CAPITAL STRUCTURE CONVERGENCE IN SLOVAKIA

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Abstract:

The paper deals with the topic of undercapitalization in the Slovak economy and its position within CEE countries. The capital stock structure is considered particularly important in the process of real convergence to other developed countries. The economy has been lagging in the field of labour to capital ratio since 90's, however, significant improvements occurred in recent periods. Still, the patterns of convergence in capital formation are unfavorable for quick convergence in capital structure. Especially, in the category of intellectual property products, Slovakia still performs quite poorly. In order to improve the position of Slovakia in capital to labour ratio and improve the convergence process, the focus of capital formation should be shifted from machinery and equipment towards more intellectually oriented assets.

Keywords:

Undercapitalization, Convergence Process, Gross Fixed Capital Formation, CEE Countries

I. Introduction

Lagging in the capital to labor ratio (i.e., undercapitalization) was perceived as a barrier to higher performance of the former transition economies of Central and Eastern Europe. The economic theory perceives changes in the capital to labor as an explanatory factor for the economic growth and convergence of their level (see Solow's Growth Theory). In this paper, we examine how the Slovak economy overcame this problem of undercapitalization. We assume that during the transformation of the economy, the level of capital to labor ratio improved significantly, but such development was differentiated by sector. It is also possible that there were significant differences within the group of former socialist economies of Central and Eastern Europe.

II. Literature Review

In the well-known simple production function, the output quantity is a function of labor (L) and capital (K). The K/L ratio (capital to labor) is generally used to express the capital intensity. Several remarkable papers addressed the topic of how changes in capital volume and capital intensity affected economic growth and the convergence of CEE countries. For example, Dombi (2013) with the use of growth accounting proved that the main driver of economic growth in CEE countries in the period after the year 1995 was the capital accumulation, while the impact of the labor and multifactor productivity was only marginal. That means the CEE countries followed the model of extensive and investment-oriented growth with a significant increase in K/L ratio. The results of so-called "development accounting" suggests that lower levels of GDP per hour worked in CEE countries (particularly compared to Germany) can be primarily attributed to their smaller K/L ratios and secondary to their lower multifactor productivity (while the job quality is about the same as in Germany). The low initial level of K/L ratio coupled with the higher level of investments rate (share of capital formation in GDP) created the potential for capital accumulation and thus, rapid economic growth.

Doyle, Kuijs and Jiang (2001) analyzed the contribution of the fixed capital formation growth to GDP growth for the period from 1991 to 1999 and stated that in the case of Slovakia, the capital growth was the dominant driver (six times stronger than the contribution of multifactor productivity). However, the group of CEE countries achieved relatively heterogeneous results with the various

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contribution of capital in different countries. They also pointed out to difficulties in estimation of capital stock and capital to labor ratio at the beginning of a transformation in these countries. A significant part of the capital had to be discarded as outdated and inappropriate for further production. The estimated capital intensity in Slovakia was relatively high even before the transformation process began (what was caused by the historically significant investments in the sectors of heavy machinery, arms production, and other capital-intensive productions).

The importance of capital (more precisely its contribution to economic growth) varies greatly depending on the selected period of analysis: Borys, Polgár, and Zlate (2008) in their analysis of the period 1997 – 2006 came to little different conclusions than papers mentioned above. They attributed in the CEE countries higher contribution to multifactor productivity and less contribution of capital changes. However, what these analyses have in common is the relatively high contribution of changes in capital and significantly lower (sometimes negative) contribution of changes in the labor force. Okáli (2008) estimated the contribution of production factors for different time periods. The contribution of changes in the capital is always dominant.

As well as in the already mentioned paper by Doyle, Kuijs and Jiang (2001), the paper by Němec and Prachár (2000) addresses the topic of the specific barrier for greater growth in the capital intensity – a slow depreciation of assets. Němec and Prachár (2000) elaborate the issue of blocked funds for capital renewal. Due to the increase in prices of capital goods (with the slow depreciation of capital), there was no room to cumulate sufficient amount of funds for replacement of worn-out capital. Consequently, other resources of funding must be used (loans and other "temporary solutions alleviating the pressure on resources").

Ezzahid and Nihou (2017) analyzed the capital accumulation and efficiency of aggregate capital in Marocco within the period 1970 – 2012. The phases of overinvestment and underinvestment changed during the period several times with the last trend reverse to overinvestments since 2006. However, the country faced the same issue as countries of CEE with difficulties to evaluate the true stock of reproducible capital. They conclude that even Marocco seems like lacking significant capital accumulation, the country is only in early stages of this process. The main reason for such lack of capital is found in a low return to capital. They find institutional factors, human capital quality and absence of transformative reforms to be the main setbacks of capital accumulation.

Silaghi and Alexa (2015) used the growth accounting in period 1993 – 2008 to reveal that, on average, capital per worker accumulation was the main engine of growth in CEE, followed by the contribution of TFP. However, in sub-period 1997 – 2004, the TFP proved to be the main driver of growth for some CEE countries including Slovakia.

Schadler et al. (2006) studied the growth of the eight CEE countries and members of EU: the Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia. They compared the sources of growth in CEE-8 and other emerging economies, during 1990-2004 and found that CEE countries stand out from other developing countries by having small contributions from labor and remarkable contributions from TFP. Also, a two-speed catch-up process – rapid in the Baltics and slower in CEE-5 can be depicted, with the Baltics having larger contributions from TFP than the rest of the CEE.

In summary, the increase in capital to labor in Slovakia and CEE countries is in the literature considered to be a decisive factor in economic growth (although differently seen in various periods). The capital formation was complicated and distorted by slow depreciation, especially in the earlier stages of transformation (depreciation did not create a sufficient supply of capital reproduction).

III. Methodology and Research Hypothesis

Our research hypotheses are listed as follows:

- Is the problem of low capital to labor ratio in Slovakia overcame? If no, to what extent it was removed (or alleviated)?
- Are there any sectors in which has this process significantly progressed or lagged?

- Was the elimination of the undercapitalization associated with the formation of a similar fixed capital structure as we see in the most advanced economies?
- Has the convergence to the level of capital intensity of advanced economies been accompanied by imitation of their structure of fixed capital?

We employ comparative analysis methodology with the focus on the position of Slovakia among other CEE countries.

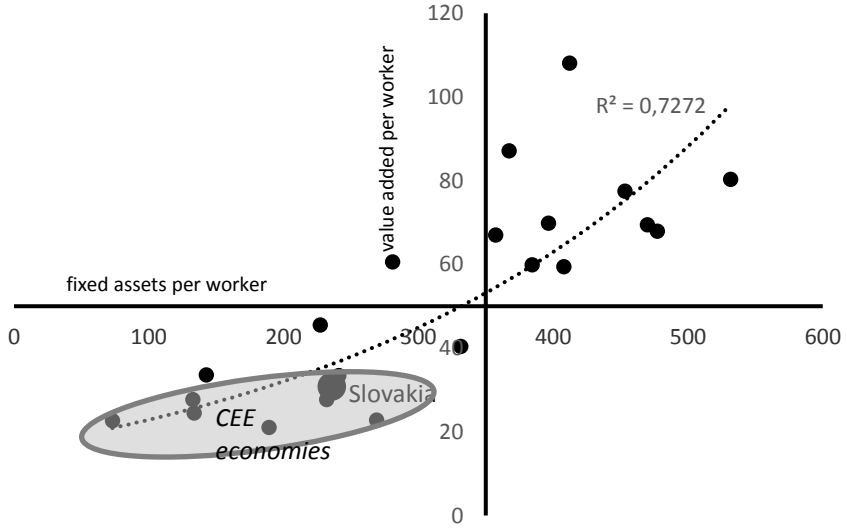
IV. Empirical results

Problem of low capital to labor ratio has moderated. However, in some areas, this process lagged behind.

The literature demonstrates the importance of capital expansion and need for an increase in capital to labor ratio for the growth of the Slovak economy. Therefore, the undercapitalization of the economy explains the underperformance of the economy. On the other hand, it provides the opportunity for higher economic growth and quicker catching-up. We focus here on the evaluation of the undercapitalization and changes in capital to labour ratio. To reflect the level of undercapitalization, we utilize the volume of fixed assets per worker - an approach based on national accounts methodology. The volume of gross fixed assets is divided by the employment (based on ESA 2010 methodology). This ratio is capable of international comparison. Its values describe what was the fixed assets volume (fixed capital) per worker.

The higher levels of fixed assets per worker are linked with higher labor productivity (Figure 1). The CEE economies are concentrated in the lower-left quadrant of the figure where the low levels of capital to labor ratio is combined with low labor productivity (labor productivity is expressed as value added per worker).

Figure 1 Combinations of Fixed Assets per Worker and Value Added per Worker (thous. EUR, 2013)



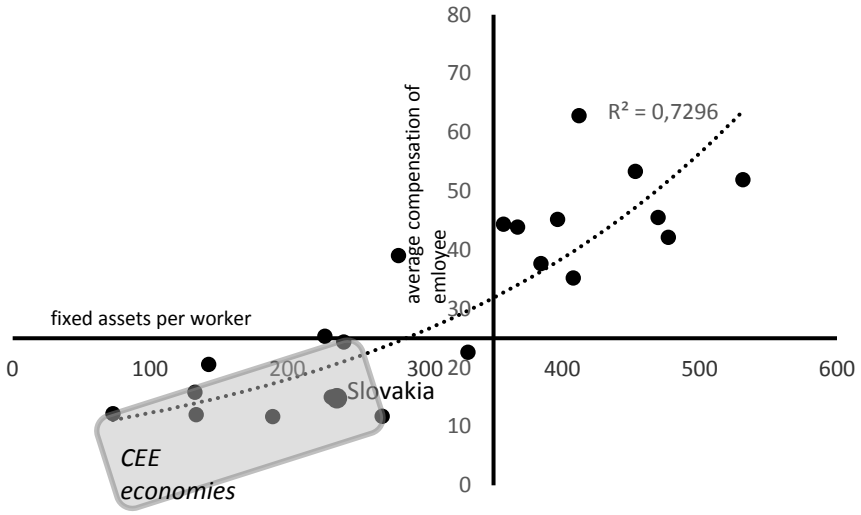
Note: CEE- Central and Eastern Europe
Productivity calculated as value added divided by a number of working people.
Source: Own calculations based on Eurostat- data.

Approximately the same level of determination can be identified in the relationship between fixed assets per worker and compensation of employees level[2]. The trend has an exponential character in both cases (Figure 1 and 2). When the fixed assets per worker reach level 350 thousand EUR, there is a significant increase in the labor productivity, as well as in average employees' compensation. However, this is only a static view. It does not allow us to gain the information on development in

[2] The compensations of employees volume divided by the number of working people (by categories of national accounts)

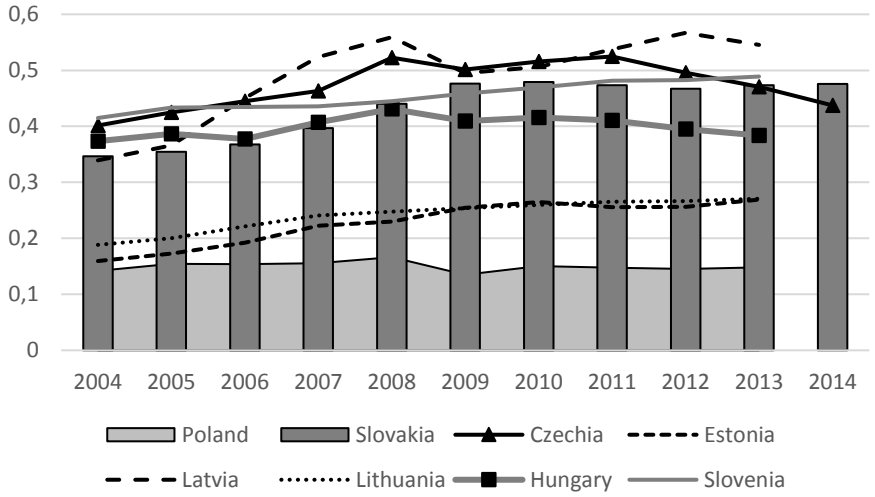
fixed assets per worker and evaluate whether the phenomenon of undercapitalization has diminished. Therefore, we use the comparison of CEE ratios to the group of TOP3 countries (see Figure 3). TOP3 group consists of three EU countries with the highest level of fixed assets per worker.

Figure 2 Combinations of Fixed Assets per Worker and Compensation of Employees (thous. EUR, 2013)



Note: CEE- Central and Eastern Europe.
Average compensation calculated as compensation of employees (per year) divided by a number of working people.
Source: Own calculations based on Eurostat- data.

Figure 4 Relative Level of Fixed Assets per Worker Ratio (TOP3 = 1)



Note:
TOP3- average level of three countries with the highest level of total fixed assets – labor ratio (these countries are Denmark, Austria, and Finland).
Source: Own calculations based on Eurostat- data.

Up to 2009, there was clear and significant catching-up process in the case of Slovakia to the level of TOP3. However, since then, the relative level of Slovakia to TOP3 did not change dramatically. Moreover, the catching-up process in fixed assets per worker was also hampered in other CEE countries. It might be associated with the general fall in investments during the "troubled" period after the recession.

Further on, we focus on the relative level of fixed assets per worker – by type of asset and by sectors. We follow the typology of fixed assets according to the methodology of national accounts (see Box 1). We examine the top three categories of fixed assets: total construction, machinery and equipment

and intellectual property products – for the sake of simplicity we refer to them further as "intellectual assets". "Intellectual assets" consist of software, databases, research and development products and others.

In the overview, we observe that the Slovak economy improved its relative fixed assets per worker to TOP3 from 34.7 % in 2004 to 47.3 % in 2013 (Table 1). It implies a substantial convergence. However, this process took place mainly in period 2004 – 2009. Since 2009, the ratio is rather stable at the same relative level with no significant change.

The undercapitalization does not apply to the sectors which can be described as the newly emerging in the former transforming economy. Those are the IT sector, as well as the sector of financial and insurance activities. In these sectors, the level of fixed assets per worker is in Slovakia almost at the same level as in TOP3 countries (in 2013). The less favorable development is in the "traditional" sectors such as agriculture, manufacturing, trade, transportation, accommodation or food services. The relative position of Slovakia has been better than the average of CEE countries and V4 (V4 average is lowered by very low levels in Poland).

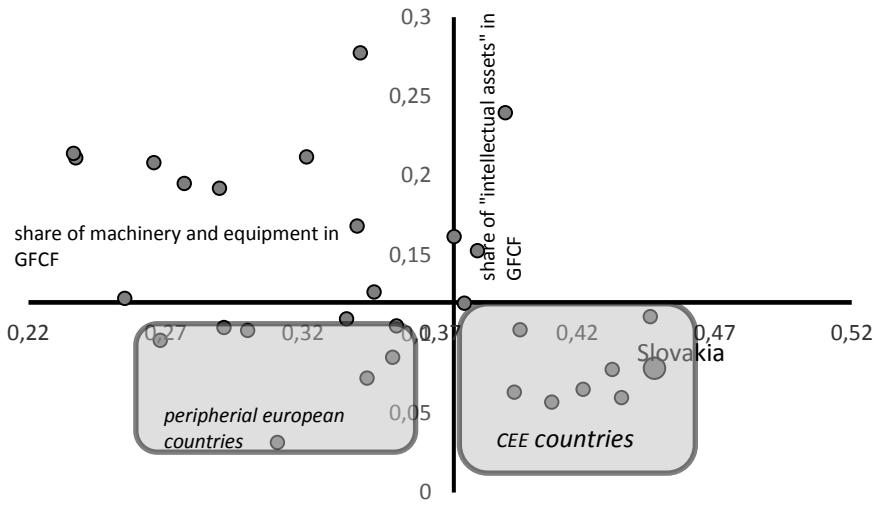
In the overall image of capital to labor in Slovakia, the weakest element is the level of intellectual assets per worker. The overcoming of the lag in the intellectual assets per worker has been proved to be far less successful than the overall overcoming of the deficit in the total assets per labor. Particularly significant is the lagging in the manufacturing sector – however, the Slovak manufacturing is achieving the best results among the CEE countries with available data. (Figure 4C and 4D). Moreover, the fact that this problem emerged in manufacturing represents an additional problem: the manufacturing performance is considered to be crucial for the competitiveness of the economy.

Particularities of Capital Formation Structure in the Slovak Economy

In the following, we deal with the category Gross Fixed Capital Formation (GFCF is a flow variable - up to this point we analyzed only the stock variable). The CEE countries are characteristic by their extremely high share of machinery and equipment in the GFCF and extremely low share of intellectual assets. In Figure 5 (combining the share of machinery and equipment with a share of intellectual assets), the group of CEE countries is located in the lower-right quadrant. A notable case is also the group of "peripheral" EU countries (e.g., Greece, Portugal, Spain) where the low share of machinery and equipment in GFCF is combined with a low share of intellectual assets (therefore, the share of construction is very high).

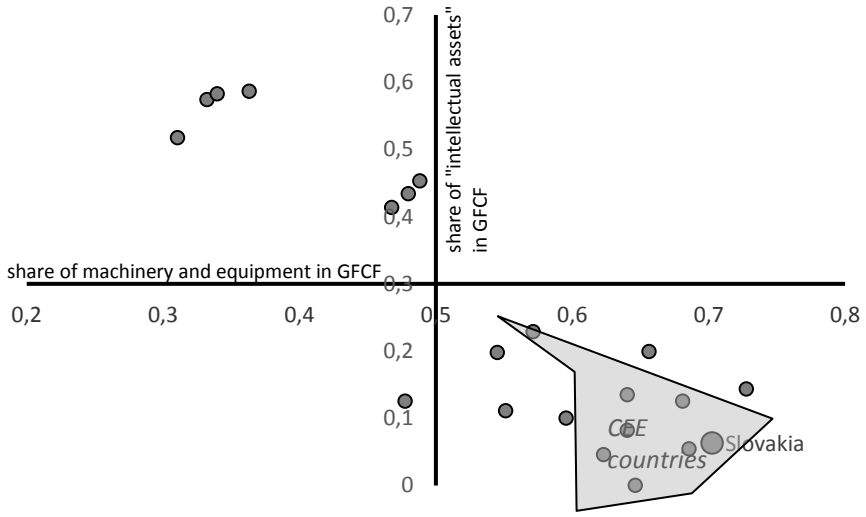
If we narrow down our focus only to the manufacturing sector (previously labeled as a specific case in the undercapitalization of the Slovak economy), we find a similar situation, however, with even more "extreme" values (further away from the values in the most developed economies – they are located in upper-left quadrant of Figure 6).

Figure 5 Shares of Machinery and Equipment and "Intellectual Assets" in Gross Fixed Capital Formation



Note: GFCF- gross fixed capital formation
Calculated from indicators in current prices.
Source: Own calculations based on Eurostat- data.

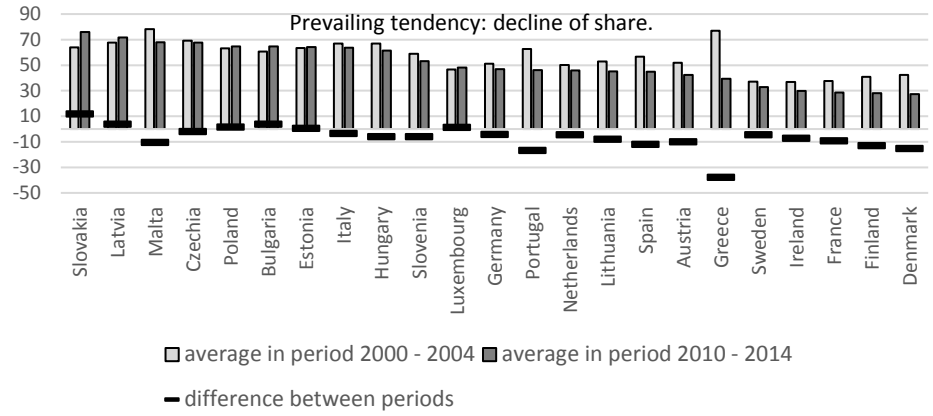
Figure 6 Shares of Machinery and Equipment and "Intellectual Assets" in Gross Fixed Capital Formation- in Manufacturing



Note: GFCF- gross fixed capital formation
Calculated from indicators in current prices.
Source: Own calculations based on Eurostat- data.

There is an extremely high proportion of machinery and equipment in GFCF in Slovakia. Still, the international comparison suggests that there is an overall tendency of decline in the share of machinery and equipment (Figure 7). On the other hand, the share of intellectual assets has increased in the majority of countries. The increase of this share was also recorded in the case of Slovakia and other CEE countries, but only with almost insignificant changes. Therefore, it is visible that the structural change is taking place in the advanced economies: the investments in machinery and equipment are substituted by investments to intellectual assets (by generally known facts about the investment process). More interesting is rather the fact how the CEE countries strongly deviate from these tendencies. The increase in fixed investments (in CEE) is mainly driven by machines and equipment with only an insignificant contribution of intellectual assets. It could be partially explained by the fact that optimal conditions for convergence in intellectual assets can be created after only a certain level of machines and equipment is achieved.

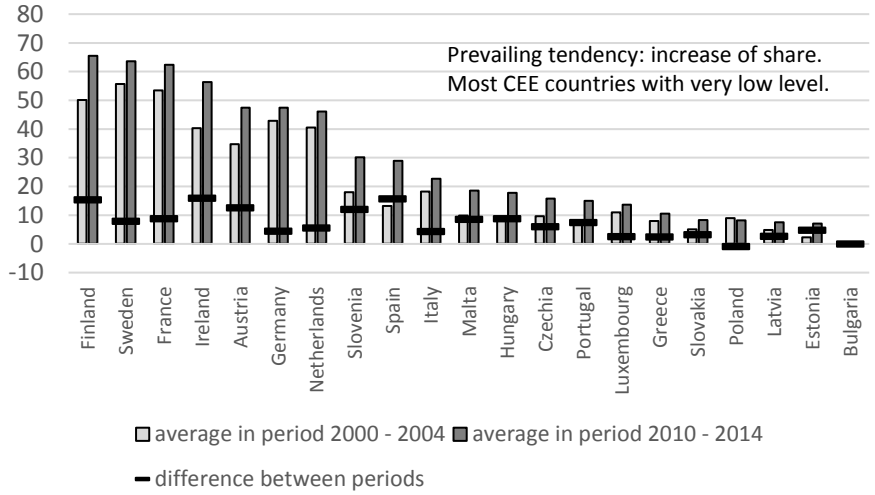
Figure 7 Structural Change of Fixed Investment in Manufacturing: Share of Machinery and Equipment on GFCF



Note: percentage of total gross fixed capital formation, differences in percentage points.
Source: Own calculations based on Eurostat- data.

Also, the investment structure was influenced by the typical fragmentation of production during which the less intellectually demanding activities of mass production developed in the CEE countries (see Garielová, 2008 or Morvay et al., 2015). It is the middle part of production chain which is characterized by a lower rate of value-added; it has assembly nature or high intensity of physical capital in the form of machinery and equipment. This fragmentation contributed in a certain phase of former transition economies development to investments expansion in machinery and equipment. The evolving nature of production is necessarily related to the nature of fixed investments.

Figure 8 Structural Change of Fixed Investment in Manufacturing: Share of "Intellectual Capital" on Gross Fixed Capital Formation.



Note: percentage of total gross fixed capital formation, differences in percentage points
Source: Own calculations based on Eurostat- data.

V.Conclusion

Following, we evaluate our research hypothesis. The undercapitalization of the Slovak economy has eased during the recent decades. However, it was a very uneven process: the massive convergence in labor to capital ratio lasted till the period of 2009 recession, and then it stabilized. The undercapitalization used as the general characteristics of the economy in the previous period was deeply differentiated by sectors: It was absent in the sectors formed during the post-socialist period. The sectors such as information and communication or financial and insurance services were formed with similar capital to labor ratios as they did in advanced economies. However, the

undercapitalization was significantly present in sectors which have been traditionally present in the former socialist economy (agriculture, manufacturing, trade, transportation, accommodation, and others).

Although the Slovak economy lagged in capital to labor ratio behind the most advanced economies, the position of Slovakia in the CEE countries has been relatively favorable. The total fixed assets per worker increased in Slovakia substantially. However, the level of intellectual assets per worker remained at very low levels. The Slovak economy has particularly improved in one segment of capital to labor indicator: the machinery and equipment per worker. It appears to be related to the nature of the production which is especially intensive for this component of fixed assets.

In the process of undercapitalization overcoming, the similar structure of fixed capital as may be observed in advanced countries has not been formed yet. The dynamics of machinery and equipment accumulation was particularly high, however, the accumulation of intellectual assets almost negligible.

The "weak spot" in the process of capital to labor ratio convergence is the development of intellectual assets per worker in manufacturing and sophisticated services (professional, scientific and technical activities). Here is the position of the Slovak economy particularly poor.

Acknowledgements

This paper is a part of research project VEGA 2/0182/17 (50%) and VEGA 2/0070/15 (50%).

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Appendix

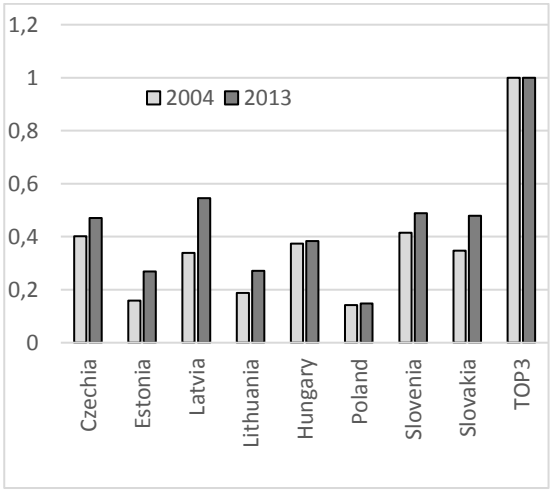
Table 1 Relative Level of Fixed Assets - Labor Ratio
(relative level of Slovak economy to selected country groups)

	SR to TOP3		SR to CEE		SR to V4	
	2004	2013	2004	2013	2004	2013
Total fixed assets						
Total economy	34,7	47,3	117,3	124,2	109,8	128,4
Agriculture	21,3	38,7	166,6	198,4	118,4	154,5
Manufacturing	35,9	51,2	161,8	182,4	129,2	149,2
Trade, transport, accomodation...	41,9	59,3	120,2	128,6	108,2	122,7
Information and communication	72,4	95,6	123,9	162,7	99,9	130,9
Financial and insurance activities	70,7	94,7	182,7	209,9	157,8	174,6
Professional, scientific and technical activities....	31,9	47,8	91,8	117,9	85,3	111,7
Public administration, education, healthcare....	53,5	77,1	123,8	143,4	87,8	111,4
Fixed assets- construction						
Total economy	32,8	43,5	107,7	113,8	104,7	122,2
Agriculture	19,7	34,5	181,5	208,4	123,0	153,0
Manufacturing	46,6	63,3	150,8	165,4	131,7	145,0
Trade, transport, accomodation...	73,1	95,1	121,1	131,8	110,1	124,1
Information and communication	74,5	71,9	93,8	106,1	87,2	97,4
Financial and insurance activities	60,0	83,4	150,3	160,3	142,4	152,5
Professional, scientific and technical activities....	83,6	143,8	108,8	164,5	100,6	150,1
Public administration, education, healthcare....	79,3	83,4	112,6	136,4	79,3	105,5
Fixed assets- machinery and equipment						
Total economy	43,7	73,5	141,8	154,3	116,7	140,4
Agriculture	22,9	42,4	141,8	167,2	111,2	150,2
Manufacturing	35,9	69,8	157,5	193,0	116,4	147,4
Trade, transport, accomodation...	44,9	75,1	106,1	110,8	93,3	110,7
Information and communication	81,3	147,7	152,4	213,4	105,7	149,4
Financial and insurance activities	87,7	112,0	206,7	286,9	161,0	200,8
Professional, scientific and technical activities....	14,4	18,1	67,1	71,9	69,0	68,6
Public administration, education, healthcare....	60,1	71,6	178,4	173,6	127,9	134,8
Fixed assets- intellectual property products						
Total economy	12,9	23,0	112,4	157,8	105,3	150,0
Agriculture	30,3	53,2	161,9	288,1	132,1	180,9
Manufacturing	5,2	7,5	88,9	126,6	81,1	118,8
Trade, transport, accomodation...	26,4	50,8	110,7	240,0	144,5	176,6
Information and communication	44,0	79,1	207,4	272,4	125,1	181,0
Financial and insurance activities	65,1	88,1	258,9	284,8	180,4	183,7
Professional, scientific and technical activities....	5,5	7,8	28,6	31,7	23,2	33,5
Public administration, education, healthcare....	18,1	30,5	196,2	246,6	189,7	204,1

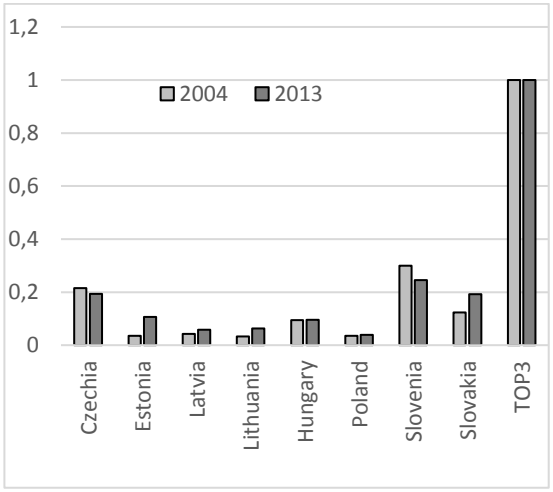
Note:
TOP3- average level of three countries with the highest level of total fixed assets – labor ratio (these countries are Denmark, Austria, and Finland).
CEE- Central European economies (average). Data are available for Czech Republic, Estonia, Lithuania, Hungary, Poland, Slovenia, and Slovakia.
V4- Visegrad countries (Czech Republic, Slovakia, Poland, and Hungary).
Source: Own calculations based on Eurostat- data.

Figure 4 Catching-up with the Most Developed Economies in Assets to Labor ratio

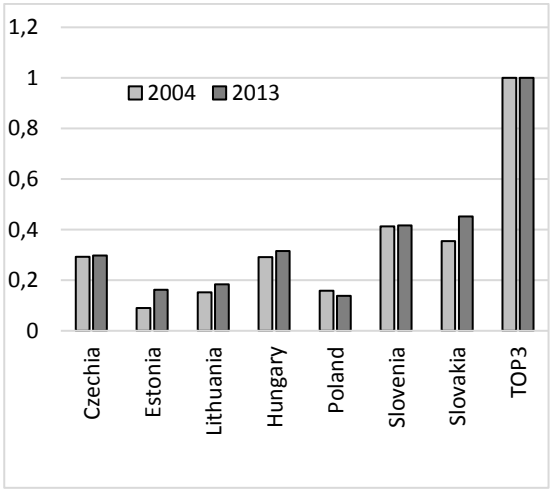
A. Convergence with the TOP3 level in total fixed assets to labor ratio (whole economy, average of TOP3=1)



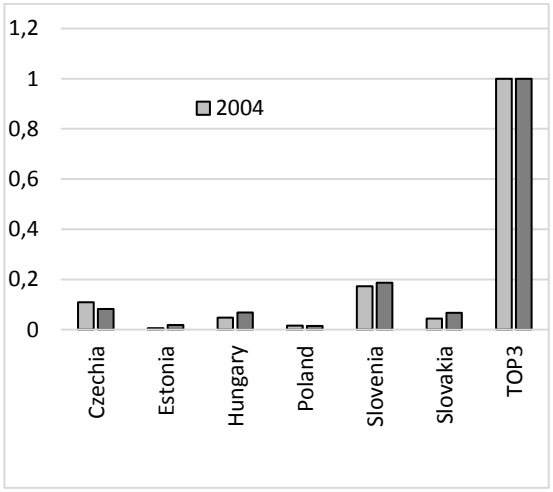
B. Convergence with TOP3 level in „intellectual" assets to labor ratio (whole economy, average of TOP3=1)



C. Convergence with the TOP3 level in total fixed assets to labor ratio (manufacturing, average of TOP3=1)



D. Convergence with TOP3 level in „intellectual" assets to labor ratio (manufacturing, average of TOP3=1)



Note:

-TOP3 in figure 1A- an average of the group of three counties with the highest level of total fixed assets to labor ratio. In this case, the three countries are Denmark, Austria, and Finland.

-TOP3 in figure 1B- an average of the group of three counties with the highest level of „intellectual" assets to labor ratio. In 2004 these countries were Denmark, France, and Finland. In 2013 Denmark, Ireland and Finland.

-TOP3 in figure 1C- - an average of the group of three counties with the highest level of total fixed assets to labor ratio in manufacturing. In 2004 these countries were Denmark, Austria, and the Netherlands. In 2013 Denmark, Belgium and Finland.

-TOP3 in figure 1D- an average of the group of three counties with the highest level of „intellectual" assets to labor ratio in manufacturing. In 2004 and also in 2013 this group included Germany, France, and Finland.

Source: Own calculations based on Eurostat- data.