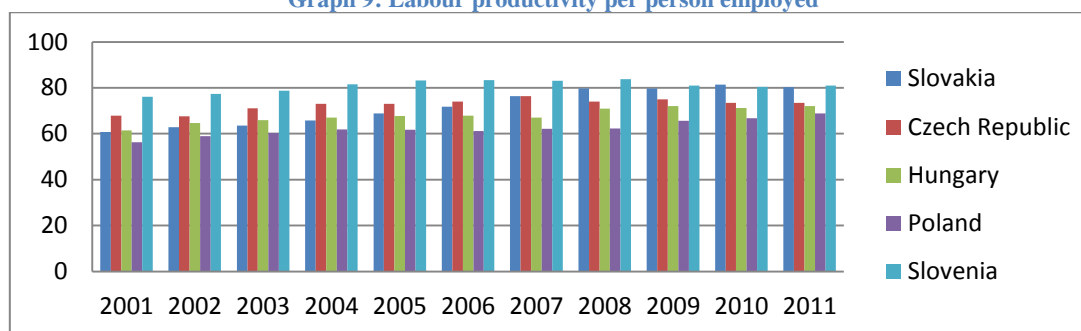
Source: Eurostat 2012, adjusted by author

Although Slovenia has slightly higher labour productivity per person employed than Slovakia, Slovakia can boast about being the most productive within the V4 countries.

Other strong ingredients supporting the competitiveness of business enterprises based on the results of a survey conducted within **World Competitiveness Yearbook 2012** are as follows:

- the level of communication technology as well as the investment in telecommunications meet adequately business requirements (rank 17)
- future energy supply, access to commodities, energy infrastructure are efficient (rank 15, 14 and 16 respectively)
- high secondary school enrolment (rank 3)
- low unit labour costs in the manufacturing sector (rank 9)
- productivity of companies is to a certain extent supported by global strategies (supplies, off-shoring, outsourcing) (rank 20)

Nevertheless, the report in general evaluates the overall Slovak competitiveness to follow a slightly downhill trend. Deteriorating performance is present in every subgroup of

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[11] The EU indicator Gross Domestic Product (GDP) in Purchasing Power Standards (PPS) per person employed relative to the European Union average (EU-27=100).

competitiveness scorecard. Economic situation, government as well as business efficiency and infrastructure were downgraded.

**Table 7: Snapshot of competitiveness ranking**

Rank	2008	2009	2010	2011	2012
Overall Competitiveness	30	33	49	48	47
Economic Performance	32	34	54	57	55
Government Efficiency	31	34	41	42	43
Business Efficiency	26	26	43	42	43
Infrastructure	36	37	40	41	39

Source: The World Competitiveness Yearbook 2012, adjusted by author

6.3.3 A road to knowledge-based economy

Until recently, Slovakia (as well as other CEE countries) embarked on the strategy of pure cost competitiveness as a mean to converge with Western and Northern Europe. The graph below divides European countries into four groups in relation to the competitiveness (WEF score, horizontal line) and unit labour costs (ULC, vertical line). As the red circle indicates, Slovakia is positioned as a less competitive but cheaper location. However, having recently moved to the innovation-driven stage of development, such industrial model of growth and competitiveness based on cost advantage is no longer sufficient.
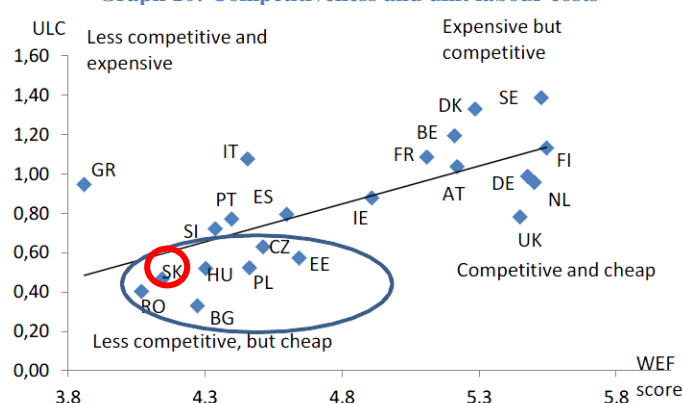
Source: Erste Group, CEE Special Report 2013

The baseline of long-term sustainable growth and prosperity is a quality-based competition advantage (Hečková, et al., 2012). Slovakia has to change the game from a low cost play to a knowledge-based system (Erste Group, 2013). It should embark on a wiser course.

Slovakia, as well as other *"CEE countries will need to increase productivity of capital and labour by their own means and this makes investments in education and R&D crucial."* Such shift is only possible with bigger focus on innovation and education (Erste Group, 2013). In this way, Slovakia and other CEE countries face many challenges. Slovakia, together with Czech Republic, Hungary and Poland belong to the so called "catching-up" group according to the **Industrial Performance Report** prepared by European Commission. The progress towards more knowledge and skill-oriented industries is held back by feeble knowledge

transfer and weak innovation capacity. Business environment is troubled by lack of transparency, efficiency of public institutions and domestic infrastructure (European Commission, 2012).

Where does Slovakia stand on its way to become more knowledge-based economy, demonstrates the following **Knowledge Economy Index** (The World Bank, 2012) developed by the World Bank. This index addresses the question whether the country has encouraging environment for using knowledge effectively for economic development. According to the World Bank, the "knowledge economy" is represented by four pillars:

- economic incentive and institutional regime (EIR) - promotes the efficient use of existing and new knowledge and the flourishing of entrepreneurship
- innovation and technological adaptation - firms, research centres, universities, think tanks, consultants able to create new technological solutions or adapt the global knowledge to local needs
- education and training - an educated and skilled population is capable of creating, sharing, and using knowledge
- ICT infrastructure (Information and Communications Technologies) - ICT - facilitates the effective communication, dissemination, and processing of information (The World Bank, 2012)

Slovakia was ranked 33th in the sample of 146 countries (The World Bank, 2012). It came across very well in terms of the first pillar – Economic Incentive Regime. Yet it has a longer way to go when it comes to Innovation and Education.

<div align="center">

Table 8: Knowledge-base Index 2012

</div>

1.Knowledge Economy Index	7.64
2.Knowledge Index	7.46
3.Economic Incentive and Institutional Regime	8.17
4.Education	7.42
5.Innovation	7.30
6.ICT	7.68

Source: elaborated by author based on the data available from KAM 2012 report

Innovation performance

The figure below illustrates the evaluation of innovation performance of Slovakia in 2010-2012. Slovakia´s results in various dimensions of innovation are average (top 10% of performers in the sample get 9-10 ranking points, the second best 10% get 8-9 points etc.).

Graph 11: Innovation Performance of Slovakia in 2012
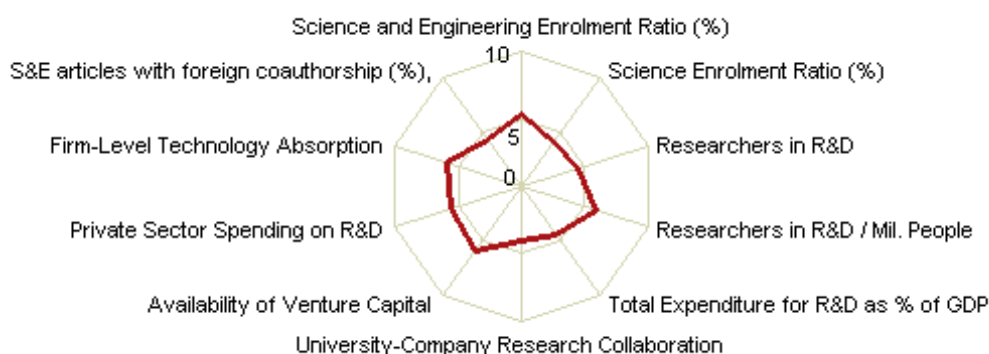
Source: Based on an interactive tool of KAM Report 2012 ,The World Bank

All in all, Slovakia continues to have one of the lowest R&D expenditure in the EU. Private R&D (or share of business-driven R&D) accounted only for 0,2% of GDP in 2011 (European Cluster Observatory, 2011). According to the document Europe 2020 that entails strategic goals of the overall EU in various areas, the EU Target for 2020 is to invest 3% of GDP in R&D, whereas Slovakian national target is 1%. In 2012, 0,68% of GDP was invested on R&D (Statistical Office of the Slovak Republic, 2012), what is a perturbing figure for the future especially when noticing that this is a constant rate during the last couple of years (European Commission, 2012).

Graph 12: Gross domestic expenditure on R&D (% of GDP)
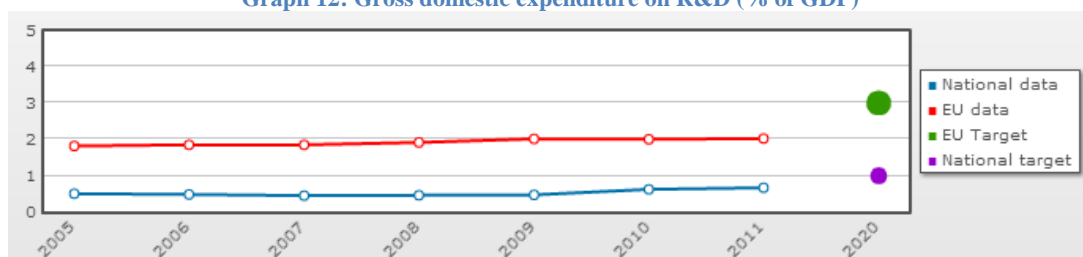
Source: Europe 2020 in Slovakia, 2012

The following graph portrays the level of competitiveness and knowledge economy of chosen CEE countries ranked by WEF rank (Global Competitiveness Survey) and KEI rank (World Bank – Knowledge Economy Index). The red bubbles refer to innovative economies (Slovakia and Czech Republic – both moved to the innovation-driven stage of development). The lower the rank, the better (Erste Group, 2013) the performance is.

It can be observed that Slovakia stands in the middle of the road to become more competitive and more knowledge-focused.

Image 18: Level of competitiveness and knowledge economy
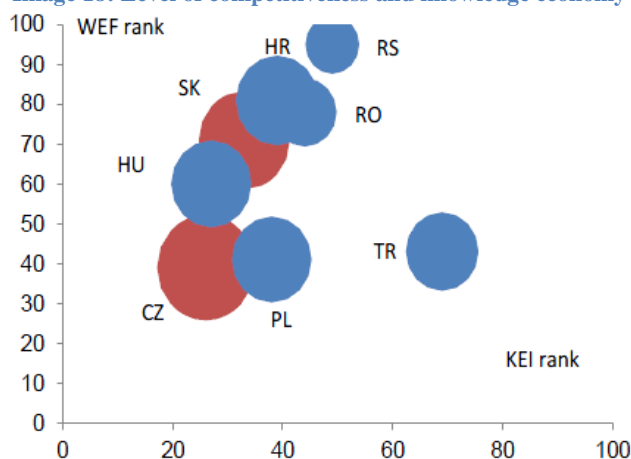
Source: Erste Group, CEE Special Report 2013

6.4 Clusters in Slovakia

From a micro level view, a cluster can thrive in the region with implemented legislative policies and within an environment that provides support to existing clusters in terms of research and innovation, small and medium enterprises and regional industrial development (Boja, 2011). Is there a special cluster policy or other framework supporting cluster development? What type of clusters are here and in which way they were built?

In general, the topic of clustering is quite new in Slovakia. Such late discovery of cluster subject was common for all post-communist countries in Central Europe. There were mainly two reasons explaining the late emergence of industrial clusters in Slovakia. On one side, a **considerable lack of information and knowledge about clusters** slowed down the adoption of cluster-based approach and on the other side, there was a **general mistrust towards regional governments** (Klimovský, 2006).

It is thus understandable that there is no official definition of what a cluster under Slovak conditions is. Therefore, the most suitable proxy for a cluster definition that can be applicable to Slovak circumstances is the one used in the neighbouring Czech Republic. The agency Czechinvest understands cluster as *"a set of regionally linked companies (entrepreneurs) and affiliated institutions and organizations - in particular, tertiary education institutions - whose ties have the potential to consolidate and increase their competitiveness"* (Czech Invest, 2004). To add perspective of an already existing and successful Czech cluster organization, the Plastics cluster defines cluster internally as *"an association of those who know each other. Even though they compete, they want to cooperate, because they know that they can make money"* (Plastics cluster Czech republic, 2012).

6.4.1 Pursuit of clustering

The Ministry of Economy realized in its regular report within the Operation Program "Competitiveness and Economic Growth" (Ministry of Economy SR, 2013) that there is a

considerable lack of cooperation between research institutions, universities and business sphere. Slovakia lags behind in transfer of research outcomes and in development of innovation processes. The infrastructure for enterprises is underdeveloped in areas of business incubators or consulting services for research, development and innovation. Industrial parks that could entice the entry of strategic investors and development of innovative entrepreneurship are not sufficiently endowed with technologies. The report identified impeding factors for SMEs – lack of capital for innovation activities and harder access to industrial information, new technologies, and research outcomes. SMEs have often an unsatisfactory level of marketing and they lack possibilities for training and education of human resources.

Although since 2005 the support of SMEs was identified as one of the top priorities across all governance levels, no cluster-based policy approach was spotted. The only similarities to cluster approach were found in promoting Slovak automotive industry and industrial parks. A more than decade ago, various international organizations recommended to take some action steps to implement cluster-based approach to regional development. Until today, the situation remains more or less unchanged.

The **first cluster** appeared **in 2004** (Biterap Košice cluster) and the majority of current clusters came into existence in 2008 (Balog, et al., 2010). Prior to that, many international efforts have been conducted to raise awareness among Slovak policy-makers or business owners to establish clusters, for instance an OECD project "Clusters in transition economies" within the LEED programme (Local Economic and Employment Development) aimed to promote clusters as long-term policy approach for regional development (Ionescu, et al., 2002).

Unlike the rest of the V4 countries, Slovakia is the only one with **neither complex cluster policy nor a legislation** containing a framework for cluster initiatives, although there are now approximately 20 registered clusters. There has been **no significant supportive mechanism** for the creation, development and reinforcement of clusters yet. All the existing clusters have thus developed without the support of any concrete policy directed specifically to the creation of clusters. Such way of cluster evolution is very different from what was experienced in Czech Republic, where thanks to the Operation Program Clusters the country embarked on cluster boom. However, in case of Czech Republic many of the established clusters have not behaved as actual clusters trying to promote the growth but were only "quasi-clusters" or free associations of enterprises". The main purpose for such "associations" was to become entitled to get public financial sources. Some members stayed in cluster formation only to get information about its rivals and were only passive participants (Stejskal, 2011). On the other hand, despite the possible threat of misusing the Czech cluster policy, clusters have at least better access to public support and have a status of existing legal entity what makes the process to apply for some European funds much easier.

By all means, a clear policy able to foster the cluster development is evidently missing in Slovakia. The further successful existence of clusters can stumble on this fundamental gap, especially due to the high impact of small and medium businesses on the economy.

6.4.2 Government´s envisioned plans to support clusters

Slovak economy consists from 99,89 % of small and medium enterprises that together employ 72,23% of all employees in private sector (Ministry of Economy SR, 2013). At the beginning of 2013, the Slovak government accentuated the importance of a strategy shift from supporting big investors to focusing on SMEs. SMEs have an indispensable place in supply chains and account for a major part of economy.

The Ministry of Economy proposed a new supportive tool for clusters. The so called **"Scheme of support for industrial clusters"** (Communication Department, 2013) is anchored in a government bill about subsidies. The bill provides a possibility to get subsidy for projects aimed at research, development and innovation also for associations of legal entities (prior to that it was difficult for such type of organization to be entitled to get subsidy). The bill was approved by the National Council on the May 1st 2013; however the cluster program is currently subjected to approval procedure. According to the announcement of Ministry of Economy in Slovakia, the scheme should be finally submitted for approval on the last summer meeting of Ministry of Economy and afterwards, it would be forwarded to Ministry of finance for the last approval. If approved, the scheme will be then implemented by Slovak Innovation and Energy Agency. In general terms, this tool should increase the competitiveness of SMEs. The selection criteria for cluster are based on cluster ability to bring new innovations and knowledge from abroad. Clusters are seen as enablers of aligning the science-research institutions and consequent development of new production processes and materials.

The scheme should include arrangements to support:

a) Education organized by clusters or education of cluster members (workshops, conferences, seminars, specialized education activities)
b) Presentation of clusters and its member in Slovakia and abroad through participation on information venues and fairs
c) Creation of mutual expertise base, technological cluster mapping, strategies of cluster organizations and expert activities
d) Participation of clusters in international projects and networks

Based on email response from the Ministry of Economy, the precise date of launch of this scheme is not known yet. It must be positively concluded however, that the preparation of this scheme is at least a glimmer of hope that the government tries to facilitate cluster-based approach for the growth of competitiveness.

6.4.3 Indirect support of cluster development

On a national level, there is so far only a lukewarm endorsement for existing clusters. In general, Slovakia lags behind other EU countries in clustering. National governmental authorities recognise the importance of cluster in a rather hidden form, within the document **Innovation Strategy 2007-2013.** On the other hand, clusters themselves (in form of cluster organizations) are taking initiatives and are part of various international projects, what may signalize their true unbiased effort to fortify a cluster. The Innovation Strategy states that companies usually do not consider innovations to be an important source of their competitiveness or they tend to underestimate the importance of innovations, what carries along a risk of not using all the opportunities that may be offered throughout various innovative programmes supported by the EU.

In other words, the culture of innovativeness among firms is not very developed. Therefore, the Slovak government decided to establish a special Commission on coordination and evaluation of knowledge-based economy and incorporate it to the National strategic framework for the period 2007-2013. The Innovation Strategy document itself raises concerns about the nonexistence of strategic policy supporting innovations, about the lack of focus on R&D, lack of proactive tools propping up innovations, diminishing share of R&D on GDP, small amount or fragile relation between the scientific research and business world leading to the extremely low share of private sphere on R&D etc. One of the suggested solutions targeting the improvement of innovative environment only mildly tackles also the topic of clusters. Clusters are thought to be one of the tools which enable better cooperation between academia and business sector and that can enhance the regional competitiveness (Ministry of Economy, 2005). Slovakia offers a lacklustre support for regional clusters. Clusters can get financial support from a limited number of funds and interregional projects. The only operational program in the frame of structural funds that dedicates at least some attention to clustering is **Operation programme "Competitiveness and economic growth".** The Innovation Policy of Slovak Republic approved in 2011 puts the *"highly qualified infrastructure and effective system for innovation development"* as a priority number one. In this context, the very first measure is *"to support innovative industrial cluster organizations"* (Ministry of Economy, 2005). It targets certain cluster activities that are contributing to the higher competitiveness of cluster members. Yet seemingly, there is a gap between a plan and its actual implementation.

With no national framework for cluster policy, cross-frontier and international cluster collaboration could serve as appropriate compensation tools enabling to improve the competitiveness of a region and firms. Slovakia is a member of various international projects focusing mainly on cluster networking within EU and also within the Visegrad Four area.

- **European Cluster Alliance** – initiative fostering cluster cooperation involved in various cluster policy projects funded by the European Commission. Slovakia is represented by the Business and Innovation Centre (BIC) Bratislava

- **CLUSTERPOLISEE** – interregional project for cluster policies and implementation of best practices. Slovakia is represented by the Union of clusters in Slovakia, Trnava City and Ministry of Economy.
- **Cluster COOP** – directed to improve conditions for cooperation among clusters in Central Europe (Ministry of Foreign Affairs of the Slovak Republic, 2004) to increase their competitiveness.
- **CluStrat** initiative of Central Europe – this programme was implemented by the National Agency for Development of SMEs (NADSME) within the Operational Program Central Europe. It is concentrated on improvement of competitiveness of SMEs belonging to clusters and its main tool is to foster a dialogue about strategies and new development concepts for clusters in Central Europe. It envisions preparing and testing new forms of cluster functionalities.
- **Cluster CORD** – project provided support to SMEs in their efforts to launch cluster initiatives in Central Europe and ended in February 2013. It emphasized cooperation through study visits or exchanges.
- **Eureka Clusters** – focused mainly on raising competitiveness through technology
- **CLOE** (Clusters Linked over Europe informal alliance) – aimed at creation of a European network of clusters through knowledge exchange and partnership programmes such as Interreg IIIC in which industry clusters from different regions work together on common projects.
- **CENTRAMO** (Cluster Excellence Network for Training and Mobility) – organization of workshops on cluster management and administration, best practices, study programmes for cluster managers from chosen CEE countries (SIEA, 2012)

Many of the currently existing Slovak clusters have been created with so called **bottom-up approach** by business entities and with significant support from regional authorities. Additionally, a number of institutions or agencies supporting small and medium enterprises have also positively contributed to the emergence of new cluster initiatives. In terms of legislative framework, clusters have a form of "association of legal entities" and usually, members need to pay a symbolic fee to be eligible for a valid membership.

In 2010, some of the existing clusters created an umbrella organization called The **Union of Slovak clusters** (Klastrová únia). The Union contributes financially to the Operational Program Central Europe, which is considered by the Union to be the main tool for opening the dialogues that could propel the creation of cluster policy adopted by the Slovak government. To formulate and to receive an approval for legislation about cluster policy is a primordial aim of the Union. This legislation should cover issues related to cluster activities and cluster financing (TASR, 2010). The Cluster Union serves as a common brand platform for its cluster members, which are thus, represented under one name. The main goals consist of stimulating the development of employment and fostering cooperation among members as well as communication between domestic and foreign companies. The Union executes various tasks in improvement of education system relevant to industries in which the cluster members are active, tackling especially the secondary education level. It also supports the information

exchange by taking part in various international projects or by organizing workshops and courses. Apart from that, the Union conducts research analyses and market prognoses.

6.4.4 Current state of cluster awareness and cluster development

Interviews and consultation with experts on clusters brought interesting insights regarding the evaluation of current state of cluster development and perception of cluster advantages. The former director of Automotive Cluster West Slovakia Mr. Chudoba identifies lack of trust among business enterprise as the main caveat in the improvement of cluster awareness. "*Firms are too atomized and are not very willing to participate in networks. The commonly spread philosophy among Slovak firms –"do your business alone" is harmful"* (Chudoba, 2013).

Mr. Maják from the Slovak Investment and Trade Agency evaluates the awareness about cluster benefits among firms and general public as rising. *"Firms slowly but gradually realize what participation in clusters can bring and this creates more frequent media coverage as well"* (Maják, 2013). There is a shared opinion that one of the crucial factors impeding further development of clusters is the reluctance of firms to co-operate. "*People still have difficulties to understand that one can gain thanks to the co-operation with the competitors. Therefore, it doesn´t always prove sensible to oppose to this form of cooperation at all costs."* On a more positive note he assesses the overall situation as improving. Trust among enterprises is increasing. The impact of clusters on the enhancement of competitiveness can be thus fortified along time. "*The recent natural (although a bit slower) development of clusters leads to the desired outcome.*"

The president of Union of Clusters, Mr. Daniel Ács is convinced that the general awareness about clusters is indeed low and their promotion needs to be run mainly in the circle of professional public. To the main impediments for the development of clusters he attributes the *"Slovak mentality not to co-operate"*(reflected sometimes even in the case when some enterprises consider industry associations and groups for a competition) and *"non-existence of state support in clustering"* (e.g.: no strategic document on the national level has been so far prepared). In terms of government support towards clusters, "*ministries would like to show some form of assistance, but they lack resources"*. And as the government has usually low awareness about clusters and cooperation, there are no resources to be used. For clusters to be able to have a more significant impact on firm and regional competitiveness, "*cooperation efforts and clusters need to be gradually and patiently implemented within a relatively stable environment"*. The stumbling block, however, is the *"unstable environment"* present in Slovakia married with the "*lack of sense for patience and continuality"* (Ács, 2013).

6.4.5 Cluster Mapping

The very first cluster mapping exercise was conducted in 2005 on behalf of OECD. The intention was to create a snapshot of cluster phenomenon in post-socialist countries in Central Europe. In Slovakia, 46 spatial concentrations were then identified by applying a location

quotient analysis. The following sector clusters were highlighted: automotive, electronics, clothing, shoe making, wood processing, furniture, paper products, mechanical engineering, printing and publishing. The biggest attention was dedicated to manufacturing industries – auto assembly and component, electronics, chemicals and clothing.

According to European initiative **Cluster Observatory** serving as a proper tool for cluster mapping, there are 45 spatial concentrations identified as potential industrial clusters, that received at least 1 star. The **3-star rating system** enables to pinpoint industries with significant agglomeration, employment and technological advantage. Based on the data from 2011, automotive cluster category clearly enjoys the highest ranking amongst other sectors in Slovakia. In case of automotive industrial clusters, the Slovak cluster is ranked slightly higher than the German one and therefore, it again represents a number one in this star rating.

Table 9: Star rating of industry sectors

Sector	Observatory star rating
Automotive	2.31
Building fixtures, equipment and services	1.69
Footwear	1.58
Transportation and logistics	1.54
Plastics	1.46

Source: European Cluster Observatory, 2011

Based on the European Cluster Observatory, the highest level of technological specialization is achieved in footwear and automotive sector. Specialization is *"an indication that the economic effects of the regional cluster have been strong enough to attract related economic activity from other regions to this location, and that spill-overs and linkages will be stronger."* (Cluster Observatory, 2011). It is worth adding that in terms of specialisation, Slovakian footwear and automotive cluster categories outperform other peers in CEE (Germany, Czech Republic, Poland, Hungary, and Slovenia).

Table 10: Specialization rating

Sector	Specialization
Footwear	4.9
Automotive	3.4
Power generation and transmission	3.39
Oil and gas	2.57
Plastics	2.49

Source: European Cluster Observatory, 2011

In terms of employment, sectors related to the manufacturing employ the highest amount of employees. Official statistics from 2012 with data that are consistent with SK NACE (Branch Classification of Economic Activity) reveal the following. Sectors such as manufacture of transport equipment and manufacture of metallic products employ the majority of employees.

Table 11: Number of employees in manufacturing

Sector – manufacture of:	Employees
Metallic products (except machinery and equipment)	91 672
Transport equipment	66 044
Rubber and plastic products (and other non-metallic mineral products)	47 854
Other manufacture, repair and installation of machinery and equipment	39 632

Source: Statistical Office of the Slovak Republic, 2012

One of the positive impacts of clusters is often linked to higher employment. The abovementioned manufacturing sectors have the highest amount of employees what could indicate the existence of spatial concentrations, which could possibly be clusters per se. It's not the scope of this paper to examine whether all the identified potential regional industry clusters are really clusters as this would require more in-depth, input-output and performance analyses. However, this exercise provides arguments in favour of those clusters that went through institutionalization in the aforementioned sectors.

Nowadays, there are allegedly 14 registered clusters scattered across the whole country with the majority of them being technologically oriented.

Image 19: Registered clusters in Slovakia

Source: Own illustrative representation of cluster organizations

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Technological clusters:

Name	City	Year of birth	Focus	Number of members[12]
BITERAP cluster	Košice	2004	IT	13
Košice IT Valley	Košice	2007	IT	27
Automotive cluster – Western Slovakia	Trnava	2007	automotive industry	40
Electrotechnological cluster – Western Slovakia	Trnava, Galanta	2008	electro	3
1.Slovak Engineering cluster	Detva	2008	manufacturing	22
Z@ict	Žilina	2008	ICT	12
Slovak plastic cluster	Nitra	2009	production of plastics	42
Energy cluster – Western Slovakia	Trnava	2009	energy	6
Cluster AT+R	Košice	2010	automation technology and robotics	10

Other clusters:

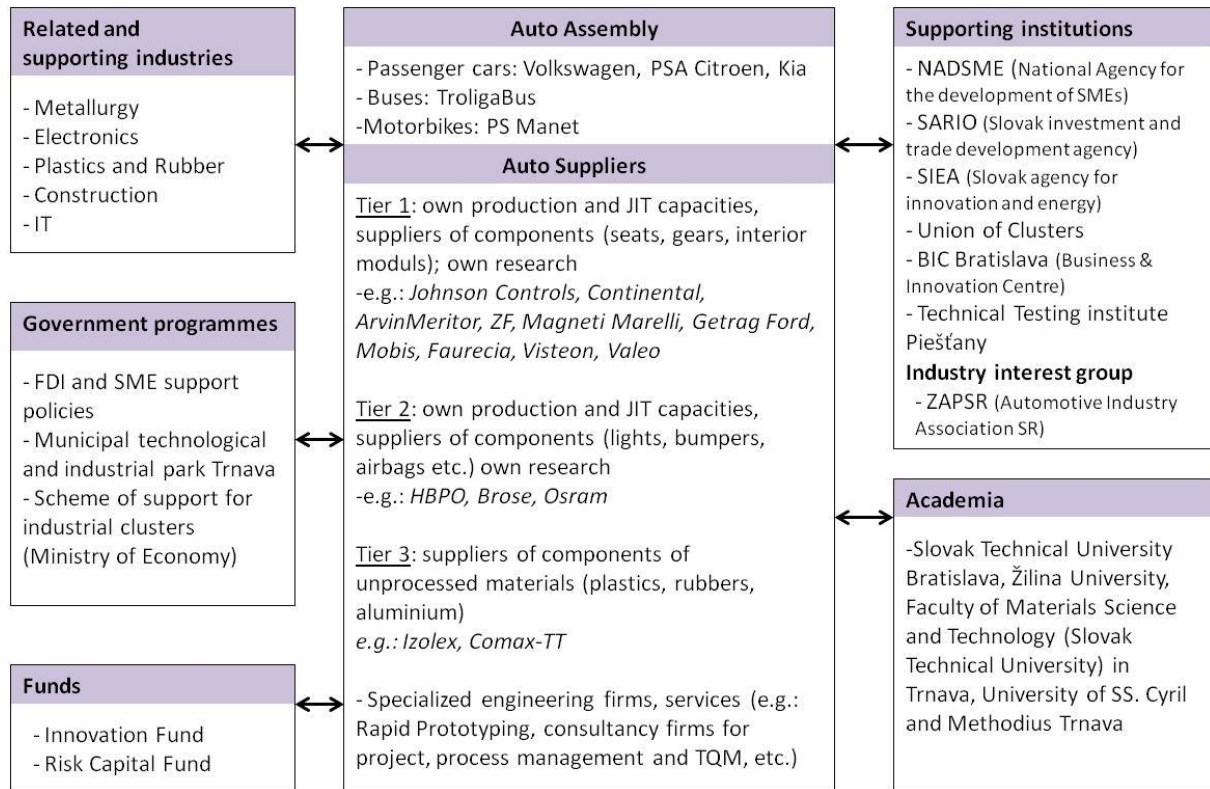| Name	City	Year of birth	Focus	Number of members
Balnea Cluster	Dudince	2008	spa	8
Cluster Orava	Dolný Kubín	2008	tourism	14
Cluster Liptov	Liptovský Mikuláš	2008	tourism	7
Cluster Turiec	Martin	2009	tourism	6
Danube knowledge cluster	Bratislava	2010	generation of knowledge	47

7 Analysis of Automotive cluster in West Slovakia

7.1 Concentration of automotive sector in cluster

Firstly, it is useful to depict the automotive cluster in order to view the structure of supply chain and the interrelation with the rest of cluster constituents. in. Cluster is understood here as agglomeration in the Porterian perspective, not as organization.

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[12] Includes companies, academic sector and supporting institutions

Image 20: Slovak Automotive Cluster

Related and supporting industries	Auto Assembly	Supporting institutions
- Metallurgy - Electronics - Plastics and Rubber - Construction - IT	- Passenger cars: Volkswagen, PSA Citroen, Kia - Buses: TroligaBus -Motorbikes: PS Manet **Auto Suppliers** Tier 1: own production and JIT capacities, suppliers of components (seats, gears, interior moduls); own research -e.g.: *Johnson Controls, Continental, ArvinMeritor, ZF, Magneti Marelli, Getrag Ford, Mobis, Faurecia, Visteon, Valeo*	- NADSME (National Agency for the development of SMEs) - SARIO (Slovak investment and trade development agency) - SIEA (Slovak agency for innovation and energy) - Union of Clusters - BIC Bratislava (Business & Innovation Centre) - Technical Testing institute Piešťany **Industry interest group** - ZAPSR (Automotive Industry Association SR)

Government programmes

- FDI and SME support policies
- Municipal technological and industrial park Trnava
- Scheme of support for industrial clusters (Ministry of Economy)

Tier 2: own production and JIT capacities, suppliers of components (lights, bumpers, airbags etc.) own research
-e.g.: *HBPO, Brose, Osram*

Tier 3: suppliers of components of unprocessed materials (plastics, rubbers, aluminium)
e.g.: Izolex, Comax-TT

Academia

-Slovak Technical University Bratislava, Žilina University, Faculty of Materials Science and Technology (Slovak Technical University) in Trnava, University of SS. Cyril and Methodius Trnava

Funds

- Innovation Fund
- Risk Capital Fund

- Specialized engineering firms, services (e.g.: Rapid Prototyping, consultancy firms for project, process management and TQM, etc.)

Source: updated map of OECD (2003) and automotive supply chain map of SARIO (2012)

Secondly, the strength of concentration of the automotive industry will be verified. A quick analysis is performed to verify whether the automotive cluster located in the region of West Slovakia really fulfils the prerequisites to be labelled as cluster agglomeration. Although the organization OECD conducted in-depth research about spatial concentrations in various industry sectors already in 2005, I believe it is appropriate to update these results solely for the automotive industry by plugging in the most recent official statistical data from the year 2011. For this purpose, I will employ the location quotient (LQ) that is in our case the most appropriate and efficient way to identify the eligibility of a spatial concentration to be called automotive cluster. This will be confirmed in case that the automotive industry reaches LQ higher than 1. LQ was frequently used by Mr. Porter (Soviar, 2009).

In the case of Slovak automotive cluster, the location quotient was calculated in the following way. Data were taken from the Statistical Office and the indicator for economic activity NACE 29 – Manufacture of motor vehicles was used. Taking the equation LQ = (x/X)/(y/Y), its components can be expresses as this:

LQ **NACE-29 /2011** region West Slovakia vs. All Slovakia	**x**= no. of employees in **automotive** sector in the region	**X** = no. of **all** employees in the whole region	**y** = no. of employees in **automotive** industry	**Y** = no. of **all** employees in Slovakia
Total *Total* *(incl.Bratislava)*	*21 646,4* *37394,4*	*829800* *1144000*	*56 770*	*2 315 300*
Trencin Trnava Nitra Bratislava	7743,4 7760,5 6142,5 15748	262500 268100 299200 314200		

Source: own calculation based on data available through Statistical Office Slovak Republic

The region West Slovakia is comprised of Trencin, Trnava and Nitra. However, geographically, Bratislava is located in a very proximity to the other three counties so I decided to show both results for LQ once by including and once by excluding Bratislava. Because of the presence of Volkswagen in Bratislava, it is logical that the LQ reached higher values than the LQ calculated only for the official location of West Slovakia. As a matter of fact, Kia Slovakia, another big car producer is not incorporated in these statistics due to its factory situated in Zilina that does not belong to the region West Slovakia. Nevertheless, **the outcome makes it clear that the spatial concentration present in the automotive sector is indeed a natural cluster**. Automotive industry in this part of Slovakia is much more concentrated and interlinked.

1.) **LQ without Bratislava** (x/X) / (y/Y) = (21646,4/829800) / (56770/2315300) = **1.064**
2.) **LQ with Bratislava** = (37394,4/1144000) / (56770/2315300) = **1.33**

Herewith, it can be concluded that the **proposition 2** set at the beginning of the paper is **confirmed.** Automotive industry is 1.064 (or 1.33 when adding Bratislava) times more concentrated in West Slovakia than in the rest of Slovakia.

7.2 Emergence and Development of Automotive cluster in West Slovakia

Automotive Cluster West Slovakia came into existence in 2007 as a result of joint efforts of City of Trnava and Trnava Municipality Region. The initial idea came from the Mayor of City of Trnava Mr. Štefan Bošnak who at the same time persuaded Mr. Tibor Mikuš from the Trnava Municipality Region. Their key objective was to provide support to regional small and medium enterprises in terms of innovations (Chudoba, 2013). The region is a home of PSA Peugeot Citroen and even before its arrival, other international automotive companies – Sachs and Boge had already settled in Trnava (Sabadka, 2008). Overall, this region could capitalize mainly on the favourable location and dense supply chain.

The development of supply chains and the creation of platforms, in which firms could have a stronger position, was seen as the way how the firms could get better access to euro funds and to more contracts. If a small firm stands alone and is not a member of any network, it can face difficulties in terms of future business. Platforms facilitate the exchange of knowledge and information, as well as of contacts. It took 10 years for the Volkswagen to get started with material purchases from local suppliers (EuroActiv, 2011).

Yet the expansion of VW´s operations required making something with the strengthening and quality improvement of the local suppliers. The gradual enlargement of supply chain in West Slovakia and a boom of automotive clusters were calling for the creation of a first automotive cluster in the country. After the establishment of PSA plant, the City of Trnava changed its priorities and decided to concentrate on providing support to SMEs (SITA, 2007). Since the beginning of its existence, the cluster counted on a close cooperation with Vienna Automotive cluster. Building up international linkages was considered to be the future for SMEs. The cluster embarked on international strategy early after its inception.

7.2.1 Aim to change

During the first year of its existence, Autocluster identified a set of issues that the automotive industry faced. The biggest failures were the R&D ignorance, shortage of qualified labour force and low support for innovative firms. The role of this cluster was seen in the enhancement of competitiveness of its constituents, in attracting investments and in increasing innovation capacities of companies (ACWS, 2012). The cluster aimed to help companies leverage on common marketing and research activities, which they would otherwise not be able to conduct if working on their own.

The idea of creating a cluster in automotive industry may not have been fully materialized without a commitment and willingness of its first director Štefan Chudoba, ex CEO of Škoda Auto Slovakia. Mr. Chudoba set up a personal goal during his role as director of ACWS. He wanted to overcome the light-heartedness that impeded to join forces or to create concrete projects through which innovative solutions in automotive industry could be offered. It is indispensable to step out of the position of a country that can only produce and assembly car parts into a position where the country can come up with complex solutions in production processes (in plastics, metal welding, logistics etc.). Otherwise, Slovakia would not be able to get rid of a label with a heading "an assembly country with cheap workforce".

In literature, a notion about "clusterpreneur" has recently emerged. This role refers to a key cluster personality, that has a vision, facilitation, networking and leadership skills, who is an expert, negotiator and motivator (Pavelková, 2009). Mr.Chudoba aimed to bring more emotions into the cluster management in a sense to get people mobilized to work in line with a vision that makes sense for them. A cluster should work as a consultancy entity built on partnership basis, where consultancy is understood as a fruitful discussion among partners and not as an inspection. Cluster should be based on mutual trust (Múčková, 2009). However, one of the greatest challenges was the actual feeble trust among cluster members. Things changed

only after 18 months since the establishment of ACWS in 2007 when more cluster awareness was created. Members found especially inspirational to observe new possibility after getting to know the "best practices" from partners abroad (Chudoba, 2013). Another impeding factor was the fact that it was difficult to gain more members, to get them involved in new projects and to prepare for them new projects financed by the EU.

Luckily, these problems were then partly overcome thanks to a range of good decisions and events. A good start was set through the cooperation with Plastic cluster in Zlín (Czech Republic) and with company Czech Dex helping with the financial management of some projects. Thanks to the enthusiasm of a few cluster members and cluster management, as well as thanks to cooperation with Technical University in Trnava the cluster could grow. Another successful milestone was a project "Innovative park for the City of Trnava" (Chudoba, 2013). Moreover, cluster was perceived as excellent in its perfect orientation toward production-innovative firms in automotive industry in the region of Trnava and the successful preparation and management of international projects in CEE and cross- bounder project Austria, Czech Republic, Slovakia and Hungary. On the other hand, a supportive framework for clusters implemented by the government and better cooperation with central Slovak institutions were still not matched with cluster expectations and needs.

7.2.2 Going back to move forward

In 2011, new director of cluster was announced. When Mr. Roman Bíro assumed his steering position, he came across a few disconcerting issues.

It was mainly the lack of mutual trust that has been weakening the power and potential of cluster. Although the cluster has been successfully involved in many international projects, it has not had sufficient amount of projects in its pipeline, which would include activities targeted on its local members. The cluster was very positively perceived abroad, but at home the perception of cluster benefits was not united. Some companies decided to even leave the cluster (Bíro, 2013).

It is therefore evident that the evolution of ACWS cluster did not follow the typical pattern. In a standard cluster life cycle, international projects and cooperation with other (foreign) clusters come gradually after the cluster has already exploited the potential of enterprises cooperating in local environment. In case of ACWS, the opposite was truth. It commenced with international activities and even improved its performance abroad into such extent that the cluster received a bronze label certificate award of European Cluster Excellence Initiative in December, 2012. ACWS was a leading partner in 3 international projects – Autoclusters, Autonet and Clusters without borders. The cluster deserved such a positive recognition abroad. The flipside of this was that the actual constituents of ACWS were deprived of projects focused only on the mutual collaboration locally.

7.3 Cluster organisation administration, activities and financing

The Automotive Cluster West Slovakia counts currently on 44 members, majority of them being small and medium enterprises. All cluster members and their brief description based on their major business activities are presented on the next page. These are the most up-to-date data. Apparently, cluster organisation manages reasonably well to maintain its base of members. Whereas in 2007 there were 40 members, in 2011 the number increased to 47. Although for the year 2012, a slight drop in the number is noted, we can still talk about rather stable development of cluster when it comes to membership.

Cluster management team consists of the director Mr. Roman Bíro, two project managers and one communication and finance manager. The role of director is similar to the role of facilitator and requires coordinating multi-lateral relations between companies of different size and specialization, academia and public bodies. Mr. Bíro believes that his team is one of the crucial assets the ACWS has. Already the previous director positively evaluates that this cluster team is the reason the cluster can be lucky about. Employees are apparently highly dedicated and qualified (with PhD level of achieved education). The presence of strong team that shares common vision fortifies the whole cluster organization.

The **vision** of ACWS aims "*to help and support highly prestigious and modern base for the automotive industry, prepared not only to improve the quality of human resources, but also in terms of technology transfer and innovation processes in subcontracting chains.* (ACWS, 2012)*"*

Cluster was established in order to fulfil the **mission** that envisions *"helping SMEs to be successful and competitive in automotive industry chains."* The main general strategic objectives can be described with the following key words:

- Strategic partnership
- Participation in EU projects
- Networking, B2B
- Development and innovation activities
- Education activities /Automotive managerial activities
- Supplier development programs with OEMs
- Innovations transfer and start up projects

Image 21: Cluster members

Member type	Field of activity
Academia	
Faculty of Material Science and Technology in Trnava	university
Institute of Materials & Machine Mechanics - Slovak Academic of Sciences	research centre oriented to development of advanced nonferrous materials & technologies
Technical Testing Institute Piešťany (TSU)	certification of conformity for construction products, mechanical devices, pressure vessels etc.
Harmony - European language school	education for companies
University of SS. Cyril and Methodius	
Technical high school, Galanta	
Technical high school, Senica	
GetOn, s.r.o.	agency providing interns to companies and preparing students to get involved in a real working environment
Public bodies - innovation, research centres, agencies	
City of Trnava	co-founder
Municipality of Trnava region	co-founder
Slovak-German Chamber of Commerce and Industry	
BIC Bratislava, s.r.o.	Business and Innovation Centre aimed at SMEs
Trnava regional chamber SOPK	
SARIO	Slovak agency for trade and investment
Association of Manufacturing industry	
Association of Automotive industry	
Industry - companies	
COMAX-TT a.s.	production of metal-sheet pressings, special toolings, jigs and measuring devices for needs of automotive industry and mechanical engineering
Služba výrobné družstvo Nitra	stamping, PCB production, assembly line, testing
WIGO s.r.o.	production of plastic, metal, wooden load carriers
Automotive Group SK, s.r.o.	cutting and sewing upholstery
Pavol Skubeň - Profitlač	printing services
Bornet, s.r.o.	telecommunication and satellite services
Carl Zeiss Slovensko	measurement and optical technologies
Dipex spol. s.r.o.	technical fabrics made of glass fibre
FORM Engineering s.r.o.	mechanization, automation of forming operations, cutting of material, development and construction of single - purpose machines
Ing. Juraj Galovský - JAG	fiberglass, laminate exterior and interior automotive parts, cover for air conditioning
Ing. Mária Majerská - ANEX	cleaning and washing preparations and liquid soaps for industrial objects, own know-how
Makino s.r.o.	high-precision machining processes, metalworking
PGS Automation, s.r.o.	automation, laser technologies, welding
PROPSY - RWS, s.r.o.	education agency, professional psychology
Technodat	product lifecycle management
SimPlan Optimizations	process analysis, procedural advice, material flow simulations
ŠVEC a SPOL s.r.o.	stamping tools, moulds, components from aluminum and stainless steel, production of sheet metal assemblies, steel constructions
Qintec s.r.o.	IT, industrial automation, software development
Carisch s.r.o.	consultancy in engineering technologies, event management
KLAUKE Slovakia s.r.o	manufacturer of interconnection products supplying terminals, connectors, insulators and application equipment to OEM's
Nebotra s.r.o.	consultancy, project management
MAPRO Slovakia s.r.o.	plastic injection molding machinery
c2i s.r.o.	manufacture of carbon-fibre parts
CCN castings s.r.o.	turbochargers, injection systems, variable valve timing, castings
Matador Group Bratislava	automotive (pressing, welding, scoring etc.), engineering, R&D activities
Emerson	international manufacturing and technology company, 7 business units in SR
Inekon	implementation of orders in automotive industry with the lowest possible costs
CRT-Electronics	electro-Manufacturing Services for various industrial branches

Source: Own adaptation of data taken from ACWS as well as from corporate websites

Financing

During the first half of 2008, the cluster was financed with allocated resources from grants provided by the City of Trnava and then during the 2nd stage of implementation from EU grants and partly from membership fees (ACWS, 2007). As Mr. Chudoba clarifies, the cluster faced continuous financial issues and his existence was more or less dependent on the

financial resources stemming from the EU grants. This struggle is corroborated by the evaluation of financial situation made by Mr. Bíro during an interview.

The most problematic part in terms of financing is imbalance in cash-flow that occurs during various projects. Return-on-investment comes with a considerable delay and firms are naturally concerned and reluctant to join another project in the future knowing it would take time to gain return on invested funds. In addition to that, sometimes the EU institutions are too rigid and bureaucratic. Control processes performed during the project can be too lengthy and recipients may wait even almost a year to get their investments reimbursed. Even small and low-value items need to be purchased through official public procurement. Moreover, Slovak partners sometimes complicate the running projects by creating additional rules that are harder to comply than the rules imposed by the already strict EU. Eligibility rules are sometimes repeatedly updated during the project cycle what creates uncertainty and mistrust. Another issue poses the loophole in the legislation system that doesn´t recognize clusters as organization. When a cluster organisation applies for a bank credit, it is not perceived as eligible to get one. Cluster organisation is neither a company, nor another type of business subject and thus it is more or less impossible to get a loan for instance (Bíro, 2013).

<u>Activities and resulting benefits</u>

Cluster claims to bring all kinds of benefits towards its members. For companies and for the better performance of cluster, activities that enable them to save costs are of utter importance. Cluster implemented joint projects - **purchase of energy and overhead materials**. Close cooperation with ZAP SR (Association of automotive industry) has proven as fruitful. Members have now a possibility to reduce their costs. **Common marketing promotion** and projects based on **collaboration** open individual companies to new markets abroad and opportunities. ACWS realized activities that resulted in creation of various special databases that facilitate the search for partners for cooperation. Through the presence in network, firms are more powerful to influence the situation in the business environment. Acquirement of information is accelerated within a cluster.

In 2012, these were the official plans that the cluster envisioned:

- To keep and increase the number of members in ACWS
- To submit a Danube strategy FP7 proposals (projects such as Fast in Charge, Recofuel, Carbonglas, Episted CE, Plastocar)
- To find and participate in convenient project calls in South East Europe (SEE) and Central Europe (CE)
- To closely cooperate with Trnava Municipality Technology and Innovation Park
- To closely participate in projects and development with partners with Faculty of Materials Science and Technology
- To prepare an Coordination Cell for innovations and transfer of technology with MTF, TMTIP and ACWS

- To promote Trnava region via Information and Comm. Techniques
- To create a critical mass of our members for goods and service purchase
- To become the member of the Automotive Industry Association/ZAP

The abovementioned goals and plans were examined partly during the interview with Mr. Bíro and partly by following the news about the latest development from the website. ACWS actively participated in numerous projects that are in line with the strategic objectives and envisioned plans.

Strategic Partnerships
AWCS closed a partnership deal with ZAP SR (Association of automotive industry) in 2012. Together they initiated joint purchasing of electricity to reduce costs for participants. This partnership resulted in a series of workshops of biggest manufacturers (VW, Kia, PSA) for suppliers and subcontractors. In May 2013, ACWS signed contract with the Faculty of Materials Science and Technology in Trnava aimed at applied research in the field of *"improvement and management of technological processes and production lines in the industry by employing the most modern information systems"* (ACWS, 2013). These are great examples of how a cluster can fruitfully cooperate with other relevant institutions and how to reinforce the Triple Helix model (industry-academia-public bodies).

Participation in EU projects
In the period of 2012-2013, ACWS has been involved in the following recent or ongoing projects:
- AutoNet (Transnational Automotive Network in Central Europe) – ACWS took the position of project lead partner. The objective was to create a permanent network of business supporting actors coming from leading automotive CE regions (Italy, Germany, Slovenia, Slovakia, Czech R., Poland, Hungary). Duration: 03/2011-02/2013
- React (Cross-border Austrian-Slovak cooperation project) – The objective is to develop applicable solutions for the construction of production, testing and exploring renewable energy carriers made of renewable biogenic sources. Various components of triple helix model are involved – Slovak University of Technology, University of Burgenland, Energy Consortium of Bratislava. Duration: 08/2012-12/2014.
- Fast in Charge (International project)– The objective is to foster the democratization of electric vehicles in the urban environment by developing easier and more comfortable chargers facilitating the usage of these vehicles by large public. Other participants of this project stem from France (Douaisienne De Basse Tension, Commune De Douai), Bulgaria (TU Gabrovo), Spain (Fundacion Tecnalia Research & Innovation), Greece (Institute of Communication and Computer Systems) and Italy (Centro Ricerche Fiat Scpa). Duration: 10/2012-09/2013.
- AutoClusters SEE – ACWS participated in the role of project lead partner. This project allowed for the establishment of the 1st permanent automotive network in SEE. Project brought together 11 partners from academia, R&D area, business; both from

EU as well as from non-EU countries. Activities were focused solely on upgrading the innovation capacities. More than 200 innovating capacities in SEE were identified in the created database of R&D centres. Duration: 3/2009-3/2012

- InnovMat – expert database enables to find a contact partner by entering a keyword relevant to specific materials, technologies or equipments. Duration: 8/2010-9/2012
- AC Centrope – The project dealt with the benchmarking of automotive subcontractors in Austria and Slovakia. Vienna and Trnava universities cooperated closely in the area of innovations. Duration: 1/2009-6/2011
- Autoplast (cross-border cooperation SK-CZ) – The project allowed creation of laboratories for construction and simulation of plastics forming in the Trnava University. A new study programme "Plastics technologies" gained accreditation. Duration: 1/2009-9/2011
- Clusters without borders (cross-border cooperation SK-HU) – both parties fortified information exchange and sustainable business cooperation by creating automotive database. Duration: 9/2010-9/2011

Networking for B2B and services for members
In 2012, there were several networking events in which cluster members and other automotive players could participate. Matchmaking events took place in Turkey, Ucraine, Italy, Hungary, Russia, Poland, and Austria. To other regular events strengthening networking belonged suppliers' days, exchange study visits to other companies, automoto-shows.

Apart from networking activities, ACWS is concerned with human resources development as well. For this aim, cluster established Automotive Academy for professionals to teach professionals. The objective of this academy is to improve skills and knowledge of managers in automotive sector through seminars, workshops and courses. Gradually, a unique educational institution should be formed, so that it would become the best option for managers in automotive industry to get more expertise. ACWS devotes to other educational activities such as workshops, seminars, English language lessons, soft skills trainings. In 2012, it implemented a training programme "Innovative and flexible manager" in Kia Motors Corporation.

In 2012, ACWS and the Faculty of Operation and Economics of Transport and Communications in Zilina built a Competence Centre for Business Intelligence. The project aims to develop a robust tool providing information, analyses and modelling future situations for automotive industry by plugging in different variables. ACWS consults the upcoming project calls in the cooperation with a project management company Simplan. Another successful project is the creation of demand-supply portal where members list their suggestions and requirements for R&D, HR, innovations.

Innovations and start-ups
In 2012, ACWS cooperated with two automotive start-ups – STUBA Green Team and RTU Europe. STUBA Green Team was established as student initiative project aimed at development, design and manufacture of e-racing cars and participation on Formula Student

Electric competitions. ACWS facilitated matchmaking event in Italy and several meetings with representatives from abroad. This resulted in cooperation agreement between the start-up and Technical University Ostrava. RTU Europe was founded in 2012 as a technology research company focused on examination of thermodynamic processes in internal combustion engines that should reduce levels of air pollutants, increase efficiency of currently produced engines and reduce high fuel consumption. ACWS assisted to this start-up in providing a database of suppliers in the automotive industry, consultation on mapping the existing business and advice on current project calls.

Concerning further research activities, the ACWS cooperates closely with the dean of the Technical University in Trnava. The shared vision of the university and cluster organization led to a successful research projects about 3D printing technologies, that has started recently. The ACWS envisions to enhance the cooperation with universities so that one day it could resemble the campus in Eindhoven (Netherlands).

It must be positively concluded, that the cluster managed to fulfil the majority of the goals set for the 2012 or at minimum, initiated first steps to do so. Numerous projects indicate the highly active approach of ACWS to the enhancement of competitiveness of its members. However, it is not only about the number of projects offered by the cluster organization, but also about the willingness of local companies to get involved in them.

7.4 Analysis of Automotive cluster through Porter´s Diamond

Application of the Porter´s Diamond model analyses competitive advantages and also deficiencies embedded in the automotive cluster understood as agglomeration. The model reveals strong and underdeveloped factors important for the further cluster development.

7.4.1 Factor conditions

There are basic and advanced factor conditions from which the competitive advantage of cluster arises, however the more specialized the factors are, the more sustainable the competitive advantage is.

The region of West Slovakia is **highly industrialized** and the most prosperous region in the country. The majority of manufacturing companies operating not only in automotive industry, but in other related industries as well, have been historically located in this region because of the proximity to the Czech market and other Western states. Therefore, a relatively strong and concentrated automotive supply chain could be established. It is this region that enjoys the **presence of three global car manufactures**. In 2011, 202 out of 274 production plants supplying automotive industry are located in western part of Slovakia. The cluster can leverage on developed transport infrastructure, relying on highway D1 connecting Bratislava and Žilina (KIA) and R1 connecting Trnava (PSA) with Banská Bystrica located in the centre

of Slovakia.[13] Moreover, the cluster neighbours with other thriving clusters in Czech republic (e.g.: Moravian-Silesian cluster) and Austrian clusters. Crucial

In terms of employment, the region of West Slovakia accounts for **38% of employees working in Slovak automotive industry**.[14] The wage level of people employed in all industries is above-average compared to other regions. In 2011, the average monthly wage was 942 Euros and the nationwide average wage was 895 Euros. When it comes to automotive industry in the whole country, the national average wage was 955 Euros.

Concerning the labour productivity, the overall economic activity "manufacture of motor vehicles" (later called only automotive industry) achieved the 4th place, losing to "manufacture of coke and refined petroleum products" with the absolutely highest productivity, " electricity, gas, steam supply" and to "manufacture of computer products". On the other hand, companies operating in automotive industry achieved the highest turnover compared to other industrial economic activities. There was a 25% increase in turnover in the automotive sector YoY (comparison of 2010 and 2011).

The region is a home for the **best technical universities in Slovakia**. In spite of that, car suppliers who responded to a survey conducted by the consultancy PwC in 2012/2013 identified the **"lack of specialization and experience"** as the main setbacks of the new employees. This signalizes that the education system is inconsistent with business requirements. Lack of availability of qualified workers poses a threat for the future of automotive cluster.

The share of West Slovakia´s R&D investment on the overall national R&D was 23% in 2011 (Bratislava excluded). There was a drop in R&D investment in West Slovakia by 13% YoY (2010 vs. 2011) although the national R&D increased. From all R&D personnel in the region of West Slovakia, 25% of them worked in technological R&D. Compared to other regions, West Slovakia has still an edge in R&D related activities. However, the general R&D investments are still much lower than the European average. The majority of investments support basic research, only then the development research and the last priority goes to applied research enabling to bring the R&D outcomes on the market.[15] Scientific and technological infrastructure is still underdeveloped. Based on the Global Competitiveness Report[16], Slovakia as a country has **one of the worst performing institutions**. On the other hand, the region of West Slovakia enjoys a considerably better infrastructure than other regions. Financial market is relatively well-developed.

In the recent car survey conducted by consultancy PwC among car suppliers, respondents stated that their competitive advantage was *product quality* (77% of respondents), *qualified*

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[13] Please see Appendix 2 to see the map showing the concentration of production plants supplying automotive industry in Slovakia.
[14] Calculated based on the LQ in the previous subchapter.
[15] Statistical data take from the Yearbook of Science and Technology 2012. Basic research: 228 931 000 eur, applied research: 115 391 000 euro, development research: 124 117 euro
[16] Please see the chapter "Analysis of Slovak competitiveness from a global perspective"

labour force (60%), *long-term business relations* (49%), *low production costs* (37%), *low prices* (30%) and *innovative products* (only 23%). Innovations are crucial for the enhancement of competitiveness. The fact that only 23% of the respondents identified innovative products to be their competitive advantage, but 37% chose low production costs, is an indication that the **automotive cluster´s competitive advantage depends rather on basic factor conditions**.

The **quality of products** does pose a competitive advantage of the whole automotive industry and of the cluster as well. Products that are outcomes of the economic activity labelled "manufacture of motor vehicles" achieved the second highest rank in the measurement of "value added products" after the category "Electricity, gas, steam supply".

As mentioned, the World Competitiveness Yearbook 2012 revealed that the highest-ranked competitive advantages are high secondary school enrolment, low unit labour costs, future energy supply, access to commodities, and the level of communication technology. On the other hand, cluster thrives because of several advanced conditions as well (so far still skilled labour force, efficient transport in West Slovakia, information infrastructure, production processes etc.) Summarizing the factor conditions and their particular importance, it can be observed that the cluster´s competitive advantage is indeed still driven more by basic conditions.

7.4.2 Demand conditions

The demand of customers and their level of sophistication pressurize firms to innovate their offerings and develop products. Particularly in automotive sector, the industry is highly customer-driven and therefore, the level of local demand can play a crucial role. However on the whole, the cluster is immensely export-driven and almost 100% of production of global car manufacturers located in this region goes to export. The cluster is driven by **highly internationalized demands**. Local car suppliers follow therefore trends stemming from global car manufactures and from the needs of foreign buyers. Consequently, the production of cars increases year on year.[17]

The customers from the West Slovakia region can purchase cars from car producers such as VW, Kia and PSA Peugeot Citroen located in Slovakia, Fiat and Opel in Poland, Hyundai and Skoda in Czech Republic. The trend of the global customer preferences is in favour of cheaper car with efficient fuel consumption and smaller size due to higher level of urbanisation. The automotive cluster in West Slovakia is exposed to type of local customers that have similar preferences as the global trends show. In terms of the profile of local consumers in the region of West Slovakia, the **cluster is exposed to relatively sophisticate local consumer base** compared to other regions although still with rather modest needs and lower purchasing power. More than half of the consumer base is comprised of the middle and lower middle class (class C and D) with 11% of the regional population having accomplished university degree and 33% high school (Market&Media&Lifestyle TGI survey, 2013). Also,

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[17] For more details see the overview of "Automotive industry today and then"

more than half of the households owns car for private purposes, mostly hatchbacks and combi.

On the whole, the power of demand should increase with improving standards of life. Currently, the monthly trend of the registration of new passenger cars has decreasing tendency when the same months are compared year on year. For instance, when comparing months of 2011, 2012 and 2013, the highest increase of purchase of new cars was seen in September 2012 (compared to September 2011). From then on, however, **Slovaks buy fewer cars** in the months of 2012 than in 2013.

Image 22: Monthly trend of the registration of new passenger cars in Slovakia
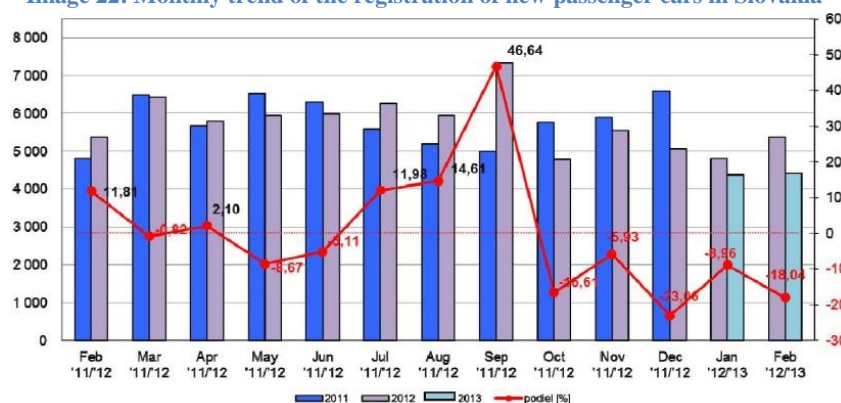
Source: ZAPSR, 2013

7.4.3 Related and supporting industries

Generally speaking, the automotive industry is highly interlinked with related and supporting industries due to the numerous components that are needed for the car assembly. It is however difficult to evaluate the competitive power of these industries and their linkages with the automotive cluster within the region. Therefore, this part of the Diamond analysis will focus on the presence of quality of business services, ties with research institutions, coordination of inter-firm activities within cluster, performance of supporting entities relevant to the automotive industry.

Automotive industry has considerable support emanating from the activities of the **Association of Automotive Industry** (ZAP SR) that conducts regular survey, analyses, organizes automotive events and mainly, since 2012 became strategic partner of the cluster organization **ACWS**. The Association aims to improve the quality and competitiveness of local suppliers by providing various education trainings. The most recent example is the organization of workshops with the topic "Quality and systems of quality" co-organized with ACWS (ZAP SR, 2013). **Inter-firm activities** in the region are coordinated mostly by the cluster organization ACWS and association ZAP SR. As was already mentioned in the description of activities offered by ACWS, local suppliers have a plethora of **possibilities to get involved in various international projects**, fairs, events, surveys. In addition to that, the

cluster organization ACWS together with ZAP SR have more joint power when it comes to legislation proposals or lobbying beneficial for the automotive industry.

Although local suppliers are concerned about the inconsistency of educational system with their business needs as the PwC car suppliers' survey reveals, 48% of them does not have any cooperation, contact or plans to work with schools and universities. Only 7% of them cooperate in the field of innovation and R&D projects. This poses a great **opportunity for local suppliers to create long-term plans for the cooperation with academia** in order to have a positive impact on the region and their own future performance by actively tackling the existing setback of education system. Mr.Bíro from the cluster organization ACWS welcomes the reinforcement of the dual educational system, in which companies are closely cooperating already with technical high-schools. Moreover, as was already mentioned when describing the cluster organization´s activities, the ACWS cluster embarked on the strategy of cooperation with universities in various industry-related projects (research of 3D print, creation of databases, Automotive Academy...)

Although there is a considerable amount of all kinds of supporting institutions for the automotive industry, the **structure of associations, chambers of commerce and other government institutions is fragmented**. On the government level, there is a shortage of a partner institution/initiative that would coordinate the development of cluster initiatives.

7.4.4 Firm strategy, structure and rivalry

The thesis attempts to articulate the importance of cooperation for the cluster upkeep, enhancement of competitiveness and its relevance especially for automotive industry. One of the global trends in car manufacturing is sharing the costs. This enables to produce cars in a cheaper way. Such strategy requires the ability to work in partnership with multilateral entities – competitors, suppliers, academia, and government. Firms should be pressed to upgrade and to innovate the processes, products or services by the existing strong competition. They should invest heavily in R&D, innovation, new knowledge.

The Innovation Union Scorecard labelled the region of **West Slovakia as modest-medium innovator**. The biggest caveat is that generally, Slovakia has very low share of "innovative SMEs collaborating with others" (8,3% of all SMEs). The **lack of collaboration** among firms in the automotive cluster was also confirmed by interviewees conducted for the purpose of this thesis. Building-up the social capital is yet at the beginning. Concerning the investment and involvement in R&D, approximately 26% of car suppliers from the PwC survey dedicate to these activities, but only 2% think about the establishment of R&D centres. 60% of them claim that the function of R&D activities is centralized and conducted within a group of companies. This implies that firms are gradually learning to cooperate. The biggest focus is put on technologies and production processes, and then comes design of products and new materials. When it comes to number of patents created in 2011 in all industries; 31,4% of total patents from the whole country stemmed from the region of West Slovakia and 30% stemmed

from the Bratislava region. Expressed in absolute terms, it was approximately 13 patents for the West Slovakia and 11 for Bratislava region (OECD Stats, 2011).

Regarding the general firm strategy in the whole automotive industry in the close future, firms fear of the pressure to push prices down and of the tendency of decreasing demand for their products. Their objectives are responsive to these expectations. The majority of respondents of the PwC survey stated as their key objectives the investments into new production technologies, development of new products and improvement of existing products (PwC, 2013). The automotive industry in West Slovakia can leverage on the production facilities that are designed to manufacture car models favourite in West Europe and outside of EU as well (smaller size of cars and SUVs).

Although lower production costs are still one of the biggest competitive advantages of Slovak automotive enterprises, there is a real threat of shift of production facilities and transfer of new capacities in Russia and other cheaper Eastern-European states. Local companies should therefore focus on the further development of their more sustainable competitive advantage – quality of their products. Participation in networks and cluster organizations can help to promote their strengths also in abroad.

The cluster organization ACWS can be undoubtedly praised at the best cluster in Slovakia in terms of the orientation on international projects (Bíro, 2013). Globalized automotive industry requires local companies to expand abroad and to search for new orders outside their country. As a matter of fact, 88% of local car suppliers bring their products and services to West Europe, 84% to Central Europe and 30% to Eastern and South Europe (PwC, 2013). Regional automotive companies have opportunities to find new business partners through the participation in international projects offered by the cluster organization ACWS. For instance, the ACWS cluster organization and ZAP SR help firms aspiring to enter international markets with penetration to the Swedish market. In fact, the cluster organization ACWS is in many aspects substituting the work that normally other institutions should perform (business chambers, government institutions etc.)

7.5 Analysis of ACWS through Cluster Dynamics model

The "Cluster dynamics loops analysis" reveals more than a brief scorecard of how a cluster operates. It investigates and assesses the dynamics and interrelations within the cluster. The results should provide useful insights for the potential future cluster strategy.

For the purposes of academic work on the Master´s thesis level, I decided to simplify the methodology embedded in this special tool. Nevertheless, the core approach is maintained and so is the target group, for which this assessment tool serves. Cluster management is not only the target audience but also a key expertise group that must be involved in the question set analysis. The same original range of questions and Likert scale are employed.

Ideally, this research tool should be put into practice during a workshop, where more key cluster stakeholders would participate (usually up to 10 people depending on the size of a cluster) and not only cluster management. However, I was working on the assumption that a cluster manager is highly knowledgeable about cluster´s constituents and thus, can answer the questions while reflecting the key members 'view and feedback.

I see the main advantage of this assessment tool in its questions that challenge the perception about the cluster organization and about interactions among its members. In this way, the tool captures the level of cluster performance in five areas – **rivalry, cooperation, collaboration, venture attractiveness** and **future breakthroughs**.

7.5.1 Results

Each section or loop of the questionnaire contains 5 to 6 questions, whose answers are rated on a five point scale – absent, weak, medium, strong and very strong. The answers have different weight, ranging from 1 point (weak) to 5 points (very strong).

It is important to note that the cluster management team has answered the questions reflecting the situation of current cluster members and the impact of the aftermath of economic crisis experienced in Slovakia. It means that this cluster is to a great extent influenced by external forces. The findings analyzing the performance of ACWS cluster as a whole reveal the following dynamics.

The main strengths and areas for improvement are shown in the graphical representation below. At a first glance, the strongest performance is observed in categories L3 (collaborative advantage) and L1 (inter-firm rivalry). On the other hand, the L2 (inter-firm cooperation) got achieved the lowest score. This fact actually corroborates the hypothesis stated at the beginning of this paper. More attention will be devoted to this finding in the next paragraphs.

To benchmark the assessment of the performance of ACWS, another so called "perfect cluster" is added for better imagination. The silver line presents a cluster performing on 100%, in other words, such cluster has been assessed as "very strong" in every single question. Naturally, as questions in case of ACWS cluster were rated differently, there are gaps between these two clusters.

L1: Inter-firm rivalry
100%

L5: Distinctiveness Generation

50%

0%

ACWS cluster

L2: Inter-firm Cooperation

L4: Venture Attractiveness

L3: Collaborative Advantage
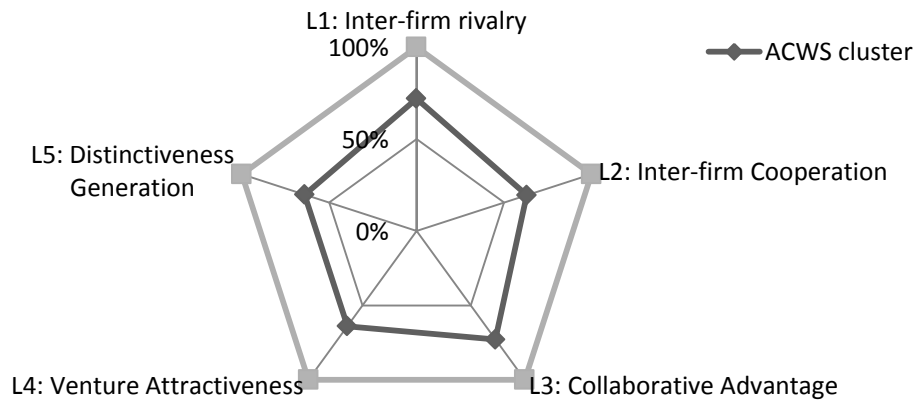
<u>L1 (Inter-firm rivalry)</u>
Results: 18 points/5 questions = 3,6 or 18 points/maximum 25 points = 72%

The main driver in this loop is the competition and rivalry among firms. This behaviour results in innovations and improvement and is therefore positive for the whole cluster. There are many competitive pressures that can push for more innovations. Especially important is the **presence of global automotive companies** (PSA, KIA, VW) that are reachable within a short distance and undoubtedly, the presence of **technical schools**. Moreover, companies have **strong ability to respond to global and local competition**.

From a global perspective, the group of companies within the ACWS cluster enjoys very positive perception as a **concentration of competence and expertise**. Despite the good reputation and responsiveness to global competition, the businesses put less importance on their participation in international value chain. To participate in international supply chain is not considered as strongly essential. This tendency may be related to a certain reluctance to expand abroad or to a fact that these firms are **at the beginning of their expansion efforts**. The overall performance taken from this loop oscillates between "medium" and "strong".

<u>L2: Inter-firm cooperation</u>
Results: 19 points/6 questions = 3,16 or 19 points/maximum 30 points = 63%

There are two extremes observed in the second loop. The loop deals with the level on which firms are able and willing to work together. Companies should have a shared view on common problems. There should also be a feeling of common identity as a group. In case of ACWS, this point is validated by the evaluation of **"common identity" as strong**. On the other hand, when it comes to implementation of common identity in form of established common business practice and cooperative projects, the performance is perceived as weak. Cooperation among firms in not yet fully proved as beneficial. This evidence supports the claim of OECD that clusters in post-communist societies lack sufficient social capital. The OECD report points out to the **weak culture of collaboration in post-communist states**.

Social capital is understood as *"networks together with shared norms, values and understandings that facilitate co-operation within a group"* (OECD, 2005). The focal idea of social capital is that trust in other enterprises and reciprocity among firms are necessary ingredients for successful clusters.

Networking among firms and willingness to actually tackle common issues together is evaluated as medium. This again suggests that there is **still some way to go in building up trust and cooperation** among businesses. The more open and trustful to each other are the companies, the better results they can achieve in quality, costs, supplies and partnerships (Tomek, et al., 2009).

In ACWS, the trust of cluster members - not only among themselves but also to the cluster and willingness to participate in cooperative projects may be undermined because of very unbalanced cash flows reached during the (mostly international) projects. The return-of-investment comes late and so do various financial reimbursements of expenses. These **mishaps during international projects** are caused mainly by the extensive red tape and control. Paradoxically, the rules that Slovak entities impose are often much stricter than already rigid rules of EU institutions (Bíro, 2013). Deadlines and milestones of some projects are not fulfilled on time. Such encounters contributed to the reasons for the cluster´s slower development of the culture of cooperation among members.

Hence, the social capital in OECD´s point of view needs to be reinforced. Needless to say, there is no one-off solution and it takes a continuous effort to **build social capital in a cluster**. Strong recognition of common identity as a group is already a crucial foundation. Moreover, cluster management has already decided to offer more activities directed at cluster members at home. To exemplify some of these **joint projects**, the cluster has recently launched a **shared portal** for common purchase of goods and electricity for its members. More **matchmaking and networking** conferences are in the package as well.

L3: Collaborative Advantage
Results: 22 points/6 questions = 3,6 or 22 points/maximum 30 points = 73%

Moving on to the third section, there is a slight improvement in perception of collaborative advantage. Collaborative advantage refers to the ability of cluster to think in a long-term view in terms of their joint collaborative strategy. Firms should be able to share critical knowledge and prioritize areas of research. This loop shows a better than medium assessment of ACWS.

Under ACWS conditions, it seems that **collaboration among firms takes place when these enterprises are not direct competitors**. Businesses are still not very keen on sharing their core knowledge. On the other hand, some of the cluster activities such as educational project Automotive Academy and joint promotions are popular among members.

However, there is a **rather feeble perception of common vision** for the next level of competitiveness. This can be explained by the fact that there is a **shortage of activities aimed**

at improvement of member's cooperation, which would include joint development of a new product, processes or some research. It must be noted though that cluster management has already undertaken a few steps in this direction. New momentum can be felt and firms see the future more optimistically. Strongly perceived is the way how firms are thinking about their **long-term collaborative strategy**. Moreover, it´s not only a small group of enterprises that think so, but this strategy concept has widened beyond a tiny number of critical companies.

L4: Venture Attractiveness
Results: 16 points/5 questions = 3,2 or 16 points/maximum 25 points = 64%

This loop received the second lowest score oscillating between medium and strong, pointing more towards an average. Cluster´s **ability to attract venture capitalists** is assessed **as mediocre**. However, the main driver of this loop is the positioning of automotive sector as a strong magnet for investors.

The existence of ACWS is globally perceived as a little bit less important factor for the attractiveness of automotive industry. As a result, **cluster has not yet reached its full potential to pull more corporate venturing and research collaborations**. There is still a big room that could host a greater influx of new players, talent and joint ventures. The recent formation of strategic partnership with Automotive Industry Association and membership of Union of clusters in Slovakia may accelerate the positioning of this cluster as a place to invest.

L5: Distinctiveness Generation
Results: 16 points/5 questions = 3,2 or 16 points/maximum 25 points = 64%

Is the ACWS truly distinctive? Is the collaboration focused on the future breakthroughs? Those are the indirect question that this loop addresses. It was investigated in the loop 3 that the common vision of a next level of competitive success was assessed as medium. It comes as no surprise that **a shared pursuit of future breakthroughs is weakly tackled**. Members are not perceived as owners of excellent knowledge in some area and the group focuses on the search of new ideas rather mildly.

However, Slovak enterprises are **strong at the process of development of ideas into business success**. For instance, there was a start up project aimed at racing cars that was created thanks to a student initiative at the Faculty of Mechanical Engineering in Bratislava and promoted through ACWS abroad during matchmaking events and conferences. Another start up established as a technology research company examining thermodynamic processes in combustion engines leveraged on ACWS that created a database of automotive suppliers.

Research and business agendas are evidently strongly aligned and set to achieve long-term success. This can be proven by **thriving cooperation with Trnava University**. On top of that, there is a **common goal to move the cluster office to the university campus** so that the

interaction would be more intense. They envisage creating a similar model of research and business cooperation as in Netherlands (High Tech Cluster Eindhoven).

<u>Breaking through the barriers to the evolution of the full cluster potential</u>
The last part of questionnaire tackles the state of possible barriers that can impede cluster´s development.

The outcomes for the query related to the loops 1 and 2 hint at the **lack of sufficient collaboration on common services and infrastructure**. Direct competitors do not cooperate and it´s **not an established practice that firms are working together** in an incubator or lab.

The finding that are thematically close to the loops 2 and 3 reveal, that firms have not yet embarked on the challenge of building up deeper trust and are not sharing critical knowledge. **The co-operative culture is perceived as weak**.

More positive view is observed in the question related to the loop 3.
Leading enterprises are helping to create critical breakthroughs linked to identified benefits that possibly all member could harness.

A shortage in terms of attractiveness and new participation was identified when addressing the question related to loops 3 and 4. The collaborative strategy of ACWS has not yet woken up more global interest and **cluster has not achieved a global significance so far.**

Based on the question linked to the loops 4 and 5 it is believed that the cluster organization ACWS managed to build a **strong foundation for an integrated research** that may move the cluster to meet its competitive advantage.

7.5.2 Assessment of the stage of cluster development

Cluster is a dynamic system. The Automotive cluster in West Slovakia has undergone a certain evolution and in 2007, the cluster organization ACWS came into existence. In this part, several theories of life cycle, type and stage of cluster will be applied based on the knowledge gained about the Automotive cluster.

<u>Type of cluster</u>

Markusen distinguished four spatial types of agglomeration. The Automotive cluster in West Slovakia is closest to the type of **Hub-and-Spoke District**. Economic activity is cultivated around several large business enterprises surrounded by smaller firms/suppliers.

Moreover, this cluster is rather of a **lateral type** by applying Pavelková´s theory. Lateral types of cluster are typical for automotive industry. Such clusters are presented in a location where many firms modify, complement or assembly standard products of big corporations.

<u>Life cycle theory</u>

Sölvell´s theory explains that clusters undergo a process of emergence, growth, sustainment/maturity, decline or eventually renaissance. In case of Automotive cluster West Slovakia it can be claimed that this cluster is still in the **growing stage**. In this stage, the cluster becomes part of international competition. More intense dynamics can be observed.

Mezel & Fornahl used similar life-cycle pattern. Applying their theory, the Automotive cluster West Slovakia is **positioned between the growing and sustaining cluster**. Growing cluster is characterized by increasing employment, gradual creation of collective activities among cluster actors and by building up cluster institution. These features are all valid for the ACWS. In case of sustaining clusters however, they can leverage on external cooperation with other clusters. The ACWS does cooperate with other clusters and because of this aspect, it is positioned between two categories. The role of facilitators and partly governmental support is still instrumental in the growing stage.

The Scottish Enterprise identified three level of building up a fully working cluster. The process starts as a collection of companies operating within an additive economy with low inherent dynamics. As cluster constituents interact more, the process shifts to network. In networks, the collaboration has deeper levels. Clusters are more attractive for business, academia, labour force. Trust is what connects the constituents. The stronger the dynamism, the more synergies are observed. The final stage of cluster upkeep is reached. Based on this description and the case study about the Automotive cluster West Slovakia, it can be concluded that this cluster has not reached the final stage of building up dynamic working cluster in the context of synergic economy. The cluster´s attributes are closer to the **network type (combinatorial economy).**

Findings, Suggestions and Conclusion

The primordial objective of the thesis was to determine the factors for success and impediments of growth of the automotive cluster in Slovakia. For this purpose, it was crucial to present a complex analysis of cluster against the backdrop of automotive industry and economic development of Slovakia. In order to evaluate the performance of cluster, two analyses were conducted. Porter´s Diamond framework enabled to identify the main competitive advantages and barriers for the cluster as agglomeration. The Cluster Dynamics method showed the level of interactions in the cluster organization ACWS. Application of these models led to verification or refutation of the propositions set at the beginning.

The **first proposition** stated that the *overall awareness about clusters among policymakers and firms is low*. The presence of considerable lack of information and knowledge about clusters slowed down the adoption of cluster-based approach, what explains a late emergence of first cluster initiatives in Slovakia (Stejskal, 2011). The first proposition of this thesis corroborates the existence of law awareness about clusters mentioned in Stejskal´s publication. All interviewees agreed that the **cluster awareness is still not strongly embedded**. It can be positively valued, however, that various entities put a continuous effort to improve the cluster awareness. The government finally initiated creation of a cluster scheme. Several Slovak clusters actively promote themselves, including ACWS.
Strongest promotion about clusters and cluster-based approach to the economic development should be communicated mainly to business leaders, experts and governments. Clusters themselves should remember that they are not be positioned as closed communities. Clusters and cluster initiatives in Slovakia could not count on any relevant strategic document or program supported on the national level. It is therefore quite remarkable, how some of the existing cluster organizations emerged in the bottom-up way, without any national governmental incentive. That was the case of ACWS as well. It came into existence mainly thanks to a shared vision and expertise of the founding members.

The **second proposition** stated that *the presented automotive cluster agglomeration is indeed a real cluster*; meaning that a critical level of concentration is achieved, which allows labelling the cluster as cluster in Porter´s point of view. Based on the calculation of location quotient, automotive industry is 1.064 (or 1.33 when adding Bratislava) times more concentrated in the region of West Slovakia than in the rest of country. The automotive cluster is a real cluster indeed. The **proposition is thus confirmed**.

The **third proposition** - *performance in inter-firm cooperation is still weak*; emanated from the OECD research conducted in 2005. In the report, the researchers pinpointed the lack of trust, willingness to cooperate and the underdeveloped social capital as the biggest impediments for the development of business clusters in post-communist countries. Eight years after the OECD report, its outcomes are still reflected in Slovak context. Interviewees confirmed that firms are reluctant to cooperate. To change the mentality requires time and continuous efforts. The cluster organization ACWS offers numerous activities and projects

that aim to enhance the level of collaboration. The cluster is praised abroad and was even awarded with the bronze label certificate by European Cluster Excellence Initiative in 2012. Moreover, ACWS has been a leading partner in several international projects – Autoclusters, Autonet, Clusters without borders, just to name a few. The cluster established strategic partnership with the Association of automotive industry and closely cooperates with the Technical University in Trnava. In 2012, the cluster worked together with two automotive start-ups. Moreover, the organization developed databases thanks to which the companies have easier and quicker access to the prospective business partners. However, the cluster dynamics loop model revealed that the **inter-firm cooperation has a weak performance indeed**. Possible reasons lie in the considerable administrative burden that results from the involvement in international projects. As a matter of fact, the cluster organization is actively engaged internationally. On the flip side, this engagement drops off on the local level.

The **fourth proposition** says that the *cluster environment is stimulating and enabling to spur innovations and R&D*. The performed **analyses did not confirm** this last proposition.

Although the automotive industry in West Slovakia thrives thanks to the presence of world-class companies, central location and developed telecommunication and physical infrastructure, the region is coined as modest-medium innovator. This is an indication that the environment is not fully conducive for innovations and R&D. There is no track of spin-offs companies or evidence of strong entrepreneurial spirit not only in the automotive industry, but generally in Slovakia. The insufficient focus on innovations and R&D (only 0,68% of GDP is allocated to R&D) is a nation-wide drawback. Many times, the fragmented institutions conduct the same or very similar research. It would be better to link the institutions, research centres and businesses together. Researchers would thus be closer to real business needs and come up with outcomes applicable for praxis. Cluster organizations can pose a proper solution. The R&D investments made in automotive industry are rising, however, the majority of researchers are involved in conducting basic research. In order to spur innovations and R&D, the key is to learn how to cooperate. As Mr. Ács from the Union of clusters concludes, *"the ones that cooperate are bound to become more competitive"*.

The cluster organization ACWS is very young and there are almost no relevant systematic data that would permit to compare concrete indicators on the year on year basis (such as number of filled patent applications, number of patents, successful spinoffs, innovation products or processes). However, it can be concluded, that the cluster organization ACWS attempts to embrace innovations as a step enabling to increase the competitiveness. There are several highly positive outcomes of the cluster´s plans and efforts, such as the strategic partnerships with ZAP SR, Trnava Technical University and Slovak Academy of Science; creation of supply-demand portal or the initiative Automotive Academy. Interestingly, Mr. Chudoba believes that the ACWS cluster can become even a catalyst for the change of automotive industry position – shifting from the "production assembly" to more innovative, research-oriented industry, in which new solutions in production processes come to light. This scenario is conditioned by the very strong cooperation with the Association of Automotive Industry and by the continuation of doing research projects with universities.

The main outcomes from the Porter´s Diamond and Cluster Dynamics models can be briefly summarized in form of factors for success and barriers for growth of the cluster and cluster organization. The most powerful factors for success are the presence of encouraging factor conditions and the active participation of cluster organization ACWS in numerous international projects. On the other hand, the most crucial impediments of further growth of cluster are low level of cooperation among firms and minor focus on R&D.

Factors for success:

- Extremely favourable basic factor conditions
- Proximity to relatively sophisticated customer base in the region
- Proximity to international customers, whose demands and needs correspond to the models produced in Slovakia
- Presence of three global and successful car manufacturers
- Density of car suppliers concentrated in the West Slovakia
- High labour productivity and product quality with the highest added value among all industries
- Strong export activity and amount of car produced
- Thriving cooperation with academia and supporting institutions
- Excellence in international projects; proven ability to perform successfully in the role of project group leader
- Established common identity of the ACWS
- Foundations for the further integrated research
- Joint projects, shared costs for electricity, databases
- Providing access to the prospective business partners
- Education and HR related activities (Academy, curriculum for Universities)
- Some companies in the cluster embarked on the long-term collaborative strategy
- Committed and dedicated cluster organization team

Barriers for growth:

- Automotive industry strongly driven by the orders made by the biggest players → orientation on mechanic assembly and not on R&D
- Looming lack of qualified workers who are at the same time becoming more expensive (losing the advantage of being cheap location)
- Lack of advanced factor conditions and weak (fragmented) institutions
- Lack of trust among enterprises, towards supporting institutions
- Low level of local collaboration
- Underdeveloped social capital
- Feeble sharing culture
- Perception of cluster organization as a prolonged arm of EU or public funds (in the beginning of cluster organization´s emergence)

- Individualized approach of companies
- Lack of financial backing and venture capitalists to spur innovations
- In case of ACWS cluster organization → lower amount of projects aimed at local cooperation

Suggestions for the cluster organization ACWS

Based on the identified set of drivers and barriers, several suggestions for the improvement of cluster´s performance are offered. The ACWS should further leverage on synergies that are gradually becoming more visible. The cluster must undoubtedly continue with the close cooperation with ZAP SR and academia. Active participation in international projects should by all means persist as this is one of the key distinguishing features of this cluster. In addition to that, it is now the time for the cluster to go back to its local members and to fortify the local linkages.

Cluster organization should perform in the role of boundary-crosser. By following this approach, more activities targeted at local members should be carried on. As a result, cluster organization can be the "change agent" who will enable to generate social capital. Firstly, it is essential to gather feedback on members'needs regularly. As the majority of cluster´s members are small and medium enterprises, matchmaking and networking events will be still valid for them. In terms of making the cluster environment more conducive to R&D and innovations, the cluster should leverage on the cooperation with technical universities. Building a shared laboratory that would be accessible for all cluster members (e.g.: lab for process simulations) is probably very costly, but it is one of the options to consider for the future. Furthermore, cluster organization could show even more initiative in regards to the improvement of education quality in high schools and universities by proposing new subjects or curriculum. Additional idea would be to support or launch new student competitions, for instance something like "Best product/process innovation in automotive industry".

For the promotional purposes, the cluster organization could refurbish its website by making it more interactive and more members-oriented. Outcomes of the projects could be regularly published on the website, as well as short press releases about the recent happenings in the automotive industry locally and globally. This may spur the interest of potential new members to officially join the cluster. Cluster organization could create a common knowledge management database for sharing information, posting researches, analyses or posting questions to a discussion forum (e.g.: opinions on recent directive relevant for the automotive industry, opinion on some new technology, etc.). Such platform (e.g.: part of website accessible only for the members, SharePoint intranet etc.) would create more buzz and cooperative activities among members.

Closing thoughts

The role of cluster organization lies in the reinforcement of the Triple Helix system (industry-academia-public bodies) by providing opportunities that increase interactions among the

cluster constituents. Cluster organization coordinates inter-firm activities to help upgrade companies´ sophistication. It serves as a platform for joint actions. One of the crucial findings in the presented case is that there is a lack of trust and willingness to collaborate among firms. The cluster organization can of course provide a robust offer with numerous activities for its members, but it´s also up to the companies how they will embrace this strategy. The global tendencies, especially visible in the automotive industry, point out to the necessity to learn how to cooperate with competitors and other cluster stakeholders. If a cluster consists of firms, that are not able or willing to work together, then the cluster may be doomed. Cluster is based on a two-sided process; cluster organization should provide a thriving and well-functioning platform enabling to build bridges among its stakeholders and simultaneously, members should become active participants with a shared vision.

The ACWS can leverage on reasonably strong membership base, highly positive reputation abroad and relevant international projects. It now faces another phase of cluster upkeep. The cluster organization should focus mainly on the cultivation of relationships with its local-based members. The cluster organization should gather regular feedback and consequently, plan new tailored-made activities and projects targeted on the current needs of the cluster´s member. Firms should connect locally to grow globally. Embarking on this path, the whole automotive cluster in West Slovakia will be able to reap all the benefits that a cluster-based approach can offer.

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Interview with Mr. Roman Bíro, ACWS
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Interview with Mr. Jozef Maják, SARIO[18]
Interview with Mr. Daniel Ács, Union of Clusters
Email consultation with Communication Department, Ministry of Economy

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[18] The presented statements are Mr. Maják´s own subjective opinions and do not have to reflect SARIO´s official point of view.

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Appendices

Appendix 1: Innovation Union Scoreboard – Break down of Innovation indicators
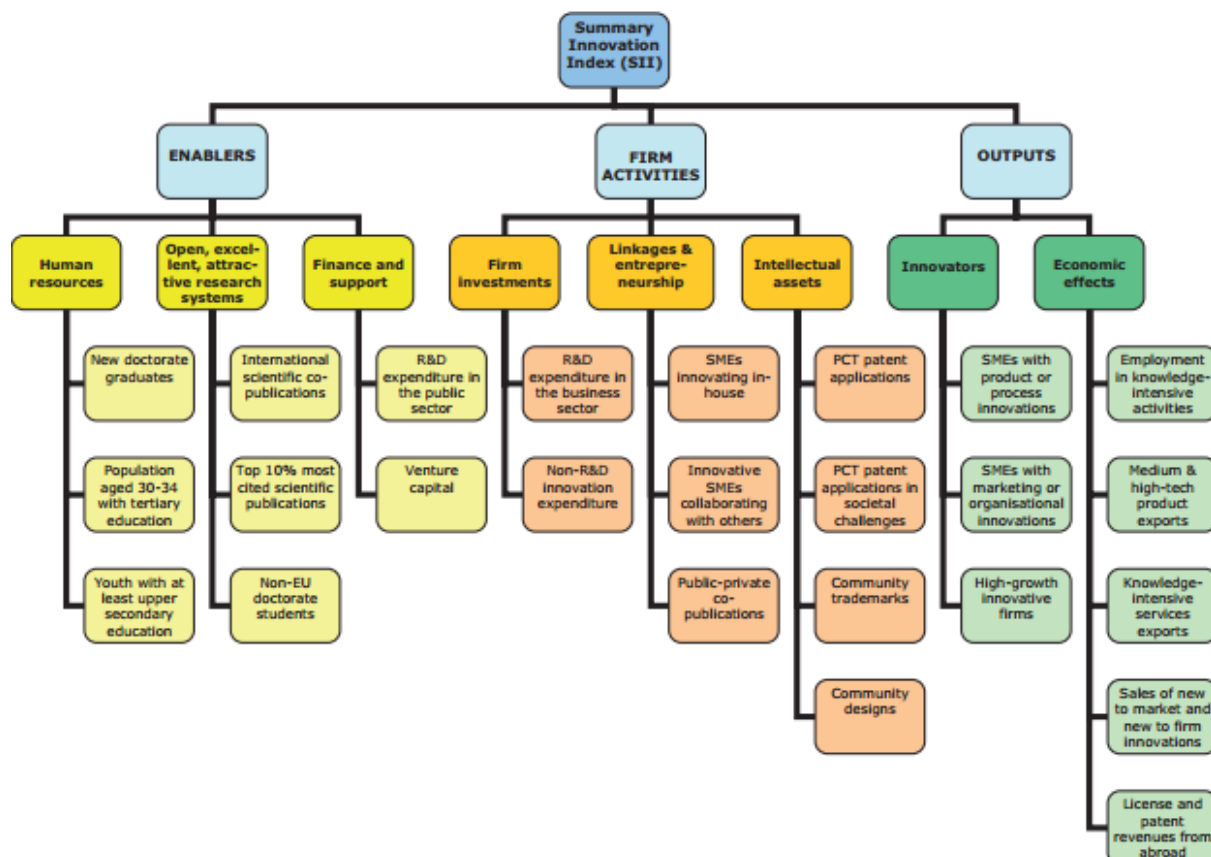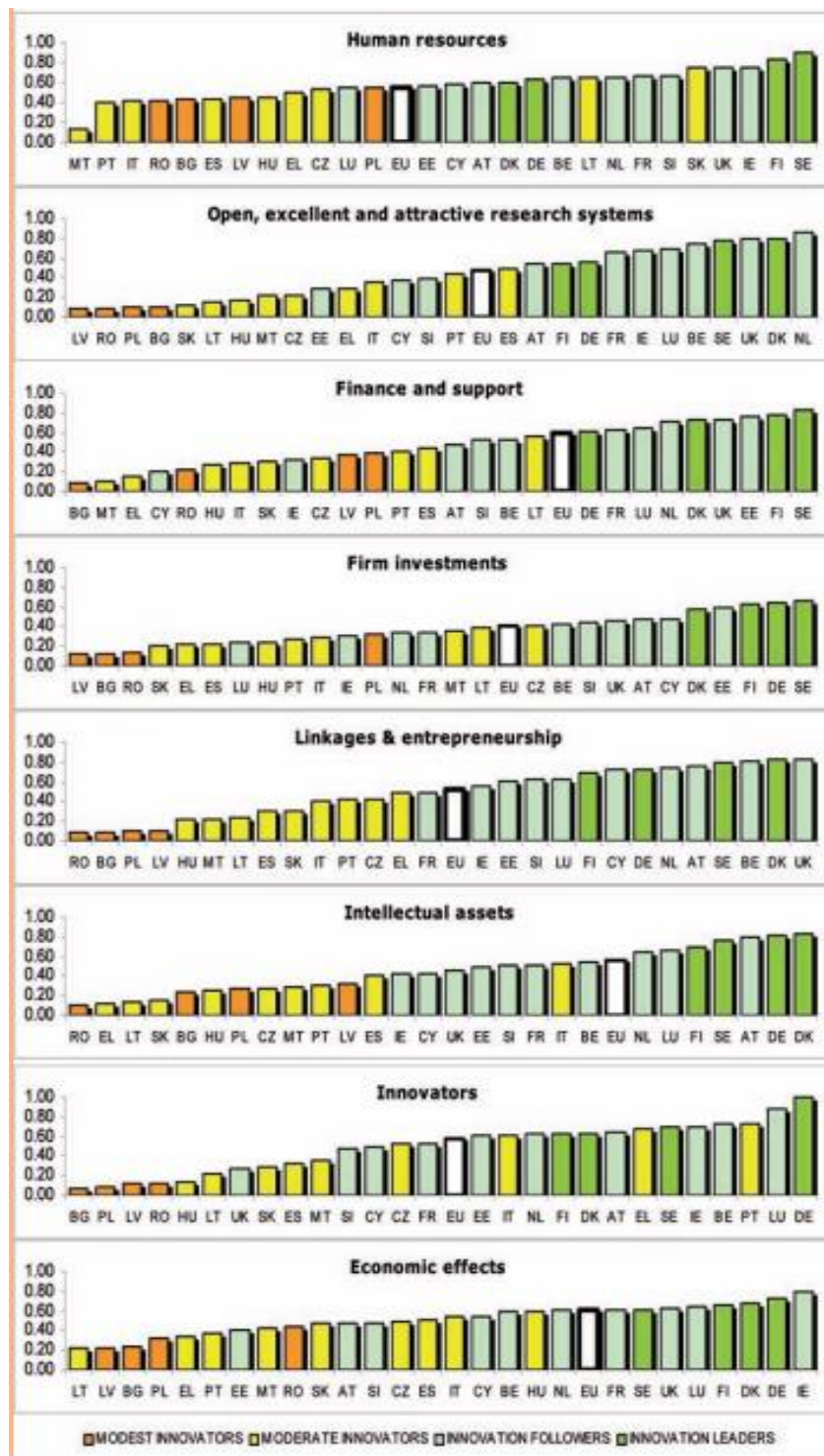

Source: Innovation Union Scoreboard, 2012

Appendix 2: Location of production plants supplying automotive industry

Red lines indicate important highways; orange line separates western part of Slovakia.

Source: ZAP SR 2011

Source: Innovation Union Scoreboard, 2013

Answers were provided by the management of ACWS.

L1 INTER-FIRM RIVALRY	**Very Strong**	**Strong**	**Medium**	**Weak**	**Absent**
Questions	**4**	**3**	**2**	**1**	**0**
1. To what extent does competitive pressure drive innovation, improvement and change?		x			
2. To what extent do companies respond to global as well as local competition?		x			
3. What is the level of competition between businesses within this group?			x		
4. To what extent is it essential for businesses to be part of an international supply/value chain?			x		
5. How well is this group of businesses recognised internationally as a concentration of expertise and competence?		x			
Totals		**3**	**2**		
L2 INTER-FIRM CO-OPERATION	**Very Strong**	**Strong**	**Medium**	**Weak**	**Absent**
1. To what extent is there a recognition of common identity among the group of businesses?		x			
2. To what extent is there a shared tackling of common issues?			x		
3. How far is networking amongst businesses and their staff seen as a positive factor?			x		
4. To what extent is business benefit generated through presenting a joint identity?			x		
5. To what extent is co-operation between firms proven to be beneficial and established as common business practice?				x	
6. How effectively is research and innovation supportive of and linked to business issues and market needs?		x			
Totals		**2**	**3**	**1**	
L3 COLLABORATIVE ADVANTAGE	**Very Strong**	**Strong**	**Medium**	**Weak**	**Absent**
1. Is there a common vision of a next level of competitive success?			x		
2. To what extent are businesses willing to share core knowledge?			x		
3. To what extent have firms embarked on a longer term collaborative strategy?		x			
4. To what extent has this widened beyond a small number of critical firms?	x				
5. To what extent has longer term collaborative strategy allowed the group to respond to demand placed by government, external shock or societal challenges?			x		
6. How far has trading core knowledge proved to be successful in achieving the next level of success?		x			
Totals	**1**	**2**	**3**		
L4 VENTURE ATTRACTIVENESS	**Very Strong**	**Strong**	**Medium**	**Weak**	**Absent**

		Very Strong	Strong	Medium	Weak	Absent
1.	To what extent has this become a prime place to invest in for this sector?		x			
2.	To what extent is this group of firms seen as globally important in this sector?			x		
3.	To what extent has the shared activity attracted intermediaries, supply chain and other infrastructural support?			x		
4.	To what extent has the shared activity attracted corporate venturing, joint ventures and research collaborations?			x		
5.	To what extent does this collaboration attract new players and talent?			x		
	Totals		1	4		

L5 Future focus and Securing Long Term success		Very Strong	Strong	Medium	Weak	Absent
1.	To what extent is there a shared pursuit of future breakthroughs?				x	
2.	To what extent is the group focused on the search and exploitation of new ideas?			x		
3.	To what extent do members of the group hold leading edge knowledge in some crucial area?			x		
4.	How well is the process of development of ideas into business success understood and practiced?		x			
5.	How well aligned are the research and business agendas for achieving long term business success?		x			
	Totals		2	2	1	

Appendix 5: NACE system - statistical indicators

Industry in total

05	Mining of coal and lignite [?]
07	Mining of metal ores [?]
08	Other mining and quarrying
09	Mining support service activities
10	Manufacture of food products
11	Manufacture of beverages
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals
21	Manufacture of basic pharmaceutical products
22	Manufacture of rubber products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products
26	Manufacture of computer products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery
35	Electricity, gas, steam supply
36	Water collection, treatment and supply
37	Sewerage
38	Waste collection, treatment and disposal activities
39	Remediation activities [?]

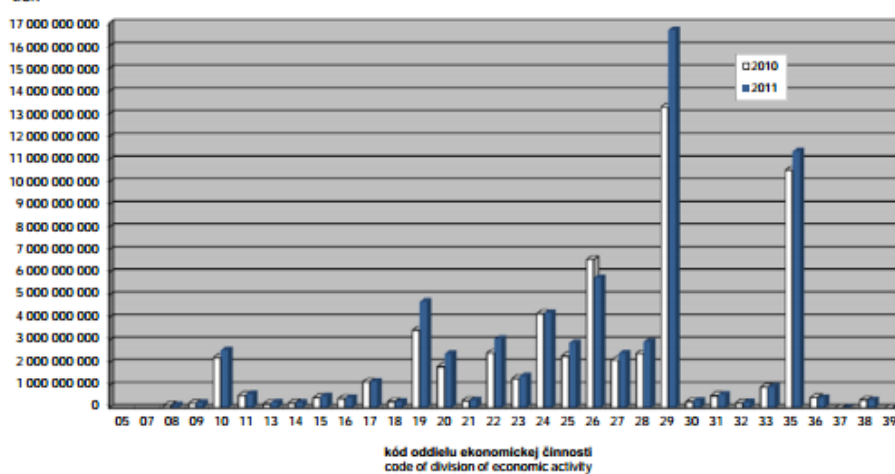*Source: Statistical Office of the Slovak Republic, 2012*

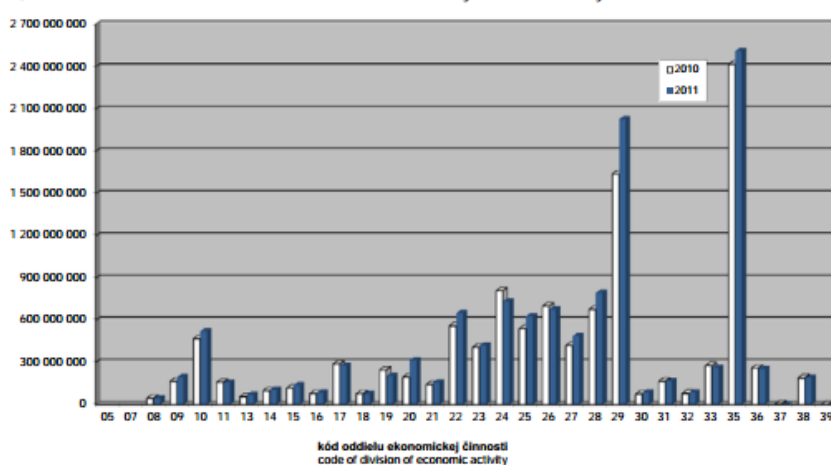Labour productivity per employee by economic activity
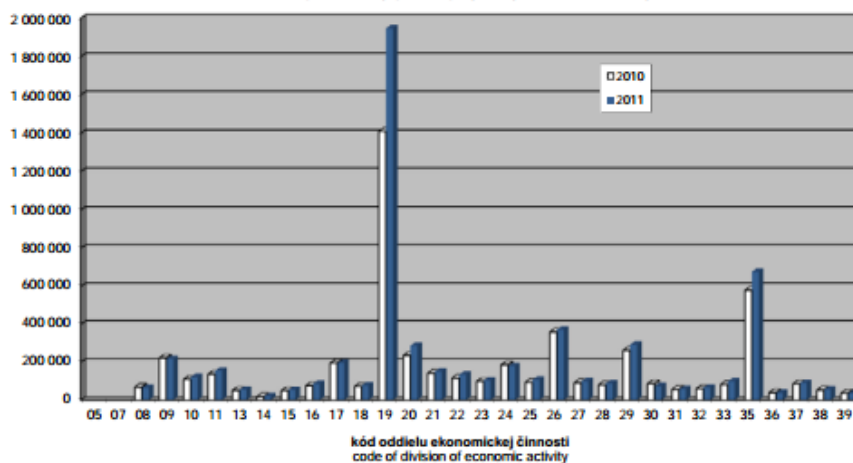
Produkcia podľa ekonomickej činnosti
Production by economic activity

Pridaná hodnota podľa ekonomickej činnosti
Value added by economic activity

Source: Statistical Office of the Slovak Republic, 2012

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