

***Łukasz Cywiński, Ruslan Harasym,  
Robert Pater, Kazimierz Tarchalski\****

## INTANGIBLE CAPITAL, LEVEL OF ECONOMIC DEVELOPMENT, AND MIDDLE INCOME TRAP<sup>1</sup>

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### ABSTRACT

The aim of this article is to interpret levels of intangible capital in Poland and in eastern European economies, as well as its role in their development. Authors provide some explanations of the so-called middle income trap in terms of intangible capital deficiency and structure. They also discuss caveats of intangible capital measurement. The analysis is based on publicly available data up to 2005 and on authors' estimates of intangible capital for Poland after 2005. In order to do this, the Corrado, Hulten, and Sichel methodology was used. It was found that: (i) tangible to intangible capital ratio is considerably larger in the eastern European economies than in the western ones; the reason is that the former countries mostly import technology, while still relying on traditional growth factors; (ii) structural changes in middle-developed and highly developed economies are connected to the structure of intangible capital; faster economic growth and development

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\* Department of Economics, University of Information Technology and Management in Rzeszów, Poland.

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may be obtained by acquiring more innovative property; (iii) low intangible capital accumulation results in low productivity of service sector; the reason is less developed knowledge-intensive service sector, the result is slower growth of GDP per capita; (iv) for intangible capital acquirement it is important to ensure economic, civic and political freedoms and intangible capital monitoring.

**Keywords:** intangible capital, growth factors, growth convergence, middle income trap, structural change

**JEL Classification:** E22, E61

## 1. INTRODUCTION

Economists have for a long time stressed the importance of knowledge and its application to economic growth and structural change. Already Joseph Schumpeter wrote in 1930s about the waves of “creative destruction” and the role of product and process development, organizational change, management, marketing and finance in generating those waves. In this sense the search for the role of the recently discovered importance of intangible capital – in contrast to the historically well-established role of tangible (fixed) capital – has its intellectual roots in Schumpeterian evolutionary economics.

Any economic phenomenon should be measurable to a larger or smaller extent. Intangible capital – in spite of its intangibility characteristics – should both be made measurable and put into an already existing accounting framework. Of special interest here is the economic growth accounting framework, as intangible capital, when properly measured, contributes to economic growth.

In the methodological/statistical sense, the measurement of intangible capital draws on the theorizing and empirics of, in particular, Denison (1962, 1967, 1969, 1972, 1974), Jorgenson and Griliches (1967, 1972). Their work resulted in an increased understanding of economic growth factors and reduced the so-called residual – that is the unexplained part of growth ascribed to an interaction among the already well established growth factors.

The last 10–15 years witnessed an increased interest in the issue of intangible capital (sometimes called also immaterial capital) and its measurement. It stems from the fact that various analysts perceived the existence, importance and growth of certain expenditures that are intended to increase output and profits in the future, but cannot be classified as traditional tangible (fixed, physical) capital formation. In consequence they are not presently made a part of value added in growth accounting, but classified as intermediate input (or “throughput”). As a consequence, value added, or GDP, is lower than it would have been with the proper classification of investments in intangible capital. The calculations in the EU-financed *Innodrive* project reveal that the aggregate GDP in the EU–27 countries would have been approximately 5.5% higher with the inclusion of all investments in intangible capital than the conventionally measured GDP.

But there is a more important distortion involved. Determinants of GDP growth are missing from such accounting due to the fact that intangible investment – in contrast to tangible investment – remains unaccounted for and the extent of its contribution to economic growth is by and large unknown.

Early empirical studies on intangibles concentrated on the developed economies (high income economies, see their review, e.g., in van Ark et al., 2009). In the quoted review study, only three such countries were included (the Czech Republic, Slovakia, and Greece). A quantitative breakthrough came with a large EU-financed project called *Innodrive* that covered all member countries of the European Union plus Norway, and presented calculations, applying the same Corrado, Hulten, and Sichel (CHS) methodology<sup>2</sup>. The project that was completed in 2011 and covered the 1995–2005 period not only offered a static picture of intangibles across countries, but also a medium-term evolution of their ratio to GDP for each country covered by the project.

In this article authors concentrate on a narrower group of countries, that is, selected middle-developed countries from Central Eastern Europe: the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia. They were previously classified as post-communist transition leaders and later were rewarded for their successful efforts by becoming first post-communist economies that achieved full membership in the European Union. They were prized both for their institutional progress and economic performance, including foreign trade, or more widely, external performance – that has been not only better than the performance of “old” EU members, but also better than world foreign trade performance (see, i.e. Winiecki, 2009). Authors decided that it is worth looking at the group of high performers also from the vantage point of their creation of intangible capital in the process of economic growth and structural change.

The aim of this article is to interpret levels of intangible capital in Poland and in eastern European economies as well as its role in the development of post-communist transition leaders. Authors provide some explanations of the “middle income trap” by intangible capital deficiency and structure. They also discuss caveats of intangible capital measurement. The analysis is based on publicly available data up to 2005 and on the estimates of intangible capital for Poland after 2005 made by authors. International comparisons are made up to 2010, as estimates for more recent years in other eastern European countries are generally unavailable.

The next section of this article contains intangible capital measurement issues as well as its relations with economic growth in high income and middle income countries. The third section includes an analysis of intangible capital levels in the EU new member states. In the fourth section the role of intangible capital in explaining the “middle income trap” is discussed. The last section concludes the article.

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<sup>2</sup> See, in particular, a collection of papers in Piekkola (2011).

## 2. INTANGIBLE CAPITAL: ECONOMIC GROWTH, STRUCTURAL CHANGE AND DIFFERENCES IN THE LEVEL OF DEVELOPMENT

What is intangible capital and how to measure investment in intangible capital? As defined by authors of the most often used methodology (Corrado et al., 2005, 2006) “intangible investment is expenditures of businesses that are intended to boost output in the future but that are not traditional, tangible, physical capital” (see Sichel, 2008). The very term “intangible” implies, apart from difficulties in measurement, also a much broader range of assets created by investments in intangibles. This range is much broader than plants and equipment, means of transportation and buildings, classified traditionally as fixed, i.e. tangible investment. In line with CHS methodology, the broad range of intangible investments, that is business spending on intangibles, is divided into three categories, within which further subdivisions are made (see primarily Corrado et al., 2005, 2006):

- computerized information,
- innovative property,
- economic competencies.

Piekkola (2011) shows the detailed procedure of intangible capital calculation, adapted in the *Innodrive* project. Detailed intangible capital categories with data sources and description were shown in Table 6 in the appendix.

According to the presently applicable rules, only a small fraction of intangible investment is taken into account as part of GDP. Of the first category of intangibles, that is *computerized information*, only software is included in growth accounting. Other activities, such as creation of data bases, a growing range of applications of cloud computing, etc., are not.

The second category, i.e. *innovative property*, is the most varied, and includes scientific research and development (R&D), including that in the social sciences and humanities, generation of knowledge on mineral exploration and evaluation, costs of copyrights and licenses in the literary and entertainment activities, development expenditures in financial services, as well as architectural and engineering designs. Of these it is only R&D that has been included in the NIPA (National Income and Product Accounts) used to measure US economic growth as of 2013 (with some other countries attempting to follow suit). The rest by and large continues to be calculated as intermediate input not included into value added or GDP.

R&D is studied most often of all subcategories of innovative property. It is interesting, however, to note (cf. Sichel, 2008) that in spite of all the calls for an increase in the R&D/GDP ratio (see, e.g., EU Lisbon Strategy of the year 2000) and attention lavished on R&D, in fact R&D, seen as the main source of innovation, contributes a relatively small part of the aggregate intangibles calculated according to CHS methodology.

Investment in organizational capital of firms is the largest sub-category within the third, *economic competencies*, category, and overall. Efforts of management are necessary in adjusting the firm to the changing technology and other changes taking place in the firm and in the market. This particular issue is not new.

Carlsson (1981) presented his study of the Swedish manufacturing industry over the decade of 1970s, calculating how important such adjustments had been for the productivity gains from new technology. He revealed that technological change alone contributed in between 20–30% and 60–70% to the aggregate productivity growth. The remaining part had been the result of accompanying organizational changes, combined with training of the personnel, etc. Thus, technological change (more often than not considered to be the outcome of R&D activities) should not be seen as the one and only source of the growth of productivity among intangibles. A large range of investments in intangibles (although they were not called so in Carlsson study) are important co-investments that contributed at least as much to productivity growth as (presumably R&D-generated) technology itself.

However, the variety and other characteristics of the intangibles pose serious challenges to measurability of these investments. Some challenges have been overcome by better calculating methods as well as have forced researchers to roughly estimate proportions of expenditures that were building value in the longer run (beyond one year range) and expenditures that helped increase current sales (within one year). Examples of such agreed proportions consist of advertising and market research. The foregoing proportions were not off-the-cuff numbers, but were results of numerous studies of the aggregate expenditures in various categories of activities.

Yet there is no doubt that such intangibles create value for the future, as for example product and process developments in the financial sector. Innovative property arrangements, combined with computerized information and managerial adjustments, contributed, for example, to the emergence of 24/7 online banking for customers. They were a major step forward in both efficiency and service expansion of banking services in the long-run.

With the rapidly growing acceptance of CHS methodology of estimating expenditures on intangible capital, a number of empirical studies that show country time series and cross-country comparisons have begun to be published. Nonetheless, a caveat is needed: the measurement of expenditures on intangibles covers the market sector expenditures only.

More importantly, these publications revealed certain characteristics of investments in intangibles that are – in our opinion – of high significance for the research on hypotheses concerning determinants of the role of intangible investment in the process of economic growth and structural change. Also, they should be of help in considering the issue of how to avoid the “middle income trap” considered also in this article.

A series of country and comparative studies applying CHS methodology yielded important generalizations concerning the relationship between the volume

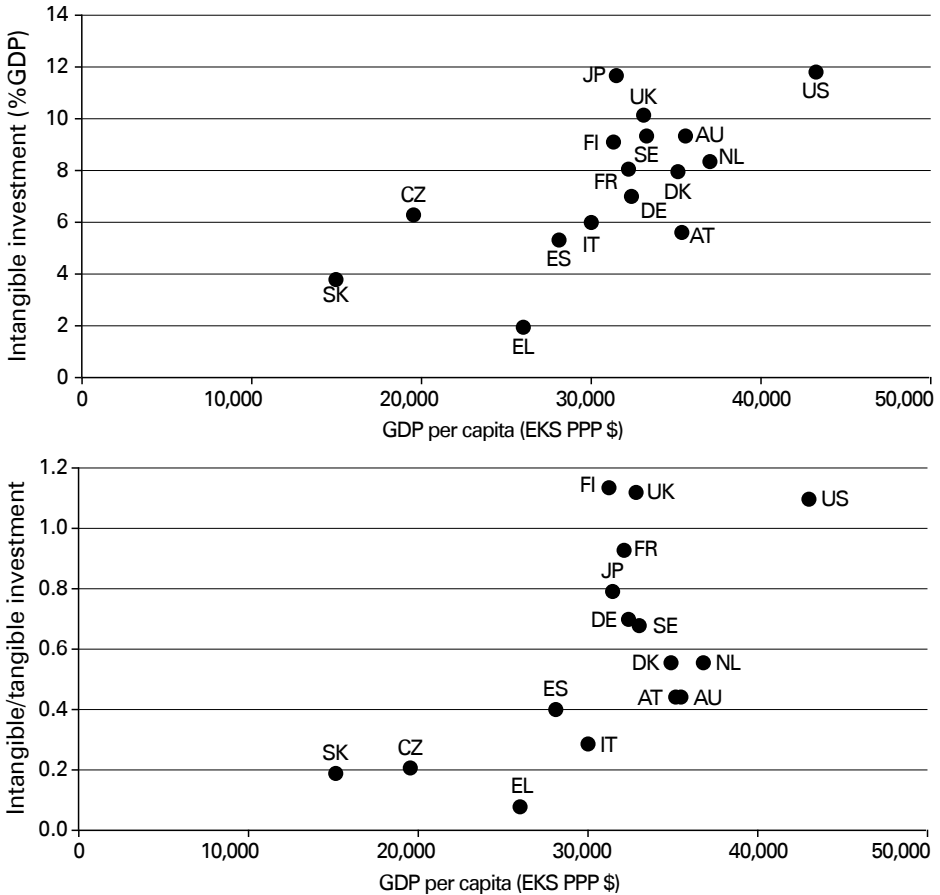
of intangible investment and the level of economic development. Two of them are of special importance both in general analysis and with respect to this article.

The first is a statistically established positive correlation between the volume of intangibles relative to GDP and the level of economic development measured by GDP per capita. On the whole, the higher the GDP per capita level, the higher the intangible investment/GDP ratio.

Van Ark et al. (2009) compared all studies available at the time, mostly of highly developed economies and a few of middle-developed economies, and established a strong positive association between the two variables in question. The scattergram in Figure 1 presents graphically the association in question.

The reasons why intangible investment is of lesser importance for less developed or even middle-developed economies are varied, but they lead to similar conclusions. Economies that are at the early or even middle phase of industrialization depend on different drivers for their economic growth and associated

**Figure 1. Intangible investment and GDP per capita (2001–2004)**



Source: van Ark et al. (2009).

structural change. First, their development depends primarily on the availability of lowly skilled, low wage labor force, largely moving out of agriculture into labor-intensive branches of manufacturing. Such labor does not require large quantities of intangible investment.

Second, at that stage of economic development their demand for technology is limited to easily mastered, standardized, off-the-shelf technology. It is available on the world market or applied by subsidiaries of multinational firms in the so-called export platforms established for the production and exports of standardized (nowadays they are often called “commoditized”) manufactured products in less or middle-developed economies.

Unsurprisingly, then, intangibles are concentrated in highly developed economies. For example, even now – with all the trumpeted competition from the BRIC countries – the five largest Western economies account for almost 60% of world expenditures on research and development. But R&D expenditures are just one component of intangibles. Less developed and middle-developed economies need also less of other components of intangibles.

Thus, the concentration of investment in software and data bases is not much less concentrated in highly developed Western economies than R&D, in spite of strong competition from India, and increasingly China. Furthermore, investment in intangibles belonging to the category of economic competencies of the firms is also tilted in favor of rich, highly developed economies. Large firms, firms in sophisticated industries, as well as multinationals operating in a number of countries emerge usually at higher levels of economic development.

There is, however, no sharp divide in intangible investment/GDP ratio between middle-developed and highly developed economies. The ratio tends to grow over time and with the GDP per capita. Accordingly, the same economy – already classified as highly developed – tends to increase the intangible investment/GDP per capita ratio as its GDP per capita continues to grow. Thus, the path-breaking studies of the US economy (Corrado et al. 2005, van Ark et al. 2009) revealed that in 1973–95, the average intangible investment to GDP ratio amounted to 9.4%, while in the subsequent period of 1995–2003 the ratio in question increased to 13.9%. Of course, not all categories of intangibles grew at the same rate. For example, the computerized information grew the fastest and increased its computerized information/GDP ratio from 0.8% to 2.3%, while firm-specific economic competencies grew from 3.5% to 5%.

As economies grow and their GDP per capita level increases, structural change continues to take place. The share of manufacturing in GDP and employment usually declines, while that of market services increases. The growing ratio of intangibles to GDP should be looked at also from that perspective. Early studies tend to show also a marked increase in intangible investment in the fast growing sector of market services (Uppenberg, 2011). Importantly, it is the sector whose share increases not only in terms of output, but also in employment.

However, the recent research revealed also a difference in composition of intangibles between manufacturing and market services. For example, the R&D

expenditures are more heavily concentrated in manufacturing. This suggests that intangibles in manufacturing are more oriented toward product and process innovations, generated by R&D, while intangibles in market services are more concentrated on innovative property arrangements, brand equity support, especially marketing, upgrading the skills of the personnel, as well as creating and applying organizational innovations. The latter are also legitimate innovations, covered by the recent, third revised edition of the Oslo Manual on innovation. The manual recognizes four broad categories:

- Product innovation;
- Process innovation;
- Marketing innovation;
- Organizational innovation.

Within the above classification, differences emerge between manufacturing and market services. It is especially visible in Germany, Portugal and Slovenia (cf. Uppenberg and Strauss, 2010). These differences are going to increase in importance, reflecting the previously stressed trend of the growing share of market services relative to manufacturing in output and employment.

The distribution of intangibles between the two major sectors is sharply different in e.g. the United Kingdom and Germany. In the former only a quarter of aggregate intangible investment has been taking place in manufacturing compared to more than half in Germany (Pesole et al., 2010). However, the difference between countries broadly at the same level of GDP per capita becomes less surprising if we keep in mind that the share of manufacturing in GDP in the UK accounts for about half of that in Germany. Nonetheless, the analyzed ratio suggests that Germany is far behind the United Kingdom in terms of intangible investment in the fast growing market services – and accordingly in the aggregate intangibles to GDP ratio: 7.2% and 10.5%, respectively. Because of structural change, the importance of growth-promoting intangibles in market services in generating economic growth in high income economies has continued to increase.

### 3. TANGIBLE AND INTANGIBLE INVESTMENT IN THE EU NEW MEMBER STATES

Middle-developed economies tend to acquire more intangibles as they not only grow, in terms of GDP per capita, but also change their output and employment structure in the direction of a greater share of market services. The level of intangibles is not as high as in highly developed, but it was by and large increasing over the 15 years' period for all countries in question (see Table 1).

As stressed in the preceding section, the ratio of intangibles to GDP rises in the process of GDP per capita growth. It is not, however, a linear process. Nor is it a process independent of other contributions to economic growth, primarily



**Table 1. The intangible investment to GDP ratios in % in 1995, 2000, 2005, and 2010 for the eight countries**

Country	1995	2000	2005	2010
Czech Republic	5.4	6.6	7.6	6.3
Hungary	5.8	7.0	7.3	–
Slovenia	6.0	6.8	7.0	7.2
Slovakia	3.2	5.8	6.4	–
Estonia	5.1	4.6	5.2	–
Latvia	2.8	3.8	4.7	–
Poland	3.0	4.8	4.6	5.8
Lithuania	2.4	3.2	4.0	–

Source: Calculated by Jona-Lasinio et al. (2011) on the basis of *Innodrive* project data; 2010 for Poland – own calculations.

the that of tangible capital (i.e. gross fixed capital formation – GFCF). We noted in the preceding section that in highly developed economies the share of tangible capital in GDP tends to stabilize or even decline, while intangible capital continues to grow in terms of intangibles to GDP ratio.

Nonetheless, middle-developed countries differ markedly from highly developed ones also in this respect. In high income countries the tangible/intangible ratio, measured in GDP, ranges between 2:1 and 1:1 (the latter registered in the US, Japan, or UK). Notable negative exceptions are South European countries. However, the middle income countries display different structural characteristic from the high income ones (Table 2). The share of manufacturing in GDP in the middle income group is usually higher, sometimes markedly.

Economic growth in middle-developed economies is still primarily driven by manufacturing. This sector is either close to its peak share in GDP or has already reached its peak and whatever structural change takes place therein, it occurs within the confines of the stable – or already declining – manufacturing share (see Winiecki, 2014). Thus, gross fixed capital formation plays a very important role in economic growth of these countries.

It is, therefore, not surprising that among the eight countries considered in this section the share of tangible capital (GFCF) is much higher than that of intangible capital. It ranges between 5:1 and 2:1, with three notable leaders, the Czech Republic, Hungary and Slovenia. Each exception is different though. The Czech Republic is often classified as a post-communist economy being the closest to mature Western (highly developed with high income) economies. It is not surprising, therefore, that with respect to its intangibles/GDP ratio, as well as tangible/intangible capital ratio it also resembles mature Western economies.

**Table 2. The intangible/tangible investments ratios, excluding residential capital (1 = equal)**

Country	Total IC/TC		Computerized information/TC		Innovative property/TC		Economic competencies/TC	
	2005	2010	2005	2010	2005	2010	2005	2010
<i>Highly developed economies</i>								
France	0.8	0.9	0.1	0.2	0.3	0.3	0.4	0.4
Denmark	0.7	0.9	0.2	0.3	0.2	0.3	0.3	0.3
Germany	0.7	0.7	0.1	0.1	0.3	0.3	0.3	0.3
Austria	0.5	0.5	0.1	0.1	0.2	0.2	0.2	0.2
Italy	0.4	0.4	0.1	0.1	0.1	0.1	0.2	0.2
Spain	0.3	0.4	0.1	0.1	0.1	0.1	0.1	0.2
<i>Middle-developed economies</i>								
Latvia	0.2	–	<0.1	–	<0.1	–	0.1	–
Hungary	0.5	–	<0.1	–	0.1	–	0.3	–
Czech Republic	0.4	0.4	<0.1	<0.1	0.1	0.2	0.2	0.2
Slovenia	0.4	0.6	<0.1	0.1	0.2	0.3	0.2	0.3
Poland	0.3	0.3	<0.1	<0.1	0.1	0.1	0.2	0.2
Slovakia	0.3	–	<0.1	–	0.1	–	0.2	–
Lithuania	0.3	–	<0.1	–	0.1	–	0.2	–

IC – sum of intangible capital, TC – sum of tangible capital.

Source: *Innodrive* project data; 2010 for Poland – own calculations.

The latter ratio is also close to 2:1, that is typical for the latter economies. Slovenia was increasing R&D expenditures between 2005 and 2010 by 10% per year. Over a half of all these investments is private. Slovenia is efficient in case of scientific output. Unlike other transition economies, it has strengthened its universities and R&D infrastructure.

Hungary is a more difficult case to interpret. It is also a post-communist economy with a high intangibles/GDP and low tangibles/intangibles ratios, but the latter ratio is largely due to a rather low absolute share of tangible capital (GFCF) in the market sector (12-14% GDP only). Thus, it is probable that the low share of GFCF is due to other factors such as macroeconomic and/or other policy errors, which might have resulted in markedly lower or even negative economic growth, and in consequence – also lower level of tangible investment.

Interesting features of statistics in Table 1 are the differences of intangibles/GDP ratios among the countries in question that are larger than the differences of their GDP per capita ratios. In fact, the same can be said about highly developed economies of the West. To add yet another feature, some post-communist countries with high intangibles/GDP ratios register higher ratios than some higher income Western economies. This latter feature is revealed in Table 3, ranking 10 EU member countries with the highest intangibles/GDP ratios.

**Table 3. Top ten EU countries by intangible capital formation/GDP ratio in 2005 and 2010**

Country	IC/GDP Ratio 2005	IC/GDP Ratio 2010
Sweden	9.1	8.7
United Kingdom	8.9	8.5
Belgium	8.1	8.5
France	7.6	7.8
<i>Czech Republic</i>	7.6	6.3
Netherlands	7.5	6.9
Finland	7.3	7.4
<i>Hungary</i>	7.3	–
Denmark	7.1	7.8
<i>Slovenia</i>	7.0	7.2

Middle-developed countries under consideration in italics.

Source: see Table 1.

So far we have largely been stressing certain similarities and continuities both within the group of eight former post-communist transition leaders and in comparison with mature, highly developed Western economies. At this point we would like also to stress certain differences, apart from the obvious one stemming from a relatively high positive correlation between the IC/GDP ratios and GDP per capita levels.

These differences are noticeable at less aggregated levels than intangible investment as a whole. For example, the middle-developed economies differ from highly developed ones in terms of proportions between the shares of two largest basic categories of intangibles, that is innovative property and economic competencies of firms. In highly developed economies these proportions are roughly equal. In middle-developed ones the share of intangibles in economic competencies, especially in firm-specific human capital, was markedly higher until late 2000s. Then it rapidly decreased to even lower levels (Table 4).

**Table 4. Firm-specific human capital to GDP ratio in selected highly developed and middle-developed economies**

Country	2005	2010
<i>Highly developed economies</i>		
France	1.51	0.96
Denmark	1.49	1.35
Germany	1.29	0.94
Austria	0.79	0.79
Italy	1.02	0.55
Spain	0.81	0.40
<i>Middle-developed economies</i>		
Latvia	2.89	–
Hungary	2.83	–
Estonia	2.73 <sup>a</sup>	–
Czech Republic	2.28	0.57
Slovenia	2.06 <sup>b</sup>	0.74 <sup>c</sup>
Poland	1.81	0.30
Slovakia	1.63	–
Lithuania	1.46	–

<sup>a</sup> – 2004; <sup>b</sup> – 2003; <sup>c</sup> – 2009.

Sources: van Ark et al. (2009) for highly developed economies; Cywiński and Harasym (2016) for middle-developed economies, both on the basis of *Innodrive* project data, data for Poland in 2010 – own calculations.

At the even more disaggregated level, other often large differences may also be discerned. In the most important case, R&D, including that in social sciences and humanities, contributes sharply different shares to intangibles in highly developed and middle-developed economies.

Except for two countries regarded as parts of the former group (Italy and Spain), the contribution of extended R&D to intangibles in terms of their ratio relative to GDP has been dramatically different. Following the already quoted survey by van Ark et al. (2009), the contribution of R&D to the intangibles, measured in terms of GDP, fluctuated in highly developed economies between 1.0% and 2.0%. In Italy and Spain it was only around 0.6%. However, the same ratio for the middle-developed post-communist transition leaders was much smaller (again, except for the Czech Republic). Elsewhere, it fluctuated around barely 0.2% of GDP.

Such large differences require an explanation. However, the issue is going to be dealt with in the following section as it is to be important for the next major

issue to be considered in this article, namely, whether middle income economies – including the eight central eastern-European countries under consideration – face an intellectually fashionable, but not well defined, so-called “middle income trap”<sup>3</sup> on their path to becoming high income economies.

To close this section we would like to mention the structural change-related issues. For example, Uppenberg (2011) calculated that there are large differences in the contribution of each major sector to the aggregate productivity growth of national economies across three geographical areas: middle income new member countries (the eight countries under consideration plus Malta and Cyprus), “old” EU member countries (EU-15) and the United States. Thus, in the middle income economies market services contributed 17% to the aggregate productivity growth, in the EU-15 group 35%, while in the US – market services contributed the overwhelming share of 57%. Uppenberg (2011) correctly stresses the importance of economic structure, apart from the growth rates of sectoral productivity. For although output and employment in the market services’ sector in middle-developed economies in question grew in the period under study, the shares of that sector were still lower or significantly lower than in “old” Europe (to say nothing about the United States).

#### 4. INSTITUTIONS, INTANGIBLE CAPITAL AND THE MIDDLE INCOME TRAP

In the opinion of the authors of this article, the meaning of the middle income trap should be clarified as follows. First, we should look at manifestations of that phenomenon and define the level of development of countries that could be affected by the said phenomenon. A good starting point is the definition of such manifestations as “sustained slowdowns [of economic growth] in increasingly mature economies” (Eichengreen et al., 2011).

The above authors studied all cases of fast growing economies since 1957 that already reached what we call middle income level and they call increasingly mature economies, which subsequently registered periods of sustained slowdowns in economic growth (at least 2.5 percentage points annually over the 7-year period). The average GDP per capita of these countries ranged between 15000 and 17000 USD in 2005 PPP prices.

Shifting from manifestations to the sources of such slowdowns, Eichengreen et al. (2011) point first to proximate sources, which they define as a dramatic decline in total factor productivity (TFP) growth. They point out that 85% of GDP growth slowdown is explained by TFP slowdown.

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<sup>3</sup> See, in particular Aiyaret al. (2013). The categories of variables taken into consideration do not seem to be well defined, as for example the separate categories of macroeconomic fundamentals, including the size of government, and institutions, including property rights and regulations.

Next, they shift from proximate to original sources and single out two such sources. The first is the end of a stage of economic development (more precisely: the industrialization phase) when workers shift from low productivity agriculture to higher productivity manufacturing. With the end of that phase, the major source of productivity growth disappears. The second source is less precise in terms of timing, but no less important. It is the declining ability of such economies to benefit from the available standardized technology (either easily obtainable off-the-shelf technology or that applied by multinationals in their export platforms established in such economies). As these economies reach the stage of development that Eichengreen et al. (2011) define as being “increasingly mature”, while we define as approaching or already reaching middle income level, they are under increasing pressure to develop their own, original technologies, or, at least, to show the ability to significantly upgrade the technology obtained from external sources.

In conclusion, the failure of finding new sources of productivity growth once the old ones accompanying the industrialization process have been exhausted, is the main cause of the sustained slowdowns creating in turn the middle income trap. We would add to the above also the inability to find ways to expand the human capital-intensive market services, that is to pursue structural change at a new, higher level of development (measured by GDP per capita).

Even with the added structural change context, however, a well-defined and empirically supported hypothesis of Eichengreen et al. (2011) is – in our view – incomplete. For these authors tend to neglect non-economic (institutional) determinants of barriers to continuous high, or reaccelerating, economic growth of middle-developed economies. Institutional economics points to such determinants (or at the very least enabling factors). Fatás and Mihov (2009a, 2009b) note the existence of what other call middle income trap, but stress that main barriers to further growth leading to the high income level result from the low quality of institutions.

Like Eichengreen et al. (2011), they note the recurrence of economic slowdowns once economies reach certain level of GDP per capita range (for them it is 10000–12000 USD in 2007 prices). Many economies, given their weak institutions, get stuck at about that level that these two authors call *the Great Wall*, in an obvious reference to future problems of China as it approaches that income level. They see serious problems with weak, low quality Chinese institutions. Countries that surpassed *the Great Wall* have all been benefiting from possessing high quality institutions.

Winiński (2014, 2015) stressed that countries undergo two major structural transformations within the ongoing process of economic growth – industrialization and the shift in the growth engine role from manufacturing to human capital-intensive market services. The latter requires not only economic freedoms, but also civic freedoms and even political freedoms (together, they are defined by Fatás and Mihov, 2009b, as high quality institutions), and the separation of powers.

To offer an example, in the latter structural transformation both phases: research resulting in invention and subsequent innovation of business firms depend on institutions and policies (within the framework of these institutions). Thus, invention requires freedom – from choosing the topic of research, to unshackled debate, to publishing the results, to being able to express oneself freely not only within the relatively narrow confines of a professionally pursued subject, but also with respect to wider ramifications of that subject.

The fear of repression greatly reduces the free debate, as well as prospects for achievement. Moreover, not only scientists and technicians working on R&D, but also academics working in humanities, scholars and artists licensing their works, advertisers, market researchers and others need a wide range of freedoms in pursuing their activities.

Being protected from petty vengeance and more serious encroachments of the rulers and their henchmen matters. Otherwise their ability to create intangible capital is going to suffer, reducing the dynamics of economies affected by the deficit of freedoms.<sup>4</sup>

In such a wider economic and political framework of analysis it is easier to see the similarities and differences between countries and groups of countries in terms of their ability to overcome the middle-income trap or, alternatively, *the Great Wall*. Thus, it is our opinion that a group of Central Eastern European countries under consideration have successfully passed the test of the quality of institutions. Even if their institutions are far from being perfect, the major institutional progress has been, so to say, confirmed by being the first post-communist countries that became in 2004 full members of the European Union.

The caveat should be made that no institutional arrangements last forever. There is always a danger of institutional retrogression that would recreate barriers to becoming a high income economy. And signs of the existing or prospective retrogression are appearing in some countries in question.

This is not always the case with other middle income or approaching middle income economies. In his study of the BRIC group of countries, Winiński (2012, 2015) stressed that some countries of the group face – apart from their economic problems related to insufficient economic freedoms – a major problem with the absence of other freedoms – civic and political – which strongly reduces the probability of overcoming *the Great Wall*. He pointed out that these countries are primarily Russia and China. In fact, Russia had already failed to overcome *the Great Wall* in its earlier institutional guise as the Soviet Union. And both present day Russia and China failed so far to create institutions of sufficiently high quality, to set the stage for the next major structural transformation and the advancement to the club of high income countries.

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<sup>4</sup> Interestingly, Buser and Connors (2012) tested Winiński's hypothesis of the importance of non-economic freedoms (he calls them "democracy-related freedoms") for overcoming "the Great Wall" – or alternatively middle income trap – and found strong support for the hypothesis. Also, research by Knutsen (2015) supplies an indirect evidence that countries with high quality institutions (he calls them democracies) tend to grow faster than autocracies.

Given the above juxtaposition, it seems that the eight former post-communist transition leaders are in a relatively advantageous position in their attempts to advance to the Western club of highly developed economies. The nonexistent – or at most weak – non-economic barriers create better environment in which to tackle the middle income trap. A weakly defined (see above) middle income trap is concentrating on economic freedoms. Thus, our remaining considerations will concentrate on economic issues.

There is a number of interrelated factors that may help to explain the difference between relative intangible capital in high- and middle-developed economies. First of all, intangibles are created in the process of investment, also of tangible investment. As the middle-developed economies display much higher tangibles/intangibles ratio, given the large role of manufacturing in these countries, intangibles accompany to a much greater extent the tangibles.

The major share within the sub-category of economic competencies of the firm is held by what we call *organizational* capital that in CHS methodology covers two sub-categories: firm specific human capital and organizational structure. The former covers various forms of training, while the latter presents involvement of an important share of managerial/marketing personnel in absorbing, adapting, and upgrading the technological change. The large role of manufacturing in middle-developed economies ensures higher demand for and, consequently, higher supply of intangibles in the form of firm-specific human capital and organizational structure, accompanying the introduction of new technologies. Its decline during late 2000s negatively influenced the structure of the economies and resulted in a slow pace of economic growth in many countries after the 2007–2010 crisis.

There is yet another distinguishable feature of middle-developed economies associated with the organizational human capital. Intangibles in organizational structure appear in two ways – by involvement in the actual management of the firm or they may be purchased from outside (expertise, consultancies, etc.). Middle-developed economies in their efforts to catch up with highly developed competitors invest more tangibles in their manufacturing and other competitive sectors. They also generate more accompanying intangibles.

Moreover, the foregoing processes in middle-developed economies take place with a greater or smaller involvement of foreign direct investment (see, for example, Uppenberg, 2011, on new EU member states). The participation of foreign firms, often large multinationals, affects – in our opinion – both the share of organizational capital and the proportions between purchased and own account organizational structure sub-category. The technological/organizational distance between a multinational and an intercepted local firm is usually greater than in the case of a domestic takeover. Therefore, purchased organizational capital would normally be higher relative to corresponding own account efforts in these areas.

These are important indicators that currently accentuate the difference between middle-developed and highly developed economies in terms of their tangible/intangible investment characteristics. But will they be appropriate



tomorrow, that is if want to monitor prospects for reducing the gap between the GDP per capita of countries under consideration and the countries that long ago reached their present highly developed economy status? The most obvious thing would be to monitor innovativeness indicators and, from the intangible capital perspective, first of all the contribution of R&D to the creation of intangible capital, measured in terms of percentage of GDP. We stressed in the preceding section the large distance between the R&D contribution in highly developed and middle-developed economies (except for the Czech Republic, whose contribution again was closer to highly developed than to other middle-developed countries under consideration).

It is worth stressing that contrary to general tendency of thinking about innovation in terms of national systems, concentrating on national firms and public support for these firms, the available empirical material suggests the opposite. Namely, it suggests that it is foreign-owned or at least partly foreign-owned firms that contribute most in middle-developed countries to business-financed R&D (see, e.g., Jurajda and Stancik, 2011, for the Czech Republic, and Swiadek, 2015, for Poland). Greater interaction of public authorities with these, often very large firms, would undoubtedly help increase the R&D base in these countries (and this is what Hungarian governments were successfully pursuing for a long time).

And, while we are considering the role of country's policies for the innovativeness of firms, it is worth stressing one supply side issue that remains – to some extent – within the realm of influence of the state. We have in mind the supply of university graduates in science and engineering, an issue which becomes important as trendy preferences tempt students in other directions. Table 5 suggests that there were sharp differences across the eight countries in question in terms of the share of science and engineering graduates in the total supply of university graduates in 2001. In the following years these differences were gradually decreasing. In 2013 they were considerably lower.

**Table 5. The share of science and engineering graduates in the supply of university graduates in 2001 and 2013 in percentage points**

Country	Percentage 2001	Percentage 2013
Lithuania	25.6	22.2
Slovakia	25.6	20.5
Czech Republic	22.0	23.2
Slovenia	20.2	26.1
Estonia	18.1	24.7
Latvia	12.1	17.9
Poland	10.4	21.0
Hungary	10.0	17.3

Source: own calculations on the basis of Eurostat database.

Coming back to more general issues of intangible capital, R&D in science and humanities are just one component of the larger category of intangibles classified in CHS methodology as *innovative property*. Innovative property, apart from R&D, encompasses a wide range of arrangements in mineral exploration and evaluation, in new architectural and engineering design, in issuing copyrights and licenses, or in innovative arrangements in such sectors as the financial industry. An increased activity across that very wide range of innovative property arrangements would signal the catching up process considered here.

In the preceding section we noted that in highly developed economies the proportions between the intangible capital created in these innovative property arrangements and the capital created in the area of economic competencies of the firm have been roughly equal in terms of their share in aggregate intangible capital. A shift in the direction of such proportions from the present state of the dominance of economic competencies of the firms to innovative property would also be an indication of evolution in the right direction. The list could easily be made longer but at the cost of further increasing the size of this article – still preliminary in both its indicators and conclusions.

## 5. CONCLUDING REMARKS

Intangible capital is an important source of economic growth. Firms that are in the centre of innovative growth increase their economic competencies, produce specialized software and other intangibles. Therefore, this type of capital can be a valid source of economic growth in the European economies, while traditional growth factors will provide low growth.

The authors found that most of the eastern European countries share common features in the intangible investment structure, which differentiates them from highly developed countries. Tangible to intangible capital ratio is considerably larger in the eastern European economies. These differences between Eastern and Western Europe are roughly proportional to the differences in GDP per capita. It is connected to the fact that eastern European economies mostly import technology, while relying on traditional growth factors. The Czech Republic and Hungary are outliers, with certain structural characteristics, discussed in the article.

During digital revolution countries undergo significant structural changes. The authors found that this may be connected to the structure of intangible capital they acquire. In highly developed economies proportions between two largest basic categories of intangibles – innovative property and economic competencies of firms are approximately equal. In the middle-developed ones the share of economic competencies in intangibles was markedly higher until late 2000s, and then it rapidly decreased to even lower levels. The extended R&D measure is much smaller in the eastern European countries. It is connected to low productivity of services. Thus, there is a strict relation between intangible capital development, its structure and knowledge-intensive services development.

It is one of the factors behind the developmental gap between Eastern Europe and Western Europe, but also between Western Europe and the USA.

The authors clarified the middle income trap definition as troubles in finding new sources of productivity growth, in the presence of exhausting the previous ones. Knowledge-driven economy, toward which Poland and other eastern European economies are headed, is the phase of developing new technologies or at least upgrading the technology obtained from external sources. Intangible capital is connected to transition from manufacturing to human capital-intensive market services. In authors' opinion acquiring more intangible capital may be induced by high quality institutions. These are the institutions that ensure economic, civic and political freedoms.

The process of acquiring intangible capital will intensify in the following years. Thus, it is of great importance to carefully monitor its level and changes. Careful monitoring of the level of intangible capital and its components might contribute to improved knowledge of structural changes in the economies, and of the cyclical changes, especially in industrial and service sectors.

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## APPENDIX

**Table 6. Detailed intangible capital categories with data sources and description**

Type of Investment	Data source	NACE	Description
1. Computerized information	Software publishing + Database		
a) Software publishing	Eurostat	NACE J582	Software publishing
b) Database	Eurostat	NACE J5829	Other software publishing
2. Innovative property	R&D, including social sciences and humanities (expenditure) + Mineral exploration and evaluation + Copyright and license cost + Development cost in financial industry + New architectural and engineering designs		
a) R&D, including social sciences and humanities (expenditure)	Eurostat		R&D expenditure exclude expenditure by government and high education sector (sectors: Business enterprise sector, Private non-profit sector; type of R&D: Basic research, Applied research, Experimental development and Not specified)
b) Mineral exploration and evaluation	Eurostat	NACE B0910 + NACE B0990	Support activities for petroleum and natural gas extraction + Support activities for other mining and quarrying
c) Copyright and license cost	Eurostat	NACE J59	Motion picture, video and television programme production, sound recording and music publishing activities
d) Development cost in financial industry	CSO		In CHS position was estimated as 20% of NACE K649 (other monetary intermediation); we have used exact values from Polish CSO (based on F-02 form).
e) New architectural and engineering designs	Eurostat	NACE M71	Architectural and engineering activities; technical testing and analysis

**Table 6. cont.**

Type of Investment	Data source	NACE	Description
3. Economic competencies	Brand equity + Firm-specific human capital + Organizational structure		
a) Brand equity	Advertising expenditure + Market research		
Advertising expenditure	Eurostat	60% of NACE M731	Advertising
Market research	Eurostat	NACE M732	Market research and public opinion polling
b) Firm-specific human capital	Continuing vocational training + Apprentice training		
Continuing vocational training	Eurostat		Continuing vocational training
Apprentice training	Eurostat		Apprentice training
c) Organizational structure	Purchased + Own account		
Purchased	Eurostat	NACE M7022	Business and other management consultancy activities
Own account	Eurostat		Organizational structure: own account

Source: Piekola (2011); Development cost in financial industry – own elaboration.

## KAPITAŁ NIEUCHWYTNY, POZIOM ROZWOJU GOSPODARCZEGO I PUŁAPKA ŚREDNIEGO DOCHODU

### STRESZCZENIE

Celem artykułu jest interpretacja poziomu kapitału nieuchwytnego w Polsce i wybranych państwach Europy Wschodniej oraz jego roli w rozwoju tych gospodarek. Autorzy dostarczają wyjaśnienie „pułapki średniego dochodu”, wiążąc ją z niedoborem i strukturą kapitału nieuchwytnego. Omawiają również zastrzeżenia dotyczące pomiaru kapitału nieuchwytnego. Analiza opiera się na danych dostępnych do 2005 r. oraz na szacunkach własnych wysokości kapitału nieuchwytnego w Polsce po 2005 roku. W tym celu stosują metodologię Corrado,

Hulten i Sichel. Wnioski są następujące: (i) relacja tradycyjnie mierzonego kapitału fizycznego do kapitału nieuchwytnego jest znacznie wyższa w gospodarkach Europy Wschodniej niż Europy Zachodniej; powodem jest to, że kraje Europy Wschodniej głównie importują technologię, jednocześnie opierając się na tradycyjnych czynnikach wzrostu; (ii) zmiany strukturalne w gospodarkach rozwiniętych, jak i w tych na średnim poziomie rozwoju są powiązane ze strukturą kapitału nieuchwytnego; szybszy wzrost i rozwój gospodarczy można osiągnąć poprzez większą akumulację własności innowacyjnej; (iii) niewielka akumulacja kapitału nieuchwytnego przyczynia się do niskiej produktywności sektora usługowego; powodem jest słabszy rozwój sektora wiedzyintensywnych usług, rezultatem zaś jest wolniejszy wzrost PKB na mieszkańca; (iv) dla przyspieszenia wzrostu wartości kapitału nieuchwytnego jest ważne zapewnienie i utrzymanie wolności gospodarczej, politycznej i obywatelskiej oraz monitorowanie zmian kapitału nieuchwytnego.

**Słowa kluczowe:** kapitał nieuchwytny, czynniki wzrostu, konwergencja, pułapka średniego dochodu, zmiana strukturalna.

**Klasyfikacja JEL:** E22, E61