

The Effects of Monetary Easing on Spatial Convergence in Hungary

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SUMMARY

There has been no substantive change in the existing disparities between the central and peripheral regions in the ten years after the Hungarian accession to the EU (2004-2014). The authors summarise in their study the possibility of econometric modelling of the relationship between regional convergence and monetary easing. On the basis of the represented model the effects of monetary easing, beginning in 2012, on the central, peripheral and semi-peripheral territories are construed, and other interventions needed to reach substantive path-correction are identified.

Keywords: territorial disparities; monetary policy; fiscal and monetary easing; convergence.

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INTRODUCTION

Spatial economic convergence is a recent topic in today's economics. Convergence means a tendency for poorer countries/ regions to grow more rapidly than the richer ones. Most of the researches related to convergence are focused on income convergence. The aim of this research is to analyse the financial policy effects on spatial convergence.

Cause for this is that in the spatial economics literature there is a recurring question of what kind of effect fiscal interventions of the state have on territorial disparities. Few studies have been published on the territorial effects of monetary easing in the past few decades. As a consequence of the financial crisis of 2008 there was a balance correction in Hungary. The crisis also changed the credit capabilities and willingness of banks, which has resulted in a decrease in the growth of the economic output. To compensate this, the Central Banks of the developed countries have started a monetary easing process. This study analyses the effects of the Hungarian monetary easing (started in 2013) on territorial (regional and county level) convergence.

HISTORY

The market-influencing role of the state and its reasoning (from a theoretical and also practical viewpoint) has long been in the foreground of debates. Several arguments have appeared, both pro and contra, and several underlying model-based empirical analyses appeared (e.g.: Alesina&Perotti 1995; Barro&Sala-i-Martin 1991; Elmendorf&Furman 2008). Hence it is worth reviewing briefly the theoretical history of the topic.

It is well known that the classical economists (1776-1871) believed in the efficiency of the market (invisible hand), and considered the state's economic engagement as unnecessary. Later the neoclassical economists (in the last third of the 19th century and first third of the 20th century) noticed that some goods and services have to be granted by the state. They wanted to limit the degree of the government's latitude by laws and orders. Namely, the neoclassicists' initial hypothesis was that the performance of the private sector is stable; hence there is no need for significant interventions. Another hypothesis arose, that the state's engagement raises the budget deficit and government debt, while the state's investments have a negative effect on the investments of the private sector (because of the crowding-out effect), which is unbeneficial for long-term economic growth.

Belief in the market's regulating role was strongly damaged during the Great Depression (1929-33), when the world had to face the fact that the market was unable to

restore equilibrium. In this context Keynes came to the conclusion that the crisis was caused by the insufficient demand of the private sector. To restore equilibrium he suggested the government apply a countercyclical economic policy. This means that in case of recession the governments have to stimulate demand at the expense of the budget, and in the case of overheating the government has to cool down the economy with low-keyed state engagement.

Economic policy not only accepted the theory of Keynes in hope of a recovery but also applied it to reducing territorial disparities (for example, the New Deal of 1933). Keynes admitted that a budget deficit can arise due to the effects of the state's interventions, but he thought that later (after returning to the growth cycle) it would be easy to erase these deficits. The efficiency of the Keynesian countercyclical budgetary policy has often been criticised because of its limited success from the mid-1960s in Europe's structural crises (for example the crisis of the Ruhr area) (Benedek&Kocziszky 2013).

The new neoclassical theory, which emerged after Keynes, had the initial hypothesis that on the one hand the economy can be described exactly, and on the other hand the economic actors behave rationally (e.g. Lucas 1976; Sargent&Sims 1977; Sargent&Hansen 1987). For this reason fiscal interventions are inefficient, because in the case of provisional governance the economic actors build their expectations into their decisions (so the crowding-out effect appears). In the case of unforeseen decisions the instability of the economy grows.

According to the monetarist theory of Milton Friedman and Friedrich August von Hayek, if the government would like to increase consumption, the government does not need budgetary easing. Instead, it has to increase the amount of money existing in the economy.

However, in the last few decades the balance building capability of the monetarist economic policy has not been proven. Instead of leading to convergence

between the core and peripheral regions the territorial differences remain stable, or in some cases are growing. (Reason: the processes of the real economy are in a sub-alternate role of the financial processes.) Hence the neo-Keynesian theory (which appeared at the beginning of the 1990s) has redrawn the Keynesian theory of monetary and fiscal intervention (Galí et al. 2011). According to the neo-Keynesians, in the short term there is a need for state interventions because of the inelasticity of prices and wages, but in the long term (in the case of flexible prices and wages) balance building capability has a greater chance of success.

The debates between these theoretical schools deepened after the effects of the financial crisis of 2008. This is because the monetarists could not predict the crisis, and their reactions were a little late and uncertain.

THE EFFECTS OF THE FINANCIAL CRISIS

The financial crisis of 2008 decreased the economic growth in the countries of the EU, but it did not lead to significant realignment in national or regional competitiveness rankings. The crisis had a specific effect on the territorial convergence of the EU. In the cluster of the core regions there was no significant change, but across the peripheries some realignment occurred, although this did not come together with qualitative change.

Between 2007 and 2011 sigma convergence was realised across the EU regions. The reason for this can be found not in the positive change of the peripheries, but in the decline of the core regions (Figure 1).

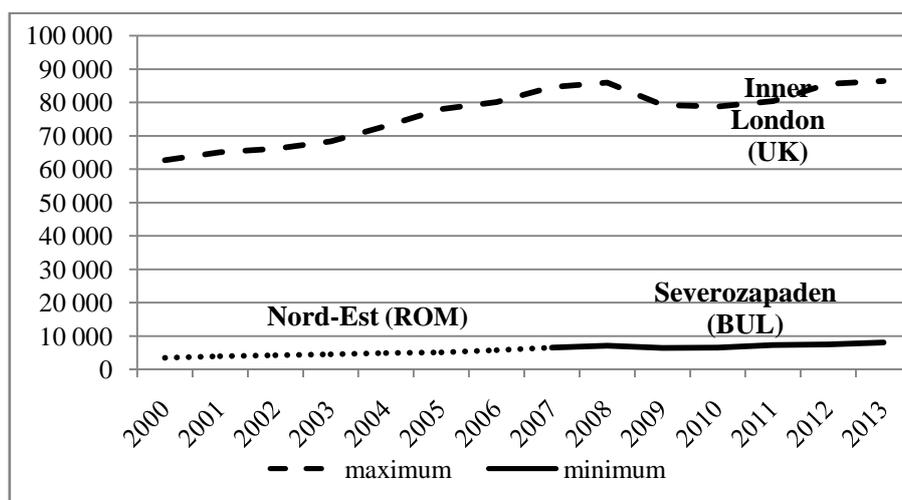


Figure 1. The financial crisis of 2008 had different effects on the richest and poorest regions of the EU-28 (2000-2013) (Euro/capita)

Source: authors' own calculation

The financial crisis had negative effects on the economies of the peripheral countries and it also slowed down the economic growth of the Visegrád Four (V4 –

Hungary, Slovakia, Poland and the Czech Republic) (Figure 2).

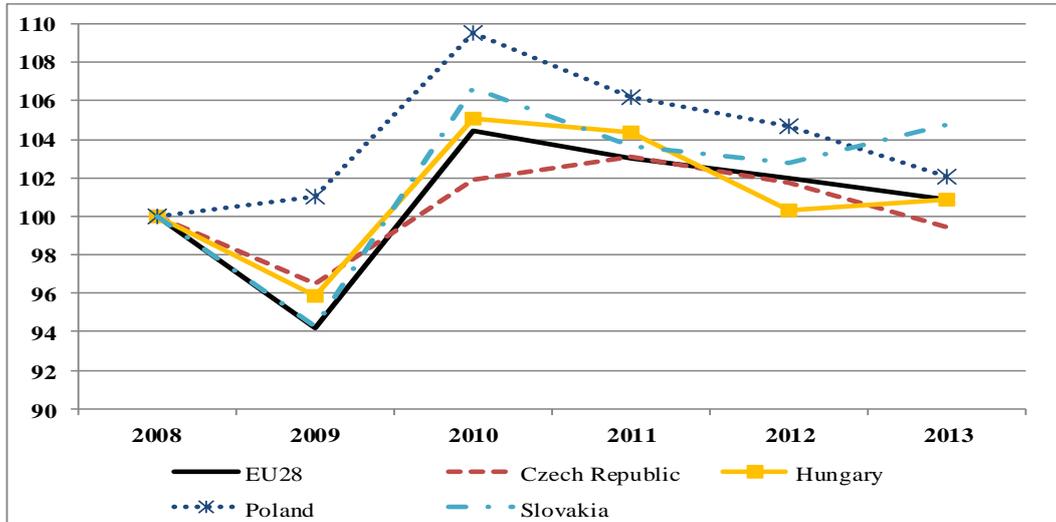


Figure 2. The effect of the financial crisis of 2008 on the economic output of the V4 (% change to 2008)
Source: authors own calculation (from the Eurostat database)

Before the EU accession (in 2003) the Hungarian GDP was at 62% of the EU average, the Czech at 77%, the Slovakian at 55% and the Polish at 48% of the EU average. In the last ten years Poland and Slovakia have overtaken Hungary.

The Hungarian actors made a balance correction after the crisis of 2008. As a result of it the bank's credit

capabilities and willingness decreased and the credit conditions of enterprises became stricter. The foreign currency debt of households (more than 1 million families) has decreased as well as the consumption credit. The decline of credit has held back the investments, which had a negative effect on the economic output (Figure 3).

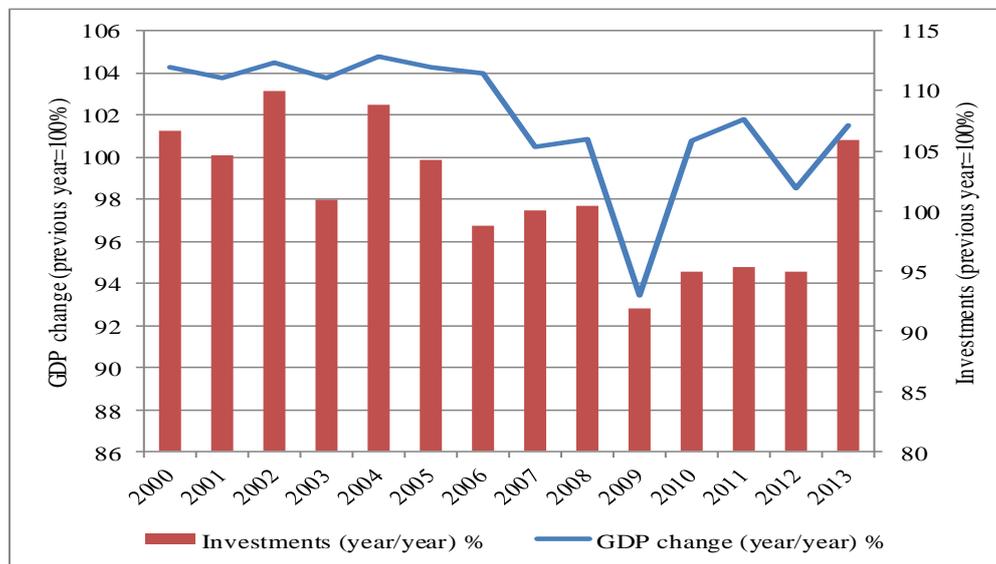


Figure 3. Change in GDP and investments in Hungary (previous year=100%)
Source: authors' own calculation

The financial crisis of 2008 had only small effects on the peripheral regions of Hungary (for example Northern Hungary or Southern Transdanubia because of the low investment and employment rate of these regions), while it held back the output of the regions in

which GDP was higher than the national average (for example the Central Hungarian region) (Figure 4).

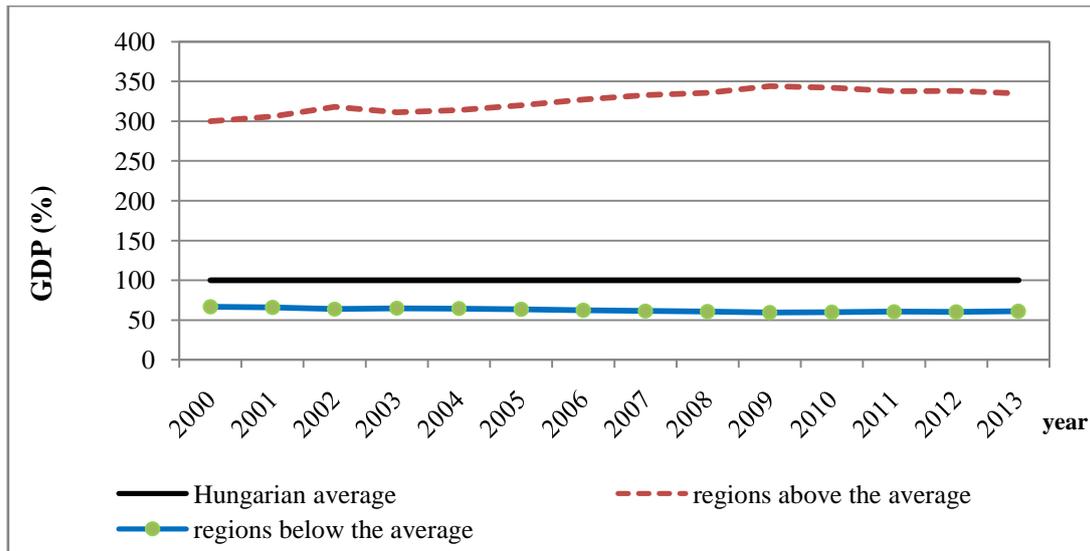


Figure 4. The output of the more and less developed regions in Hungary

Source: authors' own calculation

THE NATIONAL PRACTICE OF MONETARY EASING

In several countries of the world there were two main monetary policy methods for reacting to the effects of the financial crisis of 2008. The first type of activities was the modification of the Central Bank's base rate, and second the injecting more liquidity into the economies (for example the QE program of the USA's Federal Reserve, or the Funding for Growth Scheme of the Hungarian Central Bank, etc.).

In the first case the initial hypothesis was that an increase in the Central Bank's base rate would decrease the demand for credit, which would result in lower investment and less consumption, and vice versa. Namely, the decrease of the Central Bank's base rate increases the credit willingness of the commercial banks, which has indirect positive effects on the investment and consumption willingness.

The Central Bank's base rate has an influence on the exchange rates (because by decreasing the base rate the creditors would realise their expected profits through

the exchange rates). This is especially important in small, opened economies where the market financing of the budget deficit plays a big role. The effect of the exchange rates has an influence also on the region's export capabilities, but that depends on the region's economic structure.

The Hungarian Central Bank, in harmony with the inflation processes, started a base rate decreasing period in 2013. As a result of this the base rate sank from 7% (21 December 2011) to 2.1% in mid-2014 (23 July), and then reached its historical low point in mid-2015 (22 July) at 1.35%.

The second step (in keeping with the practice of the Central Banks of developed countries) was the start of monetary easing. The cause for this can be found on the one hand in the change in the inflation rate and on the other hand in the danger of a credit-crash by commercial banks. The MNB (Hungarian Central Bank) started its Funding for Growth Scheme (FGS) in 2013 (1 November), which was expanded upon in FGS+. The main aim of FGS is to support domestic small and medium-sized enterprises (SMEs) in accessing credit at a maximized interest rate (2.5%) (Table 1).

Table 1
Main characteristics of the Funding for Growth Scheme

Period of availability	In the second phase of FGS new credit contracts can be formed until 30 December 2015, or until a date to be determined by the Hungarian Central Bank. In the case of credit contracts the last payments can be made by 31 December 2015.
Credit amount	Minimum 3 million to a maximum of 10 billion forints, which is the total amount of new forint and foreign currency transactions in the first and second phase of the FGS. The maximum amount is valid also together with the SMEs' partners and connecting enterprise's credit access in FGS.
Currency of credit	Forint, and not revolving credit.
Duration	In the case of current assets the maximum is 1 year, in any other case maximum 10 years.
Credit interest rate	Maximum 2.5% yearly, which also contains the related credit guarantee fees. The interest rate is stable throughout the whole credit duration.
Other fees	Not chargeable, exceptions: costs related to credits which are paid to a third person (for example lawyer fee, valuation fee, notarial fee or mortgage fee).
Guarantees	Any usual guarantee is accepted to access credit.

Source: Hungarian Central Bank

The Funding for Growth Scheme was successful, as it stopped the decline of the credit stock of enterprises (Figure 5).

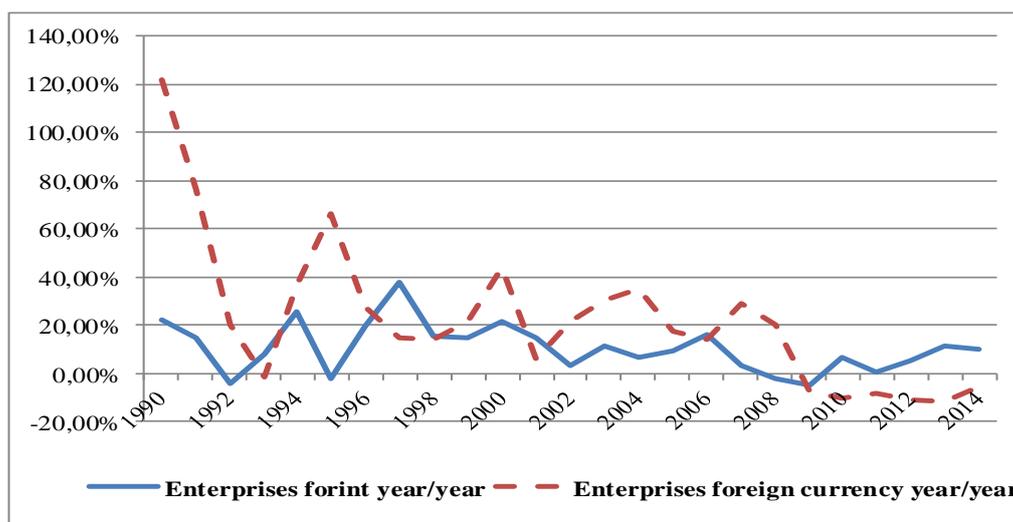


Figure 5. Change in enterprise credit stock in Hungary (1990-2014)

Source: Hungarian Central Bank, Hungarian Financial and Stock Exchange Almanac, Hungarian Financial Supervisory Authority (PSZÁF)

AIM OF THE RESEARCH

The aim of this recent research is two-fold:

- The first question is related to the requisition¹ of the financial instruments: namely what kind of territorial consequences does intervention have, and what effects does this have on territorial convergence?

¹ It is generally accepted that an intervention is good when it is regulation based and limited in time, and furthermore has no negative effects (Elmendorf & Furman 2008).

- The second question is the duration² of monetary easing.

The question is important, because the duration of the monetary easing is limited. In a positive case it speeds up the investments of the private sphere, but in a negative case it can lead to the emergence of new bubbles.

² The literature distinguishes between interventions according to their character and duration. There can be a single intervention or impulse. The first is discretionary, so it is based on the decision of the economic policy's actors. An impulse is a consciously repetitive intervention whose measures and signs can be derived from the state of the economic cycle (its measure is determinable for example depending on the investment/GDP ratio).

METHODOLOGY OF THE RESEARCH

The effect of fiscal and monetary interventions is basically different in the case of territorial, social and

economic indicators. While some fiscal interventions have mainly a territorial nature, most monetary interventions is focussed rather on the macro-level, which makes only indirect effects on the region's economic actors. The causal connections of the econometric model are represented in Figure 6.

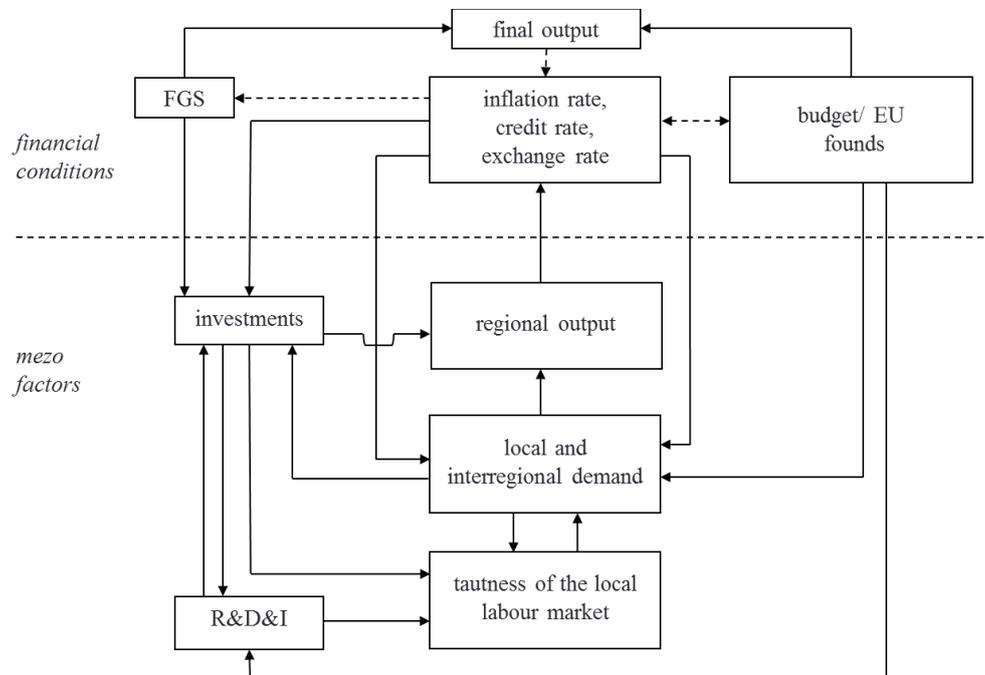


Figure 6. Influential financial conditions of the regional output
Source: compiled by the authors

The model operates with four exogenous factors (regarding the available territorial statistical data): macro output, the price index, real interest rate, and the measure of budgetary transfers (targeted territorial EU and governmental transfers; social support: regular social assistance in the region, payments for public work, social assistance for persons before retirement, and amount of employment benefits).

The model has five endogenous blocks: the regional investments module, regional consumption module, regional income module, regional output module and the regional research and development module. For endogenous blocks and factors the limited availability of territorial statistical data is a great problem, so several compromises and approximate solutions are needed.

FACTOR CHARACTERISTICS AND RESULTS OF THE ANALYSIS

Exogenous factors

a) Inflation rate: Central Bank's base rate, exchange rate

The increase in the Central Bank's base rate reduces the inflation rate, but also tightens the access to credit, and decreases the investment willingness, so finally the size of the GDP. But at the same time the strengthening exchange rate can improve the net export position, which leads to the growth of the output.

b) Funding for Growth Scheme

In the Central Bank's liquidity expansion programmes (whose aim is to improve the investment willingness of SMEs) source usage and intensity is different across the regions. They depend on the region's economic growth and also on its development. But as the consumption data prove, these programmes can correct territorial disparities. Earlier (2012) 56% of the credit stock was used by SMEs based in Central Hungary, but the Funding for Growth Scheme's first and especially the second phase have modified these shares substantially (Figure 7).

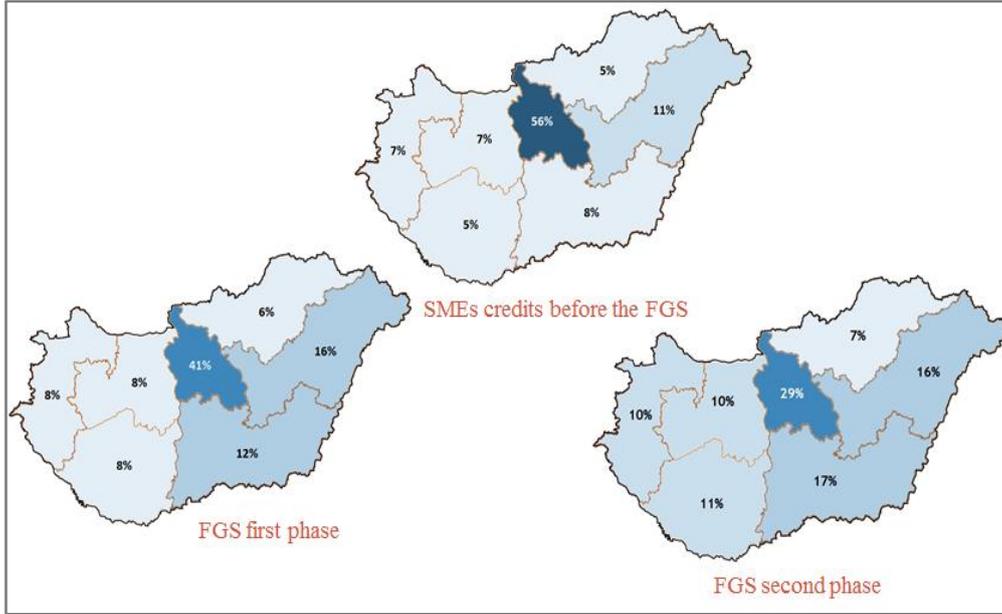


Figure 7. Territorial usage of the Funding for Growth Scheme
Source: Hungarian Central Bank.

Endogenous factors

a) Regional output

The regional output can be examined with the following panel model:

$$d(y_i^t) = \beta_0 + \beta_1 d(Y^t) + \beta_2 d(NETER_i^t) + \beta_3 d(c_i^t) + \beta_4 d(k_i^t) + \gamma_i^t$$

where:

- $d(y_i^t)$ - change in the specific GDP growth rate in region i at year t ,
- $d(Y_i^t)$ - macro GDP change in year t ,
- $d(NETER_i^t)$ - change in specific net production in region i at year t ,
- $d(c_i^t)$ - change in specific territorial consumption in region i at year t ,
- $d(k_i^t)$ - change in specific regional investment in region i at year t ,
- γ_i^t - random effect.

b) Regional and interregional consumption

The regional consumption can be determined implicitly from regional income.

$$d(C_i^t) = \beta_1 d(JÖV_i^t) + \beta_2 d(JÖV_i^t) + \beta_3 d(FOGL_i^t) + \gamma_i^t$$

where:

- C_i^t = regional consumption in year t in a given region;
- $JÖV_i^t$ = regional income in year t in a given region.

Income, as an endogenous factor, has an effect on the regional demand of the sectors. The model determines the employment of the certain sectors (similarly to other regional models) with the use of an inverse production function.

c) Regional investment

According to the literature the estimation of the regional investments is the hardest problem because of the endogenous effects.

$$d(I_i^t) = \beta_1 d(I_i^{t-1}) + \beta_2 d(Y^t) + \beta_3 d(TR_o^t) + \beta_4 d(KFI_i^t) + \gamma_i^t$$

where:

- I_i^t - gross amount of investments in period t ;
- TR_o^t share of EU transfer used for investments in region i , in period t ;
- KFI_i^t share of research and development expenditure for investments in period t .

The value of per capita investment differs significantly across the regions in Hungary (Table 2). The difference between the regions has been increasing in recent periods. The highest value, for Western Transdanubia, is almost three times higher than the lowest value, that of Northern Hungary. Only Central Hungary and Western Transdanubia were able to reach higher values than the specific (per capita) investment level. Central Transdanubia has a moderate lag to the most developed regions, while the less developed regions are characterised by very low (significantly below the national average) investment levels.

Table 2
Main data of investment performance (2013)

Region	Volumeindex, previous year=100.0	Per capita	
		investment	GDP, 2011
		in % of the national average	
Central Hungary	92.0	111.8	163.5
Central Transdanubia	100.6	96.6	87.9
Western Transdanubia	119.5	176.9	101.7
Southern Transdanubia	71.8	68.5	66.6
Northern Hungary	85.9	62.4	59.5
Northern Great Plain	110.1	83.5	63.7
Southern Great Plain	87.6	81.0	66.0
Country aggregate	96.1	100.0	100.0

Source: Hungarian Central Statistical Office

d) Regional labour market

The income can be described with the following equation:

$$d(J\ddot{O}V_i^t) = \beta_1 d(BLGSR_i^t) + \beta_2 d(INTRANS_i^t) + \beta_3 d(ALUR_i^t) + \gamma_i^t$$

$$d(BLGSR_i^t) = \beta d[\sum_j FOGL_{i,j}^t \cdot BVR_j^t] + \gamma_i^t$$

where:

$J\ddot{O}V_i^t$ - total income of the region in given year t ;

$BLGSR_i^t$ - gross wages and incomes of the regional inhabitants in given year t ;

$INTRANS_i^t$ - net transfer income of the region (without unemployment support and subsidies) in given year t ;

$ALUR_i^t$ - the amount of subsidies paid for the unemployed people in the region in given year t ;

$FOGL_{i,j}^t$ - number of employed persons in sector j in given year t ;

BVR_j^t - real gross income per capita in sector j in given year t .

$$d(BVN_{ji}^t) = \beta_1 d(VPI_i^t) + \beta_2 d(APRODR_{ji}^t) + \beta_3 d(ALQ_i^t) + \gamma_i^t$$

$$\frac{\delta BVN_{ji}^t}{\delta VPI_i^t} > 0, \frac{\delta BVN_{ji}^t}{\delta APRODR_{ji}^t} > 0, \frac{\delta BVN_{ji}^t}{\delta ALQ_i^t} < 0,$$

where:

BVN_{ji}^t - nominal value of the gross wage per capita for a worker in sector j in a given year t ;

VPI_i^t - consumer price index in a given year t ;

$APRODR_{ji}^t$ - per capita productivity in sector j in a given year t ;

ALQ_i^t - unemployment rate in a given year t .

e) Regional research and development

For describing the change in regional R&D expenditures we can use the following equation:

$$d(KFI_i^t) = \beta_1 d(dKFI_i^{t-1}) + \beta_2 d(TR_i^t) + \gamma_i^t$$

Enterprises finance 90% of their research and development expenditures from their own resources. The share of supports/orders coming from other enterprises is one tenth. The financial support coming from other sources (research institute support) is minimal. In every region of Hungary the use of a firm's own resources is crucial in financing R&D (Table 3).

Table 3
Expenditures, consistence and financial resources of the R&D bases (2013)

Region	From this		Financial resources			
	R&D expenditure	investment	enterprises	state budget	non-profit	foreign source
Central Hungary	89.4	10.6	49.9	31.8	1.3	17.0
Central Transdanubia	88.5	11.5	65.4	30.6	0.0	4.0
Western Transdanubia	83.4	16.6	33.3	47.7	0.1	18.9
Southern Transdanubia	87.8	12.2	25.1	67.7	0.3	6.8
Northern Hungary	86.7	13.3	53.4	40.7	4.3	1.7
Northern Great Plain	87.0	13.0	51.7	43.9	0.0	4.4
Southern Great Plain	88.2	11.8	36.0	57.4	0.1	6.5
Country aggregate	88.6	11.4	48.3	37.1	1.0	13.7

Source: Hungarian Central Statistical Office

After 5 years (in 2013), parallel with improvement in enterprises financing, the share of budgetary R&D resources had decreasing significantly. The only exception was Western Transdanubia, where these expenditures had increased to a more than doubled value, growing by more than one fifth. An increasing amount of R&D expenditures is coming from across the border (from other countries). In 2011 45 billion forint came from foreign countries in the form of R&D support to Hungary, which was 1.7 times more than 5 years earlier; 80% of the amount was used in the R&D bases of the capital city (Budapest), which was followed by Western Transdanubia with 7.6%. All other regions remained below a 4% share. In our model we have analysed the FGS contribution to the GDP growth rate in the Hungarian regions, the results can be seen on Table 4.

Table 4
FGS contribution to GDP growth - Results of the model calculation

No	region	Δy (%)	ΔFGS (%)
1.	Central Hungary	3.48	2.1
2.	Central Transdanubia	6.07	3.4
3.	Western Transdanubia	6.47	3.6
4.	Southern Transdanubia	3.77	1.8
5.	Northern Hungary	6.89	3.0
6.	Northern Great Plain	3.54	1.9
7.	Southern Great Plain	6.24	2.4
	Country aggregate:	3.3	1.0

Symbols:

Δy – growth rate of the GDP (2014/2013)

ΔFGS – FGS and FGS⁺ effects from the growth shift

Source: authors' own calculation

According to our calculations a 1% increase in the enterprise's credit stock can increase the macroeconomic GDP by 0.18-0.2%. The growth effects of the FGS' first and second phase were 0.8% according to the estimations of the demand side, and 0.9% on the supply side (calculated with 700+300 billion forint FGS usage up to 31 December 2014). Considering also the second phase effects of the program, the macroeconomic growth effect of the two phases was about 1% during two years (2013 and 2014) (Table 4).

CONCLUSIONS

At the beginning of the 1990s orthodox economics considered the problems arising from territorial disparities as manageable, and also believed (at least at the political level) in territorial convergence. The reason for this was the availability of macroeconomic and fiscal (like the criteria of Maastricht) interventions and territorial support (for example, EU regional support system).

The financial crisis of 2008 has weakened the belief in orthodoxy, because the monetary policy based economic policy could not predict the building up and blowing out of the bubbles. The situation became more complicated when the main characters of the EU's monetary policy made a late and at first incorrect response to the situation. This has deepened the output gap between the member states. The slowdown in the member state's convergence had a negative effect on the countries of the periphery, and also on their disadvantaged regions.

The monetary easing starting in 2013 (stimulus following a Keynesian approach) was successful. Due to the improvement in credit availability change take place both in investments and in employment, which had positive effects on the demand and supply side, so finally on the national economic output. The effect of the Funding for Growth Scheme is observable also at the territorial level. So the Keynesian stimulus was successful.

REFERENCES

- ALESINA, A.&PEROTTI, R. (1995): Fiscal expansions and adjustments in OECD countries. National Bureau of Economic Research, NBER WorkingPaper, 5214.<http://dx.doi.org/10.3386/w5214>
- BARRO, R.J.&SALA-I-MARTIN, X.(1991): Convergence across states and regions. *Brookings Paper on Economic Activity*, 1, 107-108.<http://dx.doi.org/10.2307/2534639>
- BENEDEK, J. &KOCZISZKY, GY. (2013): Bevezetés a regionális politikába. (Introduction into regional policy.) Miskolc: Miskolci Egyetemi Kiadó.
- ELMENDORF, D. W.&FURMAN, J.(2008): If, When, How? A Primer on Fiscal Stimulus, Brookings Institution, Online-Verbindung.Retrieved: 15.10.2013.:
http://www.brookings.edu/~media/Files/rc/papers/2008/0110_fiscal_stimulus_elmendorf_furman/0110_fiscal_stimulus_elmendorf_furman.pdf
- GALÍ, J., SMETS, F. & WOUTERS, R.(2011): Unemployment in an Estimated New Keynesian Model.
<http://dx.doi.org/10.3386/w17084>
- GLICKMANN, N. J. (1971): An Econometric Forecasting Model for the Philadelphia Region. *Journal of Regional Science*. 11(1), 15–32.<http://dx.doi.org/10.1111/j.1467-9787.1971.tb00237.x>
- HALL, O.P. &LICARI, J.A. (1974): Building small region econometric models. *Journal Regional Science*.14(3), 337-353.<http://dx.doi.org/10.1111/j.1467-9787.1974.tb00457.x>
- HAYEK, F. A. (1966): *Monetary theory and the trade cycle*, Augustus M. Kelley Publishing, p. 244.
- HICKS, J. (1937): Mr. Keynes and the “Classics”: A Suggested Interpretation. *Econometrica*, pp. 147–59.<http://dx.doi.org/10.2307/1907242>
- JÁROSI, P., KOIKE, A., THISSEN, M. & VARGA, A. (2009): Regionális fejlesztéspolitikai hatáselemzés térbeli számítható általános egyensúlyi modellel: a GMR- Magyarország SCGE modellje. (Regional development policy impact analysis with general spatial equilibrium model: the SCGE model of GMR-Hungary). *Műhelytanulmányok*, 4. Közgazdasági és Regionális Tudományok Intézete, Pécs: Pécsi Tudományegyetem, Közgazdasági Kar.
- KEYNES, J. M. (1936): *The General Theory of Employment, Interest and Money*, Palgrave MacMillan, p. 472.
- LUCAS, R. E. (1976): Econometric policy evaluation: A critique. in: K. Brunner and A. Meltzer (eds.), *The Phillips Curve and Labor Markets*, Carnegie-Rochester Conference Series on Public Policy, Volume 1, pages 19–46.[http://dx.doi.org/10.1016/S0167-2231\(76\)80003-6](http://dx.doi.org/10.1016/S0167-2231(76)80003-6)
- SARGENT, J. T. & HANSEN, G. D. (1987): Straight time and overtime in equilibrium. *Journal of Monetary Economics*, Vol. 21., Nr. 2-3., pp. 281-308. [http://dx.doi.org/10.1016/0304-3932\(88\)90033-5](http://dx.doi.org/10.1016/0304-3932(88)90033-5)
- SARGENT, J.T. & SIMS, CHR.A. (1977): *Business cycle modeling without much a priori economic theory*. New Methods in Business Cycle Research. Minneapolis: Federal Reserve Bank of Minneapolis.
- VAONA, A. & ASCARI, G. (2012): Regional Inflation Persistence: Evidence from Italy. *Regional Studies*. 46(4), 509–523.<http://dx.doi.org/10.1080/00343404.2010.505913>
- WEBER, R.E. (1986): Regional Econometric Modeling and the New Jersey State Model. *International Series in Economic Modeling*, pp.13–39.http://dx.doi.org/10.1007/978-94-009-3267-8_2
- ZHANG, W.B. (2014): Multi regional economic growth with public good and regional fiscal policies in a small-open economy. *The Annals of Regional Science*. 52(2), 409–429.<http://dx.doi.org/10.1007/s00168-014-0592-6>