Modelling the Impact of Postponed Implementation of EU Structural Funds – The Case of Slovakia

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Abstract

The financial allocation of EU structural funds for current programming period 2007-2013 has been set in 2007. The present financial framework is providing substantial amount of financial resources, which are being implemented in period 2007-2015 (n+2 rule). The new member states are among countries with substantial structural support from the EU. The evaluation of possible effects of this support on national economy was predominantly estimated by the HERMIN model. These cumulative effects were expressed by cumulative multiplier enumerated under even funds implementation. Although the previous experience with implementation of structural support (2004 – 2006) created the necessary experience for the present programming period, the implementation of structural funds in the present (actual) financial perspective is lagging behind not only in Slovakia but also in other new EU member states. This lagging behind is leading to increasing implementation of funds in later period (2010-2015) and will with high likelihood impede its overall effectiveness. The aim of the paper is to compare possible impact of even implementation as well as the impact of postponed implementation of structural funds using the HERMIN model. This will be illustrated on case of Slovakia.

Key words: *econometric model, HERMIN, national strategic reference framework, macroeconomic development*

JEL Classification: *C53, O47*

Introduction

The structural HERMIN model designed by J. Bradley [2] has been used for ex-ante evaluation of Slovak NSRF (National Strategic Reference Framework). This model represents a simplified version of complex multisectoral HERMES model, originally designed by European Commission in early 1980 for international comparison of structural funds (community support framework - CSF) effects on the national economy (*d'Alcantara and Italianer, 1982*). The simplification which is present in the HERMIN model allows the use of this model in countries with lack of statistical data (such as new member states). Model is well applicable for small open economies. This model is composed of four main

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sectors (manufacturing, agriculture, market and non-market services) and contains both supply and demand side of economy. Model was used to evaluation NSRF effects for example in Estonia, Czech Republic, Romania, Slovenia and other countries [10].

For recently acceded member states with relative low level of economic development the implementation of cohesion policy programmes elaborated in the National Strategic Reference Framework of Slovakia for 2007 – 2013 create unique possibilities for faster real convergence. The utilisation of this potential is highly dependent on the overall efficiency of this process. The quantification of these effects from structural and temporal point of views is highly interconnected with the application of economic modelling, which also the main objective of this paper.

Institute of Economic Research of Slovak Academy of Sciences in Bratislava (B_IER SAS) has been involved in the ex-ante evaluation of the Slovak NSRF. The quantification of macroeconomic effects of the respective Operational programmes on the Slovak economy has been carried out by using two different structural models. Model HERMIN has been developed for the estimation of effects resulted from the allocation of Structural funds [5,6,8]. The second model, which has been applied for the quantification of effects of cohesion policy programmes, is the Computable General Equilibrium model (CGE) [7,8]. The model is dealing with particular nominal flows, which allows analysing the structure of the whole economy as well as impact of different non- marginal changes on the economy. CGE models are predominantly used for the analysis and estimation of changes in tax and social security systems, foreign trade and environmental policy.

The allocation for Slovakia for the period of 2007 – 2013 is 11,3 billion euro. These financial resources are being spent in the framework of three strategic and nine specific priorities of the NSRF. The above-mentioned models estimate the effects using the influence of respective specific priorities to one of the four basic economic sectors – industry, agriculture, market and non-market services. Each specific priority has influence on the production function on each of these four sectors.

The objective of this paper is the application of HERMIN model for estimation of different impact of Structural funds on overall macroeconomic development related to the difference between regular, delayed and late implementation of financial support.

Description of the HERMIN model

The econometric model B_IER_SAS HERMIN has been created at the Institute of Economic Research of Slovak Academy of Sciences during the preparations of present National Strategic Reference Framework for 2007 - 2013. Is it based on the traditional HERMIN model which is illustrated in Box 1. The modified Slovak version is composed of 67 equations, of which 18 are stochastic and 49 are identities. It is based on annual data and contains 87 variables (of which 67 are endogenous and 20 are exogenous steering variables from 1994 to 2004. From econometric point of view, the model is composed of three blocks, of which two are recursive and contain eighteen equations. One simultaneous block is composed of 49 equations. The major difference between the basic specifications of the model represents the C-D production functions, which have been used for the quantification of labour demand and investments by cost minimisation. The estimation of respective C-D production functions is statistically significant and the specification of HERMIN model allows the use of these functions in case it is impossible to estimate CES production functions. The description of these modifications can be found in this paper [5].

The structure of B_IER_SAS HERMIN is divided into four sectors: industry, market services, non-market services and agriculture. In the scope of NSRF preparation, the model has been used for the estimation of financial implementation of the structural funds in the Slovak economy.

Box 1. Basic scheme of HERMIN model

Supply aspects

Manufacturing Sector (mainly tradable goods)

Output = f1(World Demand, Domestic Demand, Competitiveness, t)
Employment = f2(Output, Relative Factor Price Ratio, t)
Investment = f3(Output, Relative Factor Price Ratio, t)
*Capital Stock = Investment + (1-δ) Capital Stock*t-1
*Output Price = f4(World Price * Exchange Rate, Unit Labour Costs)*
Wage Rate = f5(Output Price, Tax Wedge, Unemployment, Productivity)
Competitiveness = National/World Output Prices

Market Service Sector (mainly non-tradable)

Output = f6(Domestic Demand, World Demand)
Employment = f7(Output, Relative Factor Price Ratio, t)
Investment = f8(Output, Relative Factor Price Ratio, t)
*Capital Stock = Investment + (1-δ)Capital Stock*t-1
Output Price = Mark-Up On Unit Labour Costs
Wage Inflation = Manufacturing Sector Wage Inflation
Agriculture and Non-Market Services: mainly exogenous and/or instrumental

Demographics and Labour Supply

Population Growth = f9(Natural Growth, Migration)
Labour Force = f10(Population, Labour Force Participation Rate)
Unemployment = Labour Force – Total Employment
Migration = f11(Relative expected wage)

Demand (absorption) aspects

Consumption = f12(Personal Disposable Income)
Domestic Demand = Private and Public Consumption + Investment + Stock changes
Net Trade Surplus = Total Output - Domestic Demand

Income distribution aspects

Expenditure prices = f13(Output prices, Import prices, Indirect tax rates))
Income = Total Output
Personal Disposable Income = Income + Transfers - Direct Taxes
Current Account = Net Trade Surplus + Net Factor Income From Abroad
*Public Sector Borrowing = Public Expenditure - Tax Rate * Tax Base*
Public Sector Debt = (1 + Interest Rate) Debtt-1 + Public Sector Borrowing

Key Exogenous Variables

External: World output and prices; exchange rates; interest rates;
Domestic: Public expenditure; tax rates.

Source: Bradley, J. (1995)

Financial implementation of the NSRF in individual scenarios

The model B_IER_SAS HERMIN has been estimated on statistical data for Slovakia and for the purpose of the NSRF evaluation a baseline scenario has been created. The effects of financial implementation in different structure and dynamics have been estimated by introducing a shock into the model (financial implementation of NSRF). The process of financial allocation for individual priorities has been carried out several months (preparation period together with review process was even longer). For the purpose of this paper we are analysing the version of Ministry of Construction and Regional Development (MCaRD) published by the Government Office on April 2006[3] (Table 1). At the same time, an optimized variant has been constructed by IER SAS, which is manifesting in more positive influence on the Slovak economy [6] (marked OPT for the purpose of this paper, Table 2[4]). Both variants are introduced only for comparison of different effects in the change of dynamics of financial implementation and do not comply with the final version of the NSRF adopted by the Slovak government and European Commission.

In the process of financial implementation, three scenarios are considered:

- First scenario, with regular (even) financial implementation (NORMAL).
- Second scenario, with lower rate of financial implementation in the beginning of and with subsequent improvement in the following years (DELAYED).
- Third scenario, with postponed implementation with strong improvement after three years, with main implementation in the end of the programming period (LATE).

Table 1. Proposition of funds allocation for to particular NSRF priorities by MCaRD SR (April 2006)

Strategic priority (SP)	Specific priority (SP)	Fund	EU contribution	
			Scenario MCaRD - SP	Scenario MCaRD - SP
Infrastructure and regional accessibility	Transport infrastructure	ERDF	14,1%	66,5%
		KF	17,8%	
	Environmental infrastructure and protection	ERDF	0,2%	
		KF	17,8%	
	Local infrastructure	ERDF	16,6%	
Innovation, informatisation and knowledge economy	Support of competitiveness of manufacturers and services	ERDF	6,0%	20,7%
	Informatization of society	ERDF	4,0%	
	Research and development	ERDF	8,0%	
	Healthcare modernization	ERDF	2,8%	
Human resources and education	Modern education for knowledge economy	ESF	7,0%	12,0%
	Support of employment growth and social inclusion	ESF	5,0%	
Technical assistance	Preparation, direction, monitoring... SF a KF	ERDF	0,4%	0,8%
	Financial management, controlling...	ERDF	0,4%	

[3] National strategic reference framework 2007 – 2013, Slovak Ministry of Construction and Regional Development, Bratislava, 2006

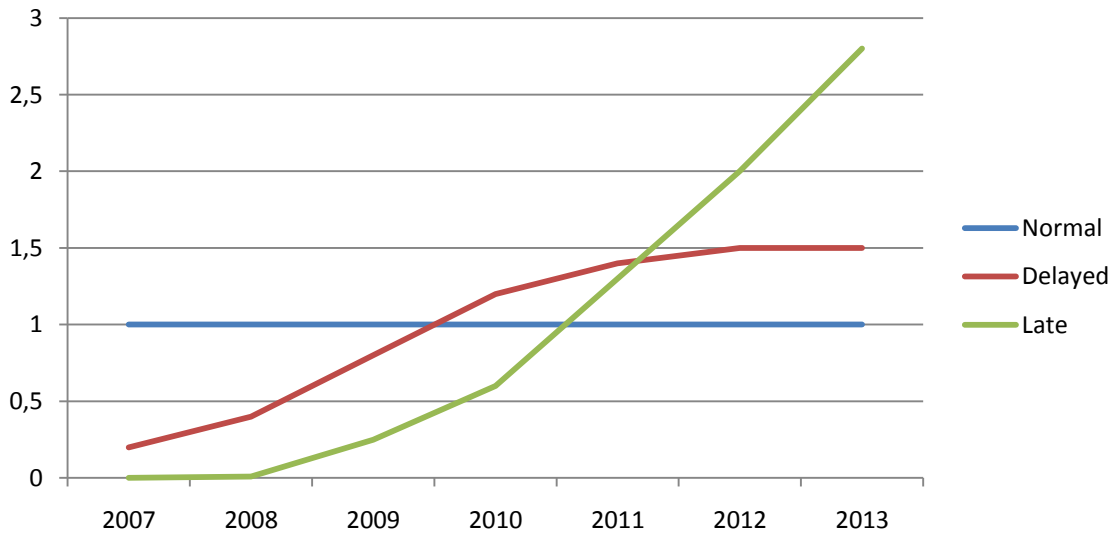
[4] Transfer of 450 mil. € (5%) from specific priority Local infrastructure and 250 mil. € (3%) from priority Transport infrastructure to priority Research and Development. This reallocation represents only 8% of total funds without change of total amount of NSRF funding.

Table 2. Allocation for to particular NFSR priorities by B_IER SAS (optimised allocation)

Strategic priority (SP)	Specific priority (SP)	Fund	EU contribution	
			Scenario MCaRD - SP	Scenario MCaRD - SP
Infrastructure and regional accessibility	Transport infrastructure	ERDF	11,5%	59,2%
		KF	17,8%	
	Environmental infrastructure and protection	ERDF	0,2%	
		KF	17,8%	
	Local infrastructure	ERDF	12,0%	
Innovation, informatization and knowledge economy	Support of competitiveness of manufacturers and services	ERDF	6,0%	28,0%
	Informatization of society	ERDF	4,0%	
	Research and development	ERDF	15,2%	
	Healthcare modernization	ERDF	2,8%	
Human resources and education	Modern education for knowledge economy	ESF	4,9%	12,0%
	Support of employment growth and social inclusion	ESF	5,0%	
Technical assistance	Preparation, direction, monitoring... SF a KF	ERDF	0,4%	0,8%
	Financial management, controlling...	ERDF	0,4%	

The difference between these three scenarios is shown in Chart 1. The overall nominal amounts of financial resources are the same for all scenarios. NORMAL scenario considers the implementation of 1/7 of total NSRF funding (14,2 %) per year and the LATE scenario considers financial implementation of 40 % of Structural funds in the last year (coef 2,8).

Chart 1. Share of NSRF financial allocation by particular scenarios with comparison to steady financing (NORM=1)



Quantification of various scenarios using HERMIN model

The estimation of the baseline scenario has been carried out by using the HERMIN model presented in previous part of this paper. Table 3 compares the absolute and cumulative differences in the government adopted NSRF and optimised variant elaborated by the B_IER SAS. Chart 1 illustrates the differences between the NORM, DELAYED and LATE scenarios. Scenario with delayed

implementation of financial support has in the beginning of the examined period noticeably lower effects on GDP than the scenarios with regular rate of implementation (NORM). However, the differences between these two scenarios are dimishing in later period of financial implementation due to higher volume of financial resources spend in the end of the programming period. This development is in line with basic economic intuition.

In the left part of table 3 we can observe the individual years and scenarios with results of simulations of NSRF allocation. The results for the individual years are relatively uneven, caused by the method of dynamics simulation in the HERMIN model[5].

Table 3. Changes in GDP growth rates in comparison to baseline scenario[6]

	Total difference						Cumulative difference					
	Scenario MCaRD			Optimized scenario			Scenario MCaRD			Optimized scenario		
	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late
2007	4,0%	1,3%	0,4%	4,3%	1,3%	0,4%	4,2%	1,2%	0,4%	4,4%	1,3%	0,4%
2008	0,4%	0,9%	0,1%	0,5%	0,9%	0,1%	4,6%	2,1%	0,5%	5,0%	2,2%	0,5%
2009	3,5%	2,2%	1,0%	3,7%	2,4%	1,0%	8,1%	4,2%	1,4%	8,7%	4,5%	1,5%
2010	0,4%	2,1%	1,3%	0,5%	2,3%	1,4%	8,5%	6,4%	2,7%	9,2%	6,8%	2,8%
2011	3,6%	2,8%	3,2%	3,9%	3,1%	3,4%	12,3%	9,3%	5,8%	13,2%	10,0%	6,2%
2012	0,1%	2,2%	3,2%	0,2%	2,4%	3,5%	12,4%	11,6%	9,0%	13,5%	12,5%	9,7%
2013	3,9%	2,7%	5,0%	4,1%	2,9%	5,4%	16,6%	14,5%	14,3%	18,0%	15,7%	15,4%

Chart 2. Development of cumulative GDP differences in comparison to baseline scenario (constant prices)

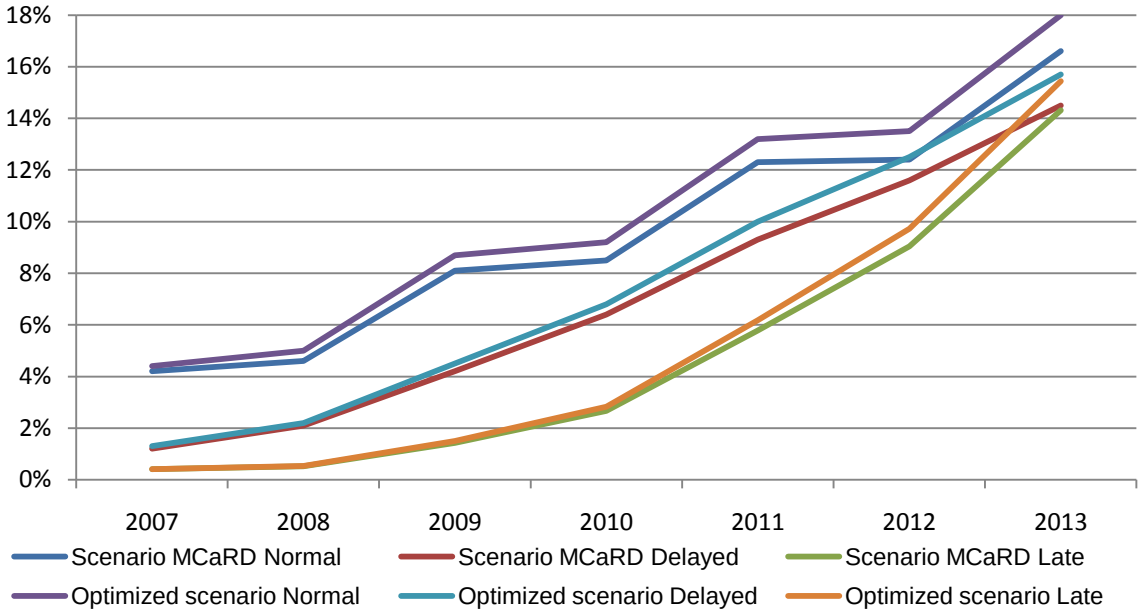


Table 3 presents cumulative differences, which are commonly used in this type of analysis. The analysis shows, that in the NORMAL scenario, the overall additional economic growth would reach 4,2 % in year 2007. In the case of the LATE scenario the additional growth would reach only

[5] Methodology of modelling the dynamics of HERMIN model and its influence is discussed in more detail in another paper [5] .

[6] Total and cumulative differences with comparison to baseline scenario are presented.

0,4% and in DELAYED scenario 1,2 %. Delays in the implementation of financial resources caused the loss of potential economic growth of 3 percentage points (in 2013). The catching-up in the implementation will gradually eliminate this loss of additional GDP growth, although not completely, because of lower multiplication effects in the previous periods[7] (mainly in the years 2007 a 2008).

In the scope of the financial perspective for 2007 – 2013, the additional cumulative GDP growth in the case of regular implementation will reach 16,6 %. In case of delayed implementation the cumulative growth will reach 14,5 % with comparison to baseline scenario. According to the B_IER SAS HERMIN simulation the implementation of the same allocated amount of financial resources will in the case of slight delays be lower by 2,1 percentage points and in case of Late scenario by 2,4 %. The main reasons are following:

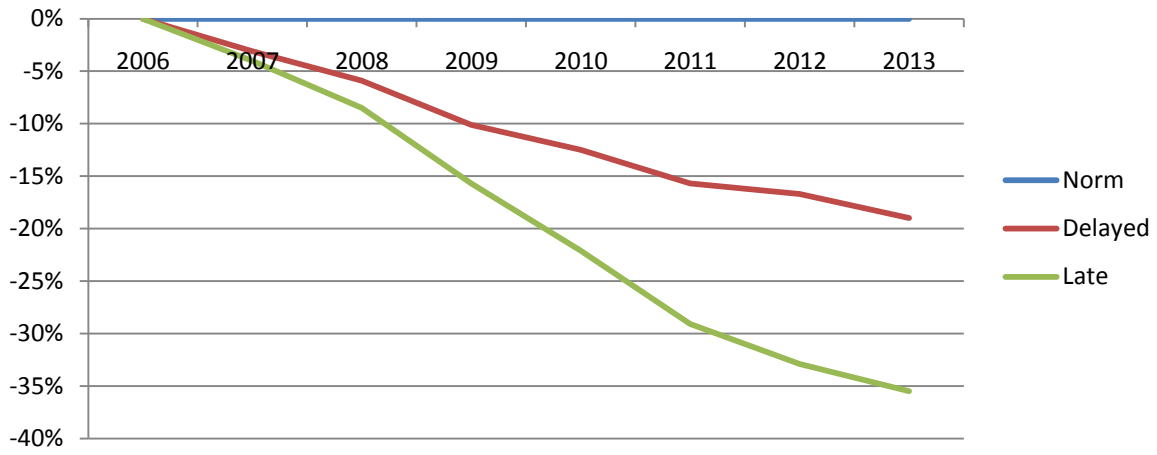
- Short time period, in which the financial resources could not provide the expected multiplication effects
- Total nominal allocation without valorisation

In the case of the optimised scenario, the financial resources are allocated in areas with higher multiplication effects thus resulting in higher cumulative deviations. In the case of regular implementation the GDP growth is 18 % and in the case of delayed scenario 15,7 % (2,2 p.p. difference).

The negative impact resulted from the delays caused by the lagging financial implementation lead to lower cumulative GFP growth. The overall contribution to additional potential product is lower than 90 % as it would be in the case of regular scenario.

Total potential macroeconomic loss (Chart 3) of late funding process can be estimated as cumulative difference between NORMAL and DELAYED, eventually LATE scenario, which is different than difference presented in Table 3 (this table represent difference to baseline scenario, not to potential growth). In LATE scenario are cumulative losses of „lost“ production to potential level about 35 % of GDP. In case of delayed scenario it's about 19 % in 2013.

Chart 3. Development of cumulative GDP differences in comparison to baseline scenario (constant prices)



[7] For example building of infrastructure has multiplicative effect in later periods.

Table 4.Changes in unemployment rate at evaluated scenarios

	Total difference						Unemployment rate					
	Scenario MCaRD			Optimized scenario			Scenario MCaRD			Optimized scenario		
	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late
2007	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	16,3%	16,2%	16,2%	16,3%	16,2%	16,2%
2008	1,3%	0,2%	0,0%	1,4%	0,3%	0,0%	14,4%	15,4%	15,7%	14,3%	15,4%	15,7%
2009	0,9%	0,4%	0,0%	1,0%	0,4%	0,1%	14,0%	14,5%	14,9%	13,9%	14,5%	14,9%
2010	2,2%	1,0%	0,2%	2,4%	1,0%	0,2%	11,5%	12,8%	13,6%	11,4%	12,7%	13,6%
2011	1,7%	1,4%	0,4%	1,9%	1,5%	0,4%	11,0%	11,3%	12,3%	10,9%	11,2%	12,3%
2012	3,1%	2,1%	1,2%	3,4%	2,3%	1,3%	8,9%	9,9%	10,8%	8,6%	9,8%	10,7%
2013	2,5%	2,5%	1,7%	2,7%	2,7%	1,9%	8,9%	8,9%	9,7%	8,7%	8,7%	9,5%

The impact of these scenarios on the development of unemployment rate show a different picture compared to GDP growth. Although, we can observe an increase in unemployment rate in the first year of delayed implementation by 1 p.p., the gradual catch-up in the implementation will result in elimination of this difference in the end of 2013. The main reasons are following:

- Lower level of implementation in the beginning lower the positive impact of multiplication effects on the unemployment rate.
- High amount of financial resources used in the end of the programming period directly generate high growth of employment.
- Nominal allocation and absence of valorisation are lowering employment in the delayed implementation.

However, when comparing the two scenarios, the difference between results in higher rate of unemployment by 0,6 p.p. in the Late scenario. This indicates the possibility of inefficient funds allocation, which will not have as strong effects to employment as progressive funding.

Table 5. Changes in labour productivity

	Total difference						Cumulative difference					
	Scenario MCaRD			Optimized scenario			Scenario MCaRD			Optimized scenario		
	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late
2007	4,1%	1,3%	0,4%	4,4%	1,3%	0,4%	4,2%	1,2%	0,4%	4,5%	1,3%	0,4%
2008	-1,2%	0,6%	0,1%	-1,2%	0,6%	0,1%	3,1%	1,8%	0,5%	3,3%	1,9%	0,5%
2009	3,9%	2,1%	1,0%	4,2%	2,2%	1,1%	7,0%	3,8%	1,5%	7,5%	4,0%	1,6%
2010	-1,2%	1,4%	1,0%	-1,2%	1,5%	1,0%	5,7%	5,2%	2,4%	6,2%	5,6%	2,6%
2011	4,3%	2,3%	2,9%	4,5%	2,5%	3,1%	10,1%	7,5%	5,3%	10,9%	8,1%	5,7%
2012	-1,5%	1,4%	2,3%	-1,5%	1,5%	2,5%	8,5%	9,0%	7,6%	9,3%	9,7%	8,1%
2013	4,7%	2,2%	4,4%	4,9%	2,4%	4,7%	13,5%	11,3%	12,1%	14,5%	12,2%	13,1%

Table 5 shows the impact of different scenarios on labour productivity. The labour productivity has been calculated as share of GDP on employment. The optimised scenario compared with the MCaRD scenario is transferring relatively small amount of financial resources to knowledge-based economy priorities. This reallocation results in cumulative improvement of labour productivity by 1 p.p. Higher cumulative labour productivity in comparison to delayed scenario suggests

implication, that higher spending in very late period will have sufficient influence to high grow of labour productivity, which is questionable and differs with intuition described above.

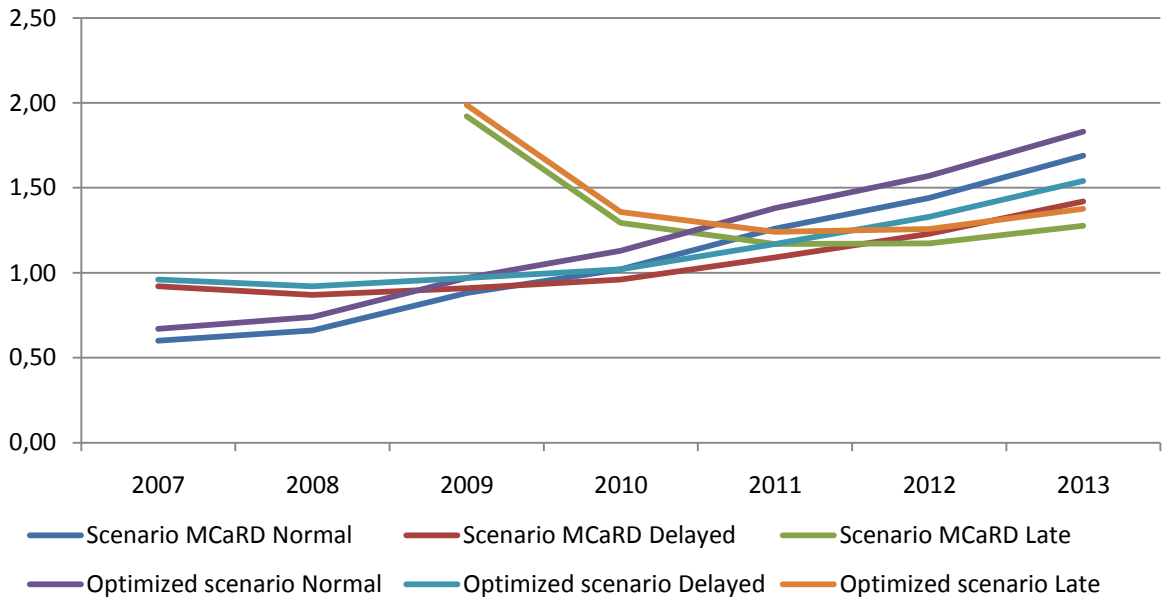
For general evaluation of respective scenarios in the framework of the HERMIN model, the CSF multiplier is widely used. It quantifies the cumulative growth of GDP compared with the baseline scenario i.e. the cumulative value of expenditures of the NSRF as a share on GDP. The values for the CSF multiplier are shown in Table 6.

Table 6. Values of CSF multiplier in various scenarios

	Share of CSF on GDP						Cumulative CSF multiplier					
	Scenario MCaRD			Optimized scenario			Scenario MCaRD			Optimized scenario		
	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late	Normal	Delayed	Late
2007	6,9%	1,3%	0,0%	6,6%	1,3%	0,0%	0,60	0,92	NA	0,67	0,96	NA
2008	6,4%	2,4%	0,0%	6,1%	2,4%	0,0%	0,66	0,87	NA	0,74	0,92	NA
2009	5,8%	4,5%	1,2%	5,8%	4,5%	1,2%	0,88	0,91	1,92	0,97	0,97	1,99
2010	5,6%	6,3%	2,7%	5,5%	6,2%	2,7%	1,02	0,96	1,29	1,13	1,02	1,36
2011	5,2%	6,8%	5,3%	5,3%	6,8%	5,3%	1,26	1,09	1,17	1,38	1,17	1,24
2012	4,9%	6,9%	7,6%	5,1%	6,8%	7,6%	1,44	1,23	1,17	1,57	1,33	1,26
2013	4,6%	6,4%	9,8%	4,9%	6,4%	9,8%	1,69	1,42	1,28	1,83	1,54	1,38

In 2013, the value of cumulative CSF was highest in optimised scenario, with normal scenario (1,83) and lowest in the case of late scenario (1,28).

Chart 4. Development of CSF multiplier in particular scenarios



High efficiency in early periods (Chart 4) of delayed and late scenarios are plausibly caused by lower spending with comparison to positive effects on GDP. However, the CSF spending in first two periods (2007-2008) in Late scenario was nearly zero, which leads to inability of enumerating CSF multiplier. Very high spending in end of observed period leads to lower efficiency and observed growth of CSF multiplier.

Discussion

The comparison of cohesion policy impact in the member states in the period of 2007 – 2013 is difficult. Actual data provided by the European Commission are including only the amounts of financial resources allocated for projects. At present, the actual amount of expenditures incurred in the member states are difficult to collect and analyse. Nevertheless, it is possible to estimate the level of expenditures incurred from the resources allocated. Taking into consideration this indicator, Slovakia is with 18,6 % share of funds allocated to selected projects on 25th place when compared with the rest of EU member states. This unfavourable development is determined by broad scale of external and internal factors. From these reasons we assume, that Slovak NSFR is from the view of simulation closest to LATE scenario.

Internal factors:

- Parallel implementation of two programming periods (2004 – 2006 and 2007 – 2013)
- Delays in preparation of the NSRF
- Low absorption capacity on the side of demand as well as supply
- Lack of efficient administrative capacities on national and regional level and on the side of managing authorities and applicants
- Lack of experience with European projects on the side of applicants
- Insufficient domestic financial resources available for co-financing on national as well as regional level
- Rent – seeking behaviour, lack of transparency
- Competences struggles between relevant national institutions
- Bureaucracy

External factors:

- Financial and economic crisis
    - Deterioration of budgetary balances
    - Lack of financial resources on the side of applicants for co-financing
- Administrative burden imposed by the Cohesion policy related regulations
- Changes in the rules on financial control

Delays in implementation will in the future impose a great pressure on the expenditure related to co-financing from public finance. This is especially the case of self-governing regions. It is also of great importance to increase the effort to overcome the above-mentioned negative factors on national as well as regional level in order to benefit from the macroeconomic and microeconomic effects of structural policy.

Conclusions

The estimation of cohesion policy effects based on the NSRF allocation with the HERMIN model has shown good results also in Slovak conditions. The total amount of financial resources allocated in the NSRF will have significant impact on the economic growth of Slovak economy. Its optimal allocation in the respective priorities can significantly increase the pace of real convergence towards the EU. The estimations have shown that delays in the implementation in the first years can lower the effects on national economy. It is also important to notice, that econometric models calculate with efficient implementation of the total allocation.

The estimation of macroeconomic effect of cohesion policy has shown several links and effects. Investments to infrastructure, mainly to local infrastructure, have nonrecurring effects. It creates demand for labour, construction material. However, after the finalization of the investments, their long-term multiplication effect is rather weak.

Investments to knowledge-based economy (science, research, innovation, education) have on the contrary strong recurring effects. Its positive impact can be seen during the investment phase (higher demand for teachers, researchers, books, inventory, and laboratory equipment), but compared to local infrastructure the effects are still manifesting in the economy even after the finalisation of the investment.

These preconditions were the foundation for the optimised scenario of IER SAS. For the purpose of this scenario, some allocations have been modified. The financial resources have been reallocated from the specific priority Local infrastructure (450 mil. €) and Transport infrastructure (250 mil. €) to the specific priority Research, technological development and innovation. This adjustment represents only 7 % of overall allocation. The effects of this scenario resulted in cumulative growth of GDP by approximately 1 p.p., modest decrease of unemployment rate and growth of labour productivity by 1 p.p.

Based on the estimation of the HERMIN model, delays in implementation in the beginning of the programming period and subsequent high financial implementation in the last years are manifesting in lower cumulative growth of GDP. Total cumulative loss is in the DELAYED scenario 19% and in the LATE scenario about 35 % when compared with NORMAL scenario. This can be explained by lower multiplicative effects of the investments financed from the Structural funds in the given time period. These differences are even more visible in the effects of knowledge-based economy priorities.

The above mentioned delays and high financial implementation in the last years can results in loss of financial resources in the case the n+2 rule will apply. High level of spending in the last year can also lead to inefficient allocation and impose pressure on existing capacities (technical, administrative). Limited capacities should also results in inability of real utilization of allocated funds. However, these risks are not included in the simulation scenarios.

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