

## **ELEMENTS OF ENDOGENOUS DEVELOPMENT IN THE REGIONS OF VISEGRAD COUNTRIES**

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### **Abstract**

Understanding territorial processes has come to the focus of relevant enquiries in the past few decades but it is especially important in the case of less favoured areas. In this particular research project presented here, the major factors of endogenous development and their presence in the regions of Visegrad countries – Poland, Czechia, Slovakia, Hungary – have been investigated.

The theory of endogenous development, namely the utilisation of the given resources, has become the focus of many empirical analyses and it means the framework of quantitative analysis. The main aim of the paper is the examination and explanation of the effects of each capital on development.

A model is proposed that explains development and includes latent variables symbolising the forms of capital. The model then is further examined using a Partial Least Squares (PLS) path analysis. This shows and helps to understand the connections between the various forms of capital, although the model is only valid in a Visegrad context.

The first part of the paper reviews the academic literature of development theories, and it outlines how the concept has been understood and developed in the last few decades. In the next chapter of the paper, the concept is examined from a narrower perspective and the focus is on the theory of endogenous development, which is assumed to be a qualitative change. Despite the fact that in this case it is very difficult to carry out quantitative analyses, they have an obvious relevance in regional research. Besides defining endogenous development, several models and capitals are compared in the paper. The comparison shows the most important elements by the usage of which the development of the Visegrad regions becomes measurable. The methodology of the empirical test can be found in the next chapter, and it means that research questions were tried to be answered based on the latest statistical indicators, i.e., the Eurostat database and the national databases of the Visegrad countries.

In the abovementioned countries 115 NUTS3 regions can be found, hence this array of territories serves as the framework for the quantitative analysis. The territorial units are compared to multivariate analysis, so the accumulation of various forms of capitals has been analysed by PLS path analysis. With the help of the method, a simultaneous factor and regression analysis is run, enabling the analysis of the direct and indirect effects among the latent variables. It helps to highlight the effects of capitals on each of these.

**Keywords:** Regions of Visegrad Countries, Endogenous Development, Partial Least Squares Path Analysis

## **INTRODUCTION**

### **The “evolution” of development theories**

Current research findings clearly show that the economic development of Eastern and Central European regions has recently shifted from the dominance of exogenous elements to an endogenous direction, i.e., an increasing number of local factors (“soft endogenous factors”,

such as human capital and informal knowledge) define the competitive advantages of regions (Capello & Perucca 2013; Smętkowski 2018). Economic development also includes the role of regional institutions as a significant element, the quality of which evidently contributes to the advancement or decline of a region (EC 2017).

Following a short review of development theories, we examine the elements of endogenous regional development, presenting some special approaches of endogenous development.

*“The concept of development, in the most general terms, refers to the process which leads to a lower level of quality to the higher level of quality”* (Szentes 2011, p. 13.). In this context, Szentes (2011) describes that the concept of development has been interpreted in various ways over the past centuries, especially recently, depending on the discipline of social science. The issue of different interpretations is also mentioned by Todaro and Smith (2009), adding that without a certain degree of general agreement, it is not possible to take measurements and to basically define which country is developing and which one is not. The authors also claim that in strictly economic terms, the concept traditionally referred to achieving a long-term increase in income per capita, which enables an increase in national output at a faster rate compared to the growth of population. Development was in fact defined in the same way much earlier by Lord Robbins (1968), which is in line with this narrower economic approach.

At the same time, Sen (1988) “goes even further”, integrating humanum into his approach, based on which he establishes that the improvement of living conditions should clearly be one of the most important, if not the most important, tasks of economics and this, earlier mentioned “improvement” process is an evident part of the concept of development (Sen 1988). Development thus needs to be understood as, for instance, a multi-faceted process involving the significant changes of social structures and national institutions, which includes the stimulation of economic growth, reduction of inequalities, and putting an end to poverty (Todaro & Smith 2009)<sup>1</sup>.

The authors of this article agree with the idea claiming that while development refers to a qualitative change, growth means a quantitative change.

Regarding the interpretation of the theory of development, Lewis (1988) uses the term “growth”, still, as we understand, his view includes the qualitative character of change. More specifically, the author interprets development theory as *“...those parts of economics that play crucial roles when one tries to analyse the growth of the economy as a whole”* (Lewis 1988, p. 36).

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<sup>1</sup> As it is also emphasised by Lengyel (2012/a), Amartya Sen’s ideas are apparent in the authors’ approach.

Or, as Chant and McIlvaine (2009) describe, development theory is concerned with change much more than it is expected in conventional social sciences. Development theory has always had a close link with the development strategies which intended to put theory into practice. The emergence of the theory was linked to the world after 1945, with its changing financial possibilities in the relationship between the developed and the developing world.

Distinguishing the major trends of the recent decades, the following categorisation is possible (Chant & McIlvaine 2009; Lengyel 2012a):

- modernisation theories, mostly prominent in the 1940s and 1950s but remaining relevant until the 1960s;
- dependency theories, significant in the 1960s and 1970s;
- neoliberal and structural change theories, emerging in the 1980s and continuing in the 1990s and 2000s;
- post-development theories, during the 1990s and 2000s.

Hoff and Stiglitz (2001) also indicate the middle of the 20th century as a point of time since when marked changes have taken place in terms of understanding development. As the authors put it, we know that development is possible but not inevitable and there is no recipe for success.

Related to this review, Szentes (2011) points out that economics has been concerned with the question of *development* since the establishment of modern social-economic systems. The author adds that the theoretical historical<sup>2</sup> review of economics can reveal several theoretical, economic, and political questions which, as described above, are also featured in development economics emerging independently after the Second World War.

In agreement with this approach of the discipline, and, at the same time, referring back to the different approaches of development theory, Sen's (1988, p. 23.) opinion can be called apt and practical, concluding that "*...work on development economics need not await a complete 'solution' of the concept of development*".

If we investigate the territorial aspects of development of any kind, the aim must be the creation or emergence of a successful region. Regarding the concept of success and a successful region, György Enyedi's (1998, 409–411.) idea of success is indicative; besides formulating the criteria of competitiveness, it pays attention to environmental sustainability and the aspects of social justice: "*...in a successful region, produced income increases. A significant part of this income is used locally for investments, entrepreneurial and personal income, as well as settlement management and development in the form of taxes. Broad sections of the population*

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<sup>2</sup> Lewis (1988) offers an excellent historical review, examining the theory of development from the dawn of economics.

*have a share in the income growth, economic growth does not harm either the natural environment or the built and cultural values of the region. Finally, the growth affects all settlement groups of the region and it does not increase the territorial inequalities within the region”.*

Among the spatiality-related trends of development, whether it is location theory or regional growth and development theory, in general, two important tendencies have gained ground in the past ten-twenty years (Capello 2012, p. 315):

- *“a tendency to achieve more realism in sometimes abstract conceptual approaches;*
- *a tendency to develop a dynamic perspective”.*

In our work, we interpret the concept of development in its narrower economic context. As regards the latter, Capello and Nijkamp (2011) include societal opportunities, healthy environment, and high-standard education as examples. However, as Stimson, Stough, and Nijkamp (2011) refer to regional and economic development in relation to development, they distinguish attributes measurable by quantitative and qualitative tools. Even though the level of wealth and income or job creation are essential, creative capital, the low level of social and economic differences, or sustainable development are of the same importance.

## **THEORETICAL BACKGROUND**

### **A modern interpretation of endogenous development**

The endogenous variety of development can be regarded as its revaluated theory. If we examine the term itself, *“...endogenous in economics refers to factors which are not hereditary (“are not from God”) but are created consciously through economic activities. In regional studies, we consider community developments and actions which are consciously created, based on unique local factors, bottom-up and actively involving the local society within a region to have an endogenous character”* (Lengyel 2012b, 145.).

The emergence of endogenous development itself is traced back to the end of the 1980s by Benko (1997), although he referred to industrial and city regions, while Vázquez-Barquero & Rodríguez-Cohard (2016) date its gaining significance at the early ‘80s.

Similarly, Amin (1999), in his article from two decades ago, establishes that the European regional policy was defined by the Keynesian heritage in the case of developed countries from the ‘60s to the then recent past. This approach relied on the redistribution of income and the demand stimulating effects of welfare policies in the case of less developed regions. In their case, the Keynesian regional policy undoubtedly increased employment and incomes, but these

territorial units could not maintain the achieved results permanently and could not manage to realise “self-sustaining” growth based on their own resources. Thus, according to the author, after the failures of the Keynesian and the pro-market, neoliberal policies, the focus on the theory of endogenous development can be interpreted as a sort of third-track approach. In line with this, Tödtling (2009) considers the theory of endogenous regional development as a kind of “counter-theory”, which responds to the former development concepts that emphasised the importance of external factors in the case of less developed regions, such as interregional trade or the mobility of capital, work, and technology.

Consequently, in the past few decades, there has been a shift in the emphasis and focus of regional development theory from exogenous factors to endogenous elements (Stimson et al. 2011), the prevalence of which is also described by Lengyel (2012/a).

It can be established that the whole theory relies on the assumption that the basic preconditions of development, sense of initiative and enterprises, are available or present in a latent way in most regions (Tödtling 2009). Similarly, according to Capello’s (2007, 2011) views, endogenous development basically depends on the concentrated arrangement of a region, it is an integral part of a social-economic and cultural system, whose components determine the success of local economy: entrepreneurship, factors of local production (work and capital), and the relationship management skills of local actors, which increasingly contribute to the increase of knowledge creation.

According to Capello’s (2007) approach, the main reason of regional differences is the uneven distribution of innovative activities. It can be observed that while today work and capital move very easily, the least mobile factors are precisely those immaterial factors which are, among others, related to innovative capacity.

When Stimson et al. (2011) refer to regional and economic development in the context of development, they distinguish attributes measurable with quantitative and qualitative tools. In another work, Stimson, Stough and Salazar (2009) make regional economic development subject to the strength or weakness of the quality of the (local) management, the efficiency of institutions, and the level of the significance of enterprises. These dynamic relationships shape the characteristics of development and the performance of a region (Figure 2). It can be observed that institutions, entrepreneurship, and the quality of (local) management are the three most crucial factors, not only in terms of shaping the performance of the region but they can also substantially improve a region’s capacity and conditions (Stimson et al. 2009).

Although the present paper primarily focuses on the endogenous variety of development, certain exogenous elements cannot be ignored even under the current circumstances. As

Stimson et al. (2009) suggest, the internationalisation of financial processes and the movement of labour between regions are typical examples. Related to their above-described new framework, the authors claim that it is crucial for a region that the institution system and the (local) management are able to and manage to acquire exogenous factors which are necessary to provide the incomplete endogenous conditions and generate new competences and conditions. Tödtling (2009) also suggests that regional development is always the collective result of endogenous and exogenous factors, thus there are several paths of development, there is no ideal solution.

The endogenous and exogenous manifestations of various capital assets are compared by Vermeire, Gellynck, De Steur & Viaene (2008) (Table 1). It is a fact that the authors base their comparison on the assets assessed and “perceived” as the most important by the entrepreneurs of rural regions (entrepreneurial perception), nevertheless, we still considered their work adaptable<sup>3</sup>.

The authors included human capital, physical capital, natural capital, social capital, and financial capital in their system, where the comparison of these elements according to endogenous and exogenous drivers is quite interesting and, in some cases, debatable. Evidently, in the case of social capital, exogenous drivers do not apply, and as for the natural assets, only the climate change appears as an explicitly external driver. Human capital may be brought into the region by occasional newcomers, while physical capital and financial capital may occur predominantly due to subsidies.

As a criticism regarding the drivers, it is to be noted that the delineation of endogenous and exogenous assets by the authors can be debated in the case of natural capital in a sense that several factors listed among the endogenous elements have exogenous aspects. There can be no question about it in the case of wind power.

Regarding the system, the consideration of each driver matters, rather than their weighting in particular regions (Vermeire et al. 2008). I.e., the authors explicitly suggest that the relative importance of the capitals may vary in different regions.

**Table 1** Perceived important endogenous and exogenous capital assets

<b>Capital assets</b>	<b>Endogenous drivers</b>	<b>Exogenous drivers</b>
<b>Human capital</b>	Knowledge base: - Agricultural knowledge	Knowledge: - Scientific & technical knowledge

<sup>3</sup> Moreover, the authors refer to NUTS2 regions as rural regions, thus we definitely considered their approach to be applicable.

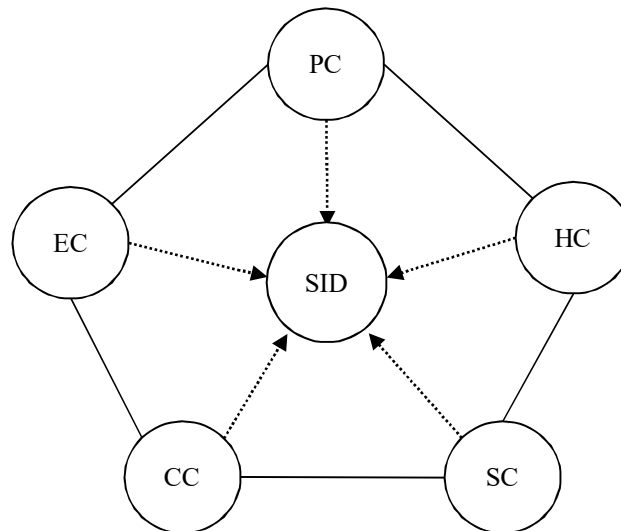
	<ul style="list-style-type: none"> <li>- Marketing &amp; management knowledge</li> </ul> <p>Availability of labour: depopulation</p> <ul style="list-style-type: none"> <li>- Highly skilled labour &amp; technical skills</li> </ul> <p>Entrepreneurship: family character</p> <ul style="list-style-type: none"> <li>- Absorptive capacity, learning, cooperation</li> <li>- Engagement, dynamism</li> </ul>	<ul style="list-style-type: none"> <li>- High-tech competences</li> </ul> <p>Rural newcomers</p>
<b>Physical capital</b>	<p>Accessibility on micro- &amp; meso-level</p> <p>Small scale mobility</p> <p>Proximity of tourist attractions</p> <p>Industrial lands</p> <p>Distribution of water &amp; energy</p>	<p>Accessibility on macro-level</p> <p>Public transport</p> <p>Proximity of urban economic complexes</p> <p>Internet</p>
<b>Natural capital</b>	<p>Natural stocks for production: agriculture, forestry</p> <p>Environmental quality</p> <p>Attractiveness of landscape and nature</p> <p>Processing water</p> <p>Wind and water power</p>	<p>Climate change</p>
<b>Social capital</b>	<p>Strong social cohesion:</p> <ul style="list-style-type: none"> <li>- informal links</li> <li>- competition</li> <li>- closed networks</li> </ul> <p>Family based firms:</p> <ul style="list-style-type: none"> <li>- internal focus</li> <li>- tacit knowledge</li> <li>- flexibility</li> <li>- attraction</li> </ul> <p>Environmental awareness (ecology, fire risk)</p> <p>Acceptance by population (not-in-my-backyard)</p>	
<b>Financial capital</b>	<p>Bank loans</p> <p>Public finances</p> <p>Clear business plan</p>	<p>Subsidies for agriculture &amp; rural development</p> <p>Support to starters, services, SME's</p> <p>Venture capital</p> <p>Financial marketing support</p> <p>Granting procedures &amp; administration</p> <p>External, large-scale investors</p>

Source: Vermeire et al. (2008, p. 851.)

As Lengyel (2012a) establishes, today endogenous trends have gained focus in the field of regional growth and broadly defined development. It is linked to the fact that the various trends include ones which base the system of endogenous elements on the concept of capital (Lengyel 2012a). Thus, besides economic capital, several new forms of capital have gained focus.

Following a similar logic, as a part of the recent evolution of economic thinking, Stimson et al. (2011) write that in the past two decades, a further move has been made in terms of integrating the directives of sustainable development in the area of regional development and planning.

**Figure 1** A pentagon model of creative forces for sustainable regional development



Source: Lengyel based on Stimson et al. (2011), Lengyel (2012c, 67.)

Based on the work of Stimson et al. (2011), sustainable innovative development can be explained with their five-factor model (Figure 1) (Lengyel 2012c, 68.):

1. *“Productive capital (PC):* it is in line with the neoclassical approach, where the traditional production function depends on work and capital.
2. *Human capital (HC):* it refers to the quality of labour force, which derives from education, training, i.e., fast acquisition of new competences; it is important that human capital is evenly distributed within the population.
3. *Social capital (SC):* the quality of the interaction and communication between people, which is the condition of social-economic relationships, business networks (formal and informal), cooperation of trust, etc.
4. *Creative capital (CC):* an efficient response to new challenges and new opportunities, it enables entrepreneurship, novel ideas, innovative visions, etc.
5. *Ecological capital (EC):* liveable environment, clean air and water, recreation facilities, urban green areas, etc. are all necessary for a long-lasting and balanced development of a region”.

## DATA AND METHODS

### Partial Least Squares path analysis, the original model

For developing the indicator system used in the empirical analysis, we summarise which (capital) factors are mentioned primarily in the academic literature of the topic (Table 2)



**Table 2** Appearance of each form of capitals in various endogenous development models

	Fixed Capital	Human Capital	Social Capital	Natural Capital	Cultural Capital	Relational	Infrastructural Capital	Institutional	Physical Capital	Creative Capital	Symbolical	Structural	Cognitive	Settlement	Entrepreneurial Capital	Built Capital	Political Capital	Activities and Business Firms	Markets/External Relations	Image/Perceptio
AEIDL (1999)	x	x	x		x				x	x								x	x	x
Kitson, Martin & Tyler (2004)	x	x	x		x		x	x		x										
Capello (2007)	x	x				x		x		x					x					
ETC (2007)	x	x	x	x	x				x											
Vermeire et al. (2008)	x	x	x	x					x											
Camagni (2008)	x	x	x	x	x	x	x	x												
Braithwaite (2009)	x	x	x	x	x											x	x			
Affuso–Camagni (2010)			x		x	x	x						x							
Milone, Ventura, Berti & Brunori (2010)	x	x	x	x	x			x			x									
Stimson et al. (2011)	x	x	x	x						x										
Brasili, Saguatti, Benni, Marchese, & Gandolfo (2012)	x	x	x	x		x	x						x	x						
Lengyel & Szakáné Kanó (2012)	x	x	x			x	x	x	x											
Atkinson (2013)	x	x	x	x	x		x	x								x				
Dinya (2013)	x	x	x	x	x	x	x	x	x											
Tóth (2013)	x		x	x	x	x					x	x								
Rechnitzer (2016)	x	x	x		x	x		x		x			x							

Source: own construction based on Tóth (2013, 44.)

Based on this, i.e., relying on their frequency in Table 2, three forms of capital have been incorporated in the model: private fixed capital, human capital, and social capital. At the same time, as several aspects of these elements can be described, we have divided them into parts.

Private fixed capital, which refers to the development of economy, but can be approached from several sides (e.g., Brasili et al. 2012; Camagni, Caragliu & Pucca 2011), has been divided into three parts: economic development, which is the target variable of the model, economic capital I., which includes industry and technology elements, while economic capital II. involves the indicators of the economy of primary and secondary sectors.

We were able to describe human capital with indicators related to research and development, thus we indicated it in its name.

Since social capital, similarly to private fixed capital, can be grasped in several ways (e.g., Affuso & Camagni 2010; Brasili et al. 2012), we also divided it into three parts and we tried to express the “content” of each capital type with their names: social capital, demography I, and demography II.

Similarly to the logic of the renewed Pyramid Model (Lengyel & Szakálné Kanó 2012), we categorised the capitals as long-run sources, drivers, and target. Long-run sources include social capital, demography I, and demography II. We involved research and development, the factor formed by industry, technology and economy, and the factor of the economy of primary and secondary sector as drivers in the model.

It must be noted that due to its relevancy, we intended to include natural and cultural capitals in the analysis, however, we could not describe them quantitatively. This failure opens up new directions in research.

If we want to build a path model between the factors, we need to run a factor analysis and regression models simultaneously, which Partial Least Squares path analysis may offer a solution for. Researchers have approved of and applied this method for decades to examine the connections between latent variables (Henseler, Ringle & Sinkovics 2009). In Hungary, however, its use has become common only in the past decade (Kazár 2014). A more detailed description about the methods and their application is found in the articles of Kazár (2014), Kovács (2015), and Krenyácz (2015).

One of the advantages of the model is that it can be used in the case of variables with non-normal distribution and a small sample size (Hair, Sarstedt, Pieper & Ringle (2012), Henseler (2010)). It is also important that the development of latent factors and the analysis of their correlations can be simultaneously conducted with a regression model among the indicators included in the procedure.

The construction of an appropriate model consists of three steps. First of all, we have to find the adequate level of data aggregation. Choosing the appropriate territorial level is an ongoing issue in territorial analyses. If we attempt to conduct an analysis on the level of the European Union, this question arises in the dilemma between NUTS2 and NUTS3 levels. We opted for NUTS3 level similarly to Fratesi and Perucca’s (2019) approach, agreeing with its advantages and accepting its disadvantages<sup>4</sup>. Thus, finally 115 NUTS3 territorial units<sup>5</sup> were featured in the analysis, 14 Czechian, 20 Hungarian, 8 Slovakian, and 73 Polish.

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<sup>4</sup> But Kotosz and Lengyel (2018) also use mostly this territorial level.

<sup>5</sup> Based on the categorisation of NUTS 2016.

Moreover, an appropriate dataset needs to be collected (Table 3). It must be noted that in our work, we used the latest data available at the time of writing the article, from the year of 2016.

**Table 3** Variables involved in analysis

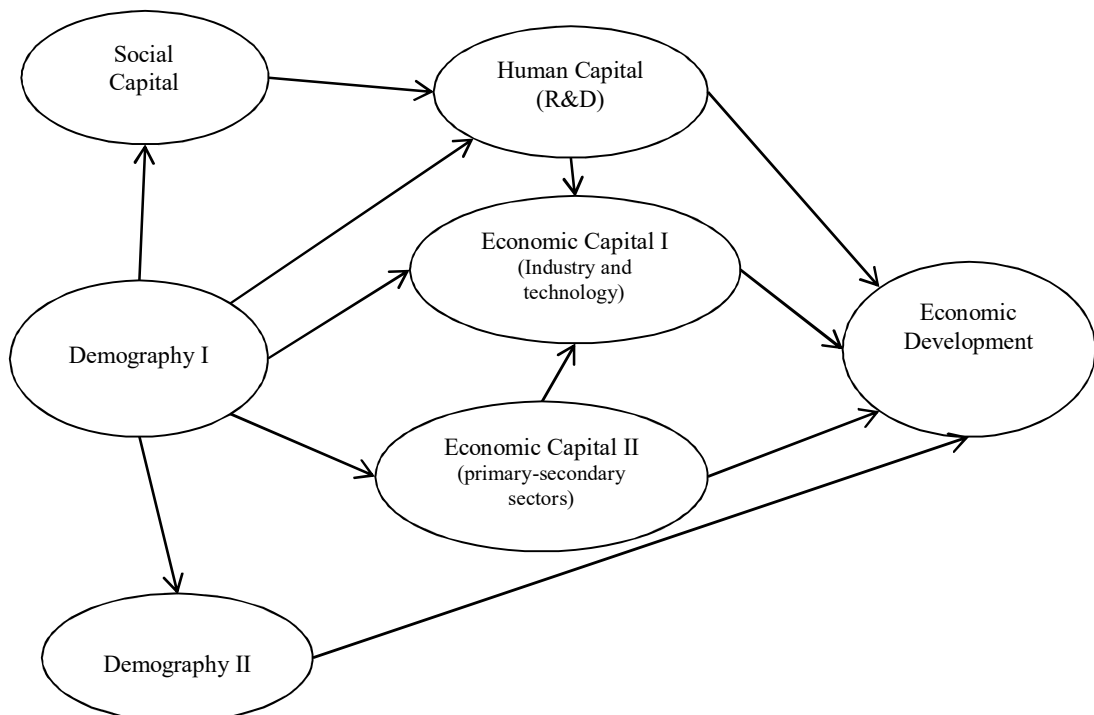
<i>Latent variable</i>	<i>Variable</i>	<i>Source</i>
Economic Development	GDP (PPS) per inhabitant (in percentage of the EU average, 2016)	Eurostat
	GVA per capita (Gross Value Added, million euro/1000 people, 2016)	Eurostat
	Labour productivity (GDP/employees, 2016)	Eurostat
Human Capital (R&D)	Community design (CD) applications (Per 1.000.000 persons, 2016)	Eurostat
	Registered Community designs (RCD) (Per 1000 persons, 2016)	Eurostat
	European Union trade mark (EUTM) applications (Per 1.000.000 persons, 2016)	Eurostat
	Unemployment rate (with college degree, within all unemployed people, 2016)	V4 countries' statistical offices
Economic Capital I.	Employment (Per thousand persons) Information and communication 2016	Eurostat
	Employment (Per thousand persons) Construction 2016	Eurostat
	Employment (Per thousand persons) Wholesale and retail trade, transport, accommodation, and food service activities 2016	Eurostat
	Employment (Per thousand persons) Professional, scientific, and technical activities administrative and support service activities, 2016	Eurostat
	Employment (thousand persons) all NACE activities employees 2016	Eurostat
	Population of active enterprises in t number - Industry, construction, and services except insurance activities of holding companies (Per 1000 persons, 2016)	Eurostat
Economic Capital II.	Employment (Per thousand persons) Agriculture, forestry and fishing (2016)	Eurostat
	Registered unemployment rate (percentage, 2016)	V4 countries' statistical offices
Social Capital	Employment (Per thousand persons) all NACE activities 2016	Eurostat
	Age dependency ratio, 1st variant (population aged 0-14 and 65 and more to pop. aged 15-64, 2016)	Eurostat
	Population density (Inhabitants per square kilometre, 2016)	Eurostat
	Mean age of women at childbirth (year, 2016)	Eurostat
Demography I.	Median age of population (year, 2016)	Eurostat
	Median age of population (females, 2016)	Eurostat
	Women per 100 men (Percentage, 2016)	Eurostat
	Median age of population (males, 2016)	Eurostat
Demography II.	Change of population (percentage, 2006-2016)	V4 countries' statistical offices
	Total fertility rate (Per mille, 2016)	Eurostat
	Crude rate of natural change of population (Per mille, 2016)	Eurostat
	Crude rate of net migration plus statistical adjustment (Per mille, 2016)	Eurostat

Source: own creation

Thus, as a third and final step, the indicators of the formerly developed factors were utilised, and we conducted PLS path analysis to study the relationships between the latent factors having an identical content by applying SmartPLS 3.2.7. software. By using the “resulting” latent variables, we intended to apply a regression model which can explain the extent of the effect the factors have on the capital describing the economic development of the NUTS3 regions of V4 countries. It is to be noted that *we intend to apply our model with a confirmative aim, i.e., as it is established by Münnich & Hidegkuti (2012) in terms of the possibilities of use, to check how the data confirm the currently hypothetical links between each form of capital.*

With the help of PLS path analysis (Figure 2), we developed a regression model which can explain the effect of the included factors on economic development among the NUTS3 regions of V4 countries. This above-mentioned economic development is represented by the factor having the same name, and the model features six additional factors. In what follows, we present the methodology, whose advantages were discussed by Tubadji and Nijkamp (2015), and we also described it in detail (Kovács & Bodnár 2016, 2017).

**Figure 2** Dependencies of elements describing economic development – original **model**



Source: own construction

As it is described by Kovács and Bodnár (2016, 2017), the reliability of latent variables is often examined with Cronbach’s alpha ( $\alpha$ ), which is built on the correlations between manifest

(directly observable) variables related to latent variables. This measure is expected to have a value of at least 0.6. However, in the PLS algorithm the Cronbach- $\alpha$  underestimates the extent of internal consistency as it assumes that each variable is assigned the same factor weight. This problem can be resolved by the composite reliability coefficient, which takes account of the different factor weight values of variables. Its value must exceed 0.7. In our analysis, these expectations are met in each case (Table 4).

**Table 4** Attributes of forms of capital

Factor	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Economic Capital II.	0.654	0.851	0.741
Economic Capital I.	0.941	0.955	0.781
Demography I.	0.916	0.945	0.815
Demography II.	0.748	0.827	0.582
Social Capital	0.771	0.856	0.606
Human Capital (R&D)	0.851	0.891	0.673
Economic Development	0.954	0.970	0.915

Source: own construction

The authors (Kovács & Bodnár 2016, 2017) add that testing the validity of the latent construction means checking convergent and discriminant validity. In the former case, we study whether a set of variables is the representative of a given artificial variable. It can be tested with AVE (average variance extracted), which shows the average percentage of each latent variable retaining the variance of their manifest variables. The value of AVE is expected to be at least 0.5 (Henseler et al. 2009), which is realised in each case (see Table 2). Further test results confirming the reliability of the model are shown in the Annex<sup>6</sup>.

## RESULTS

### PLS path analysis – the resulting model

After testing the latent variables, the question arises whether the direct links found in the model are significant. As the significance of the path coefficients cannot be examined directly in the

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<sup>6</sup> In the analysis, each value met the expectation, except in the case of HTMT values (between social capital and economic capital I), which was indicated in the relevant table (Annex 3). The correlation between the mentioned two latent variables is quite high, but as they are clearly separate, we considered it justified to include them in the model.

analysis, we conducted the procedure through bootstrap sampling of 5000 subsamples. (See Table 5)

**Table 5** Results of testing direct correlations in the model – P-values of the model

Path	Original Sample	T-Statistics	P Values
Economic Capital II. → Economic Capital I.	-0.166	3.379	0.001
Economic Capital I. → Economic Development	0.670	8.445	0.000
Demography I. → Economic Capital II.	-0.311	4.984	0.000
Demography I. → Demography II.	-0.669	12.375	0.000
Demography I. → Social Capital	0.879	11.147	0.000
Demography II. → Social Capital	0.753	9.399	0.000
Demography II. → Human Capital (R&D)	0.415	5.609	0.000
Social Capital → Economic Capital II.	-0.445	9.014	0.000
Social Capital → Economic Capital I.	0.726	11.284	0.000
Social Capital → Human Capital (R&D)	0.538	6.375	0.000
Human Capital (R&D) → Economic Capital I.	0.132	2.251	0.024
Human Capital (R&D) → Economic Development	0.279	2.621	0.009

\* *significant correlation for value  $p < 0.01$*

Source: own construction

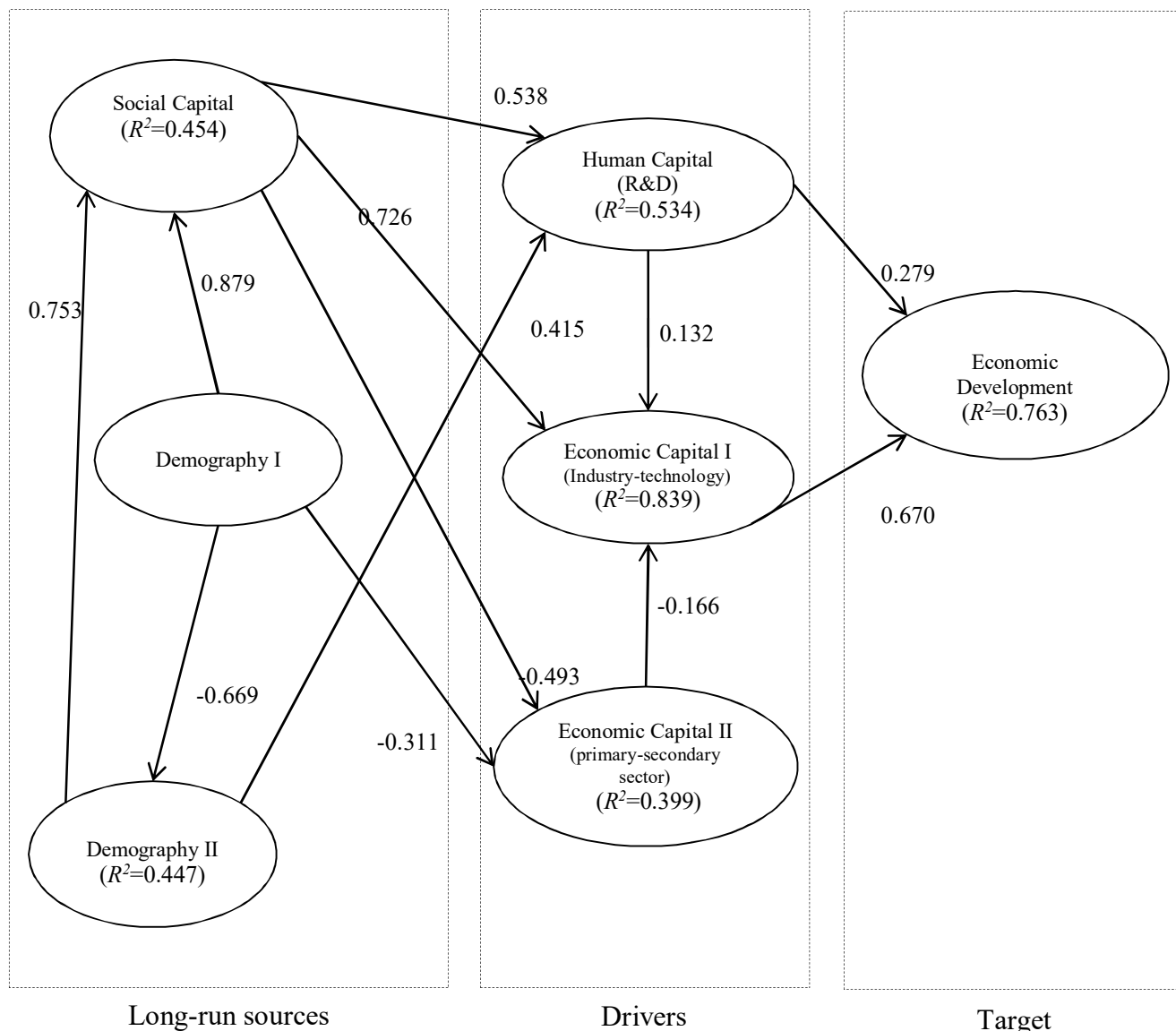
On the basis of the specificities of the indicators involved to measure the element describing the economy of the primary and secondary sector, a higher value is matched with a higher level of underdevelopment, thus the related path coefficients are negative. Furthermore, the direct effect between the two demography factors is also negative, which is also a result of the attributes of the indicators<sup>7</sup>.

Eliminating the non-significant direct paths, all the other six factors explain the element of economic development either directly or indirectly. Two paths shape the target variable directly, while four factors do so indirectly.

Similarly to the logic of the endogenous-type renewed Pyramid Model (Lengyel 2017), the factors can be categorised as follows: long-run source(s), driver(s), and target (Figure 3). In our model, long-run sources include social capital, demography I and demography II. Research and development, and the factors of the two economic capitals are the drivers, while economic development is the target. Based on model, the variance of this factor can be explained to over 76 per cent, i.e., it is formed by other elements not included in the model to less than 24 per cent.

<sup>7</sup> Thus, for instance, the question may arise whether higher population growth refers to higher development level for a region. To provide an answer is not the subject of our study.

**Figure 3** Interactions of factors explaining economic development



Source: own construction

Economic development is directly affected by the factors of research and development and economic capital I. While the former has a weak, the latter has a medium strong effect.

Examining direct effects, more specifically the more significant ones, it can be observed that the factor of social capital has an effect on R&D, and it strongly influences economic capital I. At the same time, the construction of demography II affects demography I, and it also shapes the element of research and development with a value over three tenths.

As Hetesi and Révész (2013), we also tried to explore the extent of the direct and indirect effect each latent variable has on economic development. Direct effects, as it is described by the authors, correspond to the coefficients of the path analysis (see Figure 5); and the total effect is illustrated by Table 6.

**Table 6** Values of total effect

	Economic Capital II.	Economic Capital I.	Demography II.	Social Capital	Human Capital (R&D)	Economic Development
Economic Capital II.		-0.166				-0.111
Economic Capital I.						0.670
Demography I.	-0.478	0.342	-0.669	0.375	-0.076	0.208
Demography II.	-0.335	0.710		0.753	0.819	0.705
Social Capital	-0.445	0.871			0.538	0.734
Human Capital (R&D)		0.132				0.368

Source: own construction

Social capital has a direct and medium strong effect (0.538) on the human element, while it has an indirect effect on the factor of economic development through R&D ( $0.539 \times 0.279 = 0.150$ ). It is interesting that the studied social factor affects the target variable in three more paths indirectly. It has an indirect effect ( $0.726 \times 0.670 = 0.486$ ) through the factor of economic capital I, and it shapes the element of economic development through the factors of R&D and economic capital I ( $0.538 \times 0.132 \times 0.670 = 0.048$ ), in addition, it also has an influence through economic capitals I and II ( $(-0.445) \times (-0.166) \times 0.670 = 0.049$ ). I.e., the total effect of the social factor on economic development can be considered strong despite the fact that it has an influence “only” through indirect paths ( $0.150 + 0.486 + 0.048 + 0.049 \approx 0.734$ ). Besides, the target variable is affected significantly by demography II (0.705), also through four indirect paths. Furthermore, the target is significantly shaped by the economic capital (0.676) including the indicators of industry and technology, but human capital (R&D) (0.368) also has an effect.

The evaluation of the model includes Cohen’s  $f^2$ -values (effect size) (Table 7). The measure shows how the variance of an endogenous variable changes when eliminating an exogenous variable (Hair, Hult, Ringle & Sarstedt 2017, Kazár 2017). Based on the mentioned authors, an actual effect applies over a value of 0.02, and  $f^2$ -values are medium over 0.15, while significant over 0.35 in terms of the endogenous variable.

**Table 7** Values of f Square

Path	$f^2$
Economic Capital II. --> Economic Capital I.	0.117
Economic Capital I. --> Economic Development	1.140
Demography I. --> Economic Capital II.	0.139
Demography I. --> Demography II.	0.809
Demography I. --> Social Capital	0.781
Demography II. --> Social Capital	0.574
Demography II. --> Human Capital (R&D)	0.359
Social Capital --> Economic Capital II.	0.282
Social Capital --> Economic Capital I.	1.618
Social Capital --> Human Capital (R&D)	0.604
Human Capital (R&D) --> Economic Capital I.	0.069
Human Capital (R&D) --> Economic Development	0.198

Source: own construction



Consequently, if we test the specific f-values in our model (Table 7), it is clearly indicated that each path exceeds the threshold of 0.02, and the value of 0.15 with the exception of three. The correlation between social capital and economic capital I is particularly “exciting”, i.e. the value (1.618) shows that the former has a significant effect on the latter. Economic capital I has a similarly strong influence (1.140) on economic development. The correlation between demography capitals is lower but still considered high (0.809), as well as the effect of demography I on social capital (0.781), and that of social capital on human capital (0.604).

## CONCLUSIONS

In our work, we reviewed the prominent literature of endogenous development in order to construct a model which can present various aspects of the theory. Furthermore, we attempted to measure the role of the capital factors of endogenous development in Central European contexts.

In our model tested with Partial Least Squares path analysis, we involved the latent variables defining the social and economic development of the regions of the Visegrad countries. Through categorising these variables into groups, we developed factors which can describe the various aspects of endogenous development. We created seven factors in total, of which social and the two demography constructions were considered long-run sources, while the factors of human capital, economic capital I and economic capital II were the drivers. The target was represented by the element of economic development, which, as it is reflected by its name, is the embodiment of the prospering Eastern and Central European territorial unit.

The latent variables of our model, except for one case, affected the factor of economic development positively, but to a different extent. Economic capital II, as a result of its indicators, has an inverse relationship with the target variable, although this effect is quite weak.

Economic development was most affected by the social factor (0.734) in an endogenous way, but it is shaped by demography II with a similar strength (0.705). It is an interesting fact that both factors have an effect on the target variable only in indirect paths. Of the two direct effects, evidently economic capital I (0.670) is more significant, based on our results research and development is much less (0.279) significant in the examined Eastern and Central European regional context.

As a limitation, the territorial framework of the analysis must be emphasised, i.e., having limited possibilities due to the available set of indicators. As the group of Visegrad regions provided a special framework for the effect analysis of endogenous factors, in other environments, presumably, different effects prevail. The modest effect of the factor of human

capital and that of research and development can be mentioned as an example, i.e., this question requires further analyses.

An additional research direction may be the extension of the time horizon of the study and the dynamic analysis of the relations between the examined capitals. Different dates would offer an opportunity for a better and deeper understanding of the existing effect mechanisms, or they would also facilitate the preparation of forecasts, which could be useful for practitioners, as well as policy and decision makers.

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## Annex

### Annex 1 Correlation between factors

	Economic Capital II.	Economic Capital I.	Demography I.	Demography II.	Social Capital	Human Capital (R&D)	Economic Development
Economic Capital II.	1.000						
Economic Capital I.	-0.620	1.000					
Demography I.	-0.472	0.234	1.000				
Demography II.	-0.225	0.353	-0.511	1.000			
Social Capital	-0.547	0.909	0.335	0.243	1.000		
Human Capital (R&D)	-0.348	0.621	-0.076	0.527	0.616	1.000	
Economic Development	-0.566	0.846	0.126	0.457	0.745	0.694	1.000

Source: own construction

### Annex 2 Values of HTMT indexes

Pairs of Latent Variables	Heterotrait-Monotrait ratio (HTMT)
Economic Capital I. --> Economic Capital II.	0.787
Demography I. --> Economic Capital II.	0.625
Demography I. --> Economic Capital I.	0.296
Demography II. --> Economic Capital II.	0.374
Demography II. --> Economic Capital I.	0.388
Demography II. --> Demography I.	0.672
Social Capital --> Economic Capital II.	0.806
Social Capital --> Economic Capital I.	1.015*
Social Capital --> Demography I.	0.529
Social Capital --> Demography II.	0.410
Human Capital (R&D) --> Economic Capital II.	0.418
Human Capital (R&D) --> Economic Capital I.	0.602
Human Capital (R&D) --> Demography I.	0.277
Human Capital (R&D) --> Demography II.	0.615
Human Capital (R&D) --> Social Capital	0.658
Economic Development --> Economic Capital II.	0.708
Economic Development --> Economic Capital I.	0.867
Economic Development --> Demography I.	0.198
Economic Development --> Demography II.	0.496
Economic Development --> Social Capital	0.800
Economic Development --> Human Capital (R&D)	0.683

\*: Above the expected value

Source: own construction