Nominal and real convergence in the new EU Member States

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Abstract

The advancement of nominal and real convergence in the process of EU adaptation is of special importance.

The paper studies the main factors of convergence processes in details. It pays special attention to the analysis of potential growth processes Detailed quantitative analysis is carried out covering the last two decades.

The paper uses the concepts of the growth theories in order to describe the real convergence processes. Sustainable convergence assumes that per capita potential growth rate of the less developed countries should exceed continously the indicator of developed countries. The financial and economic crisis of 2008 has resulted, however, in a fundmentally new situation as regards these issues.

Since accession the new Member States have been following transition paths leading to substantial convergence. Yet the pace of this catch up will dwindle over time and may eventually stop - assuming that there are no changes in the policies. After rapid initial convergence the EU-10 countries will increasingly constitute a stagnating "convergence club".

The accession to the stability oriented EMU provides remarkable long term advantages for the NMSs. At the same time important new challenges need to be responded to also in the context of the catch up. The fulfilment of the nominal convergence criteria per se is not enough to ensure a robust long term economic performance in the monetary union. Therefore, the promotion of fiscal and structural policies is required also in the course of the euro-adoption. The basic condition for the real economic convergence is considered the approach among the structure of the economies that might be promoted also by transfers of the cohesion policy.

Mid-term and long-term simulations imply the slow down of European convergence processes and the full stop of convergence in certain countries. All these are significant challenges for the European integration model (single market, Economic and Monetary Union.)

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I. Real and nominal convergence

New challenges of convergence during the crisis

The potential advantages of adopting the euro are of great importance for new Member States (NMSs) inspite of the present severe crises of the Eurozone countries. Euro adoption can contribute positively to long term growth and stability. It has an impact on economic performance through several macro- and microeconomic channels: the stability-oriented macroeconomic framework, access to liquid markets, more trade and foreign direct investment, lower transaction costs and increased competition.

Indeed, Eurozone membership has to be assessed in a broader context when considering it from the point of view of economic policy. The static view on the state of nominal convergence is not enough (Angeloni, Flad and Mongelli (2007)). In order to take full advantage of the single currency - taking into consideration the restrictions of the common monetary policy and irrevocably fixed exchange rate – the economic policy needs to ensure the proper functioning of the *internal adjustment mechanism safeguarding stability*. Adequate labour- and product market flexibility, as well as sufficient fiscal buffers were identified as the preconditions of successful euro adoption (Rybinski (2007), Darvas and Szapáry (2008)). Closer economic integration with the Eurozone might contribute to mitigating vulnerability against asymmetric shocks.

Considering the special conditions of the NMSs, special attention needs to be paid to the *risks* related to convergence. Countries accumulating huge internal and external deficit are very vulnerable under the conditions of the present crisis. At the same time there has been a progressive price level convergence and real equilibrium appreciation as part of the process. On the other hand the catching up process of the NMSs is effected by globalization and financial integration. The NMSs are highly sensitive against shock impacts due to their relatively small size, high level of openness and greater need for external financing. These

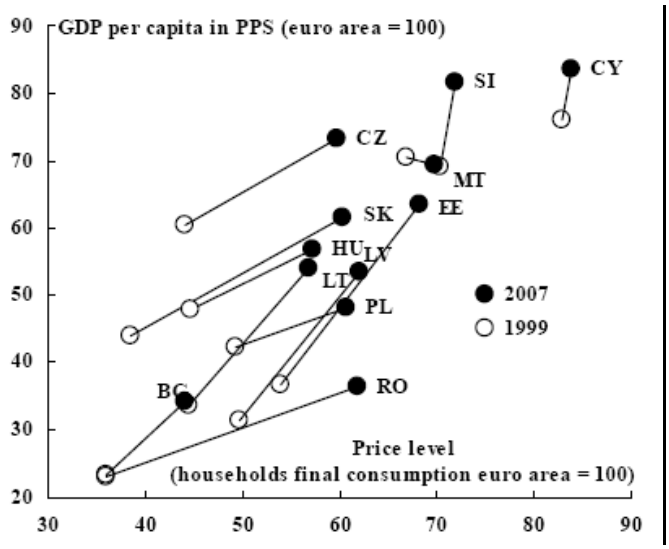
risks have become apparent during the current crisis. The retreat from risk and the search for liquidity by investors might contribute to heavy pressures on the financial markets of the NMSs.

Price level and real convergence

The majority of the NMSs achieved remarkable convergence (taking into account the advancement of macroeconomic stability and the supply side reforms related to EU-accession). Nevertheless, a broad difference among certain member states remained. The new MSs have to face a shortfall caused by the crisis and sharp decline in growth (often accompanied by a decrease in GDP). Certain countries, which had a significant catch-up growth during the past years (e.g. the Baltic States) entered into a recession. Growth in the region has slowed down permanently. Therefore real convergence – within and outside the Eurozone – remains a determinant factor shaping the economic policy strategy for most NMSs in the medium term.

The equilibrium real exchange rate appreciation (price level convergence) is considered a natural consequence of the economic catch-up (De Grauwe and Schnabl (2005)). Real exchange rate appreciation - depending on the monetary policy and exchange rate levels - might occur following two paths (or through the combination of the two): by nominal exchange rate appreciation and/or a higher internal (domestic) inflation. The pace and the channels of the equilibrium real appreciation are of great importance as regards the trajectory of nominal convergence. The fixed exchange rate system (which was introduced by the Baltic States) excludes the nominal exchange rate channel of the real appreciation. Therefore, higher trend inflation is evolving for converging economies than for the anchor area.

Figure 1 Catch-up and price level convergence in the NMSs before the crisis



Source: European Commission, 2009c.

Beyond the Balassa-Samuelson effect further factors effect significantly the dynamism of real appreciation. The pace of the income convergence, the domestic demand growth exceeding GDP growth and the exchange rate regime are significant determinants of the price level convergence dynamics. (Darvas and Szapáry (2008)). In the short term certain factors (e.g. the nominal exchange rate movements, the effect of the changes in the global resource and food prices) might temporarily deflect the inflation rates from the trends supporting price level convergence. (Certain structural factors – e.g. trade liberalization, boosting competition on the product markets, etc. – might have similar effects.) At the same time *not all inflationary differences might be consistent with the need for ensuring competitiveness and external stability of the economy in the medium term*. In certain NMSs the unsustainable domestic demand growth caused the high inflation. This process was fuelled through too optimistic future expectations of the economic agents and/or insufficient economic policies.

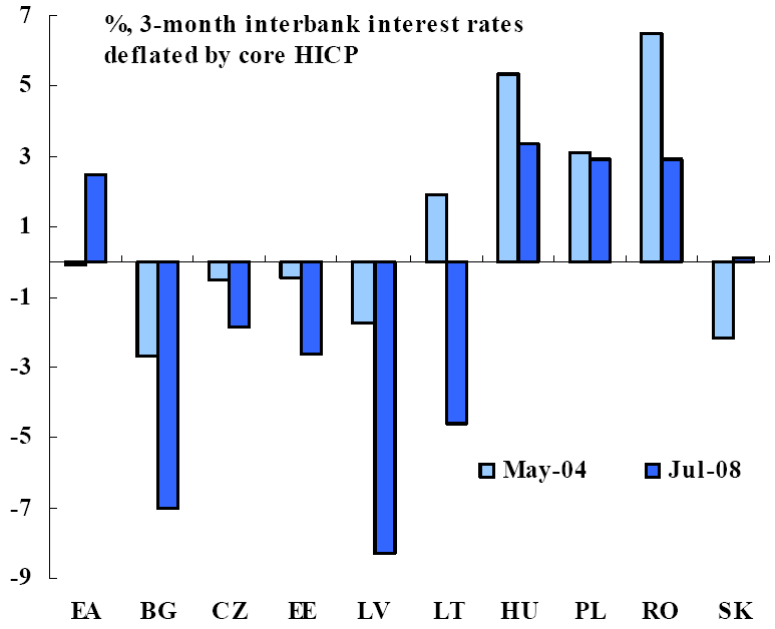
Financial integration and real convergence

The growth dynamism in the NMSs was generally accompanied – sometimes controlled – *by rapid financial deepening and credit expansion.* The financial integration of the NMSs has advanced. The NMSs were able to mobilize their external savings to a great extent due to ongoing convergence and the high returns on investment. The short-term and the long term interest rates have been converging to the Eurozone level. (see Figure 2)

This interest rate convergence mirrored the preceding favourable global environment. On the other hand it showed that EU-accession resulted in increasing confidence. EU-accession and the prospect of joining the single currency mitigated significantly the risk premia. It provided strategy focus and at the same time, a protective screen for trustworthy economic policies. (There were no such factors in the other developing market economies.) In the new MSs the sovereign risk ratings kept improving before and after accession. Following the financial turmoil the *risk perception increased* more generally.

There was higher capital inflow (including FDI) – expressed as a percentage of GDP - in MSs with tight pegs and currency boards (hereafter 'fixers') than in the floating currency countries. At the same time the fixed exchange rate regime resulted in a higher current account deficit. In the case of the 'fixers' the interest rate convergence was stronger. This process often led to negative real interest rates, especially in the case of strong inflation and rapid credit expansion. The 'fixers' started the real convergence process at a lower output level. Therefore the capital return was potentially higher that in turn forced higher capital inflow during the earlier periods of catching up. (European Commission (2008a))

Figure 2 Real short-term interest rates in the new Member States before the crisis



Source: European Commission, 2009c.

The rapid financial deepening and high capital inflow are considered a significant challenge to be faced during adaptation. (Darvas and Szapáry (2008)). The rapid credit expansion and the capital inflow in the non tradable sectors (especially housing) might change the composition of final demand. As a result a significant movement of the real exchange rate might come about. *The real appreciation and the external deficit might become excessive* due to unjustified optimistic expectations of the economic agents and insufficient economic policies. *An 'overshooting' of the real exchange rate may hinder the achievement of fast and sustainable nominal convergence*. It might cause further difficulties on the road towards the Euro. In the coming years painful macroeconomic corrections could be required due to the increasing deficit. The credit growth has slowed down under the circumstances of the global crisis. Liquidity conditions have become tighter. The risk perception of credit providers and credit takers has intensified. The financing conditions have become worse in those countries

where high external and internal deficit has developed and foreign currency lending was significant. (e.g. Baltic States, Bulgaria, Hungary, Romania.)

Following EU enlargement in 2004, four new countries fulfilled the criteria required for the adoption of the Euro. The other counties mostly made some steps as regards the fulfilment of the nominal convergence criteria. Their economic structure got closer to that of the Eurozone, but there are significant differences among the MSs.

NMS countries prepare themselves for euro adoption under very different conditions. It is of great importance to outline adequate national strategies. As a fundamental factor of these strategies the *sustainability of the convergence* should be ensured. Nominal convergence needs to be achieved and sustained by taking into account globalization and financial integration which are peculiarities of the environment.

The main current challenge is the crisis management in countries with high domestic and external deficits. A well-balanced macroeconomic policy-mix and responsible wage policy is required to avoid painful macroeconomic corrections in the coming years. Strong financial supervision is needed and at the same time all counties should keep progressing towards convergence.

The proper functioning of internal adjustment mechanism of economic policies and the focus on prudent macroeconomic aspects could ensure that NMSs take better advantage of the single currency. Flexible domestic production factors and product markets favour smooth adjustment to economic and financial shocks. The future members of the Eurozone have to push on with adequate fiscal and structural policies according to the Stability and Growth Pact (SGP), the Lisbon Program and beyond.

II. Convergence and catching up

Convergence and catch-up cannot be considered as an automatic result of EU-accession. The catch-up processes of the MSs can be analysed methodologically by means of growth

accounting, through a production function approach and the calculation and interpretation of the catch-up rate.

The pace of catching-up and convergence are not identical concepts. Both concepts may be interpreted in a negative light. However, their dynamics are not identical: *catching-up* is the distance to be travelled, while *convergence* expresses the measure of progress. Consequently, in the context of growth, the extent of the catch-up will be greater in the case of a narrower residual difference, while the measure of convergence shall accordingly be lower.

Convergence and growth. Potential growth and sustainable convergence

Precondition for convergence among economies is economic growth moreover economic growth of catch-up countries that is intentionally faster than growth in developed countries. (Convergence in the study is considered as real convergence, convergence of per capita GDP levels. When per capita GDP levels are diverging that is called divergence.)

One of the most important conclusions of the neoclassical growth model is the *convergence hypothesis*. (Mankiw et al. (1992)). The convergence-mechanism described in the model is as follows (See Barro (1991)): If the savings rates and the population growth rates are identical in each economy and there is unlimited access to the same technologies, then the relative capital intensity *(k)*[1] determines the per capita GDP differentials among countries. Neoclassical theories assume diminishing marginal product of capital. So less developed countries with low capital intensity are predicted to have higher growth rate than rich countries during transitional periods heading towards steady state equilibrium. In the case of countries with the same steady state growth path per capital GDP differentials are constant. (Those can be explained by e.g. shocks influencing certain key factors.) Transitional growth paths of countries concerned are leading towards common steady state. *This type of convergence is unconditional i.e. absolute convergence.*

[1] In an economy *k* equals average fixed capital per worker.

Under specified circumstances this might be the result among relatively homogeneous country groups or groups of regions. (E.g. Member States of the EU15 or States of the USA) However, most economies differ significantly in terms of important factors (e.g. savings propensity, governmental policies or population growth). *Those are heading this way towards different steady states*. Consequently the general convergence trend of the Solow-model is conditional. Each economy converges towards its own steady state that is determined by its own savings and population growth. (Mankiw, (1995))That's why *according to conditional convergence the growth rate of the transitional path is high, if the initial per capita output of a country is low compared to its long-term steady state*. If the countries reach their own steady state, then the growth rates level off parallel to the rate of technical progress. If the steady k^* of rich countries is higher than that of poor countries, there is no chance of convergence in absolute terms.

The most important difference in *endogenous growth theories* – as regards the above mentioned - is the lack of assumption on decreasing return to scale. The endogenous models assume constant or increasing marginal product of capital.

This paper focuses on *economic growth and unconditional (absolute) convergence across EU Member States (between old and new MSs, developed old and new MSs.)* during the past decade, following the financial and economic crisis.[2]

Real convergence assumes transition of catch-up economies, a growth path that is more dynamic than that of the more developed countries. The processes of growth can be analysed also in the context of *actual* growth mainly ex post.

It is, however, of high importance to reveal the potential growth trends. *The potential growth* is a cumulative indicator reflecting the sustainable and non-inflationary growth generating capacity of the economy. The potential growth rate indicates the steady-state economic

[2] Novel approach to unconditional convergence –highlighting sectoral difference – appears in Rodrik's work (2011).

dynamics. Unlike the actual growth rate it does not contain cyclical factors. (The difference between the actual and the potential growth rate is considered the output gap i.e. a fundamental indicator of the boom.)

Starting point of the paper is that unconditional convergence might occur if per capita potential growth rate of the catching-up countries exceeds permanently and significantly the potential growth rate of the developed EU countries. *Higher rate of per capita potential growth is a pre-condition of sustainable convergence.* Calculation of potential growth is summarized in the Annex.

Based on empirical researches convergence can be observed in country groups with relatively homogeneous economic conditions. However, convergence does not show up in countries being significantly different from each other. According to international scientific literature convergence can be proven in OECD-countries among States of the USA, Prefectures of Japan or MSs ofthe EU. Barro, Sala-i Martin (2003) Baumol (1986) claim, that 'convergence clubs" exist and economic growth resulting in convergence might occur in countries having adequate human capital and institutions.[3]

The convergence in the EU during the past decades showed a relatively steady pace. The inverse relationship between growth and the level of income is considered *β-convergence*. In the case of *β-convergence*, poorer countries get closer to the richer ones. The β-convergence ratio depends on the economic policy and other country-specific factors. It indicates how long convergence will take place (see Barro and Sala-i Martin (1992)). The pace of *β-convergence* was 2,1-2,3% among countries over the period 1960-2003. The pace of β-convergence in the EU27 during the half decade prior to accession (1999-2003) was 2.3% annually and increased to 3,4% between 2004 and 2008 (European Commission, (2009c)). The growth in the new

[3] In the case of *β-convergence* less developed countries grow at a faster pace than developed countries. I.e. there is negative relationship between initial level of income and growth rate. In the case of absolute (unconditional) β-convergence the output per capita shows a convergence trend even if no other factors having an impact on output are examined.

Member States with lower income was faster than in the old Member States. The *catch-up process accelerated after the accession.* It is an essential question whether this accelerated process is sustainable or not (see Halmai-Vásáry (2010a)).

Table 1 compares per capita GDP (PPS) among country-groups of the EU and CEECs which joined the EU in 2004 and 2007. Descriptions of the country-groups in detail are to be found in Section 3.2.2. (Table 1 indicates per capita GDP levels in terms of the average of the 'Developed' country-group (11 developed EU Member States). This average exceeds both EU27 and EU15 averages.) As it can be seen there was no substantive catch-up in the average of 'Catch-up' and 'Vulnerable' new Member States between 1995 and 2000 due to drawn-out transitional recession and its consequences. Between 2000 and 2008 the pace of catching-up was significant: per capita GDP increased from 44.5% to 55.5% in 'Catch-up' countries and from 28.9% to 45.2% in 'Vulnerable' countries. During the crisis this development came to a sudden stop and divergence occurred instead of convergence in the 'Vulnerable' country-group.

There is a significant difference in the catch-up performance in the different countries. Catch-up countries improved their positions especially after 2000. In the one and half decade examined the relative level of per capita GDP increased in this group in the interval of 12.1% (CZ) and 25% (SK). Among 'Vulnerable' countries the Baltic States had remarkable catch-up performance until the period before the crisis. The highest rate was to be measured in Estonia (30.2%). In the other Baltic States (LT, LV) it was 24%. At the same time their relative position fell back (the rate was 3-5%). The southeasternEuropean countries (BG, HU, RO) had more moderate and rugged catch-up performance (3.6-14.7%).

The convergence among regions seems to be faster. The caution is, however, justified: on the one hand the pace of convergence might be very different in certain countries and periods, on

the other hand the method applied to quantify the above mentioned indicators could cause distortion.

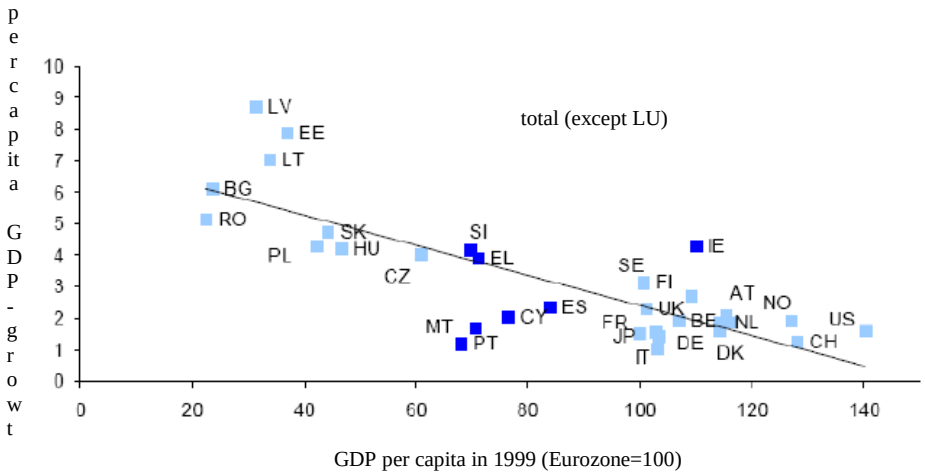
The *economic integration favoured only a limited number of regions, especially at the outset*. Among these are the most dynamic and innovative regions of certain countries that could be mostly favoured through potential externalities in the entire EU-economy (Gianetti (2002)). As a result the convergence increases at country level, however, that increase is driven only by a few regions. At the same time the level of GDP per capita might move further apart within countries. This conclusion is very important for the new Member States where the disparities of GDP per capita within countries are higher in our days than the disparities in earlier periods of the development in the EU15. *Internal disparities may grow – at least temporarily – as country level convergence progresses.*

Progress towards convergence in the decade preceding the financial and economic crisis which broke out in 2008 is illustrated in Figure 1 through a simple regression. Besides the EU MSs also Japan, USA, Norway and Switzerland are depicted.

To benchmark the catch-up performances in a more sophisticated way the extended neoclassical growth theory needs to be applied. According to this framework, growth depends on the relationship between the initial output (y) of a country considered and its steady-state level (y^*). The latter depends highly on savings, work supply (related to households' savings) government policies and institutional factors. As for certain determinants of y^*, the growth rate changes inversely with y (conditional convergence), while in the case of a given y, growth varies directly with y^*. Actually, the change in the steady-state income explains the acceleration of the catch-up process in certain countries and the slowdown in others. Government policies affecting growth include fiscal policies (tax mix, composition of public expenditures) monetary policy and institutional choices. (Barro and Sala-i-Martin, (1992)

(1995); Chalk and Tanzi, (2002)). Therefore growth might be relatively sluggish, even if the initial level of output is low and the steady-state output level is low, as well.

Figure 3 Convergence trend during the decade before (1999-2008)



Source: European Commission, 2008a.

Figure 3 clearly emphasizes disparities between the catch-up performances in the decade preceding the crisis. Exceptional growth is recorded in the Baltic countries as well as in Ireland, and in the development of certain 'Nordic' Member States carrying out bold structural reforms (Sweden, Finland). Nonetheless, unfavourable dynamics are observed in Portugal, Malta and Cyprus, as well as in the larger continental Member States.

Economic integration promotes convergence. Convergence among EU-15 countries to be observable for several decades is a significant result of integration.

The internal market with the four freedoms assumes real convergence among Member States. If the convergence of the per capita GDP-level of the MSs having different development level is low or there is no convergence, then the possibility of the free movement of people would cause an enormous migration. (From less developed and hardly converging or not converging countries towards the developed Member States.)

Table 1 Development of per capita GDP (PPS) in the EU Member States(%)

Country groups		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Development of per capita GDP (PPS) in the main country-groups of the EU (%)																	
Developed		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Catch-up		40.8	42.7	43.7	44.4	44.6	44.4	44.9	45.6	46.7	48.4	49.2	50.4	53.3	55.5	58.5	58.4
Vulnerable		29.8	29.9	28.9	28.5	28.4	28.9	30.8	32.5	34.6	36.1	37.2	39.4	41.7	45.1	44.7	43.6
Mediterranean		83.8	84.4	84.7	86.3	86.0	86.2	87.6	86.3	86.4	84.9	84.7	85.8	86.6	87.0	87.6	83.7
Mediterranean 2		70.9	71.8	72.8	74.6	75.7	76.2	77.7	79.6	80.5	80.5	81.2	83.5	84.4	84.5	85.3	82.3
Development of per capita GDP (PPS) in newMember States of the EU (%)																	
Catch-up	CZ	59.0	61.4	59.5	58.4	57.6	56.5	58.7	58.8	61.7	63.3	64.1	65.4	68.4	69.8	71.0	68.5
Catch-up	PL	34.7	36.5	38.3	39.4	39.9	40.0	39.7	40.4	41.0	42.7	43.1	44.2	46.7	48.7	52.9	53.4
Catch-up	SL	60.1	61.4	63.6	64.7	66.9	66.1	66.7	68.6	70.2	72.6	73.9	74.4	76.0	78.8	76.5	74.8
Catch-up	SK	38.6	40.7	41.8	42.8	41.8	41.3	43.9	45.3	46.6	47.7	50.6	53.9	58.4	62.5	63.6	63.6
Vulnerable	BG	25.9	23.3	21.7	22.3	22.7	23.5	24.9	26.5	28.4	29.1	30.7	32.3	34.3	37.6	38.4	37.2
Vulnerable	EE	29.2	30.7	34.3	35.0	35.3	37.4	38.8	41.6	45.8	48.1	51.8	56.0	59.4	58.7	55.5	55.9
Vulnerable	LV	25.3	26.4	28.2	29.2	29.7	30.4	32.5	34.3	36.5	38.4	40.9	43.8	47.8	48.7	45.1	44.3
Vulnerable	LT	28.7	30.1	31.8	33.5	32.0	32.6	34.6	36.7	41.4	42.3	44.6	47.0	50.5	52.9	47.7	49.9
Vulnerable	HU	41.9	42.3	43.4	45.2	45.1	46.1	49.4	51.5	52.7	53.2	53.3	53.5	53.6	55.6	56.6	55.1
Vulnerable	RO	26.4	27.0	24.2	21.9	21.8	21.7	23.2	24.5	26.3	28.7	29.6	32.7	35.7	40.4	40.3	38.6

Source: own calculation based on Eurostat's data

Notes: Definitions of each country-group are described in a following Section.

That is the system of the four freedoms without constraints would not be sustainable in the long-run if there is no significant convergence. (Similarly implicit condition of the economic and monetary integration is – besides the explicit nominal criteria –the development towards real convergence. Its permanent lack might cause insufficient productivity and competitiveness of countries concer

Quality of the catch-up and real convergence

The faster growth in the NMSs after EU-accession and before was based mainly on *faster domestic demand growth*. (Table 2)

Table 2 GDP growth and its main demand factors

Annual average change as percentage (fixed prices)	New Member States		Old Member States	
	1999-2003	2004-2008	1999-2003	2004-2008
GDP	3,4	5,6	2,2	2,2
private consumption	4,0	5,5	2,5	1,7
public consumption	3,1	2,3	2,2	1,8
gross fixed capital formation	2,0	10,2	2,3	3,4
export	8,7	11,8	4,8	5,7
import	7,9	12,4	5,0	5,6
contribution to the GDP growth				
- domestic demand	3,4	6,4	2,2	2,1
- net export	0,0	-0,8	0,0	0,1

Source: European Commission, 2009a.

After the enlargement the dominant factors of the domestic demand growth were *private consumption* and the *gross fixed capital formation*. The government consumption growth was, however, somewhat more moderate. At the same time import usually grew to a greater extent than export in the NMSs.

The gross fixed capital formation increased also in the EU-15. As the dynamics of the private and public consumption growth mitigated in these counties the dominant demand-side factors of the economic growth were increasing investments and exports.

Among the NMSs the Baltic States had the highest economic growth in the half decade preceding the enlargement. In the years after enlargement (5 years) Slovakia became one of the countries with the most dynamic growth performance. The contribution of the domestic demand to the growth exceeded the annual average 6% in three countries (Bulgaria, Estonia, Latvia). In four other countries (Poland, Lithuania, Romania, Slovakia) the contribution of the domestic demand growth reached the indicated share after the accession. Before accession the net export contributed to the growth only in Cyprus, Poland and Slovenia, after accession the Czech Republic and Hungary could be added to the above mentioned group.

In the Baltic States and the new Balkan MSs the growth based on domestic demand was dominant. At the same time after accession in certain Central European Countries (Czech Republic, Hungary, Slovakia) the demand structure of growth was more rebalanced.

The output gap in the EU-27 in the period 2004-2008 reached 1,4% of the GDP. In the old MSs the positive output gap narrowed at the outset while the negative output gap in the new MSs switched to a great positive difference (over 3%)[4].

The catch-up process was partly based on exuberant demand. The process was financed through cheap credit. At the same time notable current account deficit arose in the countries concerned. The growth as a basis of catching up outpaced the supply potential of the economy.

This dynamics was not considered sustainable. In 2008 a strong growth correction was launched. The *real convergence prospects* have *deteriorated drastically* due to the global crisis and the accumulated macroeconomic equilibrium problems.

There has been a deep recession in the NMSs mostly as a consequence of the crisis. The national economic performances have declined significantly. In order to stimulate real convergence and the catch-up process' macroeconomic equilibrium, investments increasing

[4]Own calculation, based on the database of the EPC Output Gap Working Group.

the productivity and growth based on highly educated workforce are required. Precondition of the sustainable dynamism and the *sustainable convergence* is the simultaneous fulfilment of these criteria.

III. Crisis, potential growth, convergence

Growing risks, slowing growth

The financial and economic crisis started in 2008 caused an extraordinarily rapid decline in the economic performances. The slow-down has gradually become a global recession. This hit especially the USA and the EU. *New risks* have emerged, which will burden the economic activities in the future, too. Recovery has started in the economy in 2010. It will be however slow and discursive. (The growth in the EU had slowed down by the end of 2011.)

It is a real risk that *weak potential growth performance and slow recovery can be expected in that prolonged period*. Taking all these risks and threats into account *more negative growth prospects* can be observed as it was outlined by the method (production function based on supply-side approach) used so far. *This is confirmed also by the medium-term simulations.* (See section 3.2.)

The financial crisis causes lower contribution of the labour and capital formation to the growth and results in unfavourable TFP. *The longer-term* labour market trends (e.g. the unfavourable dynamics of the working age population) affect negatively the potential growth rate. The recession intensifies these negative impacts.

Empirically it is to be proved, that a *financial crisis might coexist with drawn-out or steady-state output decline*. According to empirical researches a significant decrease in the potential growth rate was to be observed together with extended bank and financial crisis. (Cerra, Saxena et al. (2008), Haugh et al. (2009)) According to experiences gained in certain countries (Japan, Finland, Sweden) at the beginning of the 1990's the financial shock causes a

significant decline in the potential growth rate. This process is led by *permanent increase in unemployment and fall in investment rate*.

Factors of the downward pressure on the investments:

- increase in risk premia calculated for entrepreneurial and household credits;
- correction towards the 'normal' rate of the investment level, which evolves following the excessive investment rate of the boom period (generated by the financial and housing bubble).

Simulations carried out using the Quest model (see Ratto – Roeger – in't Veld (2008)) confirm the negative effects of the adjustment disturbances on the labour and product markets, the *nominal rigidity and the higher structural unemployment* on the potential growth. The simulations show the function failure of the labour market, they show that there is no nominal wage adjustment after the crisis. This nominal rigidity might result in the decrease in employment and the increase in the structural unemployment.

Deceleration* of potential *economic growth (Medium-term quantitative analysis)[5]

Slowdown in potential growth

In the medium term estimations *the uncertainty is considerably high as regards the forecasts on investments and total factor productivity*. On the one hand the moderate investment dynamics of the recovery period that is caused by the financial market problems, the growing cost of capital, and the shocked capital allocation system, on the other hand the problems of the capital allocation system and because of all of these the slower dynamics of the inevitable structural transformation intensify the uncertainty and the possibility of adverse trends. So there are several factors having significant impact through the capital accumulation channel. Thus the change in the TFP or the capacity utilization can be measured only loosely.

[5] The analysis is based on the database calculated according to the production function methodology of the EPC Output Gap Working Group (OGWG). The data were grouped and processed by the authors.

Considerable depreciation rate and at the same time the impacts of the crisis on the innovation and the structural transformation of sectors need to be taken into account.

In 2009-2010 the *potential growth rate of the old Member States (EU15)* dropped *to less than half of that measured in 2006-2007*. (I.e. the annual growth rate of 1.9% decreased to 0.9-1.0%. See table 3.) The situation in the new MSs (EU12) is more or less the same. The growth rate is, however, higher in their case as they are catch-up countries (2.4% in average per year in 2010). In the EU15 the decrease in the potential output is to be explained mainly by the decreased contribution of the capital factor and to less extent by the decreased contribution of labour. Structural unemployment is expected to rise by 0.6-0.7% and the investment as a share of GDP might decrease by nearly 3%. The dynamics of TFP had been very low in the EU-15 even before the crisis and it became more moderate after the crisis broke out. (From 2013 onwards it will grow at a very low rate according to the simulations. This TFP assessment is relatively conservative. It does not take into account that there is a one-off downward shift in the TFP level related to the change in the industrial structure.)

The financial crisis resulted in a strong decrease in the potential growth rate in the EU12: from 4.3% per year in 2008 to 3.0% in 2009 and 2.4% in 2010. The different factors of the potential growth react basically similarly to the financial crisis both in the Euro zone and the EU15.

Table 3 Potential growth in the European Union

	Potential growth (as percentage of the annual change)	Contribution to the potential growth			NAIRU (as percentage of labour force)	Investment ratio (as percentage of potential output)
		Labour	TFP	Capital		
EU15						
2001-2005	2.1	0.4	0.7	0.9	7.8	19.7
2006	1.9	0.4	0.8	0.7	7.7	20.7
2007	1.9	0.3	0.9	0.6	7.7	21.4
2008	1.5	0.2	0.8	0.5	7.9	20.8
2009	0.8	0.0	0.4	0.4	8.2	18.1
2010	0.8	0.0	0.4	0.4	8.3	18.0
2011	0.8	0.0	0.4	0.4	8.4	18.1
2012	0.7	-0.1	0.4	0.4	8.6	18.1
2013	0.9	-0.1	0.5	0.5	8.7	18.5
2014	1.0	-0.1	0.5	0.5	8.8	18.8
2015	1.1	0.0	0.5	0.5	8.8	18.9
2016	1.1	0.0	0.5	0.6	8.9	19.0
EU12						
2001-2005	3.6	-0.3	1.6	2.3	11.7	21.6
2006	4.5	0.6	2.0	1.9	10.1	24.3
2007	4.6	0.7	2.3	1.6	9.3	27.0
2008	4.3	0.6	2.3	1.4	8.8	27.6
2009	3.0	0.3	1.5	1.1	8.5	22.8
2010	2.4	0.4	1.3	1.0	8.6	21.7
2011	2.2	-0.1	1.3	1.0	8.8	21.9
2012	2.1	-0.1	1.2	1.0	9.1	21.8
2013	2.2	-0.1	1.2	1.0	9.3	22.0
2014	2.2	-0.1	1.2	1.1	9.4	22.4
2015	2.2	-0.1	1.2	1.1	9.4	22.5
2016	2.2	-0.2	1.1	1.2	9.4	22.6

Source: own compilation based on the OGWG database

In the mid-term there seem to be no significant differences in the trends of the EU15 and EU12. Potential growth rate of the EU15 might increase again after 2012 based on the simulations. (The dynamics, however, might be much lower than that preceding the crisis.) *The potential growth rate of the EU12 is decreasing until 2012 and between 2013 and 2016. Not even the half of the average annual growth rate of the period from 2004 to 2008 will be exceeded*. The contribution of the capital accumulation – after the big decrease following the

crisis – is expected to decrease further between 2012 and 2016. TFP dynamics will recover only partly in the period indicated. Structural unemployment is increasing further on and labour is having a negative impact on potential growth. (It is mainly due to the significant decrease in the growth rate of the working age population.) *These growth prospects constitute new challenges in terms of real convergence.*

Potential growth in the main country groups

The financial crisis has affected the different MSs to different extent. *The symmetric shock has had asymmetric consequences*.

The intensity of the impacts of the financial crisis depends on the *initial circumstances* and the *vulnerability* originating from them. The overvaluation of the housing markets, export dependency of the economies, their current account position, the size of the financial sector and the exposure to risky assets might have a significant role. Potential growth rate, investment rate, structural unemployment (NAIRU) etc. differ to a great extent in the individual MSs. Henceforth in our quantitative analysis countries of the EU27 are categorized into 4 groups based on GDP per capita in PPS, the current account balance, the investment ratio (as percentage as of the potential GDP), the advancement in the field of the Lisbon Agenda and the composite innovation index of the MSs (SII).(As for the latter See UNU-MERIT (2011)) Data originates from a half of a decade preceding the financial and economic crisis.) The categories were justified by cross section results of a discriminance analysis for 2005 and 2008. [6]

The group of the 'Developed countries' (AT, BE, DE, DK, FI, FR, IE, LU, NL, UK, SE) contains the continental, Scandinavian and Anglo-Saxon countries of which average development exceeds that of the EU27. Per capita GDP in PPS exceeded the 110% of the

[6] The discriminance analysis carried out couldn't be included due to size limitations, the results are available from the authors.

EU27's average in the countries of this group – with the exception of France – between 2005 and 2008. The covered interval was between 104% (France) and 133.1% (Ireland) in 2008 (except for Luxemburg, where this ratio was 280% in 2008).

The *potential growth dynamics has been moderated* in the 'Developed' countries since the beginning of the 2000s. The decrease in growth was rather peculiar to continental countries than Anglo-Saxon and Scandinavian ones which had better result as regards the structural reforms[7]. In most countries concerned there was a current account surplus during the years examined (with the exception of FR, IE and UK). Most countries joined the Eurozone (except DK, SE and UK). Because of the sensibility of the international financial relations and the higher trade-exposure and other factors the recession was deeper in the Anglo-Saxon countries compared to the continental ones.

Besides the abovementioned 'Developed' group the following 3 country-groups ('Mediterranean', 'Vulnerable' and 'Catch-up' countries') contain those Member States, which have been more or less lagging behind the most developed EU Member States i.e. the catch-up has not occurred, yet.

Dynamics of potential growth was very low in some 'Mediterranean countries' (IT, PT) for years, but it fell greatly also in the others (EL, ES, MT) at the outset of the crisis. Current account deficit and significant structural deficiencies were typical in these MSs. Certain countries (ES, IT) reached the average of the EU27, but they lagged behind the average of the EU15 and in certain cases the per capita GDP in PPS decreased compared to the average of the EU27 during the last years. (In the case of Italy the indicator reached the level of the

[7] That's why the 'Developed' country group was further divided into two country groups namely the 'Continental' and 'Reform' country groups in other studies. (The latter contains besides the Anglo-Saxon and Scandinavian countries also Austria and the Netherlands. See Halmai, Vásáry (2010b), (2011))

'Developed countries' around the year 2000, but it was only 88.6% of that in 2005 and 89.9% in 2008.)[8]

The *'Catch-up'* NMSs covers the MSs joined the EU in 2004 which showed favourable growth and convergence prior the crisis (CZ, PL, SK, SL). 2 smaller countries among them are members of the Euro zone, but the two bigger countries are not. All the countries classified as 'Catch-up' NMSs had current account deficit. (It was however relatively moderate in this group before the crisis.)

The 'Vulnerable' NMSs group consists of the Baltic States and Hungary which joined the EU in 2004 and Bulgaria and Romania which joined the EU in 2007. With the exception of these two countries (BG, RO) the potential growth rate decreased before the crisis. There was little advancement as regards the structural reforms. The countries – with the exception of Estonia - were not members of the Euro zone.[9] The current account deficit was mostly high prior the crisis (two digit!). *Dependency on external financing and the resulting vulnerability is very high*.

The characteristics of the groups and the countries in the groups are indicated in table 4. The per capita GDP (PPS) of the country groups and each MS compared to the 'Developed' country group is contained in table 4.

[8] Based on the per capita GDP (PPS) Italy belonged definitely to the developed core of the EU until the beginning of the 2000s. It used to be a target for catching-up countries. From the beginning of the past decade the Italian economic growth slowed down and started to stagnate. So, several indicators became similar to those which are characteristic in other Mediterranean countries. Data in table 4 indicates that the Mediterranean 1 country group containing also Italy has got closer to the Mediterranean 2 country group since 2003. In certain years indicators of GDP level of Spain exceeded those of Italy.

[9] Estonia has become a member of the Euro zone from 1st of January 2011.

Table 4 Main characteristics of the county groups in the EU

Country group	Potential growth rate		GDP per capita (PPS) %		Current account balance (as percentage of the GDP)		Investment ratio (as percentage of the potential output)		Lisbon performance[b] (2005 data in brackets)
	2005	2008	2005	2008	2005	2008	2005	2008	2008
'Developed countries' [(a)] (AT, BE, DE, DK, FI, FR, LU NL, UK, SE)	1.2-2.6 [(a)] (except IE)	1.2-2.3[(a)]	100	100	2.2-7.5[(a)] (except FR,UK)	1.1-8.8[(a)]	16.9-21.7[(a)]	17.6-23.7[(a)]	6.2
'Mediterranean' (CY, EL, ES, IT, MT, PT)	0.8-3.9	0.5-2.7	84.7	87.1	from -1.2 to -11.0 (except CY)	from -2.9 to -17.9	19.3-29.8	15.3-28.9	20.4 (19.4)
'Catch-up' NMSs (CZ, PL, SK, SL)	3.9-5.5	3.5-5.3	49.2	55.5	from -1.2 to -8.5	from -2.9 to -6.9	18.2-26.3	23.1-31.2	16.3 (17.8)
'Vulnerable' NMSs (BG, EE, HU, LT, LV, RO)	3.1-7.1	1.5-5.1	37.3	45.2	from -6.3 to -12.5	from -6.9 to -23.2	23.5-34.5	23.2-38.3	19.7 (19.8)
EU27	2.0	1.7	84.5	86.4	-0.3	-1.0	20.0	21.1	14.0
USA	2.4	1.3	-	-	-5.9	-4.8	19.8	17.9	-

Note: (a): Without the date of LU

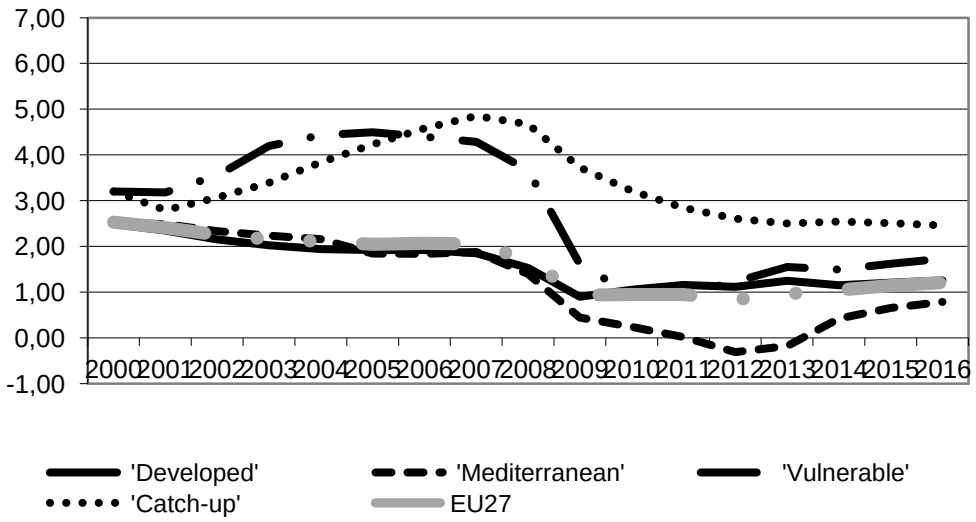
(b): Based on the ranking by Tilford and Whyte (2010), the average value of the ranks of each MSs are calculated. The increasing number indicates that the "Lisbon performance" is getting increasingly unfavourable.

Source: own calculation

Potential growth for the period 2006-2014 is shown in figure 4. Based on the dataset the following needs to be stressed in terms of the country groups. Two country-groups containing the new Member States are studied in a more detailed way.

The 'Catch-up' countries have converged persistently, but potential growth rate is decreasing also nowadays when the countries are getting out of the recession. The catch-up is slowing and development of labour's contribution will be particularly unfavourable in 2013-2014. There is basically no change in structural unemployment. When the crisis hits the bottom, the investment ratio decreases by about 4% and then it starts to increase again, but it won't reach the previous ratio. The contribution of capital to potential growth has been continuously decreasing since 2008. Dynamics of the TFP decreases until 2012 and later on it stabilizes at an annual rate of 1.3%.

Figure 4 Potential growth in the country-groups of the EU



Source: own calculation

Structural unemployment rate will increase by more than 2%.in the *'Vulnerable' countries.* Investment ratio decreased by more than 7% in 2009. That's why the *decrease in the potential*

growth dynamics is dramatic: from an annual 3.7% in 2008 to 0.9% in 2010! The contribution of labour has been negative since 2007. TFP has decreased significantly and it stabilizes at an annual rate of 0.8% only in 2014-2015. That is about half of the rate measured in 2006. Potential growth rate of the country group did not reach the average of the EU27 in 2010. Potential growth rate of this country group is expected to exceed slightly that of the 'Developed' country group only from 2013 onwards, according to the simulations. This group (although the countries concerned are very different) is highly characterized by the *convergence crisis, the catch-up has stopped almost completely in certain countries and years so this group will lag behind the average development level of the EU27.*

The following main trends can be summarised based on the analysis of the medium-term growth processes of the country groups (the main factors of which are listed in table 5.)

Table 5Potential growth and its factors in the country groups of the EU

	Potential growth rate		Contribution to the potential growth					
			Labour		Capital		TFP	
	2010	2016	2010	2016	2010	2016	2010	2016
'Developed countries'	1.1	1.3	0.1	0.0	0.4	0.6	0.5	0.8
'Mediterranean'	0.2	0.8	-0.3	0.2	0.4	0.4	0.2	0.2
'Catch-up'	3.2	2.5	0.5	-0.1	1.4	1.2	1.3	1.4
'Vulnerable'	0.9	1.7	-0.6	-0.2	1.0	1.0	0.5	0.9
EU27	1.0	1.2	0.0	0.0	0.5	0.6	0.5	0.7
USA	*0.8*	*2.2*	*-0.3*	*0.6*	*0.3*	*0.6*	*0.8*	*0.9*

Source: own calculation

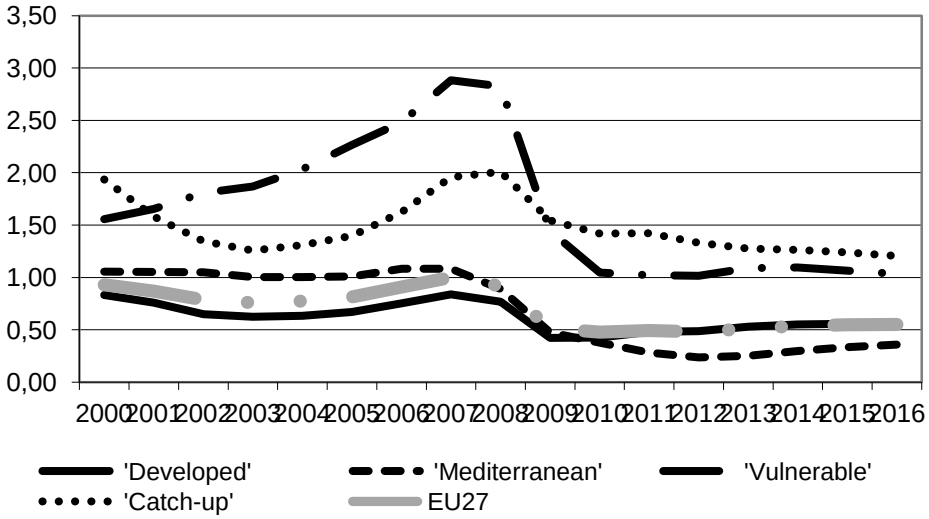
Summarising: *financial crisis might generate significant decrease in the potential output and it might have a remarkably negative impact on labour (on non-demographic driving forces, such as the NAIRU), capital and TFP*.

As regards the potential growth, the individual country groups show substantially different trends. In the developed countries the potential growth rate will recover to a greater extent

compared to the period before the crisis. This indicator is 57.1% in the EU27 in average and 68.4% in the 'Developed' country group. In the other three country groups potential growth rate will recover more moderately: it will be 53.2% in the 'Catch-up' group (2.5% instead of 4.7%), 40% in average (0.8% instead of 2%) in the 'Mediterranean' group, 37.8% (1.7% instead of 4.5%) in the 'Vulnerable' group. As potential growth rate of the less developed countries is decreasing to a greater extent than in the 'Developed' country group, *growth rates of the different country groups are getting closer to each other*. (But it cannot occur in terms of the potential growth level. That is: *a surprising convergence might develop in the growth rate of the basically different country groups.* (See figure 4)

Contribution of the individual factors to the potential growth is very different. Structural unemployment (NAIRU) basically won't change in the 'Catch-up' countries and in the more 'Developed' countries, but it will increase by about 3.5% in the 'Mediterranean' and the 'Vulnerable' country groups. Investment ratio in the developed countries will be lower in 2016 by 1% compared to the level preceding the crisis. It decreases by more than 3% in the 'Catch-up' countries, by more than 5% in the 'Mediterranean' countries and by more than 7% in the 'Vulnerable' countries according to the simulations. Contribution of labour is negative in average in the EU27 between 2009 and 2016. (This indicator – except for one year – is negative.)Impact of labour is negative in the 'Catch-up' and the 'Vulnerable' countries. Contribution of capital is the modest in the 'Developed' and 'Mediterranean' countries. TFP- as the decisive factor of the potential growth in structural terms - will grow after the crisis has hit the bottom, but it will remain at a low level on the whole. (See figure 6) The most unfavourable dynamics of this structural component is to be expected in the 'Mediterranean' and 'Vulnerable' country groups.

Figure 5 Contribution of the capital accumulation to the potential growth

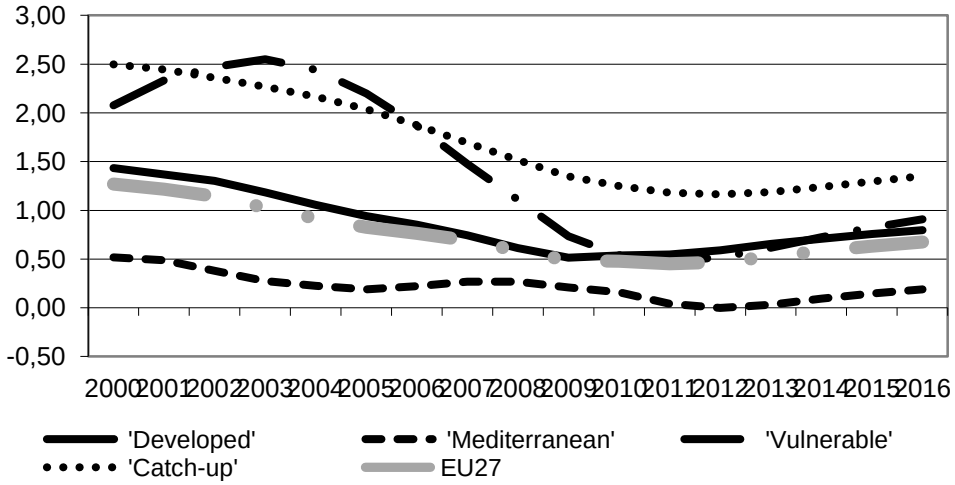


Source: own calculation

As regards the potential growth and the contribution of the individual factors, *the most unfavourable trends were to be experienced in the case of the 'Mediterranean' and 'Vulnerable' countries*. (See figure 7 and 8) In the period analysed the *catch up* will *practically stop* in the country group indicated. (As regards the average value of the 'Vulnerable' country-group there will be a moderate catch-up compared to the 'Developed' countries between 2013 and 2016, according to the simulations.)

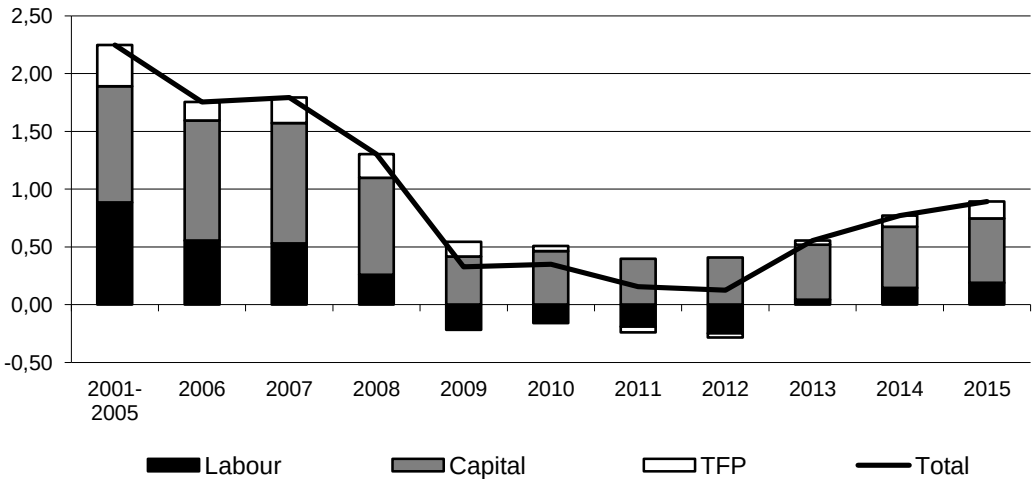
Decrease in the dynamics of potential output in certain EU MSs predicted for the coming years shows a dramatic size. (See figure 7 and 8) In connection with the sovereign debt crisis *the potential growth rate is negative and particularly unfavourable over several years in certain 'Mediterranean' countries*. In the Baltic States the annual increase in the potential output will fall from 5-6% to 1-2%. In the case of Hungary the dynamics of 3-4% fell under an annual 1% after 2008. That is: *in certain new member states the real convergence might stop in the short run and even divergence might occur compared to the more developed countries*. This *convergence crisis* might cause severe tensions in the medium-term period indicated both in the countries affected and the EU.

Figure 6 Contribution of the TFP to the potential growth



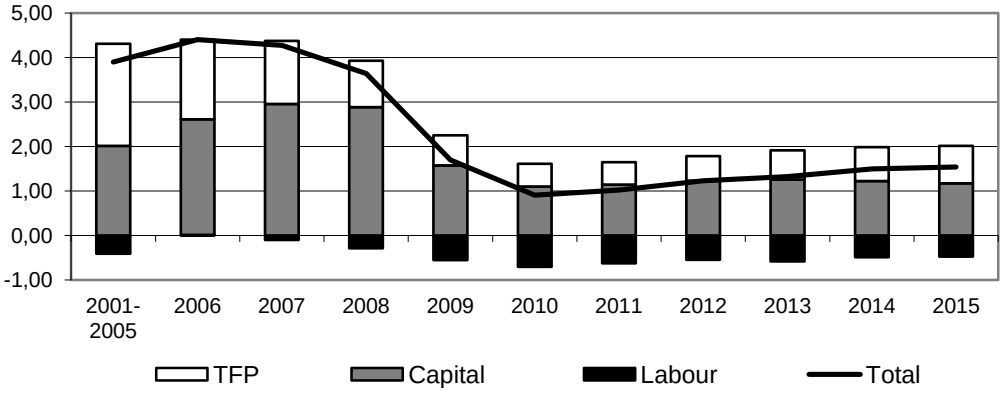
Source: own calculation

Figure 7 Potential Growth and its Factors – ''Mediterranean' Country Group



Source: own calculation

Figure 8 Potential growth and its Factors – 'Vulnerable' Country Group



Source: own calculation

Development of the catch-up potential

Development of potential growth determines the real convergence and the catch-up in the long run. General indicators of real convergence are calculated based on the level and the dynamics of the actual output (adjusted for PPS). (Catch-up rate is based on the abovementioned data, as well.)

At the same time, actual output (and actual growth) cannot diverge from potential output (and potential growth) permanently. Real convergence and catch-up accelerated during that half of a decade which started in 2004, in the year of the enlargement.. At the same time, in the new central – and eastern European member states an average positive GDP gap of 3% per annum developed between 2004 and 2008 (and 4.4 % between 2006 and 2008). It was not sustainable and from 2009 onwards the GDP-gap became negative again. (The same output gap equalled to 5.3% in the 'Vulnerable' country group between 2004 and 2008 and 6.6% between 2006 and 2008. Then the GDP gap was an average of -4.1% between 2009 and 2011 The same rates in the 'Catch-up' country group were in average 2%, 3.4% and -0.9% in the period indicated. In the case of the 'Mediterranean' country-group the annual average was 1.3% in 2004-2008, 1.7% in 2006-2008 and -3.8% in 2009-2015. See table 6).

Table 6Development of the output gap

Country groups	1999-2003 annual average	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
EU27	0.9	0.5	0.5	1.7	2.9	1.6	-3.7	-2.7	-2.1	-2.3	-1.9	-1.3	-0.7	-0.1
EU15	1.1	0.5	0.4	1.6	2.6	1.3	-3.8	-2.7	-2.2	-3.4	-1.9	-1.4	-0.7	-0.1
EU10	-2.0	0.9	1.3	3.4	4.9	4.8	-2.2	-2.3	-1.7	-2.0	-1.6	-1.0	-0.5	0.0
'Mediter-ranean'	1.3	0.6	0.7	1.9	2.4	0.7	-4.0	-3.7	-3.7	-3.6	-2.5	-1.7	-1.0	-0.3
'Vulne-rable'	-2.6	-3.1	3.8	6.1	6.9	6.8	-3.7	-4.7	-3.7	-2.8	-1.5	-1.0	-0.5	0.0
'Catch-up'	-1,7	-0.2	0.2	2.1	4.1	4.0	-1.1	-0.9	-0.7	-1.5	-1.6	-1.1	-0.5	0.0

Note: Output gap is considered the difference of the actual output and the potential output expressed as percentage of the GDP
Source: own calculation

Permanent catch-up assumes that the growth rate of the catch-up countries should exceed the potential growth rate of the more developed target countries permanently. *This permanent potential growth premium might result in sustainable catch-up.* Difference in the potential growth rates of the catch-up and the developed countries shows the catch-up capacity of a country group. This difference in the rate of the potential output dynamics is called *catch-up potential* by the authors.[10] The positive catch-up potential indicates the possibility of the permanently sustainable catch-up and the negative one the lack of it. The catch-up measured by actual growth is possible even if the catch-up potential is negative but it cannot be permanently sustainable. (In the latter case significant GDP-gap might develop after certain time has passed but it cannot be sustained in the long-run.)

Based on the quantitative analysis carried out we can see the *development of the catch-up potential.* Catch-up potential of the central- and eastern European member states can be compared to the average of the 'old' MSs (EU15) or the average of the 'Developed' countries, which is a category used by the authors previously. As the Mediterranean countries can be characterized by significant slow-down in the potential growth (as mentioned before) we analysed the catch-up potential of the new member states (EU10) through a comparison to the 'Developed' countries. (See table 7)

[10] The equation of the catch-up potential is as follows: $cp = -(g_d - g_c)$, where g_d is the per capita annual potential growth rate of the developed target countries, and g_c is the per capita annual potential growth rate of the catch-up countries. Condition of the catch-up potential is that $y_c < y_d$, where y_c equals per capita GDP of catch-up countries, and y_d equals per capita GDP of developed countries.

Table 7Development of the catch-up potential compared to the 'Developed' country group

	CEE NMS - EU10	'Catch-up' countries	'Vulnerable' countries	'Mediterranean' countries
1996	1.4	1.9	0.5	-0.3
1997	1.4	1.9	0.7	-0.3
1998	1.3	1.8	0.5	-0.2
1999	1.0	1.4	0.5	-0.2
2000	0.7	0.7	0.7	0.0
2001	0.6	0.5	0.8	0.1
2002	1.0	0.9	1.4	0.2
2003	1.6	1.4	2.2	0.2
2004	2.1	1.9	2.5	0.2
2005	2.4	2.3	2.6	-0.1
2006	2.6	2.7	2.5	-0.1
2007	2.7	3.0	2.4	0.0
2008	2.7	3.1	2.1	-0.1
2009	2.1	2.8	0.7	-0.5
2010	1.4	2.2	-0.1	-0.8
2011	1.0	1.7	-0.2	-1.1
2012	1.0	1.5	0.1	-1.4
2013	0.9	1.3	0.3	-1.4
2014	1.0	1.4	0.3	-0.7
2015	1.0	1.3	0.4	-0.6
2016	1.0	1.2	0.5	-0.5

Source: own calculation

According to the data of table 7 we can argue that the EU10 countries had relatively significant but remarkably different catch-up potential in the individual periods compared to the developed EU11. Potential growth rate premium exceeded 1% with the exception of 2 years as regards the EU 10 average between 1996 and 2010. The potential was annually 2.1-2.7% between 2004 and 2009. At the same time as regards the average of the 'Developed' countries, the annual potential growth rate was between 2-2.5% before the crisis. (The latter dynamics slowed down after 2001.)

Catch-up potential of the EU10 developed during the last one-and-a-half decade as follows:

- *1996-2003*: it was 27-79% of the annual potential growth rate measured in the 'Developed' countries, i.e. a mild pace of catch-up was facilitated.
- 2004-2009: it was 107-174% of the annual potential growth rate measured in the 'Developed' countries, i.e. *strong catch-up* was possible.

- 2010-2016: due to the crisis - according to the projections –potential growth is expected to decline and the catch-up potential in the EU10 compared to the 'Developed' countries will decrease from 74% to 90% by the end of the period. None the less potential growth rate of the 'Developed' countries decreased as well. But the decrease is more significant – as indicated above – in different groups of the convergence countries. *The average catch-up potential has dropped significantly during the crisis and afterwards.*

As regards the trends described above the *differences are significant* between the individual country groups and countries.

-the Catch-up potential is relatively balanced in the *'Catch-up' country group*: it was positive in each year and it was below 1% of the potential GDP only in 2000-2002. Between 2005 and 2009 it was annually 2.3-3.1%, and it supported a significant catch-up.

-the Catch-up potential was rather extreme in the '*Vulnerable' country group*. The indicator was negative in certain years and it exceeded 1% only in 2002-2008, however, it was over 2% between 2003 and 2008. The catch-up potential decreased drastically during the crisis. The indicator is negative over several years and it is expected to be only 0.3-0.5% in 2014-2016, i.e. 23-38% of the potential growth rate of the 'Developed' countries. *Real convergence de facto stopped* in the *'Vulnerable' country group* after the crisis and it might face divergence in certain years. The changes are rather extreme as regards the individual countries within this country group. This is described by the term '*convergence crisis*'.

Based also on the abovementioned the catch-up potential of the 'Catch-up' and the 'Convergence' countries are significantly diverging. In 2000-2005 this indicator used to be higher in the 'Vulnerable' country group. The size of the indicator has been remarkably diverging between the two country groups since 2008. (Catch-up potential has been significantly decreasing also in the 'Catch-up' countries after 2009.)

In conclusion it needs to be noted that catch-up potential of the Mediterranean countries is changing unfavourably, too. Development of the indicator is very unfavourable over the whole period examined and it has been negative compared to the 'Developed' countries since 2005[11]. *In the Mediterranean countries the trends of divergence have been characteristic over the past years.*

IV. Erosion of the European growth potential. Alternative long-term scenarios

Due to the severe structural productivity problems of the EU15 and the insufficient adjustment to the globalization, a permanent and significant decline in the potential growth rate is to be expected.

Long-run Convergence and Divergence

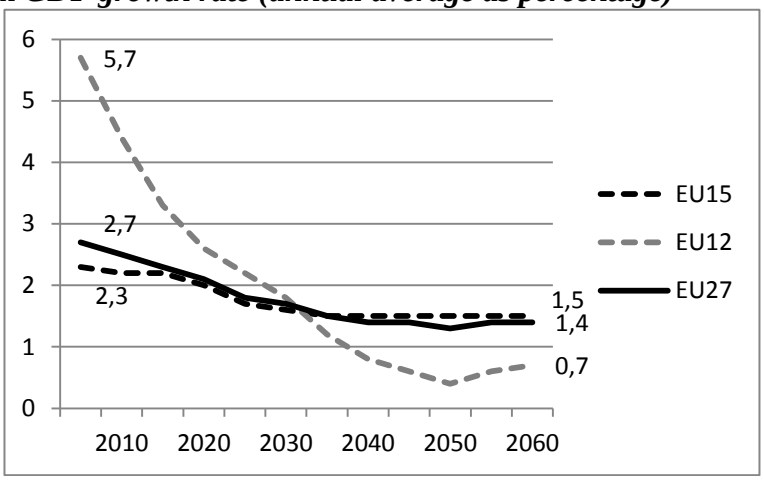
Applying the *production function* approach, the longer-term simulations indicate that potential growth rate both in the EU15 and the EU27 falls. [12](EC (2008b), (2009b)) According to the base scenario this reduction will be continuous, moving from an annual 2.4% in 2007-2020 to an average 1.7% in 2021-2030 and then down to 1.4% in 2031-2060.

The forecasted decline in the potential rate of growth is far greater in the EU10 and EU12 countries than in the EU15 states. Simulations suggest that the output in the EU12 will expand far more rapidly until 2030 than in the EU15 countries, i.e. the convergence process will continue. But as time passes the pace of convergence will slow down, and then stop after 2030. (Based on the simulations, annual GDP in the EU12 will grow by only 0.6% in 2041-2060, compared to a figure of 1.5% for the EU15 countries. That is there is a switch from convergence to divergence, see Figure 9)

[11] In the 'Mediterranean' group not containing Italy catch-up potential is to be shown until the beginning of the crisis (until 2009), but afterwards the catch-up potential became negative also in this group mainly due to the unfavourable potential growth of Greece and Portugal.

[12] In this section we used the quantitative analysis - based on the production functions - that was carried out for the European Commission, (2009b).

Figure 9 Potential GDP growth rate (annual average as percentage)



Source: own compilation based on EC, 2009b

Potential growth rate will decline at a greater pace in the new MSs, thus real convergence will stop from *2030 onwards and even a moderate divergence from the EU15 might occur*. This can be explained by the following factors: productivity growth rate might be rebalanced by 2050 on the one hand, while on the other hand, demographic simulations are significantly more unfavourable in the NMSs than in the old ones.

These processes are represented in the calculations based on the database of the 2009 Ageing Report. The calculations describe the *development of the annual per capita GDP (PPS) and its relative level in the period 2007-2060* in each county and the main EU aggregates. (See table 9, (Halmai - Vásáry (2010a)). Based on the table, catch-up shows *different dynamics* in the countries examined. The *level* of the catch-up *realized in examined countries* is very different, too. At the same time, simulations suggest that the counties would reach the highest relative level of development between 2030 and 2040. After 2060 – *in connection with the European growth process – this relative level of development might be moderate in the countries concerned.*

Table 8Development of the level of per capita GDP in the cohesion countries in the long run (in PPS)

GDP in PPS EU27=100	2007	2015	2020	2030	2040	2050	2060a	2060b
BG	38.3	47.0	50.0	54.8	59.7	59.6	58.5	55.4
CZ	81.5	92.5	96.2	97.9	97.0	94.3	92.8	88.0
EE	72.2	89.0	92.9	99.3	107.0	100.3	102.4	78.4
EL	98.0	103.2	105.8	107.9	104.9	103.4	104.2	78.8
ES	106.9	103.1	106.0	111.4	108.9	103.8	104.7	93.8
CY	92.7	93.8	92.7	98.4	101.0	99.1	101.5	78.9
LV	58.1	74.7	76.7	86.8	88.0	82.1	78.7	65.5
LT	60.5	77.5	84.1	88.4	89.6	87.5	83.3	71.7
HU	63.3	68.7	71.6	76.5	79.5	78.3	77.1	63.4
MT	77.0	80.0	83.8	87.3	87.2	83.7	78.5	91.0
PL	53.6	63.3	66.0	72.6	73.3	69.7	66.4	75.9
PT	74.6	71.6	70.8	73.1	77.2	78.5	77.6	70.6
RO	40.7	52.2	56.5	61.4	65.5	64.0	61.5	39.5
SI	88.7	95.4	99.4	102.5	96.0	94.6	94.3	89.9
SK	68.5	88.4	96.5	104.9	103.5	96.6	93.6	83.4
EU27	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EA16	110.1	107.4	107.0	105.8	104.4	104.0	104.4	102.1

Note: own calculation based on the quantitative analysis of the Ageing Report, 2009 (2060b is based on the 2012 Ageing Report (EC(2011a).)

According to previous simulations *we can argue that full convergence of the income level calculated in PPS might be taken into account in only 2 smaller MSs* also in the long run –-. The main scenario implies *persistent disparity in income* and the *potential development of the 'convergence clubs'* with 90%, 70-80%, 59-62% of the EU-27 average in the long run. (Halmai-Vásáry, (2010a)

Last column of table 7 indicates per capita GDP (PPS) expressed as percentage of the average of the EU27 for 2060 based on the database of the 2012 Ageing Report[13]. (Column 2060 b contains the data) These data having been calculated recently *emphasize to a greater extent the real possibility and threat of the trends described*. According to the calculations of 2012, relative level of development might become remarkably unfavourable compared to earlier

[13] The 2012 Ageing Report was not accessible while this study was prepared. The data were calculated based on the data published in the EC(2011).

calculations. The latest data is more favourable only in Poland, and it is less favourable in all other countries examined. In certain cases it is very unfavourable. According to the latest simulations, divergence might occur also in the case of Greece, Spain, Cyprus and Portugal (i.e. Mediterranean countries) compared to the level projected previously (and also compared to the base year 2007). There is no convergence or it is hardly to be seen in Hungary, Romania and Slovenia. Convergence is moderate in Bulgaria, Czech Republic, Estonia, Latvia, Lithuania, Malta and Slovakia. In the end, the convergence is somewhat more favourable but limited in the long-run in Poland.

Alternative long-term scenarios

Long-term paths indicating the erosion of the European growth potential could be considered rather optimistic based on the analysis of the impacts of the current crisis on potential growth. *In order to calculate the impacts of the current crisis, alternative scenarios need to be set up.* In view of the large uncertainty regarding the length of the slump in economic activity the case of the temporary shock and the case of the permanent shock needs to be defined.[14]

Two temporary shock scenarios can be described: a *'lost decade'* and a *'rebound' scenario.*[15]Those figures are much lower than the baseline projection for the period until 2014.

Potential growth components will then converge to reach the growth rate projected in the baseline:

- in the *'lost decade'* scenario, labour productivity is assumed to reach the baseline growth rate in 2020. Labour input is assumed to reach the baseline growth rate in 2020, too.

[14] In the case of the permanent shock the risk aversion changes significantly. There is a long lasting increase in the risk premia and at the same time in the capital cost, the investment rate and the TFP dynamics is shrinking and at the same time there is a permanent increase in the NAIRU.

[15] The analysis is based on the database applying the production function method of the EPC Output Gap Working Group and the database of the Ageing Report. See EC (2009b)

- in the *'total rebound'* scenario, labour productivity and labour input are expected to reach the baseline level in 2020.

Given the current economic crisis and a very considerable degree of uncertainty, the impact of a permanently worse situation of the growth potential can also be analyzed. This is the 'lasting and increasing loss' (or *'permanent shock'*) scenario. These numbers are much lower than the values calculated until 2014 in the comprehensive long term baseline scenario. According to this analysis the annual potential GDP growth in the EU27 countries is lower in both scenarios by about 0.9% than in the baseline scenario.

Potential growth rate converges to the growth rate of the baseline scenario following these corrections:

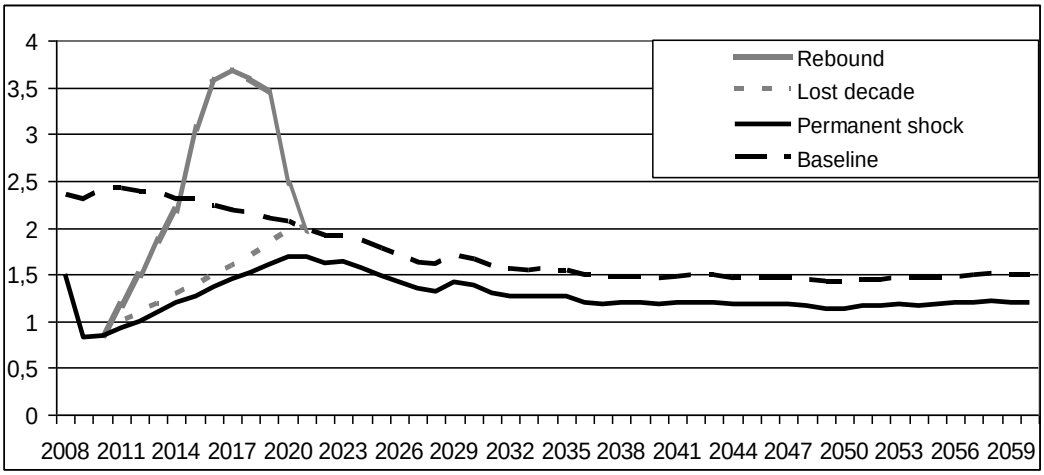
According to the 'lasting and increasing loss' scenario from 2014 to 2020 labour productivity growth and labour input growth will reach the baseline figures, but unemployment rate will be permanently 1% higher than in the baseline from 2020 onwards; and labour productivity growth rate will be 0.25 %, lower than that from 2020 onwards.

The *'lost decade scenario'* causes a lower per-capita GDP level at the end of the period examined, compared with the baseline. It implies *a lower expected potential growth* up to 2020. This period is 'lost' in terms of accumulated wealth creation. The loss in GDP per capita in the EU27 is around 11% in 2020. This scenario carries over the loss in the rest of the projection period. The growth projection remains broadly unchanged between 2020 and 2060. In the *'total rebound' scenario*, the GDP per capita by 2060 is the same as in the baseline (The deterioration relative to the baseline up to 2014 is offset by the improvement between 2015 and 2020). (EC, 2009e)

A more marked reduction in the GDP per capita level occurs in the 'lasting and increasing loss' *scenario*. In that case the GDP per capita is 12% lower than in the baseline in 2020, 16% lower in 2040 and 20% lower in 2060. It means that this scenario reflects significant lower

growth throughout the projection period than it was assumed before. (The growth path of the different variables is summarized by figure 10)

Figure 10 Potential GDP growth under different shocks (annual growth rate)



Source: EC, 2009b

The permanent shocks would result in the complete collapse of the growth and catch-up models in Europe. In the long term one fifth of the GDP would fall out and the chances of real convergence would deteriorate dramatically, though differently country by country.

V. Some conclusions

The main conclusions are the following:

1. An ‘overshooting’ of the real exchange rate may hinder the achievement of fast and sustainable nominal convergence. In the coming years painful macroeconomic corrections could be required due to increasing deficit. The credit growth has slowed down under the circumstances of the global crisis. The financing conditions have become worse in those countries where high external and internal deficit has developed and the foreign currency lending was significant.

The simultaneous sustainability of the nominal and real convergence is of great importance. On the one hand well-balanced macroeconomic policy-mix, responsible wage policy and strong financial supervision are required. On the other hand the flexible domestic production factors and product markets favour the smooth adjustment to economic and financial shocks. In the case of the lack of certain conditions (e.g. nominal stiffness) economic growth might stay for a longer period at a low level. Consequently real convergence might stop and even change direction.

2. The 2008-2009 global financial and economic crises resulted in the deepest recession we have seen since WWII.

Recovery has started in the EU. As regards potential growth in the mid-term, the individual country groups show substantially different trends. In the developed countries the potential growth rate will reach 68.4% of the level dominating before the crisis. This indicator in the other three country groups is as follows: 40% in the 'Mediterranean' group, 53.2% in the 'Catch-up' group, 37.8% in the 'Vulnerable' group. *As potential growth rates of the different country groups are getting closer to each other at a significantly lower level than previously, convergence is necessarily slowing down among them.*

Potential decrease in the dynamics of potential growth in the medium term is of dramatic size in certain convergence countries. In these countries *real convergence might stop in the short run and it might even come to a divergence*. We call it *'convergence crisis'.*

As regards potential growth and the contribution of the individual factors, the most unfavourable trends – based on the mid-term quantitative analysis - were experienced in the case of the 'Mediterranean' Member States and those new member states which are the 'Vulnerable' countries. The Catch up will practically stop in these country groups indicated in the period analysed.

3. Sustainable catch-up assumes permanent potential growth premium of the countries catching up. This difference in the growth rates describes the catch-up potential. Average catch-up potential of the NMSs decreased significantly compared to the 'Developed' countries after the crisis. At the same time, development of the catch-up potential in the 'Catch-up' country group is more balanced than in the 'Vulnerable' countries. In the 'Vulnerable' country group real convergence essentially *stopped following the crisis and in certain cases even divergence is possible. As regards the 'Mediterranean' countries, trends of divergence have been characteristic recently. (*According to the simulations the convergence crisis might be more severe in the Mediterranean countries particularly hit by the sovereign debt crisis than in the countries affected of the 'Vulnerable' group.*)*

4. In relation with challenges of globalisation and competitiveness problems of the European Union's economy - current average annual rate of *potential growth in the European Union of 2,4% in years preceding the crisis - could fall not even to half this level in the coming decades.* Decisive structural element of the changes is the decreasing dynamics of total factor productivity.

The new Member States have been following transition paths since their accession leading to substantial convergence. Yet *the pace of this catch up will dwindle over time and may eventually stop.* The growth in these countries might be more moderate in three decades than the average of the EU15 at that time. It is possible that the convergence of the new Member States will reach around 60-80% (in certain new MSs eventually even lower level) of the per capita GDP level of the EU27 i.e. *The EU10 countries will increasingly constitute a stagnating "convergence club"* after the rapid initial convergence .

5. The risk of shock repetition is high. These changes project *further erosion of the growth potential in Europe.* That is: due to the crisis and its potential long-term impacts, there might be scenarios which are more unfavourable than those indicating decreasing potential growth

in the previous point. *Trajectory of the permanent shocks threatens with the complete collapse of the European growth and catch-up model.*

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