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Nicolae-Dragos Biea

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Economic growth in Slovakia: Past successes and future challenges

By Nicolae Bîea

Summary

Between 2000 and 2008 Slovakia grew by almost 6% per year in per capita terms. As a result, Slovakia substantially narrowed the economic gap that separated it from more developed Western European countries: Slovak GDP per capita increased from 43% of the EU-15 average in 2000 to 64% in 2008. The crisis, however, significantly slowed down the convergence process; Slovakia's average GDP per capita growth since 2008 is only slightly above 1%.

This paper analyses the sources of this slowdown and examines the primary challenges to future growth. It shows that the behaviour of labour productivity largely explains both Slovakia's strong growth performance before the crisis and the sluggish growth rates since. The paper shows that, while increasing employment and labour force participation could have a significant impact on Slovakia's GDP level, there are substantial gains to growth to be achieved by closing the still large labour productivity gap between Slovakia and more developed European economies. We analyse this gap, showing that it is due entirely to within-industry productivity differences rather than to the allocation of labour across industries. We then argue that a primary challenge for Slovakia is to restart productivity growth in its tradable sector, which has been sluggish since the crisis and the substantial reduction in FDI inflows. At the same time, we stress the importance of diversification across industries, the lack of which could leave Slovakia highly vulnerable to industry-specific shocks. We finish by suggesting that a possible way forward for Slovakia to increase growth and productivity is to raise investment in equipment, given the substantial impact on growth that this type of investment seems to have. Mobilising substantial additional investment in a broader set of industries will, of course, in large part also depend on further reforms such as increasing human capital by improving the education system, enhancing the transport infrastructure of relatively underdeveloped regions such as Eastern Slovakia, and promoting a better business environment.

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Contact: Vladimir Solanic, European Commission, Directorate General for Economic and Financial Affairs, Unit F3 (Economies of the Member States – Netherlands, Czech Republic, Slovakia), vladimir.solanic@ec.europa.eu

Introduction

Between 2000 and 2008 the Slovak economy grew by more than 60% in real terms. This considerable expansion meant an average yearly per capita growth rate of almost 6%, one of the highest in the European Union. As a result, Slovakia substantially narrowed the economic gap that separated it from more developed Western European countries: Slovak GDP per capita increased from 43% of the EU-15 average in 2000 to 64% in 2008. The crisis, however, significantly slowed down the convergence process. Between 2008 and 2014 the economy grew by only 7.6%, representing a yearly average per capita growth rate of 1.2%.

This paper analyses Slovakia's past growth performance and examines its future prospects, stressing the importance of labour productivity, especially that of the tradable sector. Productivity in manufacturing, for example, grew by 10.4% per year between 1997 and 2010, as FDI flowed into the automotive, machinery and metal products, and electronics industries. Since 2010, however, productivity in manufacturing has grown by only 1.3% per year and remains less than one third of that in more developed economies. We suggest that a primary challenge for Slovakia is to restart productivity growth in the tradable sector so as to close the still large productivity gap with more developed European economies, while, at the same time, encouraging more diversification across industries, the lack of which could leave Slovakia vulnerable to industry-specific shocks.

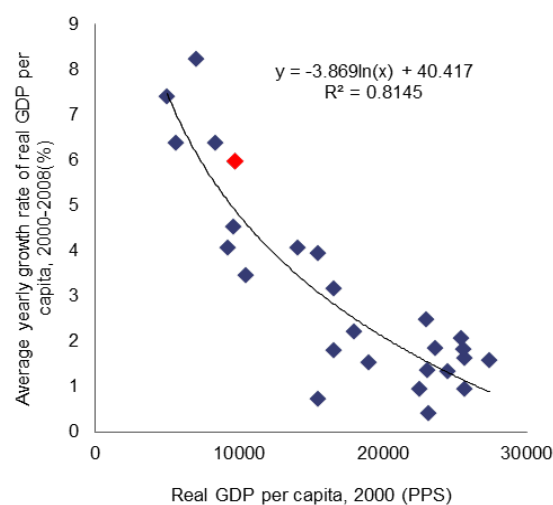
Slovakia's growth performance in a European perspective

Neoclassical growth theory predicts that per capita growth rates are inversely related to a country's level of output per person¹. Relatively poorer countries, such as Slovakia, have less capital and are farther away from the technology frontier, so they have the potential for faster, "catch-up" growth. To examine whether Slovakia grew more slowly or faster than expected through convergence alone, we regress the average annual growth rate of real GDP per capita between 2000 and 2008 of EU member states on their starting level of GDP per capita.

Graph 1 shows a strong negative relationship between initial GDP per capita and the average per capita growth rate over the period. Furthermore, a

country's starting point explains more than 80% of the variation in growth rates among Member States.

Graph 1. Growth among EU member states, 2000-2008 (SK in red)



Source: Eurostat

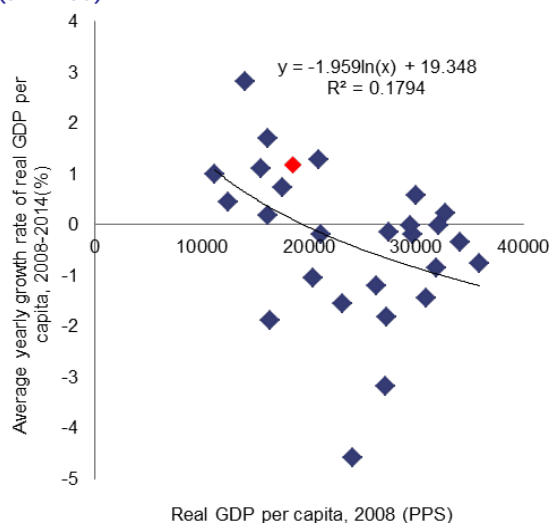
We can see that Slovakia grew at a faster rate than expected from its starting level of GDP per capita alone. The regression equation suggests that a country with Slovakia's level of income per capita should have grown by around 5% per year; in fact, it grew by almost 6% per year. The good performance of Slovakia's economy is even more evident when compared with Poland and Hungary, neighbouring countries which had similar levels of income in 2000: Slovakia's average yearly per capita growth rate was 2 pp. higher than Poland's and 2.5 pp. higher than Hungary's.

While convergence among Member States was strong between 2000 and 2008, it seems to have largely stopped since the crisis. We can see this most clearly if we compare the pre and post-2008 regressions (Graph 2). After 2008, growth was not only much lower for both richer and poorer countries (as reflected by the significant decline in the intercept), but was also much less affected by a country's level of income (as reflected by the much lower regression slope). In other words, poorer Member States have not grown at substantially higher rates than richer ones since the onset of the crisis.

Slovakia's growth rate has also declined considerably after the crisis, with a yearly average of about 1.2% between 2008 and 2014. While this is still one of the fastest growth rates in the EU and is higher than that of neighbouring countries such as Hungary and the Czech Republic (but much lower

than that of Poland), it represents a significant slowdown in the convergence process.

Graph 2. Growth among EU member states, 2008-2014 (SK in red)



Source: Eurostat

Sources of growth

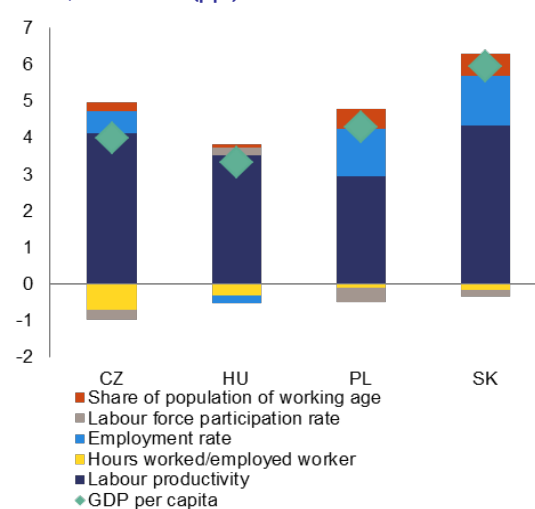
To explain why Slovak growth was so strong before 2008 and why it slowed down afterwards, we examine the drivers of growth in these periods. Graph 3 provides a growth accounting decomposition of the average annual growth rate of GDP per capita of Slovakia and three of its neighbours (the Czech Republic, Hungary, and Poland) for the pre-crisis period.

The first noteworthy point is that increases in labour productivity were the main driver of growth in all four countries. In Slovakia, increases in labour productivity contributed, on average, around 4.3 pp. to GDP per capita growth each year, accounting for around three quarters of the growth in GDP per capita. The difference in growth rates between Slovakia and countries with similar per capita income levels, such as Hungary and Poland, is thus explained to a large extent by the higher growth of labour productivity in Slovakia.

Besides labour productivity, two other factors had a significant impact on growth in Slovakia. First, increases in the employment rate contributed, on average, around 1.4 percentage points each year to GDP per capita growth, paralleling a substantial decline in Slovakia's unemployment rate over this period, from almost 19% in 2000 to less than 10% in 2008. Second, changes in the age structure of the population contributed, on average, around 0.6 percentage points each year to GDP per capita

growth. This is due to an increase in the share of people of working age (15-64), from under 69% in 2000 to 72% in 2008.

Graph 3. Average annual GDP per capita growth and its drivers, 2000-2008 (pp.)

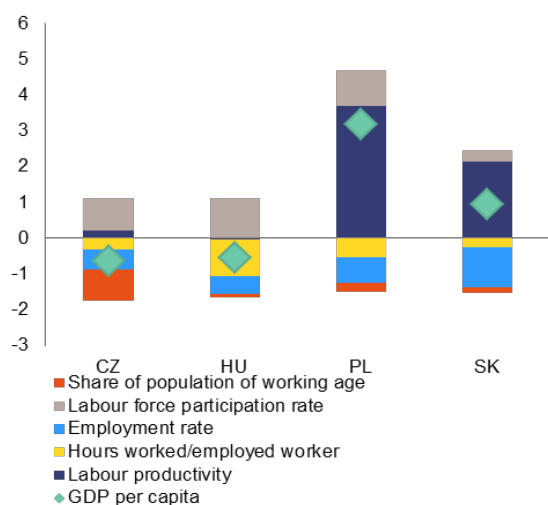


Source: Eurostat, OECD

Graph 4 repeats the analysis for the period between 2008 and 2013. The growth slowdown in three of the four countries is mostly accounted for by a collapse in labour productivity growth: in the Czech Republic and Hungary productivity growth was basically zero over the period, while in Slovakia the productivity growth rate more than halved compared to the pre-crisis period to slightly over 2% per year. In Poland, on the other hand, labour productivity growth actually increased since the crisis (from slightly under 3% before to 3.7% since), largely accounting for the country's strong growth performance since 2008.

In Slovakia, the rise of the unemployment rate which accompanied the economic crisis (from 9.6% in 2008 to 14.4% in 2010 and still above 13% in 2014) subtracted on average around 1 pp. from yearly real GDP per capita growth over the period. Demographics also acted as a slight drag on growth due to the onset of population aging, with the share of population of working age peaking in 2010. This was compensated, however, by an increase in labour force participation, mainly among older workers due to increases in the statutory retirement age.

Graph 4. Average annual GDP per capita growth and its drivers, 2008-2013 (pp.)

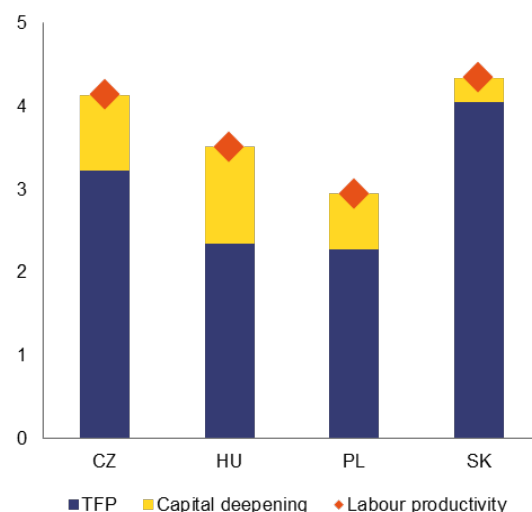


Source: Eurostat, OECD

As labour productivity was the main driver of GDP per capita growth in Slovakia both before and after 2008, an analysis of the sources of labour productivity growth is warranted. Conceptually, labour productivity can grow either due to increases in capital intensity (the capital stock per unit of labour) or to increases in total factor productivity (increases in output keeping labour and capital inputs constant). Total factor productivity will capture the effect of technological progress but also that of all other factors besides capital and labour (e.g. the quality of a country's institutions and business environment). We can apply this decomposition to data from Slovakia and the same three neighbouring countries.

Graph 5 shows the results of the decomposition for the 2000-2008 period. Growth in total factor productivity was the main driver of labour productivity growth in Slovakia, as in Poland and the Czech Republic. In Slovakia's case, total factor productivity accounts for more than 90% of the increase in labour productivity and for almost 70% of the increase in GDP per capita over this period. Slovakia had the highest increase in total factor productivity but, at the same time, the lowest increase in capital intensity, which, on average, contributed only 0.3 pp. to GDP per capita growth each year, compared to 0.9 pp. in the Czech Republic and 1.2 pp. in Hungary.

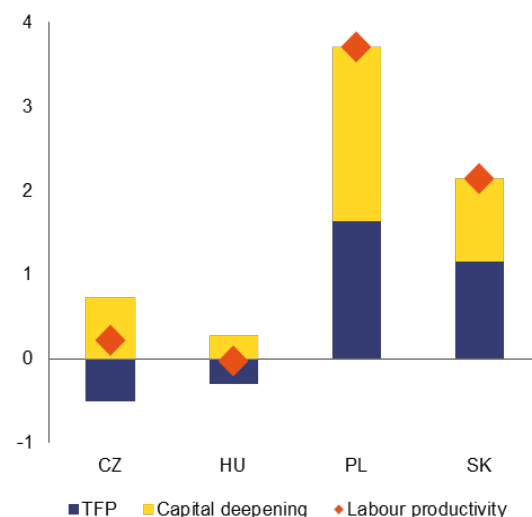
Graph 5. Average annual labour productivity growth and its drivers, 2000-2008 (pp.)



Source: Ameco

Graph 6 repeats the analysis for the 2008-2013 period. Growth in total factor productivity slowed down considerably, from an annual average of 4.1% before 2008 to 1.2% afterwards. Nevertheless, total factor productivity growth remained positive, while it actually fell between 2008 and 2013 in the Czech Republic and Hungary.

Graph 6. Average annual labour productivity growth and its drivers, 2008-2013 (pp.)

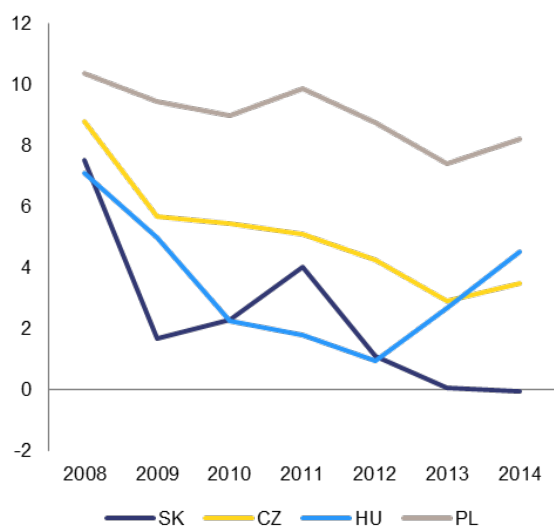


Source: Ameco

Since the crisis, labour productivity growth has been significantly higher in Poland than in Slovakia, whereas total factor productivity growth was only slightly higher in Poland. Thus, the difference in labour productivity growth between Slovakia and

Poland since the crisis does not mostly stem from different rates of total factor productivity growth but rather from the much lower rate of growth of Slovakia's capital stock. This reflects the much poorer performance of investment since the crisis in Slovakia compared to Poland (see graph 7). In 2014, net investment (gross investment minus capital depreciation) in Slovakia was actually negative, indicating a shrinking of the country's capital stock. This suggests that Slovakia has considerable room to increase labour productivity growth by promoting capital deepening. However, one should be cautious about drawing conclusions on the basis of this decomposition of labour productivity growth into total factor productivity growth and capital deepening, as it rests on the assumption that all investment is equally productive, which, as we will see later in the paper, we have some reason to doubt².

Graph 7. Net investment (% of GDP)



Source: Eurostat

Where next?

Before the crisis, Slovakia saw strong labour productivity growth that largely accounts for its good growth performance. Since 2008, the slowdown in productivity growth and the rise in unemployment have led to more sluggish GDP growth. Going forward, what are the most promising drivers of growth for Slovakia?

First of all, demographics in Slovakia can be expected to be a drag on growth for the foreseeable future. The share of population of working age peaked in 2010 and is projected to decline over the coming decades³. Unlike other drivers of growth, the share of working-age population is largely

predetermined in the medium-run, as the cohorts that will enter the 15-64 age group over the next fifteen years have already been born. We can thus estimate the effect the growth impact of change in the age structure of the Slovak population.

The share of population aged 15-64 is projected to fall from 71.2% in 2014 to 65.7% in 2030. This decline in the share of working age population will translate into a yearly drag on GDP per capita growth of 0.7 pp. between 2015 and 2020 and of 0.4 pp. between 2020 and 2030. For comparison, between 2000 and 2008 demographic factors boosted yearly GDP per capita growth by an average of 0.6 percentage points. Thus, all other things equal, one could expect growth over the next fifteen years to be lower by more than 1 pp. compared to the 2000-2008 period due to the changing age structure of the population alone.

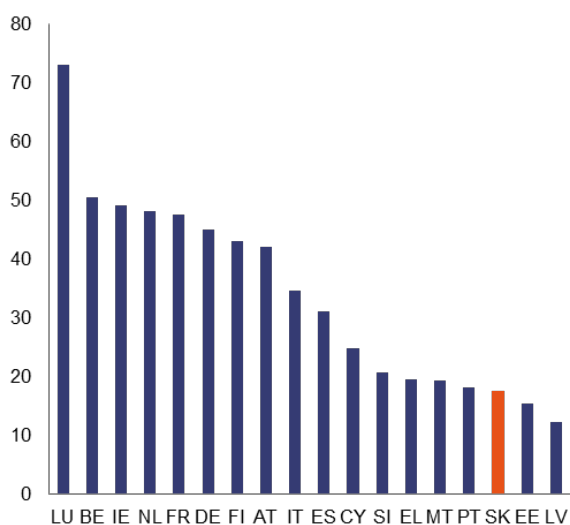
Increasing the hours worked per worker does not appear to be a likely contributor to GDP growth for Slovakia either. While working hours have declined over the last couple of years, they remain among the highest in the EU. Hours worked per worker are likely to continue falling as Slovakia grows more prosperous, as workers in richer countries tend to work substantially fewer hours each year than those in poorer countries.

Unemployment in Slovakia remains high and increasing employment would boost GDP growth. Lowering the unemployment rate to 2008 levels (the lowest since the country's independence) would, *ceteris paribus*, increase the country's GDP level by 3.8%. Labour force participation in Slovakia is also relatively low, mainly due to the low participation rates of women and younger (under 25) and older (over 55) people. Increasing the labour force participation rate in Slovakia to the EU-15 average would, *ceteris paribus*, increase the country's GDP level by 4.2%. However, while these gains would be significant, they are merely one-time increases in the level of GDP and, by themselves, cannot generate sustained GDP growth. To put it into perspective, if Slovakia would both lower unemployment to 2008 levels and increase the labour force participation rate to the EU-15 average, this would only barely offset the negative impact that population aging is expected to have on growth until 2030⁴. Thus, boosting labour productivity growth is crucial to ensuring sustainable GDP growth.

Slovakia's productivity gap

Despite its strong pre-crisis growth, labour productivity in Slovakia remains relatively low. In 2013, gross value added per hour worked in Slovakia was the third lowest in the euro area and was less than half the levels found in Western Europe (see graph 8). This section looks more closely into the reasons behind Slovakia's productivity gap.

Graph 8. Gross value added (GVA) per hour worked in the euro area, 2013 (Euros per hour worked, current prices)



Source: Eurostat

Conceptually, a country's labour productivity, measured as output per labour input, can be decomposed into the sum of labour productivities in each of the country's industries weighted by their share in the country's total labour input. Using this result, we can express the difference in labour productivity between two countries as a sum of two terms: first, the difference in labour productivity assuming that the industries' share of total labour input are the same in the two countries; second, the difference in labour productivity due solely to the fact that industries' share of total labour input are different between the two countries⁵. Using this technique we can estimate how much of the productivity difference between the countries is due to productivity differences within each industry and how much of it is due to the different allocation of labour across industries.

This technique is then applied to examine the source of the differences in labour productivity between Slovakia and more developed Member States. The weighted average of three old Member States

(Austria, Finland, and the Netherlands) was chosen as the reference. Similarly to Slovakia, the three countries are also "small", open, euro area economies. Labour productivity in the three advanced economies, however, is two and a half times higher than in Slovakia. Table 1 shows the results of the decomposition of this productivity difference, using 2013 data from 64 industries in the four countries.

Table 1. Decomposing productivity differences between Slovakia and a weighted average of three more developed small open economies (AT, FI, NL), 2013

	Labour productivity (GVA/hour worked, current prices)
AT + FI + NL	44.74
Slovakia	17.42
difference	27.32
of which:	
<i>within-industry differences</i>	29.37
<i>labour allocation</i>	-2.05

Source: Eurostat

Within-industry productivity differences account for the entire difference in productivity between Slovakia and Austria, Finland, and the Netherlands. In fact, labour allocation has a negative sign in the decomposition, showing that, in Slovakia, more labour is allocated to relatively more productive industries than in the three more developed Member States. In other words, if Slovakia's labour allocation across industries were identical to that of the more developed Member States, labour productivity in Slovakia would actually be slightly lower.

The structure of the Slovak economy is indeed different from that of more developed European countries, with services accounting less and industry accounting more of the total hours worked in the economy. Table 2 presents an overview of the tradable and non-tradable sectors in Slovakia and the three more developed countries⁶. It shows that the tradable sector is more productive than the non-tradable one in both cases (35% more productive in the three old Member States, 12% more productive in Slovakia) and that Slovakia allocates relatively more labour to the tradable sector than the more developed countries, with the share of the tradable sector in total labour input almost 9 pp. higher in Slovakia.

Table 2. Tradable and non-tradable sectors in Slovakia and a weighted average of three more developed small open economies (AT, FI, NL), 2013

Sector	AT + FI + NL		Slovakia	
	Tradable	Non-tradable	Tradable	Non-tradable
Labour productivity (GVA/hour worked, current prices)	56.02	41.53	18.78	16.81
Share of total labour input (%)	22.19	77.81	30.92	69.08

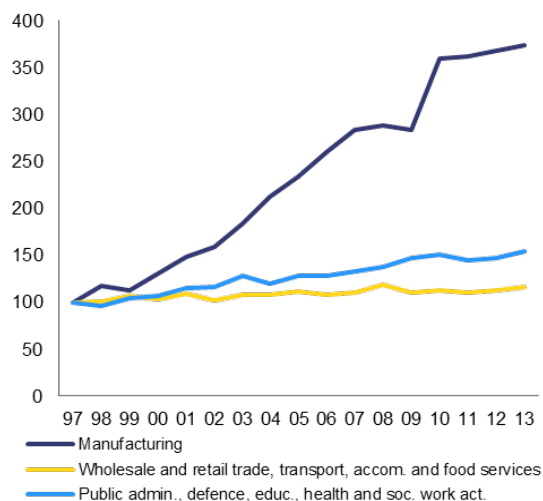
Source: Eurostat

All the results are in line with what economic theory (the Balassa-Samuelson model, for example) would predict. As a country's productivity in the tradable sector increases, its income becomes higher. If both tradable and non-tradable goods are normal, workers in the country will spend their higher income on higher quantities of both. But if there has been no commensurate increase in productivity in the non-tradable sector as well, the only way for the country to consume more non-tradable goods is to allocate more labour to that sector. We should therefore expect richer countries to have relatively larger non-tradable and relatively smaller tradable sectors, which is indeed the pattern we observe. At the same time, higher productivity in the tradable sector increases the opportunity cost of hiring labour in the non-tradable sector; coupled with the higher demand for non-tradables leading to higher prices and therefore higher nominal productivity (nominal value added per hour worked) in the non-tradable sector, even if the sector has seen no real productivity gains.

Looking at longer-term data of Slovakia supports the hypothesis that the tradable sector pulls the non-tradable one (see graph 9). Between 1997 and 2013, real productivity increased almost fourfold in manufacturing as FDI flowed into the automotive, machinery and metal products, and electronics industries; on the other hand, real productivity in two broad groups of services (public administration, defence, education, and health and social work; and wholesale and retail trade, transport, accommodation and food services) grew at a much slower pace.

At the same time, manufacturing prices declined by 12% between 1997 and 2010 while the prices of both groups of services doubled. Labour productivity deflated by the GDP deflator (instead of prices in that particular sector) therefore moved much closer in the three sectors despite the large differences in the growth of real labour productivity (see graph 10).

Graph 9. Real labour productivity in Slovakia, 1997=100



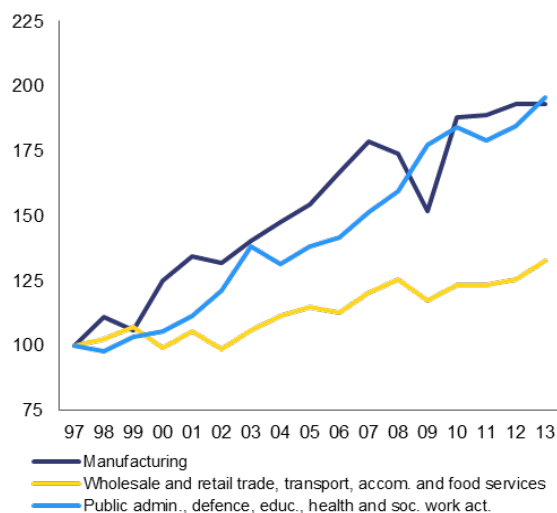
Source: Eurostat

The main challenge for the Slovak economy thus seems to be increasing productivity in the tradable sector, which would pull along nominal productivity in the non-tradable sector as well. Productivity in manufacturing in Slovakia increased considerably between 1997 and 2010, growing by an average of 10.4% per year. Since then, productivity growth in manufacturing has slowed down significantly: between 2010 and 2013, its average growth rate was only 1.3%.

There are some parallels between Slovakia's present situation and that of Finland in the late 1980s: in 1987, Finland's share of manufacturing in the economy and its labour productivity in manufacturing were similar to that of Slovakia today. Between 1987 and 2007, the share of manufacturing in the Finnish economy declined from 19% to 16% but, at the same time, real productivity in manufacturing increased by more than three-and-a-half times, for an average growth rate of more than 6.5% per year. If Slovakia is to converge to Western European levels of GDP per capita, labour productivity in its tradable sector will have to grow at a similar rate. This is not to say that the non-tradable sector does not matter; productivity growth in the non-tradable sector, however, has tended to be much lower than in the tradable one in both Slovakia and more developed countries, so it is unlikely that it can serve as the main motor of growth in the near future. At the same time, Finland's recent economic malaise serves to draw attention to the importance of diversification across industries in the tradable sector. In Slovakia, two industries alone (automotive and electrical machinery and equipment) accounted for almost half

of the country's exports in 2014. As a consequence of this lack of diversification, Slovakia remains highly vulnerable to industry-specific shocks.

Graph 10. Labour productivity (deflated using GDP deflator) in Slovakia, 1997=100



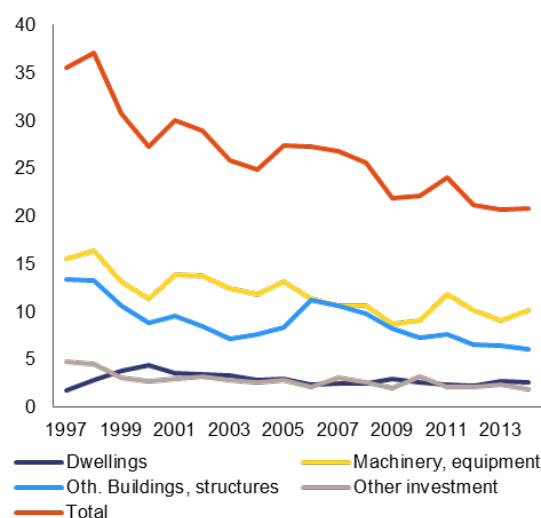
Source: Eurostat

Growth and equipment investment

The previous section has argued that the most promising path to sustained growth for Slovakia appears to be through increasing productivity in its tradable sector. One possible way of increasing productivity and therefore growth is through higher investment. In Slovakia, however, investment fell from over 27% of GDP between 2000 and 2008 to around 22% since 2008, as FDI inflows declined substantially (yearly FDI inflows to Slovakia amounted, on average, to 7.6% of GDP between 2000 and 2008 but only 2.5% since). Figure 11 shows the behaviour of different components of investment. Residential investment has been largely stable, but investment in both machinery and equipment and in non-residential construction has fallen compared to pre-crisis levels.

In a series of articles from the early 1990s, J. Bradford DeLong and Lawrence H. Summers have found a strong link between equipment investment and growth; furthermore, they showed that this link is much stronger than that between growth and other components of investment. In what follows, we investigate, using a similar methodology, whether this pattern holds for a sample of European countries for the period starting in 2000.

Graph 11. Different types of investment in Slovakia (% of GDP)



Source: Eurostat

To examine the link between growth and the different types of investment, we regress countries' average GDP per capita growth rates over the period on equipment investment and non-equipment investment as shares of GDP over the same period. The log of GDP per capita (in PPS) at the start of the period is included to control for convergence effects. In several models, interaction terms between the investment categories and the log of GDP per capita at the beginning of the period are included to allow for diminishing returns to investment as the country grows richer. All models are estimated for both the 2000-2008 period and the 2000-2013 period which includes the economic crisis⁷. Table 3 shows the results of these various regression models.

Investment in equipment has a significant positive effect on GDP per capita growth in all six models. The interactions between investment in equipment and GDP per capita at the beginning of the period are significant and negative, suggesting diminishing effects of as the country grows richer. For a country like Slovakia (GDP per capita of 20 000 PPS in 2013), the marginal effect of equipment investment (how much would GDP per capita growth change if the share of equipment increased by one percentage point) varies between 0.12 and 0.26.

Table 3. The effect of equipment and non-equipment investment on annual average GDP per capita growth in a sample of European countries

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
log(GDP per capita)	-6.34 (-5.63)	7.6 (-2.1)	2.15 (-0.4)	-4.63 (-4.09)	8.65 (-2.06)	-1.06 (-0.15)
Equipment investment	0.26 (-2.61)	6.02 (-4.17)	6.5 (-4.46)	0.19 (-1.86)	6.22 (-3.34)	7.03 (-3.77)
Non-equipment investment	0.1 (-1.3)	0.06 (-0.63)	-2 (-1.35)	0.02 (-0.25)	-0.09 (-0.96)	-3.56 (-1.65)
Equipment*log(GDP per capita)		-1.36 (-3.99)	-1.46		-1.42 (-3.24)	-1.59 (-3.66)
Non-equipment*log(GDP per capita)			0.48 (-1.38)			0.82 (-1.61)
F-test for joint significance (p-value): equipment investment and interaction term		0.0001	0.0001		0.003	0.001
F-test for joint significance (p-value): non-equipment investment and interaction term			0.34			0.19
Marginal effect of equipment investment (GDP per capita = 20 000 PPS)	0.26 (-2.61)	0.17 (-2.1)	0.23 (-2.54)	0.19 (-1.86)	0.12 (-1.33)	0.19 (-1.94)
Sample period	2000-2008	2000-2008	2000-2008	2000-2013	2000-2013	2000-2013
Sample size	27	27	27	26	26	26
R-squared	0.85	0.91	0.92	0.73	0.82	0.84

Note: T-statistics are in parentheses.

Source: Eurostat, Commission Services calculations

Model 3, whose estimate lies somewhere in the middle, could be taken as a benchmark: it includes both interaction terms but excludes the crisis period. The marginal effect of equipment investment for a country with Slovakia's level of GDP per capita is economically significant: increasing the share of equipment investment by 1 percentage point would increase GDP per capita growth by 0.23 percentage point. Raising a country's equipment investment from 9% (Slovakia in 2010) to 14% (Slovakia in 2001) would provide 1.15 pp. extra growth in GDP per capita each year.

Interestingly, the effect of non-equipment investment is not statistically significant in any of the models. This suggests that not all investment is equal: equipment investment has a substantial impact on growth while other types of investment do not seem to affect growth. Of course, reverse causation (expectations of higher growth lead to more investment in equipment) remains a possibility. However, the different effect of different types of investment would remain unexplained in this case, as one would expect higher growth to lead to more investment of every type and not just equipment investment.

The analysis above thus suggests that, over the coming years, equipment investment can still act as an important driver of growth in Slovakia. This is not to say, however, that other types of investment do not have their part to play. Slovakia's transportation infrastructure, for example, remains of relatively low quality and is unequally distributed

within the country, accentuating the separation of less developed eastern and central Slovakia from the thriving Bratislava region. Further investment in infrastructure, including through a more effective use of EU funds, could therefore also foster growth, particularly in Slovakia's lagging regions.

Furthermore, capital deepening is not the only way of boosting labour productivity. As seen above, TFP growth has accounted for a substantial portion of Slovakia's labour productivity growth both before and since the crisis. Structural reforms, such as improving the country's business environment and the functioning of its education system, have the potential to increase TFP and therefore labour productivity growth as well.

Conclusion

Between 2000 and 2008, Slovakia had one of the highest GDP per capita growth rates in Europe, driven mainly by increases in labour productivity. Since the crisis, however, growth rates in Slovakia have slowed down considerably, due to lower productivity growth and an increase in the unemployment rate. The paper shows that, while increasing employment and labour force participation could have a significant impact on Slovakia's GDP level, there are substantial gains to growth to be achieved by closing the still large labour productivity gap between Slovakia and more developed European economies. We analysed this gap, showing that it is due entirely to within-industry productivity differences rather than to the allocation of labour across industries. We then argued that a primary challenge for Slovakia it to restart productivity growth in its tradable sector. At the same time, we stressed the importance of diversification across industries, the lack of which could leave Slovakia highly vulnerable to industry-specific shocks. Finally, we suggested that a possible way forward for Slovakia to increase growth and productivity is to raise investment in equipment, given the substantial impact on growth that this type of investment seems to have. Of course, fostering substantial additional investment, both foreign and home-grown, in a broader set of industries will in large part depend on further reforms such as increasing human capital by improving the education system, enhancing the transport infrastructure of relatively underdeveloped regions such as Eastern Slovakia, and promoting a better business environment.

References

Balassa, Bela, The Purchasing Power Parity Doctrine: A Reappraisal, *Journal of Political Economy*, Vol. 72, No. 6 (Dec., 1964).

Barro, Robert J. and Xavier Sala-i-Martin, Convergence, *Journal of Political Economy*, Vol. 100, No. 2 (Apr., 1992).

DeLong, J. Bradford, Productivity Growth and Machinery Investment: A Long-Run Look, 1870-1980, *Journal of Economic History*, Vol. 52, No. 2 (Jun., 1992).

DeLong, J. Bradford and Lawrence H. Summers, Equipment Investment and Economic Growth, *Quarterly Journal of Economics*, Vol. 106, No. 2 (May, 1991).

Pritchett, Lant, The Tyranny of Concepts: CUDIE (Cumulated, Depreciated, Investment Effort) Is Not Capital, *Journal of Economic Growth*, Vol. 5, No. 4 (Dec., 2000).

Samuelson, Paul A., Theoretical Notes on Trade Problems, *Review of Economics and Statistics*, Vol. 46, No. 2. (May, 1964).

¹ Robert J. Barro and Xavier Sala-i-Martin, Convergence, *Journal of Political Economy*, Vol. 100, No. 2 (Apr., 1992)

² For a critique of using cumulated and depreciated investment as a measure of a country's capital stock, also see Lant Pritchett, The Tyranny of Concepts: CUDIE (Cumulated, Depreciated, Investment Effort) Is Not Capital, *Journal of Economic Growth*, Vol. 5, No. 4 (Dec., 2000).

³ Eurostat, EUROPOP 2013.

⁴ My estimates assume that people entering employment/the labour force would be as productive as the average worker already employed. If anything, this assumption is too generous, as those not employed or not in the labour force are likely less productive than workers who currently have jobs. Increasing employment and labour force participation are therefore likely to have an even lower impact on GDP, further supporting my assertion that increasing labour productivity is the only way to sustain GDP growth.

⁵ Formally, $Y_1/L_1 - Y_2/L_2 = \frac{1}{2} * [\sum_i (L_{i,1}/L_1 * Y_{i,1}/L_{i,1}) - \sum_i (L_{i,1}/L_1 * Y_{i,2}/L_{i,2}) + \sum_i (L_{i,2}/L_2 * Y_{i,1}/L_{i,1}) - \sum_i (L_{i,2}/L_2 * Y_{i,2}/L_{i,2})] + \frac{1}{2} * [\sum_i (L_{i,1}/L_1 * Y_{i,2}/L_{i,2}) - \sum_i (L_{i,2}/L_2 * Y_{i,1}/L_{i,1}) + \sum_i (L_{i,1}/L_1 * Y_{i,1}/L_{i,1}) - \sum_i (L_{i,2}/L_2 * Y_{i,1}/L_{i,1})]$ where Y is output, L is labour input, and i indexes a country's industries. The first term between square brackets represents the difference between the countries due to productivity differences within each industry. The second term between square brackets represents the difference due to allocation of labour across industries.

⁶ The following groups of industries are classified as tradable: agriculture, forestry and fishing; mining and quarrying; manufacturing; computer programming, consultancy, and information service activities; financial and insurance activities; and scientific research and development. All other industries are classified as non-tradable.

⁷ The 2000-2008 sample includes the following countries Austria, Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. Romania is dropped from the 2000-2013 sample due to lack of data.

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