# Estimating Effects of Structural Funds in Slovak Regions

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**Abstract:**

Structural funds are one of the main additional drivers of growth of all of the new EU member states. In this paper, the results of ex-post impact assessment of SF and CF implementation in eight Slovak NUTS3 regions are presented. Assessment is based on the regional econometric structural model HERMIN, initially developed at WARR, Poland. The proposed model framework is suitable for regional ex-post assessment due to its dependency mainly on generally available regional data. The drawback of using regional data is that they are usually published with significant time delay compared to national data. This issue needs to be treated by ex-post analytical estimation of regional data using available national data as constraints. Our proposal is to use the presented findings in policy adjustments of using SF and CF in the following programming period 2014-2020. All data sources are related to the end of the year 2013.

## 1 Introduction

Within the programming period of years 2007 – 2013, as part of the cohesion policy, almost 11.5 billion EUR was allocated for the Slovak Republic. The aims and ways of using the financial resources from structural funds and cohesion funds (SF and CF) have been defined in the National Strategic Framework of Reference (NSFR). It consists of 11 operational programmes which have been implemented to pursue the following goals: convergence and regional competitiveness and employment (programmes of European Territorial Cooperation are not part of the NSFR). All operational programmes can be characterised as sector/thematic programmes that are controlled and implemented on the national level. As a result of the start of the global economic crisis, slight changes in financial allocations for individual programmes have occurred.

The paper presents the results of ex-post analysis of NSRF region in Slovak regions using the regional HERMIN model. It is the first analysis of this kind done in Slovak conditions. Until the end of 2013, 7.85 billion EUR was allocated to projects implementing SF and CF resources. This figure includes co-financing from the state budget and own sources of beneficiaries. This amount also includes resources classified as ineligible, i.e. expenditures paid from EU sources and the state budget that were not used in line with valid legislation and payment of which is claimed from the beneficiary. From the analytical point of view, those discrepancies are implicitly contained in statistical data since they represent actual investment in economy regardless of the sources of financing. Majority of the used resources, as of the end of 2013, were made up of contributions from EU funds, namely more than 6 billion EUR.

Based on data from SF and CF implementation database (ITMS) at the end of 2013, the level of contracting reached almost 91 % of the total allocation for the programming period of 2007-2013, and it further increased in

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2014. Despite that, current real drawing of NSRF funds suggests that approximately 89 % of Slovak allocation could be utilized until the end of the programming period in 2015 (t+2 rule).

## 2 Applied methodology

The origins of the HERMIN model come from the complex, multi-sector HERMES model that was developed by EC at the beginning of the 1980 (d'Alcantara and Italianer, 1982). HERMIN was originally designed (by John Bradley) to be a smaller version of the HERMES model in order to be applicable in circumstances of decreased data availability, e.g. in poorer, less-developed member countries and EU regions of western and southern periphery: Ireland, Portugal, Greece (Bradley et al., 2004), Spain, Italian Mezzogiorno, and Northern Ireland. Due to the limited data availability and sufficiently long time series without structural changes, the applied model had to be based on a simple theoretical framework. This relatively simplified model structure is one of the major advantages of the HERMIN model.

One of the basic characteristics of the general HERMIN model is that it considers a small open economy. The theoretical model also considers the cohesion policy structure. The model creation and structure need to satisfy certain basic requirements:

- The economy needs to be split into a small amount of sectors that can identify key structural changes in the economy during the assessed period.
- It needs to specify a mechanism that connects the economy with the „outside world" and captures international trade of goods and services, inflation transfers, migration of workforce, as well as foreign direct investment. External (or world) economy is an important direct and indirect factor that influences economic growth and convergence of the country to levels of the developed EU countries.
- Production in individual sectors in the model is described by the CES (Constant Elasticity of Substitution) and C-D (Cobb-Douglas) functions.
- The creator and user of the model must be able to recognize the conflict between the current state of the economy based on the historical data as described by the HERMIN model and the future state of the economy approaching an environment dominated by a unified EU market.

The most common way to fulfill these requirements is to use a theoretical model structure of the general HERMIN model, which consists of four sectors: the manufacturing sector, which mostly consists of sectors engaged in international trade; the service sector, which mostly consists of sectors not engaged in international trade and that comprises domestic supply; the agriculture sector; and the public sector.

Looking at the production side, the model consists of three major blocks: supply, demand, and income distribution in the economy. The model is constructed as an integrated system of equations with connections between individual blocks and sectors. It is founded on the Keynesian assumptions and mechanisms that comprise the core of the model. In substantiated cases, it includes certain features of the neoclassical economic theory, specifically in the demand block. For instance, the manufacturing sector outputs are not simply determined by the demand; the model rather considers potential impacts of price and cost competition. It reflects the assumption that firms seek places and countries that allow them to minimize production costs. The demand for production factors in manufacturing and service sectors is derived from the cost minimizing production function with constant elasticity of substitution.

Within the supply block, the HERMIN model describes the aggregate supply (outputs of individual sectors), output prices, nominal wage index, wage inflation, competitiveness, demand for labour, and demand for investments. Additionally, the block includes equations of aggregate labour supply, unemployment, and labour force migration. The demand block includes the equations for modelling domestic consumption, domestic demand, and net balance of international trade. The block of income distribution includes equations used for calculation of public sector expenses, income, household disposable income, public deficit, public debt, as well as the current account balance.

The application of the model on the regional level was developed in Poland[2] (Zaleski, 2009), where for each region (in case of Poland NUTS II), a separate satellite model with a connection to the national data is considered. There are of course some limitations of applied methodology, such us limited links between regions. Thus only direct effect could be assessed (in terms of regions) as it is not possible to fully examine spill-over effects of growth of individual regions, resulting from SF and CF implementation, on other regions. From the

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[2] By Wroclaw Regional Development Agency (WARR)

sector point of view, the HERMIN model estimates the spill-over effects between individual sectors within the given region. Therefore, each regional model can predict development of the sector also in a situation when the given sector is not affected by any direct influences (expenses of SF and CF). In case of new jobs creation, the model assumes that all jobs created are filled with labour force from the given region; thus the aspect of interregional labour migration is not depicted. However, it is inevitable to realise that significant interregional labour migration occurs in real economy, and thus impacts of increased income of households and their consumption in the region of labour force origin should not be assessed. Despite these limitations, the model is suitable for regional impact analysis and is still under development. The additional spill-over effects are now taken as a difference between results of national and regional models.

## 3 Model assumptions

The presented results are based on the assumption that the total level of drawing over the programming period will reach 89%. This assumption was based on the past development of drawing and expected speeding up of the implementation process in 2014 and 2015. Implementation of SF and CF in the amount of 89% in each individual region is depicted in Chart 1. The highest drawing of EU funds in the period of years 2007-2013 occurred in Trenčín, Prešov and Košice regions.

*Chart 1: Drawing of SF and CF, million EUR, scenario 89 %*
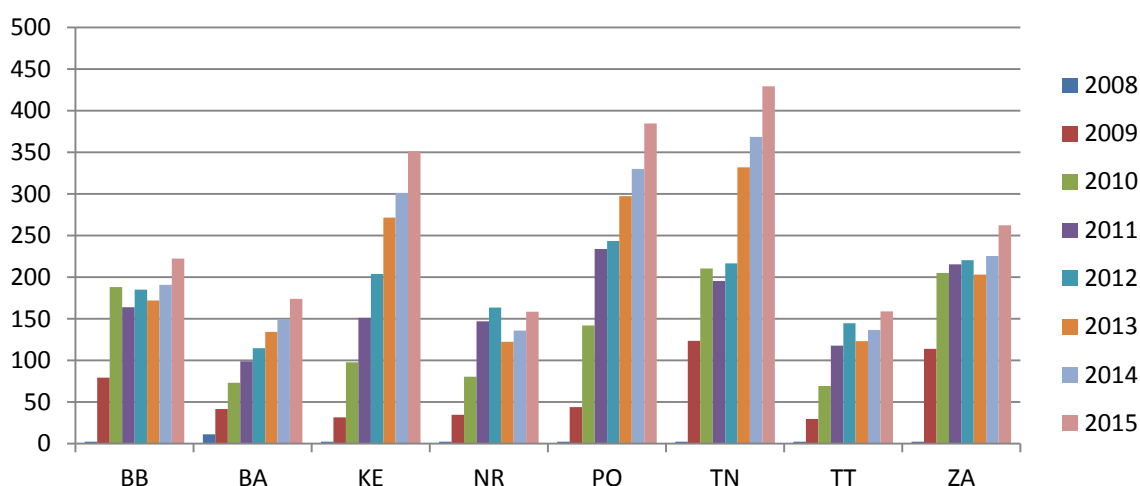


*Source: ITMS and calculation of authors*

For the years 2014 and 2015, increased level of implementation was expected. For the year 2014, additional 10% of implementation, compared to 2013, was expected in each region, and in 2015, additional 16% of the implementation level of 2014 was expected at the time of analysis creation. Over the year 2014, additional factors influenced the process of implementation, and drawing remained approximately at the level of the year 2013.

## 4 Expected Impacts

The results of the econometric model point out the fact that implementation of SF and CF has a significantly positive impact on the development of economy throughout the period of implementation. The SF and CF induced additional growth of GDP in Slovakia starts to be significant in 2009, while the expected cumulative growth of GDP in current prices represents 5.3% in 2013 and 7.5% in 2015 (Chart 2). Additional cumulative GDP in current prices in 2015 resulting from implementation is expected to be at 30% GDP (16.4% in 2013). This figure represents the sum of the additional contribution to GDP from all periods of implementation during the programming period. The year-on-year real growth of GDP in the period of years 2009 through 2015 was higher thanks to SF and CF implementation on average by 0.9 of percentage point. In 2015, the difference in GDP in current prices between the basic and alternative scenario is more than 5.5 billion EUR.

*Chart 2: Effect of SF and CF on GDP on national level, current prices. in percentage and million of EUR*
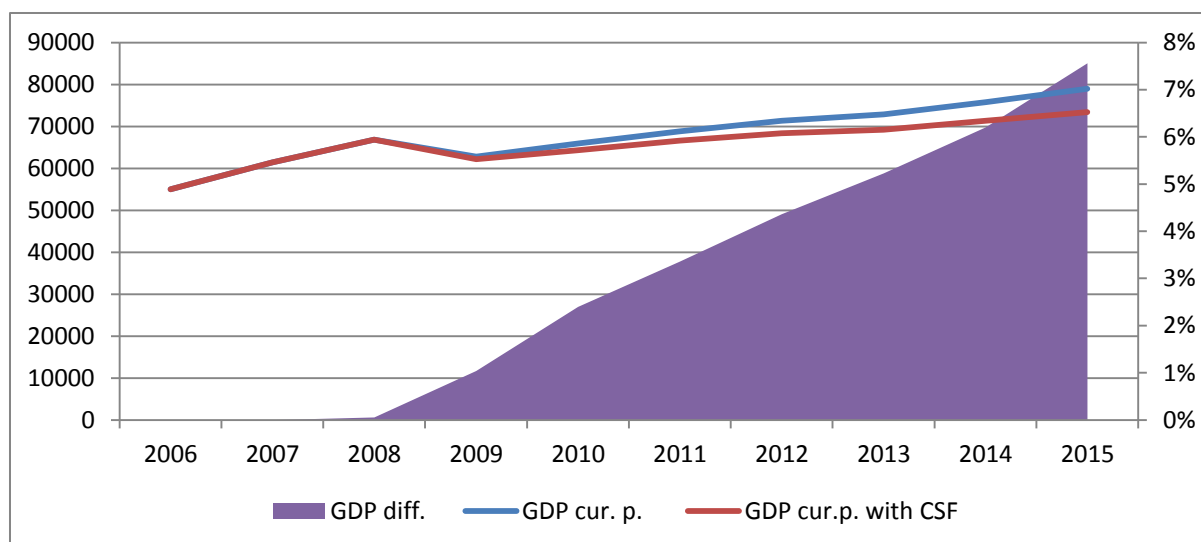
In Table 1, the effect of additional real growth of GDP is expressed on the regional level based on the results of regional econometric models HERMIN. During the period of years 2007 and 2008, significant increase of GDP due to minimal implementation of SF and CF was not observed. A more significant impact on GDP growth occurred in 2009, when the implementation of SF and CF itself had a more dynamic nature. During the period of years 2009 through 2013, the most significant increase in GDP growth was achieved in Trenčín, Žilina, Prešov and Košice regions. Trenčín region increased the most and grew by as much as 3.1% in 2013, namely due to ongoing infrastructural projects. In case of Slovakia, we recorded a year-on-year increase from 0.7 p.p. to 1.2 p.p. from 2009 to 2013.
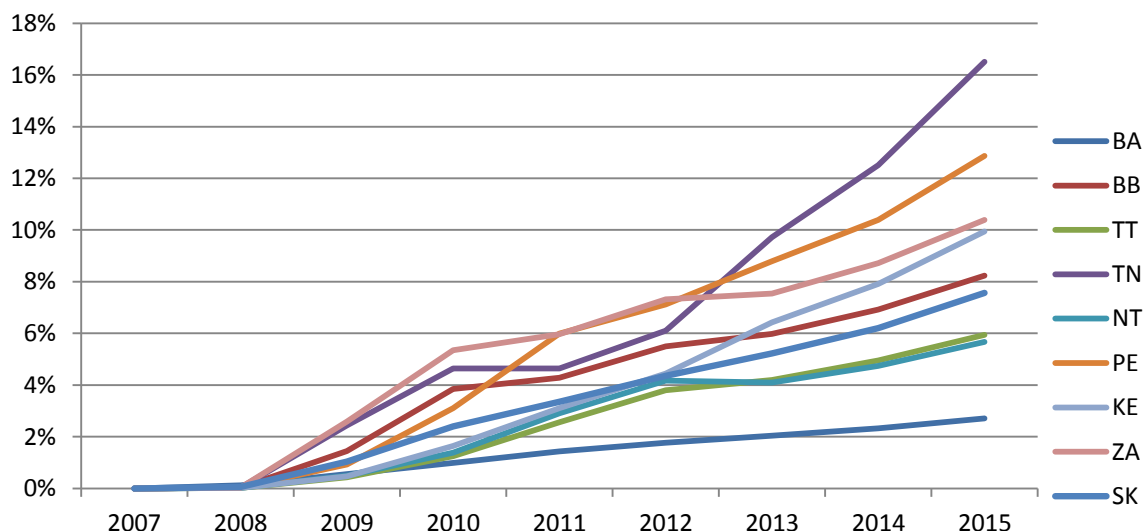
*Table 1: Difference in the growth of real GDP due to SF and CF implementation in percentage points*

|  | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** |
|---|---|---|---|---|---|---|---|---|---|
| **BA** | 0.0 | 0.1 | 0.4 | 0.4 | 0.4 | 0.3 | 0.2 | 0.3 | 0.3 |
| **TT** | 0.0 | 0.0 | 0.3 | 0.8 | 1.1 | 1.0 | 0.3 | 0.7 | 0.8 |
| **TN** | 0.0 | 0.0 | 1.9 | 1.9 | 0.2 | 1.3 | 3.1 | 2.4 | 3.3 |
| **NR** | 0.0 | 0.0 | 0.4 | 0.8 | 1.4 | 1.0 | -0.1 | 0.6 | 0.7 |
| **ZA** | 0.0 | 0.0 | 2.1 | 2.4 | 0.6 | 1.1 | 0.2 | 1.1 | 1.4 |
| **BB** | 0.0 | 0.0 | 1.1 | 2.0 | 0.3 | 1.0 | 0.2 | 0.7 | 1.0 |
| **PO** | 0.0 | 0.0 | 0.7 | 1.9 | 2.5 | 0.7 | 1.6 | 1.4 | 2.1 |
| **KE** | 0.0 | 0.0 | 0.3 | 1.1 | 1.3 | 1.2 | 1.8 | 1.2 | 1.6 |
| **SK** | 0.0 | 0.1 | 0.8 | 1.2 | 0.9 | 0.8 | 0.7 | 0.9 | 1.2 |

From the point of view of individual regions, it is clear that the greatest additional cumulative growth of GDP was recorded in Trenčín (16 %) and Prešov regions (12.5 %). More than 10% cumulative growth was recorded also in Žilina and Košice regions. On the other hand, Bratislava region achieved the additional cumulative growth only at the level of 2.5 % during the period of years 2007 – 2015. This was, to a large degree, influenced by the size of regional GDP and the volume of drawn resources of SF and CF.

*Chart 3: Additional cumulative growth of GDP due to SF and CF implementation in percentage, current prices*

Thanks to implementation of SF and CF, higher growth of GDP was recorded every year if compared to the estimated development without implementation of SF and CF. In the period of the crisis year 2009, Slovakia would have experienced additional drop in GDP by 0.8 percentage point and would have reached a year-on-year decrease in GDP at level of 6%. In 2010, Slovakia recorded a growth at the level of 4.1%, while the contribution of SF and CF implementation was at 1.2 percentage point.

*Chart 4: Estimated growth of GDP with and without implementation of SF and CF in %*
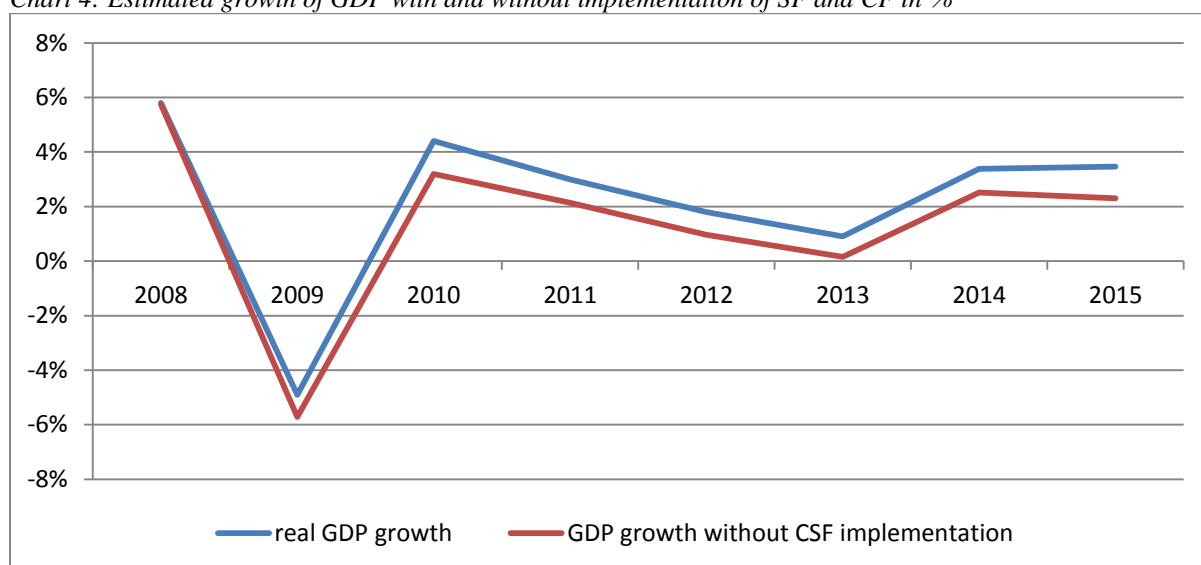
More than 110 thousand of "additional" jobs would be created in Slovakia in 2015 thanks to the SF and CF implementation, while in 2013 it was more than 80 thousand. The highest potential to create jobs as a result of SF and CF implementation is concentrated in the Trenčín region. This increase results mainly from the fact that most of SF and CF drawing was allocated in the Trenčín region. The given region recorded also the highest drawing of resources directed to creation of physical infrastructure, which is the most labour-demanding sector. More than 15 thousand jobs would be created in Prešov, Košice and Žilina regions. The least number of jobs will be created thanks to implementation of resources from the cohesion policy in the Bratislava region, where model results in 2015 indicate creation of only around 7.5 thousand jobs.

*Chart 5: The number of totally created new jobs, thousands of persons, 89% scenario*
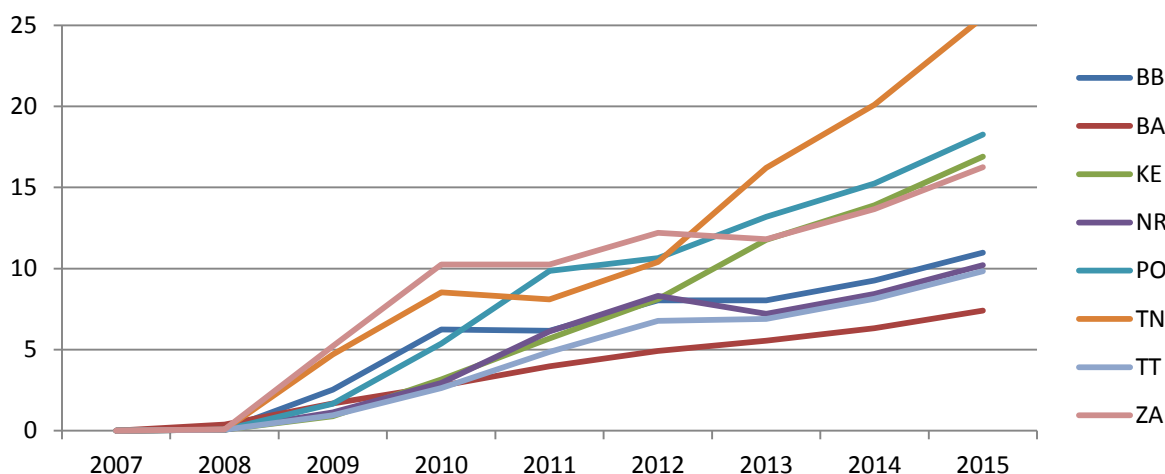
One of the limitations of the HERMIN model is that it does not contain the spill-over effects between individual regions. It means that the model does not reflect effects of additional employment among individual regions. The model also does not expect filling a job created by an employee from another region. We must, therefore, bear in mind the possibility to fill in a job position in construction in Trenčín region by labour force coming from another region of Slovakia and this possibility is not included in the HERMIN econometric model, but it should be considered when utilizing the results.

*Chart 6: Creation of new and sustainable jobs by region and sector, in thousands of persons, 2015*
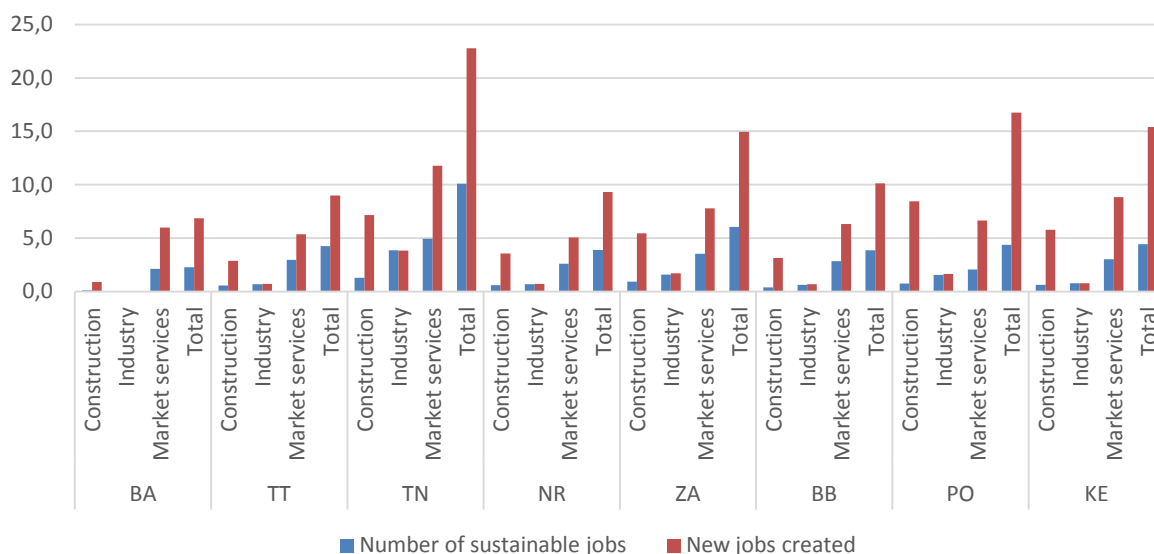
An important factor of SF and CF implementation impact on the labour market represents not only the number of jobs created but also their structure and sustainability. Sustainability of created jobs is an important factor of efficiency of EU investments. Sustainability was defined as probability that a created position will prevail for at least 3 years after the end of the programming period. Implementation of SF and CF would create 22,800 jobs in the Trenčín region, from which the share of sustainable jobs would be 44% (10,100 jobs). At the national level, we expect the impact of SF and CF on employment to be approximately 110,000 additional jobs (compared to the situation without implementation) in 2015. Out of the additional jobs created, approximately 40,000 represent sustainable jobs. In the market services sector, nearly 58,000 jobs in 2015 might be created, of which 24,000 jobs (42 %) are identified as sustainable. In the construction sector, around 37,000 jobs in 2015

should be created as a result of SF and CF implementation. Given the nature of jobs in construction, the number of sustainable jobs compared to other sectors would be at the lowest level (less than 20 %). The lowest number of jobs is expected to be created in the industry (around 10,000). However, in this sector there is the highest estimated sustainability of jobs - almost 98 %.

Consumption of households indirectly expresses the influence of SF and CF on the welfare of households that can differ from the GDP per capita. Monitoring this indicator should, therefore, be a priority from the aspect of cohesion and economic policy. Additional consumption of households representing the net effect of SF and CF implementation was recorded only after the year 2009. Consequently, in 2010, additional consumption of households increased in all regions significantly thanks to higher SF and CF implementation and creation of new jobs. In the following period, we can see ongoing growth in the consumption of households, but almost in all regions the rates are lower. Additional consumption of households has been caused mainly by the growth of employment which occurred in almost all regions. The greatest additional consumption of households in the period of years 2007 to 2013 was recorded in Trenčín, Košice and Žilina regions. The smallest increase in consumption of households due to implementation of SF and CF was recorded in Nitra and Bratislava regions. As a result of an increased level of implementation, we expect increased dynamics of consumption by the end of 2015.

*Chart 7: Additional consumption of households due to SF and CF implementation, million EUR*
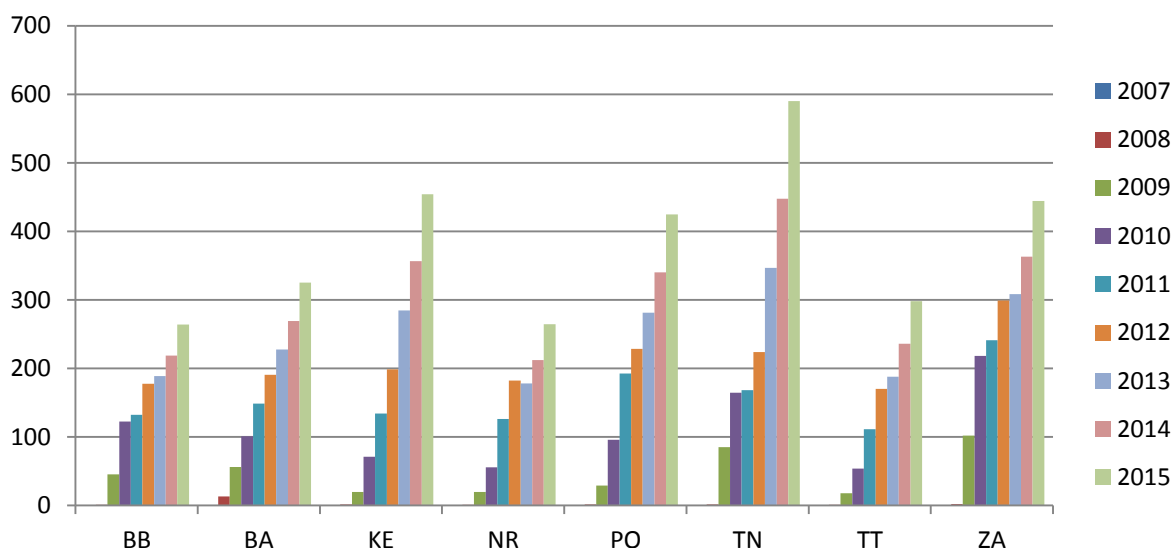


*Source: calculation of authors*

Cumulative additional consumption of households over the years 2007 - 2015 would increase in the Slovak Republic by 7% due to implementation of SF and CF resources. This increased consumption would be motivated mainly by growth of employment; however, growth of the average salary would also contribute positively to the given phenomenon. On the regional level, the development of households´ consumption will be differentiated. The most significant cumulative additional consumption of households would be recorded in the Trenčín region, which would reach the cumulative value of 14%. The second highest cumulative additional consumption of households would be observed in Žilina region. The lowest cumulative additional consumption of households would occur in Bratislava and Nitra regions, where the given value would not reach even 5%. Due to implementation of SF and CF, the consumption of households increased during the period of 2007-2013 in all individual regions that repeatedly mitigated the impact of the economic crisis on the economic growth in Slovakia.

*Table 2: Additional consumption of households due to SF and CF and CF – cumulatively in 2015*

|  | **BB** | **BA** | **KE** | **NR** | **PO** | **TN** | **TT** | **ZA** | **SK** |
|---|---|---|---|---|---|---|---|---|---|
| **2015** | 5.4% | 4.2% | 7.6% | 4.9% | 7.0% | 14.0% | 6.5% | 8.6% | 7.0% |

*Source: calculation of authors*

The implementation of SF and CF had positive effects on the average salary mainly during the period of years 2011 through 2015. The average salary in Slovakia increased by 14 EUR in 2015 in comparison to the scenario without implementation of SF and CF (+1.2%). The highest increase was recorded in the Trenčín region, where the average salary was higher by almost 35 EUR, representing (+3.6%). The average salary increased by more than 25 EUR also in the Banská Bystrica region. Lower growth than the average for Slovakia was achieved in Trnava, Prešov and Nitra regions, where the average salary was higher by 10 EUR (+1%).

*Chart 8: Increase of average salary due to SF and CF implementation, in EUR*
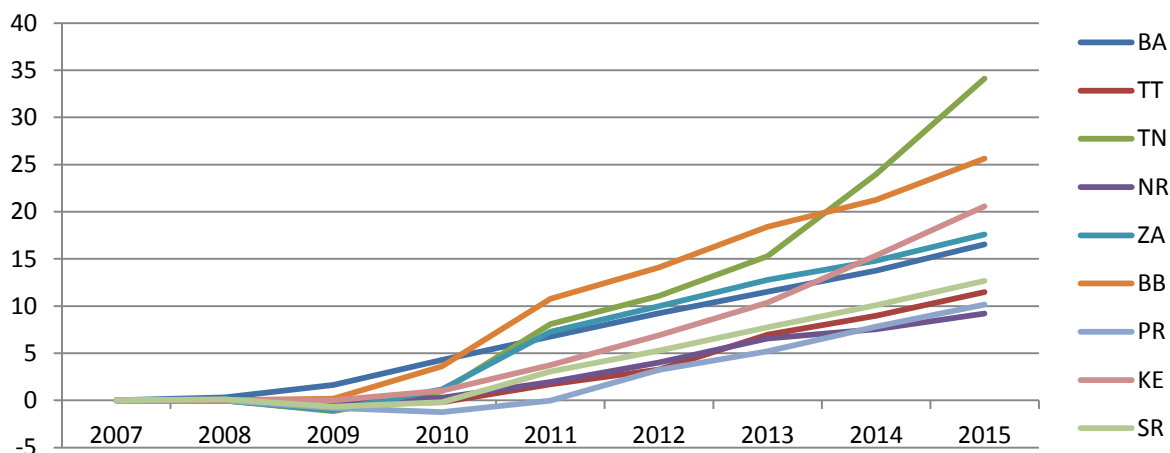


*Source: calculation of authors*

## 5 Impact on regional convergence

During the past twenty years, Slovak economy has undergone turbulent economic transformation, which began with loss of one-third of the economic performance at the beginning of the 1990´s and was followed by attempt to achieve the average level of developed EU economies. In 2000, performance of the Slovak economy reached the level only slightly above 50% of the EU 28 average. After joining the EU, in the period of conjuncture (2004-2008), the Slovak Republic reached a sudden rise of real convergence from 57 to 72% of the EU average. Due to the fact that actual implementation of SF and CF occurred only after 2009, it affected the real convergence in the period of the economic crisis.

The real convergence of Slovakia to the average of the EU countries had not stopped during the crisis period, which represents only a slight shift compared to previous development. Higher increase in convergence in the period of years 2008 to 2015 was achieved only in 2011, namely due to stagnation of other EU countries, not due to higher economic growth of the Slovak Republic. In the period after joining the EU in 2004 – 2008, Slovakia reached year-on-year average growth of convergence at the level 4 p.p. In the years 2008 – 2015, the average year-on-year growth of convergence in the Slovak Republic is estimated in the basic scenario at the level of 0.8 p.p; thus at this period, very slight convergence was achieved. In an alternative scenario without implementation of SF and CF, zero growth of real convergence of the Slovak Republic to the average of the EU countries is estimated while negative growth of convergence was achieved in several periods (see Chart 9).

*Chart 9: Model comparison of the development of GDP in PPP per capital to the average of the EU 28 countries in scenarios with implementation and without implementation of SF and CF (2012-2013 forecast, 2014-2015 outlook)*
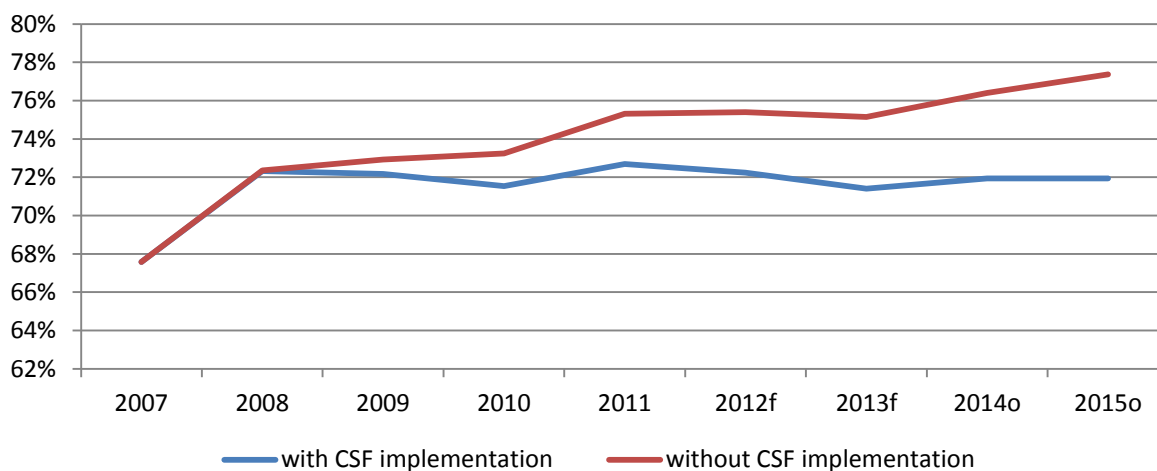
In the process of convergence of Slovak regions to the average in the EU, we can observe significant regional disparities measured by GDP in PPP per capita. The Bratislava region achieves significant growth of GDP in PPP per capital in both scenarios and creates the main convergence potential of the Slovak Republic (it is among the ten strongest NUTS 2 regions of the EU). It is caused by the economic strength of the metropolitan region of the Slovak Republic able to generate more significantly development investments also for other regions of the Slovak Republic, stagnation of population, and the fact that a part of production in the Bratislava region is created by people commuting to work from other regions, who make up for one fourth of workers. Thus, a part of GDP per capital is created by workers not calculated in the population of the Bratislava region, which positively distorts this indicator in this region. Only Trnava and Nitra regions managed to contribute to the regional convergence during this period more significantly (above the average of SR). In the basic scenario, we can also see a slightly positive growth of convergence in Žilina, Prešov and Košice regions. In Trenčín and Košice regions, there is rather stagnation in the convergence process, and the Banská Bystrica region achieved, at that time, a decrease in the real convergence also in the scenario with implementation of SF and CF. When comparing the development of convergence in the scenario without implementation of SF and CF, we can state that the real convergence would have been achieved only in three regions of the Slovak Republic (Bratislava, Trnava and Nitra regions). In other regions of the Slovak Republic, a significant decrease of this indicator would have been achieved. For better overview, only the convergence process of NUTS 2 regions to the average of EU 28 is depicted in Chart 10.

*Chart 10: Model comparison of the development of GDP in PPP per capital to the average of EU 28 countries with the scenario with implementation and without implementation of SF and CF at the NUTS 2 level without Bratislava Region (2012-2013 forecast, 2014-2015 outlook)*
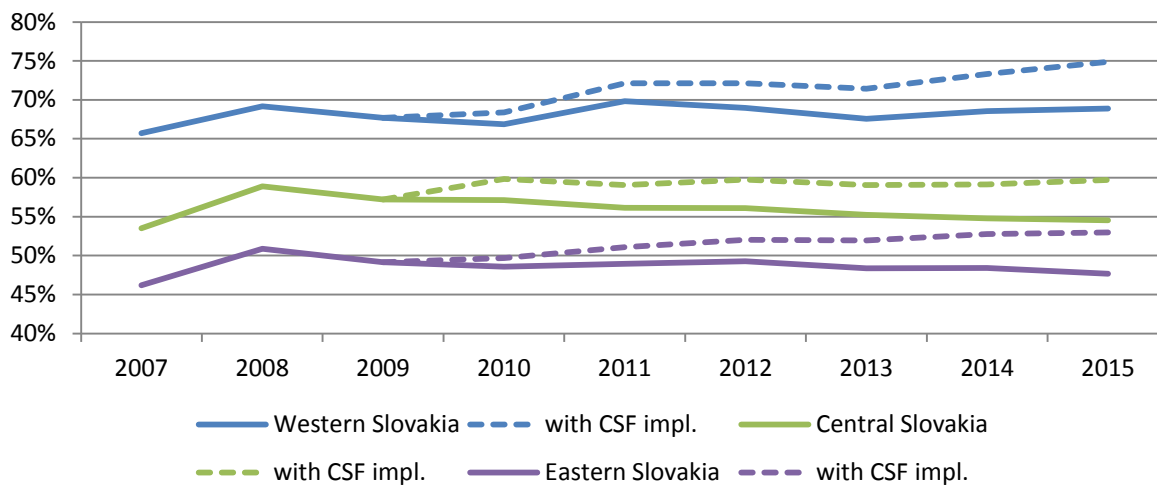


*Source: calculations of authors*

Implementation of resources of the cohesion policy contributed positively to the convergence of Slovakia to the EU countries. This cohesion would not have taken place without implementation of SF and CF. The process of convergence of Slovakia to countries of EU 28 would have developed differently without the start of the crisis. The Slovak economy experienced the peak of conjuncture before the start of the crisis while the convergence process was significant in all regions. Pre-crisis forecast suggested a significant macroeconomic growth also for the period of years 2008-13, when the developed economies were going to experience growth of GDP only at levels near to 2%. Therefore, we can assume that the convergence process would be more dynamic and more equal in all regions without the onset of the crisis (especially in weaker regions, the convergence process was weakened due to the crisis in spite of SF and CF implementation). On the other hand, created GDP of Slovakia was lower than expected considering the crisis. Therefore, the overall share and contribution of SF and CF to the convergence process was higher than expected.

## 6 Conclusions

The paper assessed the effect of NSRF implementation on Slovak regions in the period of years 2007 – 2015 by the regional HERIMN model. It represents the first utilization of this approach in Slovakia on NUTS 3 level of regions. With the help of SF and CF implementation, we expect a significant additional cumulative increase of GDP that will represent 7.5% in 2015. This growth is supposed to be supported in 2015 by creating more than 110 thousand jobs, mainly in market services and construction. The sector of industry played a support role within the structure of economy in the process of SF and CF implementation. The growth of construction was mainly caused by significant financial allocations on the renovation and building of new physical infrastructure. The sector of market services recorded the highest increase in all regions.

We have shown that implementation of SF and CF contributed positively to the continuing process of convergence to the average of the EU countries on the national level in spite of the crisis development at this time. Additionally, the onset of the crisis slowed down the expected process of convergence, and, at the same time, the contribution of SF and CF was greater than expected. What is even more important, without SF and CF implementation, the convergence process would have been reversed in the majority of regions.

On the other hand, the Bratislava region is rather different than all other Slovak regions and would be able to grow significantly even without the support of SF and CF due to its strength and demographic development. In spite of this fact, supporting the Bratislava region is important when considering its specific position and significance in supporting the economic growth of the other regions. The effects of SF and CF implementation on the state of convergence of Slovakia are permanent and significant. However, they only have slightly long-term positive influence on the convergence process.

Additional differences in the growth of GDP can be seen in all regions. The most significant growth was achieved in the Trenčín region, where most of the financial resources were allocated for infrastructure. The

lowest additional cumulative growth was recorded in the Bratislava region, namely 3%. Thanks to increased employment and growth of the average salary, the consumption of households had a growing tendency.

As we presented before, applied methodology is still under development and has some significant limitations, mostly within limited transition of spill-over effects between regions. Therefore, one must be careful when considering and applying the provided results. Despite that, we can assume that the presented effects are highly significant and are relevant to cross-regional comparison and analysis of effectiveness in different regions.

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