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Vsebina / Contents

ARTICLES

Cycles of the Housing Market in Hungary from the Economic Crisis until Today

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Abstract

The main aim of this paper is to identify the underlying reasons for the cyclical nature of the Hungarian housing market, in particular the business cycles, the construction, and market participants' expectations. Our research was conducted based on analysis of statistical data and of the housing market indices. As a result, it can be stated that cyclic behaviour of the housing market may be explained primarily with business cycles, but state subsidies and mortgages also affect the variations. Accordingly, the increasing lending and the high amount of subsidies can generate a price bubble. The supply of second-hand dwellings looks more flexible compared with that of new ones. However, the expectations of market operators do not have a demonstrable effect on the housing market.

Keywords: property market, housing market cycles, asset price bubble

Introduction

The requirement of a detailed assessment of the global crisis in 2008 also highlighted the importance of the research in the cyclic behaviour of the economy and the individual sectors, including the property market.

The property sector is one of the most important sectors of the national economy. The aggregate value of the Hungarian residential properties is estimated to be about half the total estate of households, which is approximately 30–40 trillion Hungarian forints (Békés, Horváth, & Sápi, 2016). Construction of new buildings provides 2–3% of the GDP, out of which, the production value of new residential properties is only responsible for 0.3–0.8% of the GDP (*Table 1*).

The pro-cyclical behaviour of investments has long been treated as a fact in a macroeconomy. In the case of property investments, the short-term inflexibility of stock can be seen as the main reason for delays. The inflexible market stock of land is due to the limited quantity and the immovable nature of real properties. In the case of buildings, the relatively long time required for planning, authorisation, and construction is the reason why the only way the market can react to the variation of demand on the short term is a price change.

The dominance of residential property ownership over rental has always been significant in Hungary, which was also amplified by the large-scale privatisation of state and council-owned properties at the beginning of the 1990s as well as

NG
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**NAŠE GOSPODARSTVO
OUR ECONOMY**

Vol. 64 No. 2 2018

pp. 3 – 14

Table 1. Value of Construction Activities in Hungary (2000-2016)

Year	2000	2001	2005	2010	2015	2016
Value of construction activities (million HUF)						
Residential buildings	59.694	124.566	170.266	101.158	96.369	190.479
Buildings total	397.109	471.129	669.614	591.231	684.585	779.628
Value of construction activities (percent of GDP)						
Residential buildings	0,45	0,81	0,75	0,37	0,28	0,54
Buildings total	2,97	3,06	2,97	2,17	1,99	2,20
GDP at current prices (billion HUF)						
	13.350,1	15.419,1	22.559,9	27.224,6	34.324,1	35.420,3

Source: KSH (2017a)

the state subsidies of residential properties that have been introduced since then. Based on the data of the latest census in 2011, 92.1% of all residential properties were used by the owner or his relative or the person with a right of usufruct. The proportion of rented residential properties was only 6.8%, and uses based on other titles (lodging, service flat) constituted 1.1%. Such an overwhelming proportion of property ownership makes the analysis of market cycles more difficult because these cannot be assessed by the changes in rental costs.

When assessing the economic and social effects of Hungarian property support, Hegedüs (2006), Kiss and Vadas (2006), and Mádi (2008) highlighted that the national property policy in Hungary has always favoured purchasing new properties over used ones, and that, in addition to nonreimbursable aids, mortgages also play a key role in financing. The latest type of subsidy, the family home creation support introduced in 2016, has not changed this either.

The main purpose of this paper is to identify the underlying reasons for the cyclical nature of the Hungarian housing market, in particular the business cycles, the constructions, and market participants' expectations. The following key questions were mainly addressed by the research we conducted:

- How state grants and housing loans granted influence the general housing market cycles.
- Whether the general expectations of market players have any meaningful effect, influencing the Hungarian housing market.
- Whether the time period required for new housing construction projects and the seasonality factor alter the cycles seen on the housing market.

Our research was conducted based on a statistical analysis of the data published by the Central Statistical Office for the various periods (the mean price per sqm of new and second-hand dwellings, the amount of housing loans and state grants provided, the total number of housing market transactions completed, and the total number of new constructions) as well as of the various housing market indices published by GKI Economic Research Co. The global crisis commenced in 2008 has caused a notable change in the Hungarian housing market, so the period from the commencement of the crisis will be evaluated primarily. In the case of some of the indicators used, statistical data are only available from 2007, so amongst the years before the crisis, the year 2007 was used as the starting year. The data regarding price and value used in the research are provided in Hungarian forints. At the time this manuscript was completed, the official exchange rate of the European Central Bank was EUR 1 = HUF 317.68

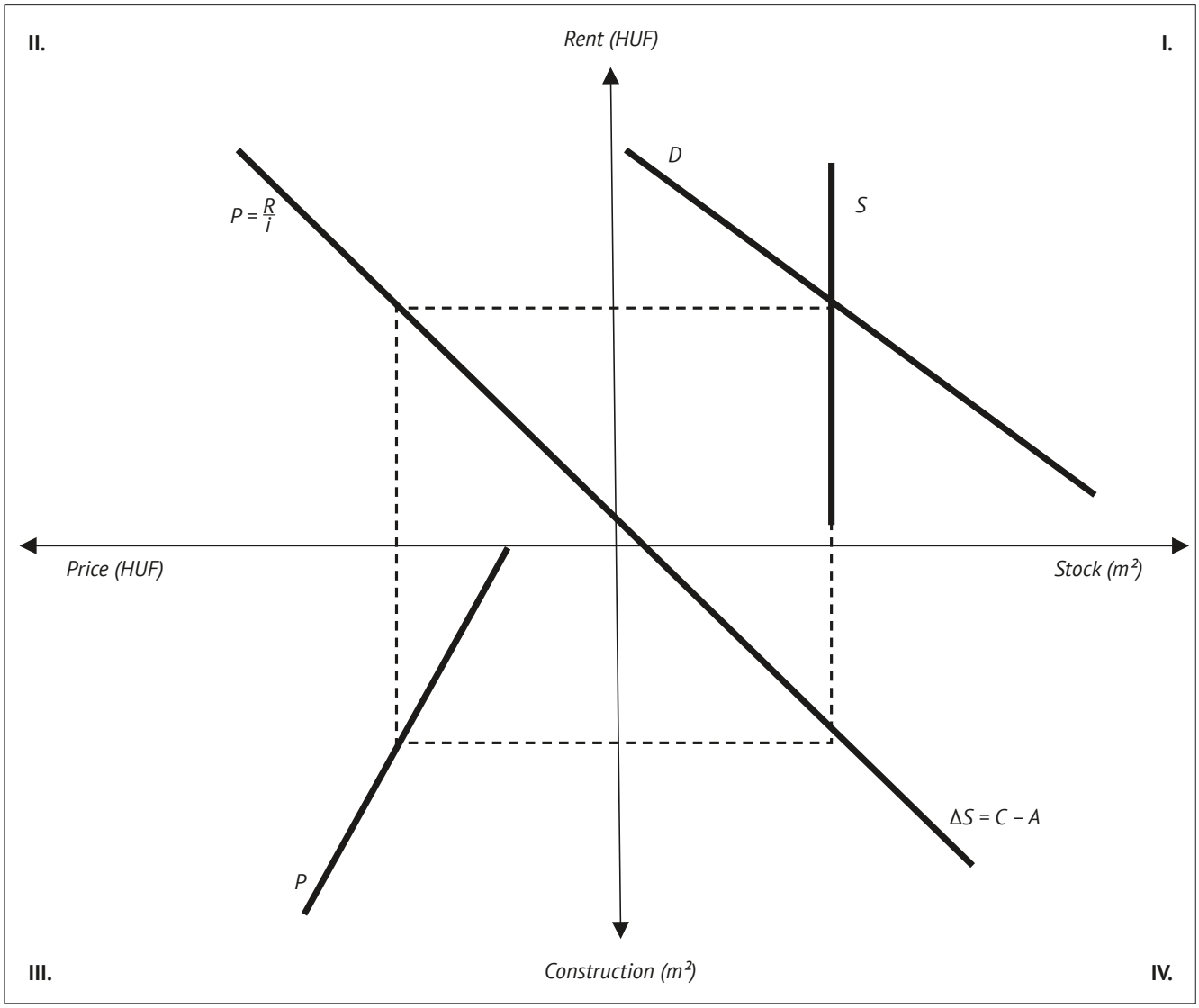
The study has four main parts. First, the theoretical bases and research results of the topic will be reviewed. The next part will show the changes of the Hungarian housing market from the political transformation until the economic crisis in 2008. The third part will analyse the behaviour of the market of residential properties over time, from the crisis until today. Finally, the conclusions will be drawn at the end of the study.

Factors Affecting the Short- and Long-Term Behavior of the Housing Market

The theoretical basis of the cyclic behaviour of the housing market, including the residential property, is the so-called four-quadrant model of DiPasquale and Wheaton (1992) (Figure 1).

Quadrant I represents the demand for real estate stock *(D)*, which primarily depends on the economic circumstances, mainly the income and the real estate stock *(S)*. Market equilibrium is achieved at the intersection of the two curves. Due to the short-term inflexibility of stock, the

Figure 1. Relationship Between the Real Estate Market and Real Estate Development



Source: Edited by the author, based on DiPasquale és Wheaton (1992)

balance rent charge mainly depends on the variations in demand. Quadrant II shows the variations of market prices (value) of real estates, which depend on the money flow expected from the property investment, where the main element is the rent charge *(R)*, and these are also affected by the expected income from the investment *(i)*. The expected income depends on the long-term interest rates as well as on the risks of the investment. If the long-term market interest rate or the risk increases, the slope of the curve also increases. Quadrant III represents new construction. For the construction of new real estate, the market prices of real estate must exceed the construction costs, so the curve does not start from the origin. Finally, quadrant IV shows the variation of stock (e.g., quantity of residential properties), which is the difference of the newly constructed quantity *(C)* and the abandoned quantity *(A)*. In the case of constant demand, these two quantities must be the same for the market equilibrium.

If the income increases, the demand curve *(D)* moves upward, so the rent charges also increase in the market, accordingly; if the construction costs remain the same, more rentable properties are built, thereby increasing the supply, which ultimately leads to the decrease of rent charges. According to the Friedman's income hypothesis, households spend a constant proportion of their permanent income on housing; thus, according to DiPasquale and Wheaton (1992), if a family lives in a property owned by them, the housing costs, as with the installments of the mortgage and the utility costs, can be treated as rent charges payable by the household. If the income increases, households can afford to pay more on their housing, which also moves the demand curve upward, so the model is also suitable to assess housing markets, where ownership is predominant over rental.

When long-term interest rates decrease, property prices increase, so, presuming that all other conditions remain

unchanged, the stock will also increase. It is similarly clear that any potential increase in construction costs will result in fewer new properties being constructed, which will increase property prices as well as rent charges.

When assessing the crisis of Houston's housing market in the 1980s and the prices of residential properties, Smith and Tesarek (1991) proved, using the so-called two-dimensional price index, that the cyclic behaviour of the housing market is also affected by regional factors, e.g., employment conditions of the relevant region and migration. They also established that even a drastic decrease in property prices does not result in an immediate increase of demand, but achieving the market equilibrium again takes several, even three to four years.

By the beginning of the 1980s, nearly 200,000 jobs were lost in Houston due to the oil and gas industry crisis; thus, the number of households started decreasing rapidly. This was party due to the migration it started and partly because grown-up children moved away from the parents owing to the decreasing income and the lack of employment prospects, so the establishment of new households was delayed in time. Nevertheless, building residential properties continued until 1983, so the number of empty residential properties doubled by the middle of the decade. Due to over-construction, house prices decreased by an average of 30%, but there were regions where the decrease in value was nearly 40% in the case of detached houses and 60% in the case of flats. However, empty properties were mostly residential properties built a few years earlier, where, owing to the decrease in value, the property no longer provided sufficient security for the mortgage debt. The concentration of empty properties, however, was not stable, but it started to spread to other segments of the housing market because many people moved to a lower category property, while the new demand was mainly aimed at residential properties in good condition built a few years earlier, with prices significantly lower than before. As a result of such market correction, the proportion of empty residential properties effectively reached the pre-crisis level in all segments of the housing market by the end of the 1980s.

Wheaton (1999) established that the cyclic behaviour of various real estate market segments might differ in various aspects. Although the main reason of the cyclic behaviour of all sectors is in the economic cycles, there are market segments (offices, stores), where this relationship is not as close as in other segments (residential properties, industrial properties). The shorter the transition period of property development is, and the more inflexible the stock is, the more effect the external factors have on the cyclic behaviour of the market. However, in the case of long transition periods, and more flexible stock, internal cycles are much more likely to develop, so the cycles of the relevant segment will be less aligned to the economic cycles. In the case of residential properties and industrial properties, the time period of property development is around one year, while in the case of offices and shopping centres, this may even take up to four to 10 years. The market stock of residences is much more flexible than the market of offices or stores, but, according to Wheaton (1999), there had not been sufficient information on industrial properties in the United States.

The cyclic behaviour of the property market was assessed in Hungary by Horváth et al. (2016). Horváth et al. (2016) described the market of offices based on profit, rental turnover, number of empty properties, and the variations of new completion in time. Their research proved that changes in the profits of investments in the market of offices had the first effects on the number of empty properties and rental turnover (with a delay of three to four months), while the reaction of rent charges and office constructions was delayed significantly more, and it roughly took one year.

From the second half of the 1990s, house prices increased rapidly on the American housing market; it stopped in the mid-2000s, and the prices started to decrease. Zhou (2010) was looking for an answer whether this effect is merely random, or the fall of the house prices are determined by market powers, thereby leading the property market toward the long-term equilibrium. During his research, he tested the long-term joint movement of the economic fundamentals (income, employment ratio, interest rates, etc.) and house prices. In many cases, earlier empiric research has not found any evidence on the long-term relationship of these factors and house prices, and Zhou believes that the reason for this is that these assessments presumed a linear relationship between the fundamental variables and house prices. In his research, he investigated the relationship of these fundamental macroeconomic variables and property prices in 10 major cities of the United States, and he could only prove a linear relationship only in one metropolis, while this relationship proved to be nonlinear in six other major cities. With his method, there were only three cities, where the relationship between house prices and the economic variables could not be proven.

Neng Lai and Van Order (2017) assessed the long- and short-term relationship of house prices, rent charge indices and interest rates in 45 regions of major American cities. Based on the analysis of quarterly data between 1980 and 2013, the authors concluded that these factors affect house prices on the long-term regardless of the locality. On the short term, however, the market prices of residential properties are also affected by local factors of the cities, so the short-term effects of the assessed variables are not significant.

Due to the financial crisis started in August 2007, it was also proven that missed mortgage payments had a negative effect on property prices (Ascheberg, Jarrow, Kraft, & Yildirim, 2014).

Having analysed the cyclic behaviour and the efficiency of the housing market of the United Kingdom, Meen (2000) highlighted the importance of the interactions among house prices, construction costs, and interest rates in the formation of high amplitude cycles. The operation of the property market is not efficient, so the excess supply of houses is a common characteristic of the market.

Davidoff (2013) has also analysed the rapid price increase affecting the American housing market in the first half of the last decade. While the negative correlation between the expansion of the stock and the prices was treated fundamental, which was also supported by empiric research at the time of the price increase in 1980, the time period subject to Davidoff's (2010) research has proven a positive correlation between the stock of residential properties and their prices.

Amongst others, the Hungarian housing market was studied by Hegedüs (2006), Kiss and Vadas (2006), Mádi (2008), Farkas et al. (2010), and Békés et al. (2016).

In their studies, Hegedüs (2006) and Mádi (2008) analysed the state policy regarding residential properties and the property subsidy systems in Hungary between 1990 and the first half of the 2000s. A main element of the subsidy system introduced in 2000 was the interest subsidy provided for mortgages. Some households brought forward their intention to purchase their property, which generated a dynamic increase in state-supported mortgages, so budgetary funding of the introduced property policy was not sustainable for the long term. In the years following the political transformation, the real prices on the housing market decreased by 35–45%. However, house prices increased by 100–150% between 1998 and 2001, which was slightly before the increasing number of mortgages after the 2000s. Subsequently, house prices increased even further until 2005, which was due to the increased demand. Hegedüs (2006) explained the change of demand resulted partly by the wide stabilisation of household income and partly by the reallocation of savings in the money market to the property sector.

Mádi (2008) primarily analysed the positive effect of residential construction and the housing market on the economic growth, the structure of the economy, employment, the equilibrium of public finances, lending, and growth of imports. As he established, the expansion of the housing market in the first half of the 2000s was mainly the result of the announced state policy on housing.

Kiss and Vadas (2006) studied the effect of the Hungarian monetary policy on the housing market in the first half of the 2000s. The authors found that the changes in interest rates did not have a large effect on the available income of households and thereby to the demand for residential properties. The reason for this is, first, the interest subsidy provided by the state, meaning that the interest rate risks were actually born by the state; second, mortgages with long interest periods were predominant, so their interest rates reacted to the changes of the key interest rate with a relatively long delay. The effect of interest rate changes on the prices, investment, and house sales is limited to the Hungarian market.

In their agent-based simulation model, Farkas et al. (2010) investigated the role of social and individual learning in the adaptability of the housing market. Market operators on the housing market conclude transactions only rarely. The market is monitored before each purchase or sale, but market operators also strongly consider their previous experience as well. Farkas et al. (2010) concluded that learning based on individual information results in unstable adaptability, so price bubbles and crashes occur on the housing market from time to time.

Using a hedonic regression method based on the Hungarian tax authority database, Békés et al. (2016) assessed the relationship of each town-level factor affecting the demand for residential properties in Hungary (natural properties, availability, educational and healthcare services, official classification) with the housing prices. On average, natural properties (especially nearby natural waters), accessibility by road or public transport, distance from institutions, and the administrative classification of the town are responsible for approximately 15% of the house prices in total. The properties of the residential property explain approximately 30% of the price variation. The four factors analysed by Békés et al. (2016) have a strong correlation with the size of the town and the average income of people living there, which are cruical factors for the prices in the housing market.

The previous domestic research focused mainly on the period from the beginning of the 2000s until the crisis, which was exclusively about demand and price increase. In this study, the behaviour of the Hungarian housing market is evaluated in respect of time from 2007, which is the year directly before the beginning of the economic crisis. In accordance with the international trends, the crisis also caused a significant decrease in demand in Hungary concerning durable consumer products, including residential properties. However, housing prices started to increase from 2011, which significantly accelerated in the past three years. The volume of remitted mortgages and state support had been decreasing every year from the beginning of the crisis and only started to increase again from 2014, which corresponds

to the beginning of the housing market expansion in progress today. The period passed since the beginning of the crisis is therefore suitable for analysing the cyclic behaviour of the Hungarian housing market.

The Hungarian Housing Market from the Political Transformation until the Economic Crisis

The events of the housing policy and housing market after the political transformation can be divided into three sections. In the period between 1990–1994, construction by the state (which was the main form of construction in the previous decades, even though it was hardly operational in the 1980s already) has completely ceased, and the division channels of the socialist housing system have been terminated. Before 1990, the Hungarian state provided massive amounts of mortgages with minimal interest rates through the only consumer bank operating at that time. This credit volume became extremely large by 1990. As a result of the sudden increase in unemployment in the years following the political transformation, households were unable to pay their mortgages, so the resolution of this credit volume could no longer be delayed. This was the period when the large-scale privatisation of state and council-owned rental properties started, and this has a significant effect on the housing structure even today. The number of constructed houses decreased year after year. Less than half as many houses were built in 1994 than in 1990.

In the period from 1995 until the turn of the millennium, the privatisation of the construction industry has been completed, and the institutions of the housing market have been established. New institutions appeared in financing, e.g., housing associations and banks providing mortgages. The state subsidy provided for construction and purchase of houses has been increased substantially from 1995. The number of constructed houses had a slight increase until 1997; then it decreased significantly from 1998 (Hegedüs, 2006; Mádi, 2008).

The turning point for the housing policy was the year 2000; new programmes started for supporting mortgages and for supporting the construction of rentable council houses. The construction of houses increased by 50% in one year, and such increase continued. By 2003, the interest rate subsidies by the state have effectively become impossible to finance from the national budget, so the government had to implement a significant correction of the housing support system (Hegedüs, 2006). At this time, the growth in the number of house constructions became slightly slower, but the turnover of the housing market kept increasing during the economic boom until the crisis. The financing role of state-supported mortgages was gradually overtaken by currency-based mortgages, but these had an inherent risk concerning exchange rates.

Once the recession started, the decrease in demand has occurred first in the case of durable consumer products, especially for real properties, including residential properties. Due to the uncertainty of their income prospects, households delayed their intention to buy their properties. The decrease of house prices only followed the lower demand with a delay because most sellers were waiting, the offer prices started to decrease only after the crisis deepened.

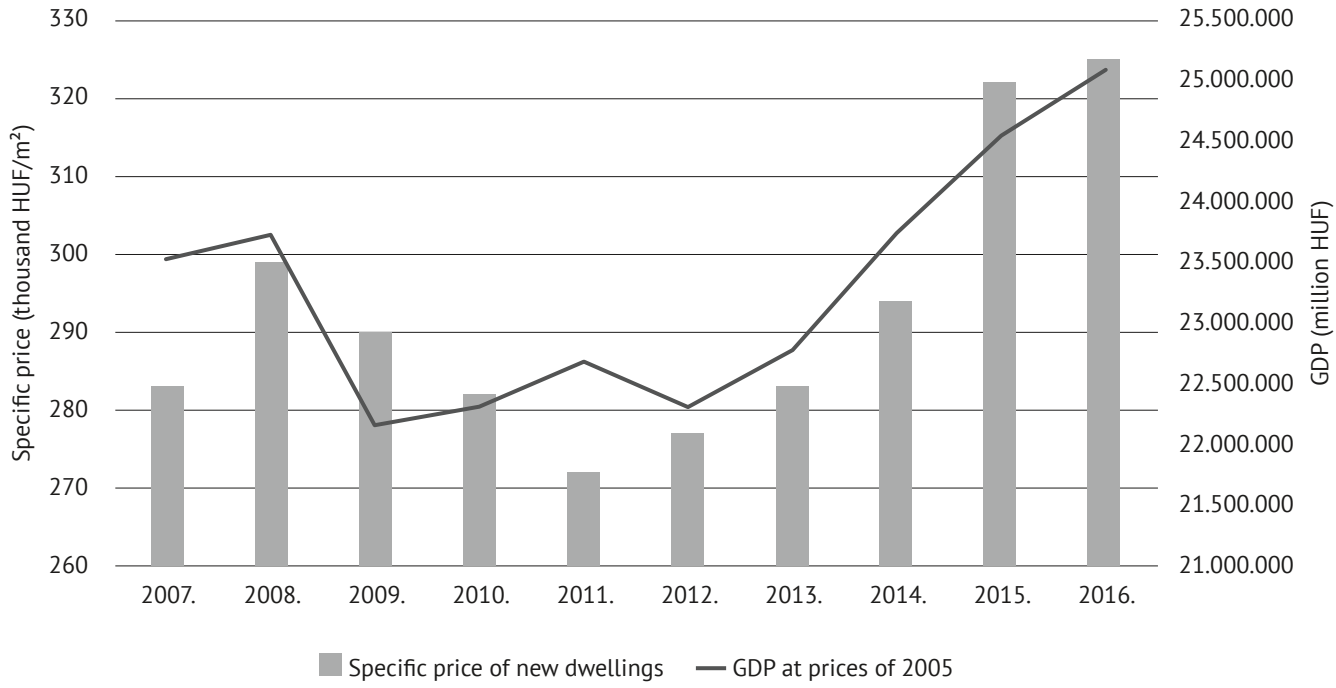
Amongst the years preceding the crisis, the year 2007 was chosen for the starting year of further analysis because, in the case of certain indicators used for the analysis, statistical data are only available from this year.

Behaviour of the Hungarian Housing Market in Respect of Time from the Beginning of the Crisis until Today

Similarly to other durable consumer products, the behaviour of the Hungarian housing market is primarily aligned with the macroeconomic cycles. There is a strong relationship in the positive direction between the constant-price GDP and the specific price of newly constructed residential properties, which is indicated by the value of the correlation coefficient (r = 0.8725) (Figure 2).

According to our calculations, the variations of the GDP have an approximately 76% effect on the variance of the square-meter price of new residential properties (the value of the determination coefficient is R^2 = 0.7613). The average specific price of new residential properties was continuously decreasing, with a total decrease of around 9% from the beginning of the economic recession started in 2008 until the year 2011 constituting the lowest point in prices, even though the output of the national economy showed a slight increase from 2009. Due to the inflexibility of the property market, residential property prices primarily depend on the demand (DiPasquale & Wheaton, 1992); this behaviour can be explained by houses being durable consumer goods because, if households consider their future income to be unstable due to the stagnation or decrease of their salaries or because of the increasing unemployment, they decrease their consumption primarily in relation to such things. The demand in the housing market is significantly affected by the provision of mortgages and state subsidies, as a strong positive correlation

Figure 2. GDP and the Mean Price Per SQM of New Dwellings in Hungary (2007–2016)



Source: KSH (2017b)

(r = 0.8166) is revealed between the remittance of mortgages and subsidies and the specific price of new residential properties. The amount of remitted mortgages and subsidies had a continuously decreasing trend from 2007 to 2013 *(Table 2)*.

Table 2. Loans and Subsidies for Housing in Hungary (2007–2016)

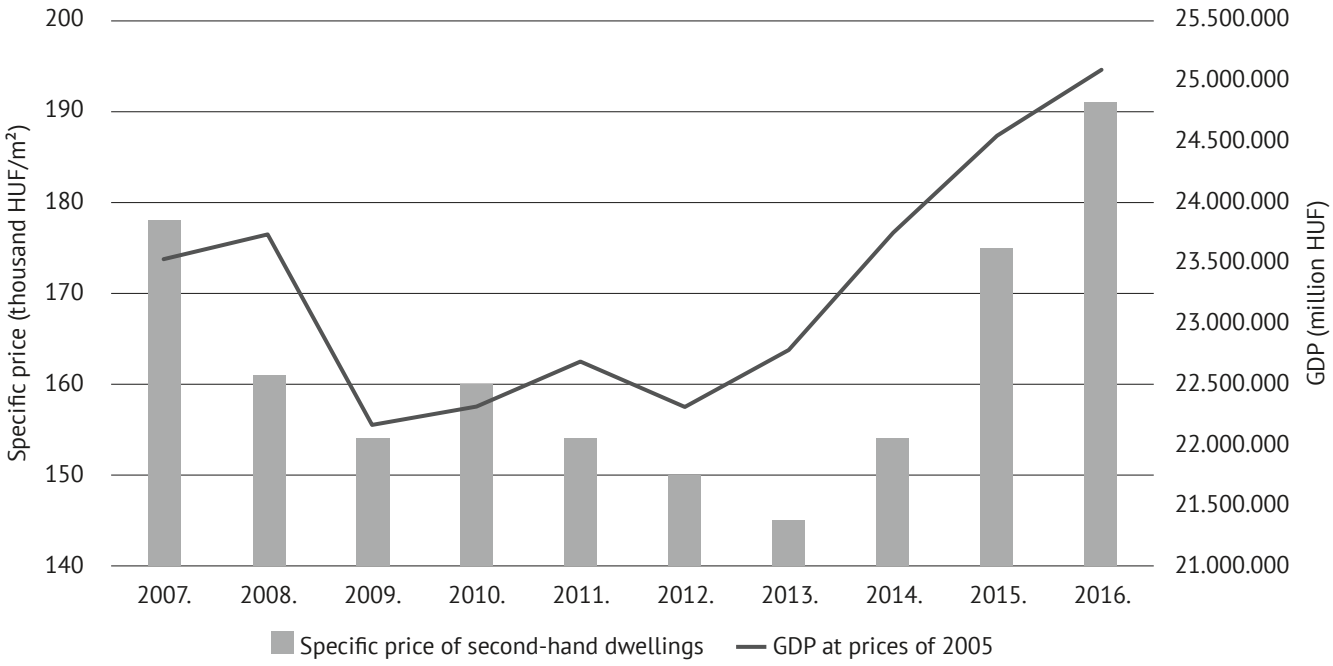
Year	Loans and Subsidies for Housing (million HUF)	Budgetary Contribution for Housing (million HUF)
2007	722.320	228.470,4
2008	886.976	185.574,9
2009	345.523	199.289,3
2010	240.183	147.402,8
2011	261.804	129.079,3
2012	235.796	124.000,7
2013	168.261	131.862,0
2014	253.631	127.959,9
2015	361.282	109.302,5
2016	455.725	148.152,8

Source: KSH (2017c)

The correlation between the specific price of used residential properties and the gross domestic product (Figure 3) is slightly lower (r = 0.7963). Approximately 63% (r^2 = 0.6341) of the price variance of used residential properties is due to the GDP. The decrease of average square-meter price of used residential properties started a year earlier, and, even though it had a slight increase in 2010, it continued decreasing thereafter; this decrease lasted about two years longer compared with that of new residential properties. This market segment had over twice as much decrease (18.5%) in this period than in the case of new residential properties.

The change of specific prices of used residential properties had approximately one year of antecedence before the 2008 recession and about a 1–1.5-year delay at the end of the crisis. The reason for the delay is that, due to the increasing demand from 2011, the stock of used residential properties gradually increased because a large proportion of people buying new properties changed their existing old house. The conclusion of this fact is that the demand on the market of used residential properties is far more flexible than in the case of the market of new residential properties. The inflexibility of demand means that, in the short term, the market can react to the increased demand only by raising the prices, as the change of quantity to be sold requires a longer period of time. In the case of new residential properties, this delay is primarily due to the time required for construction. In addition, as shown in the case of used residential properties during a crisis, sellers prefer to wait with the sale when house prices decrease, and, apart from forced sales, they try to restrict the demand. However, due to

Figure 3. GDP and the Mean Price Per SQM of Second-Hand Dwellings in Hungary (2007–2016)

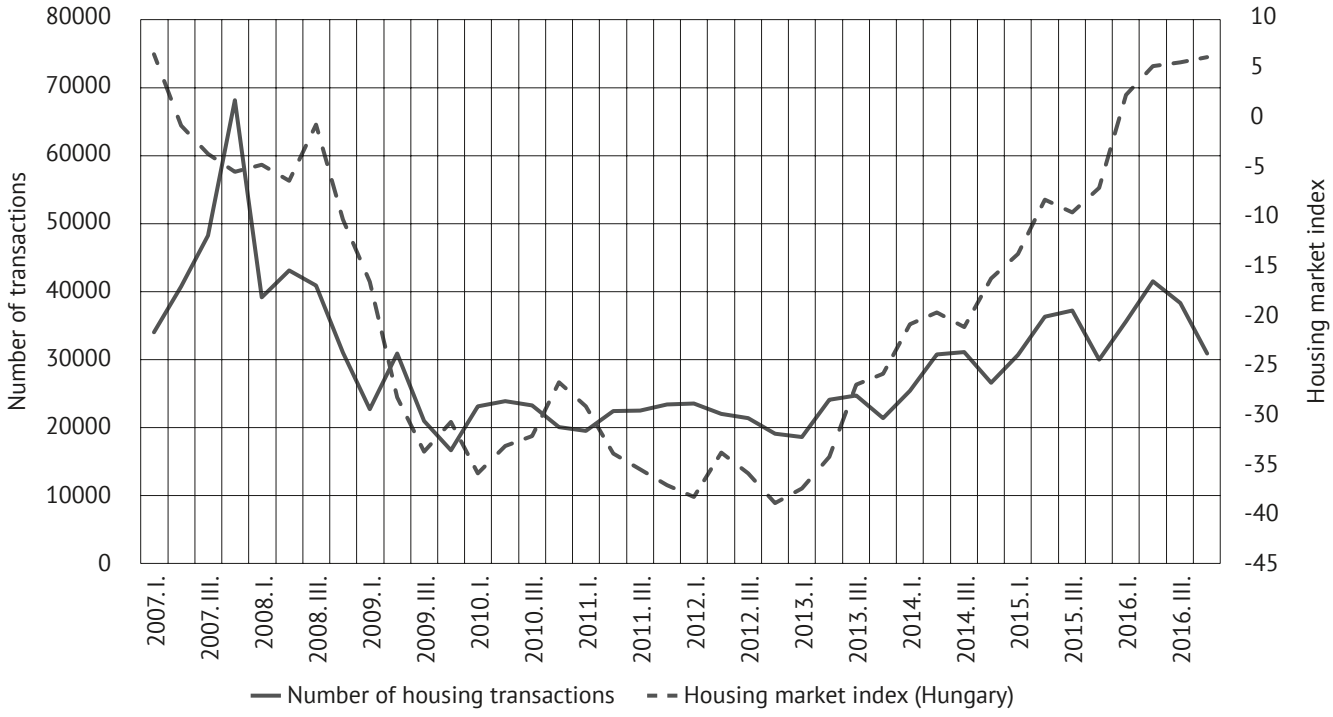


Source: KSH (2017b)

the price increases in the recent years, the stock significantly increased on the secondary market as well.

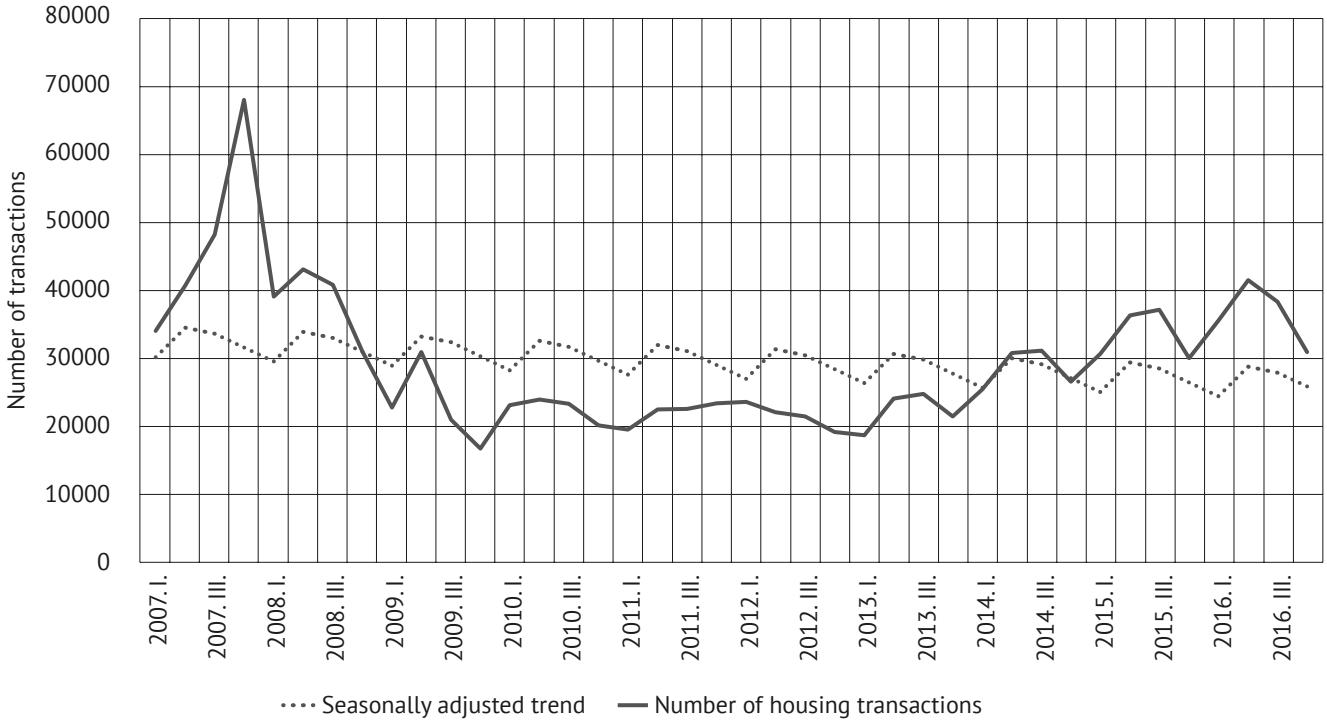
The housing market indices published by GKI Economic Research Co represent the expectations of estate agents and the residents. Comparing the expectations of the housing market with the concluded sales transactions (Figure 4) supports the conclusion of Farkas et al. (2010) that the market operators form their future expectations based on recent events by monitoring the market.

Figure 4. Housing Market Expectations and Realized Transactions in Hungary



Source: Edited by the author, based on KSH (2017b) and data of GKI Economic Research Co.

Figure 5. Seasonal Fluctuations in the Number of Housing Transactions in Hungary



Source: Edited by the author, based on KSH (2017b)

It is also revealed that expectations were much more realistic during the market downturn from the first quarter of 2008 to about the end of 2010 (the number of market transactions better confirm this) as in the case of expansion (from the fourth quarter of 2010), the expectations of market operators are rather over-optimistic.

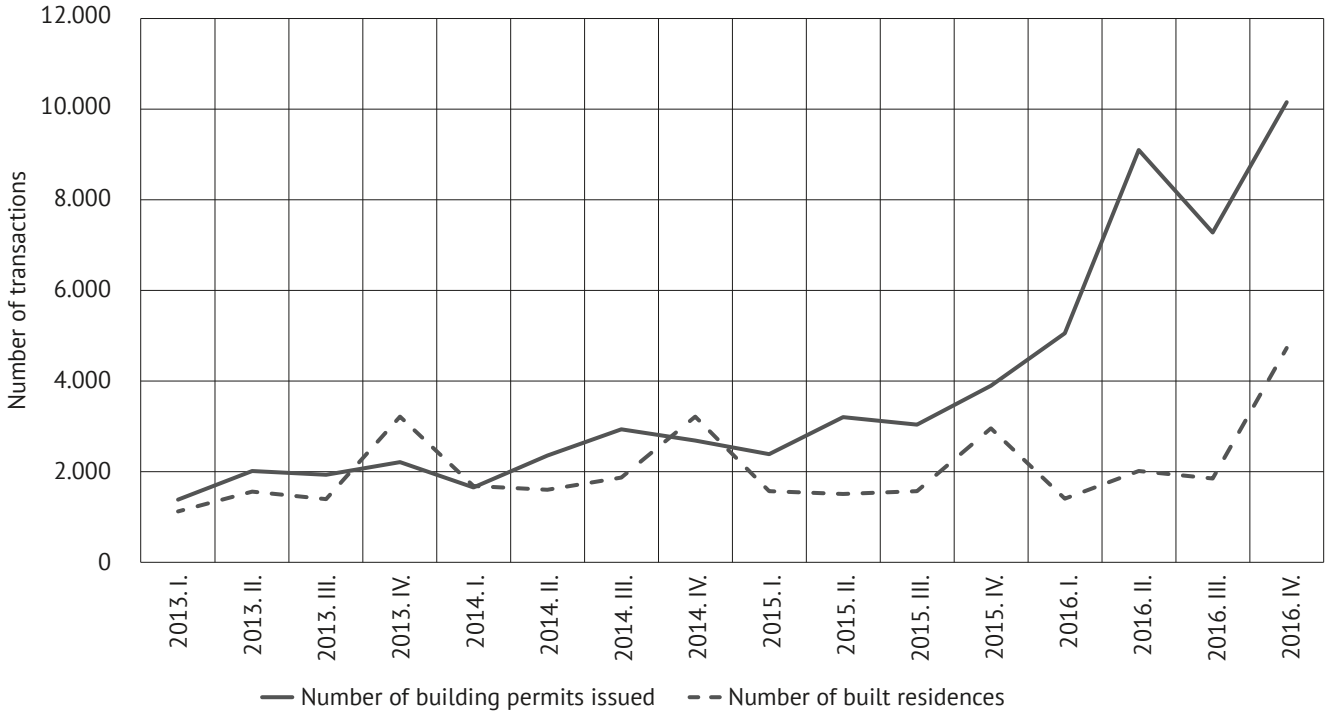
It can be established by assessing the number of transactions in the housing market that the number of property sales depends on the season. The number of transactions decreases during the first and last quarters of the year, and the number of sales increases in the second and third quarters, which means that people much more likely to buy a residential property in spring or summer than in late autumn or winter. The corrected seasonal variation calculated from the number of completed transactions was –2,568 in the first quarter, 1,945 in the second quarter, 1,221 in the third quarter and –598 in the fourth quarter. Comparison of the seasonally corrected trend and the number of actual transactions (Figure 5) reveals that the number of house sales directly before the economic recession started in 2008 and, in the very beginning of the crisis, was especially high, which is mainly the result of the pro-cyclical behaviour of the inflexibility of the demand in the housing market. The number of transactions was below the trend during the crisis, but there was rapid growth from 2015.

The expected behaviour of the market of new residential properties can also be assessed by the changes in the number of construction permits and the number of new residential properties built (Figure 6[1]). The former has a slighter seasonal fluctuation, while this is more significant in the case of home construction. The corrected seasonal variation calculated from the number of constructed houses was –513 in the first quarter, –369 in the second quarter, –447 in the third quarter, and 1.329 in the fourth quarter.

Having compared the number of the issued construction permits and the number of completed and occupied houses, we show that length of construction is approximately one year, and it causes a delay with about the same length with regards to the cyclic behaviour of the market. The number of construction permits proliferated from the third quarter of 2015, while the same happened for the completion of houses only from the third quarter of 2016. This is presumably related to the family home creation support introduced in February 2016. Family home creation support is a state subsidy that can be used for the purchase or construction of new residential properties or for the purchase or extension of used houses. The subsidy consists of non-reimbursable aid and interest rate subsidies provided for mortgages. The amount of the subsidy depends on the number of existing children and the contracted number of future children. The amount of family home creation support is significantly higher than the former state

[1] Quarterly statistical data on construction permits and construction of houses are only available from 2016.

Figure 6. Housing Construction in Hungary



Source: Edited by the author, based on KSH (2018)

subsidies. The amount of the nonreimbursable aid for new houses is between 600,000 and 10 million forints depending on the number of children, and it is between 600,000 and 2.75 million in the case of the purchase of used residential properties. Families with three or more children may receive an interest rate subsidy. In the case of an interest rate subsidy, the state undertakes to pay part of the mortgage that is above 3%.

The ever-increasing number of constructed houses and the rapid increase of house prices raise the question whether there is a risk of an asset price bubble in the Hungarian housing market. A bubble is created regarding the price of an asset if it is significantly overvalued for a relatively long period of time. Property is deemed to be overvalued if its price exceeds the present value of the income expected in the future from its possession for a long period of time, which is called "intrinsic value" or "fundamental value." The amount of the bubble is the difference between the price of the property and its intrinsic value. The process of price bubble formation can be divided into several phases. The first phase is the increase of the intrinsic value by an external factor. The subsequent phase is the boom phase, when demand for the undervalued asset increases due to the higher intrinsic value, so its market price starts to increase. This phase is represented by increased lending and housing investments. The boom phase carries the highest risk that the price of the asset is not settled appropriately, and it becomes overvalued. If this overvaluation is only moderate, a price bubble is not formed; in the professional literature this is called "price deflation." However, if the market price becomes significantly higher than the intrinsic value for a long period of time, a price bubble is formed, and it also remains for longer. In order for the bubble to pop, an event needs to happen that leads the overall expectations of future prices toward a significant price decrease. As the amount of loans in the Hungarian market is significant, the correction of the market prices when the bubble pops carries the risk that the solvency of debtors deteriorates, as only a smaller income can be expected from the sale of the residential property (Lakos & Szendrei, 2017). The changes and the period of the boom during the housing market expansion from 2015 can be determined by the increasing prices and lending and by the expansion of construction of residential properties; however, the amount of overvaluation cannot yet be measured based on the available data. Although the risk of a housing market price bubble is present, only the next few years will tell whether it is actually generated.

Conclusion

The following key questions were mainly addressed by our research:

- How state grants and housing loans influence the general housing market cycles.

- Whether the general expectations of market players have any meaningful effect, influencing the Hungarian housing market.
- Whether the time period required for new housing construction projects, and the seasonality factor alters the cycles seen on the housing market.

The cyclic behaviour of the Hungarian housing market may be explained primarily by business cycles. GDP affects the price variation of new residential properties approximately 76%, while in the case of price variations of used houses, this effect is 63%. A strong positive correlation can also be shown between the granted state subsidies and the price of newly constructed houses; thus, the expansion of mortgages and the massive amounts of easily accessible state subsidies can generate a so-called asset bubble on the market of residential properties. The expectations of market operators appeared more realistic at the beginning of the recession compared with the period of recovery from the crisis, when the market turnover was systematically below the expectations. This means that the expectations of market operators do not have a demonstrable effect on the Hungarian housing market.

The number of transactions on the housing market as well as the construction of houses significantly varies by the seasons of the year. There is a significant peak in the second and third quarters for property purchases and in the fourth quarter for completed houses.

Having compared the number of the issued construction permits and the number of completed and occupied houses, it shows that the length of construction is approximately one year, which causes a delay with about the same length with regards to the cyclic behaviour of the market. The significant expansion of the construction of houses seems to be related to the introduction of a new state subsidy, the family home creation support in February 2016. The Hungarian property market has been expanding since 2015, which is present by the increasingly growing prices and also in the expansion of construction of residential properties and mortgages.

The stock of second-hand residential properties in the Hungarian property market looks more flexible compared with that of new properties. Because of the short-term inflexibility of stock, variations of market prices depend mainly on demand. Apart from those evaluated in our study, the demand for residential properties is affected by numerous other, mainly local, factors, including transport infrastructure, various levels of service centres, availability of educational and other institutions, public safety, and the condition of public spaces. For the majority of these factors, their effect on Hungarian property prices and the cyclic behaviour of the market is yet to be explored. The price increase of the past years carries a risk of developing a price bubble in the housing market, which may also be the basis for further research in the following years.

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Cikli stanovanjskega trga na Madžarskem od ekonomske krize do danes

Ključni cilj tega članka je prepoznati osnovne razloge za ciklični značaj madžarskega stanovanjskega trga, še posebej poslovnih ciklov, gradbenih projektov in pričakovanj tržnih udeležencev. Raziskava temelji na analizi statističnih podatkov in indeksov stanovanjskega trga. Izsledki raziskave kažejo, da je cikličnost stanovanjskega trga možno pojasniti pretežno s poslovnimi cikli, vendar državne subvencije in hipoteke prav tako vplivajo na variacije. Torej lahko naraščajoče posojanje in visok znesek subvencij ustvarjata cenovni balon. Ponudba rabljenih stanovanj izkazuje večjo prilagodljivost kot ponudba novih stanovanj. Kakorkoli, pričakovanja tržnih udeležencev nimajo jasnega učinka na stanovanjski trg.

Ključne besede: trg nepremičnin, cikli stanovanjskega trga, cenovni balon dobrin

Statistical Analysis of the Development Indicators' Impacts on E-Commerce of Individuals in Selected European Countries

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Abstract

The aim of this paper is to analyse the influence of the development level indicators on the e-commerce, i.e. on the online purchase by individuals, in selected European countries in 2013. In the analysis, the main variable under study and all the independent variables are included as standardised. Based on nine variables, the principal component analysis with varimax rotation was performed and the two extracted factors were used as the regressors in the multiple regression analysis. In the regression model both components, Factor 1, which includes seven variables, called Prosperity, Investing in Education and IT Infrastructure, and Awareness, and Factor 2, comprised of two variables, called IT Skills, are statistically significant at the significance level of 1%. Both factors show a positive correlation with the online purchase of individuals. Inclusion and analysis of distributions and impacts of even nine independent variables, which make up two distinct factors affecting the e-commerce, make a new contribution of this work.

Keywords: e-commerce, broadband access to the Internet, factor analysis, multiple regression analysis.

Introduction

Electronic commerce (e-commerce), in simple terms, implies trade using information technology. In order to be able to understand what e-commerce encompasses, one should look at its core components: a business process, a business process object and the technology a business process involves. A business process includes purchase, sale, transfer or exchange. The object of a business process can be a product, a service or information. From the technological perspective, a

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business process can be conducted by a partial or total use of a computer or other electronic devices and equipment, as well as computer networks, including the Internet. The synthesis of the named components results in the following wider definition of e-commerce: "*Electronic commerce is the process of buying, selling, transferring or exchanging products, services and / or information via computer networks, including the Internet*" (Turban, King and Lee, 2008).

The main aim of the paper is to inspect the impact of chosen economic and information and communications technology development level variables on e-commerce developments. In accordance with the aim, the following research hypothesis has been set: the chosen economic and information and communications technology development level variables have a positive impact on e-commerce developments, which is observed as the Internet purchases conducted by individuals.

The paper is organised as follows. After the brief introduction, the second chapter brings literature review whereas the third chapter explains and divides variables used in the analysis into groups of development indicators. In the fourth chapter, a descriptive and exploratory statistics analysis of the observed variables has been conducted. In the fourth chapter the results of the conducted factor analysis have been shown as well. After selecting an appropriate number of factors, checking the assumption of a factor analysis application and conducting a factor analysis, a regression analysis based on results from a factor analysis has been made. The final, fifth, chapter concludes the paper and provides recommendations for further research.

Literature Review

E-commerce would be impossible without information technology. However, it would be unsuccessful without strategic management of business operations through the named processes. Electronic commerce has become an increasingly significant and profitable component of the global commerce. It has been increasing constantly and experts forecast that the increase is to continue in the years to come (Babić, Krajnović and Radman Peša, 2011; Delić and Knežević, 2012; European Commission, 2013). The main reasons for switching to e-commerce include the reduction of business operation costs, time-effectiveness, and the access to a large market, i.e. the whole world (Laudon and Traver, 2010). Therefore, this paper presents the analysis of the online purchase by individuals as one of the most important segments of e-commerce in selected European countries.

Business-to-Consumer (B2C) e-commerce or e-retail is a business transaction between a company (business entity) and an individual consumer, usually conducted through a webshop. This is the most well-known type of e-commerce. Its significance is not high if one considers only the revenue it creates (although it has an exponential increase), but considering the number of realised transactions it excels all other e-commerce models (Laudon and Traver, 2010). Contemporary e-commerce is unimaginable without intermediaries, which have recognized the need for additional service (reintermediation). Before purchasing a product in a brick-and-mortar shop, a growing number of consumers search for information on the product online (prices at other suppliers, the product's characteristics etc.). This type of purchase is denoted by the acronym ROBO (Research Online, Buy Offline), or occasionally the acronym ROPO (Research Online, Purchase Offline) (Knežević, Jaković and Strugar, 2014).

Since 2007, the portion of individuals in the Internet business operations has been on a constant rise (Eurostat, 2017a). In 2013, almost half of the EU population ordered goods or services via the Internet (Eurostat, 2017b). The increase in the number of individuals who participate in the e-commerce anticipates an increase in the e-commerce, which is thus becoming an increasingly significant factor in the economy. In 2013, e-commerce amounted to 2.2 % of the European GDP (Nagelvoort et al., 2014). The named industry nowadays employs 2 million people (Nagelvoort et al., 2014), which does not come as a surprise since retail in general has become a highly important type of trade in the EU due to the significant workforce it employs (Knežević, Renko and Knego, 2011).

When comparing specific European countries, it can be seen that online purchase is more common in more developed countries. According to the report published by E-commerce Europe (Nagelvoort et al., 2014), in 2013, B2C e-commerce realized turnover of 363.1 billion euros, out of which EU28 countries realized 317.9 billion euros. The ten leading countries make 83% of the total B2C e-commerce. However, the first three leading countries (Great Britain, Germany and France) make 61% of the total e-commerce in Europe. E-commerce Europe research has also shown that the most commonly purchased products in the EU include clothes and shoes, books, house appliances and electronics. Therefore, in the top three countries (Great Britain, Germany and France), more than 40% of consumers have bought clothes or shoes via the Internet, more than 32% have bought books, and more than 29% house appliances and electronics. In other countries only 4-10% of consumers buy such products via the Internet (Nagelvoort et al., 2014).

In Dumičić, Žmuk and Čeh Časni (2015, 2016), the purchases by individuals, defined as Internet booking for travel and holiday accommodation and Internet banking, were analysed in details for different selections of European

countries by variety of multivariate analysis methods. The scientific contribution of this particular paper, as compared to the previous research on similar topic, is represented by inclusion of more variables that comprised clear components influencing the e-commerce.

According to Liu (2013) gross domestic product (GDP) is considered to be the economic indicator, which shows relatively well the development level of a certain economy (Liu, 2013). GDP reflects the value of all final goods produced in a certain country during a year. It does not include products or services used in the production process, nor are those produced abroad (domestic investments abroad). The most favourable GDP growth is the one resulting from investment, i.e. investment into new production (Kolaković, 2008). Investment into traffic infrastructure has a positive impact on e-commerce since logistics is one of the main preconditions of successful e-business (Laudon and Traver, 2010). Investment into network infrastructure as well as into marketing and advertising can also incite the e-commerce growth. In addition to investments, other components can also have a positive impact on e-commerce. The prosperity of a country also facilitates an increase in personal consumption and government expenditure. One of the ways of increasing export is through e-commerce. Therefore, the GDP growth has a positive impact on e-commerce (Dumičić et al., 2014).

Investment into education creates workforce with better skills. Persons with a higher educational level have better employment opportunities and in general better salaries. This leads to consumption, while employment reduces social expenditure, which results in further investments and ultimately the GDP growth (Terzi, 2011).

Skills as a development indicator refer to the ability to use a computer and the Internet. The ability to use a computer seems to be a skill necessary for purchases via the Internet. Online purchase nowadays can be conducted using mobile devices, and due to that, a lack of computer skills does not seem to be an obstacle anymore. Consequently, the Internet use skills could have a more significant impact on e-commerce (Chen, Tarn and Han, 2004, Dinu and Dinu, 2014). Information-communication technology has an increasing influence on everyday lives of common people (Wirthmann, 2009). The Internet access, especially the broadband access, plays an important role in the development of an economy (Bahovec, Dumičić and Čižmešija, 2013). Due to its speed and being always on, the broadband access presents advancement in comparison to the dial up Internet access. According to European Commission (2013), the broadband access implies access to the Internet with access speed of 144 Kbit/s. It enables exchange of richer content, and a faster and more advanced communication. Being widespread and affordable, the broadband Internet access results in an informed society based on knowledge (Eurostat, 2014). Therefore, providing basic information on goods and services, and enabling a comparison of products' characteristics, availability, delivery options and similar can lead to an increase in the online purchase (Peltier and Youssef, 2015).

Data Definition and Description

The analysis presented in the paper included all 28 European Union member states, the Former Yugoslav Republic of Macedonia (FYROM), Serbia and Turkey. The main variable

Table 1. Classification of the independent variables according to development indicators categories

Development indicators	Variable	Description
Economic	$X_1=X_{GDPpc}$	GDP per capita in Purchasing power standards (EU-27 = 100)
Economic	$X_2=X_{ExpEdu}$	Public expenditure on education, percentage of GDP, direct expenditure on educational institutions
Skills	$X_6=X_{CSkill}$	Individuals' level of computer skills, individuals who have carried out 1 or 2 of the 6 computer-related activities, percentage of the total number of individuals aged 16 to 74
Skills	$X_7=X_{IntSkill}$	Individuals' level of the Internet skills, individuals who have carried out 1 or 2 of the 6 Internet-related activities, percentage of the total number of individuals aged 16 to 74
ICT/skills	$X_9=X_{InfoG\&S}$	Individuals using the Internet for finding information about goods and services, percentage of individuals aged 16 to 74
ICT	$X_3=X_{IntAccessHH}$	Level of the Internet access, percentage of households which have the Internet access, all forms of the Internet use are included, the population considered is aged 16 to 74
ICT	$X_4=X_{BBAccessHH}$	Households having broadband access to the Internet, percentage of all households, having at least one member in the age group 16-74
ICT	$X_5=X_{BBPenet}$	Fixed broadband penetration, subscriptions as a percentage of population
ICT	$X_8=X_{IntUse}$	Internet users (per 100 people), Internet users are people with access to the worldwide network

Source: Eurostat, 2016a-g, World Bank, 2016.

under the study, also observed as the dependent variable, is the variable the Internet purchases by individuals (Y_{PU}), which is defined as a share of individuals who made a purchase by using the Internet in the last 12 months in the total population of a country. List of included independent variables, carefully selected based on the conducted literature review and their availability, is provided in Table 1. The independent variables are classified into following three categories of development indicators: economic development indicators, skill development indicators and ICT development indicators.

Data for the observed variables have been taken from secondary sources (Eurostat, 2016a-g, World Bank, 2016). Furthermore, the analysis will be made by using data related to 2013. Unfortunately, it has to be emphasized that data for some variables and for some countries were not available. In such cases the most recent data has been used as an approximation of 2013 data.

Results

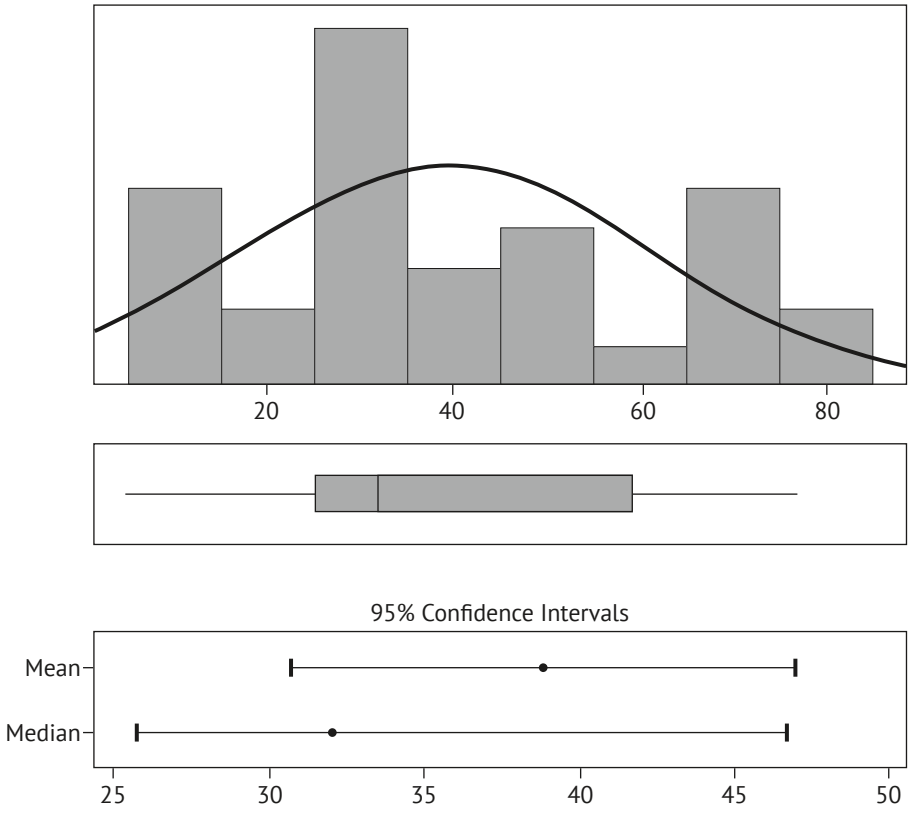
Exploratory Data Analysis

In order to inspect and look more closely at the observed data, to detect outliers, to estimate data variability and similar, exploratory graphical and numerical statistical methods can be applied (Azcel and Sounderpandian, 2009). The basic exploratory analysis of the dependent variable, the Internet purchases by individuals (Y_{PU}), is shown in Figure 1.

If the Internet purchases by individuals are observed in all selected European countries, it can be concluded that on average 38.81% of individuals made a purchase by using the Internet in the last 12 months. However, the average absolute deviation from the calculated average is 22.35%, which amounts 57.58% relatively. The great data dispersion led to the conclusion that the calculated mean here has a weak representativeness level (Dumičić and Palić, 2011). Despite a high data variability, all data can be found inside the two standard deviations interval of the mean. So, it can be concluded that outliers are not present for the main variable under the study. The outlier analysis has been conducted for all, the main and the independent, variables by using the multiple box-plots chart, too, as it is shown in Figure 2.

According to Figure 2, two outliers can be detected. Here the term outlier refers to a value that deviates more than three standard deviations from the mean of the observed variable. The first outlier is detected at the variable GDP per capita in Purchasing power standards. The outlier is represented by Luxembourg which has GDP per capita considerably higher

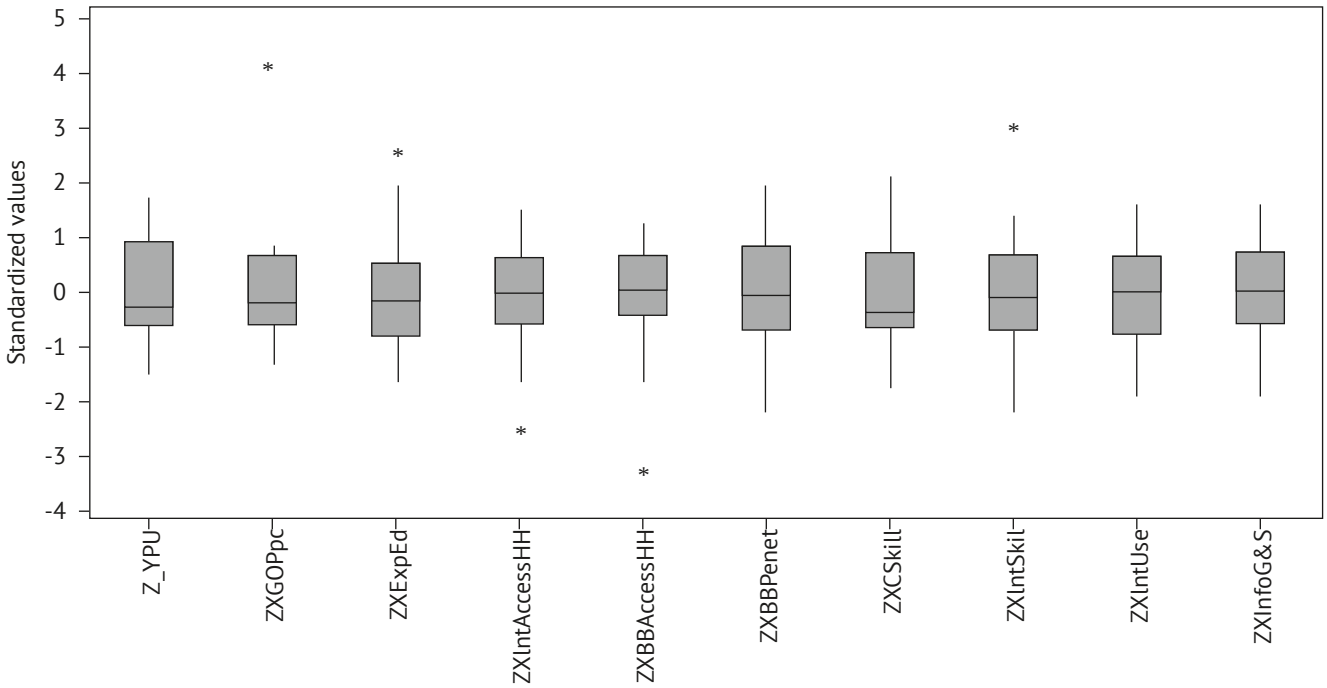
Figure 1. Exploratory analysis of the variable the Internet purchases by individuals, 31 European countries, data for 2013



Anderson-Darling Normality Test	
A-Squared	0,64
P-Value	0,085
Mean	38,806
StDev	22,346
Variance	499,361
Skewness	0,29876
Kurtosis	-1,03492
N	31
Minimum	5,000
1st Quartile	25,000
Median	32,000
3rd Quartile	59,000
Maximum	77,000
95% Confidence Interval for Mean	
30,610	47,003
95% Confidence Interval for Median	
25,675	46,650
95% Confidence Interval for StDev	
17,857	29,870

* comma (,) represents decimal separator

Figure 2. Multiple Box-plots diagram of 10 variables, standardized values, 31 European countries, data for 2013



than the other observed European countries. The second outlier is found for the variable Households with broadband access. For this variable Serbia has convincingly the lowest value. Because of a strong impact of outliers on the statistical factor analysis results, Luxembourg and Serbia have been omitted from the further analysis. The same approach to outliers exploration related to research of Internet usage by individuals in European countries was applied in Dumičić (2011), Dumičić et al. (2014), Dumičić, Čeh Časni and Palić (2014a, b), Žmuk, Dumičić and Mihajlović (2014).

Factor Analysis

Online purchase by individuals, observed via the variable Internet purchases by individuals, will be inspected by

Table 2. Correlation matrix of nine standardized independent variables, 29 European countries, data for 2013

Standardized variables	*ZGDPpc*	*ZExpEdu*	*ZIntAccessHH*	*ZBBAccessHH*	*ZBBPenet*	*ZCSkill*	*ZIntSkill*	*ZIntUse*	*ZInfoG&S*
ZGDPpc	1	0.661*	0.839*	0.784*	0.788*	0.248	0.539*	0.790*	0.821*
ZExpEdu	0.661*	1	0.647*	0.653*	0.715*	-0.013	0.081	0.623*	0.657*
ZIntAccessHH	0.839*	0.647*	1	0.966*	0.826*	0.397*	0.490*	0.952*	0.907*
ZBBAccessHH	0.784*	0.653*	0.966*	1	0.840*	0.389*	0.420*	0.929*	0.887*
ZBBPenet	0.788*	0.715*	0.826*	0.840*	1	0.203	0.359	0.820*	0.857*
ZCSkill	0.248	-0.013	0.397*	0.389*	0.203	1	0.540*	0.382*	0.356
ZIntSkill	0.539*	0.081	0.490*	0.420*	0.359	0.540*	1	0.410*	0.421*
ZIntUse	0.790*	0.623*	0.952*	0.929*	0.820*	0.382*	0.410*	1	0.961*
ZInfoG&S	0.821*	0.657*	0.907*	0.887*	0.857*	0.356	0.421*	0.961*	1

Note: * Statistically significant correlations at the 5% level.
Source: Authors' work.

using a factor analysis and, after that, by applying a regression analysis. The conducted factor analysis will result in grouping independent variables into a few factors. Those factors will be later used as independent variables in a regression model where the variable the Internet purchases by individuals will be used as the dependent variable.

The aim of the factor analysis is to compress information, which is provided by a large number of original variables, into a smaller number of common factors but with a minimal information loss. Before the factor analysis is applied, the data suitability should be checked, since factors very often seem to be difficult to interpret. Because of that, factors are first rotated and then interpreted. For the purpose of further analysis, factor scores are calculated.

The task of the factor analysis is to explain correlations between quantitative variables by introducing factors. Because of that, it is necessary for original variables to be highly correlated. In that case, the use of the factor analysis is justified. The correlation matrix of the observed standardized independent and original variables is shown in Table 2.

According to Table 2 it can be concluded that each variable has at least one correlation coefficient larger than 0.3 in absolute sense. The value of 0.3 is the minimum for including variables in the factor analysis (Field, 2011; Hair et al., 2008; Härdle and Simar, 2012). Consequently, all nine variables are going to be included in the factor analysis.

Table 3. Kaiser-Meyer-Olkin measure of sampling adequacy, standardized variables, 29 European countries, data for 2013

Variable	Kaiser-Meyer-Olkin measure of sampling adequacy
ZGDPpc	0.882
ZExpEdu	0.894
ZIntAccessHH	0.822
ZBBAccessHH	0.876
ZBBPenet	0.919
ZCSkill	0.748
ZIntSkill	0.716
ZIntUse	0.814
ZInfoG&S	0.829
Overall	0.845

Source: Authors' work.

According to Table 3, the overall Kaiser-Meyer-Olkin measure of sampling adequacy value is 0.845, which can be considered a satisfactorily high level. Furthermore, the Kaiser-Meyer-Olkin measure of sampling adequacy values at all variables are also large enough. Consequently, it can be concluded that the variable data are suitable for conducting a factor analysis.

Table 4. Eigenvalues, percentages of explained variance and cumulative percentages of explained variance

Factors	Eigenvalues	% of variance explained	Cumulative % of variance explained
F1	6.224	69.151	69.151
F2	1.367	15.186	84.336
F3	0.548	6.094	90.430
F4	0.342	3.797	94.227
F5	0.189	2.095	96.322
F6	0.161	1.793	98.115
F7	0.125	1.394	99.509
F8	0.029	0.317	99.826
F9	0.016	0.174	100.000

Source: Authors' work.

According to Table 4 two factors fulfilled the eigenvalue criteria (λ_1>1, λ_2>1). If the first two factors are going to be extracted, the explained variance approach will be also respected. Namely, according to Table 4 the first two factors together explain 84.34% of the total variance, which is significantly above the suggested limit of 60% of the total variance for social sciences (Field, 2011; Hair et al., 2008; Härdle and Simar, 2012).

Table 5. Factor matrix after varimax rotation and percentages of explained variance

Variable	F1	F2
ZGDPpc	**0.847**	0.285
ZExpEdu	**0.853**	-0.216
ZIntAccessHH	**0.898**	0.367
ZBBAccessHH	**0.896**	0.322
ZBBPenet	**0.911**	0.135
ZCSkill	0.098	**0.873**
ZIntSkill	0.246	**0.817**
ZIntUse	**0.897**	0.324
ZInfoG&S	**0.908**	0.297
% of variance explained	62.010	22.327
Cumulative % of variance explained	62.010	84.336

Source: Authors' work.

According to Table 5, after the varimax rotation of factors was applied, variables have a high factor loading on only one

factor and a low factor loading on another one. Furthermore, it can be seen that the percentage of variance explained is different than before. However, the cumulative percentage of variance explained stayed the same.

Now it is possible to interpret the extracted factors and give them appropriate names. The Factor 1 includes all economic and ICT variables, whereas the Factor 2 includes skills variables. Consequently, the Factor 1 can be named Prosperity, Investing in Education and IT Infrastructure, and Awareness ($F_{Econ\&Info}$). The Factor 2 can be named IT Skills ($F_{ITSkills}$). The resulting factor scores are used as two input or independent variables in the regression analysis.

Regression Analysis

The aim of the multiple regression analysis is to determine the relation between the variable the Internet purchases by individuals with two independent variables, Factor 1 and Factor 2. For that purpose, the resulting Ordinary Least Squares estimated standardized regression model with two regressors was built, as follows:

$$\underset{}{\hat{ZY}_{PU}} = \underset{(0.0604)}{0.8768 \cdot F_{Econ\&Info}} + \underset{(0.0604)}{0.3692 \cdot F_{ITSkills}} \qquad (3)$$

$$R^2 = 0.9050 \qquad Adj.R^2 = 0.8977 \qquad R = 0.9513$$

$$F(2, 26) = 123.90 \qquad VIF = 1.0000 \qquad DW = 2.110$$

In the evaluated regression model both independent variables, the variable Prosperity, Investing in Education and IT Infrastructure, and Awareness ($F_{Econ\&Info}$, being the Factor 1) and the variable IT Skills ($F_{ITSkills}$, being the Factor 2) are statistically highly significant (α=0.01) (Härdle and Simar, 2012). Furthermore, both variables seem to have a positive correlation with the dependent variable the Internet purchases by individuals. Because the independent variables are based on extracted factors, they are standardized. In that way, it can be concluded that the first independent variable (Factor 1) Prosperity, Investing in Education and IT Infrastructure, and Awareness ($F_{Econ\&Info}$) has a larger impact on the dependent variable the Internet purchases by individuals (Y_{PU}) than the second independent variable, named IT Skills (Factor 2).

When the regression model quality is observed, according to R-square and Adjusted R-square measures it might be concluded that the model is very good in explaining the variability in online purchases. Furthermore, the F-test statistic value of 123.90 suggests that, at the significance level of 1%, the regression model overall provides a good fit. If partial correlations are observed it can be concluded that there is a stronger correlation between the dependent variable the Internet purchases by individuals (Y_{PU}) and the first independent variable Prosperity, Investing in Education and IT Infrastructure, and Awareness ($F_{Econ\&Info}$) (correlation coefficient = 0.8768) than between the dependent variable the Internet purchases by individuals (Y_{PU}) and the second independent variable IT Skills ($F_{ITSkills}$) (correlation coefficient = 0.3692).

The fulfilment of linear regression model assumptions has been inspected for the observed regression model also (Bahovec and Erjavec, 2009; Gujarati and Porter, 2010). Because the varimax factor rotation was applied, the multicollinearity problem by default is not present in the regression model. The absence of the multicollinearity problem is confirmed by the variance inflation factor (VIF) value of 1. In order to inspect whether the problem of heteroskedasticy is present in the regression model, the White heteroskedasticy test was applied. According to the White heteroskedasticy test results, at the significance level of 5%, the conclusion that the heteroskedasticy problem is not present in the regression model can be brought (White test statistic = 1.119, degrees of freedom = 5, p-value = 0.952). Finally, the conducted Jarque-Bera test has shown that, at the significance level of 5%, it can be concluded that residuals are normally distributed (JB test statistic = 2.466, degrees of freedom = 2, p-value = 0.291).

Conclusions

The main variable under study is electronic commerce in Europe, which, defined as online purchases by individuals, as a share of individuals who made a purchase by using the Internet in the last 12 months in the total population of a country, shows a tendency to grow. Consumers can search for goods online and thus obtain information on their characteristics, they can order, pay and determine delivery conditions from anywhere in the world whenever they want. However, there are different impacts of various development indicators on e-commerce representation in different countries.

Data used in the paper come from 31 countries, i.e. the 28 European Union member states and Serbia, the Former Yugoslav Republic of Macedonia and Turkey, for the year 2013. Due to outliers at certain variables, Luxembourg and Serbia data were excluded from the multivariate analysis and the further study included 29 European countries only.

Using the factor analysis, the development indicators have been grouped into common factors. A principal component analysis with varimax rotation was performed and two extracted factors with the respective factor scores were used in the regression analysis. Factor 1 includes seven variables and is defined as the regressand variable named

as Prosperity, Investing in Education and IT Infrastructure, and Awareness, and Factor 2 includes two variables and is named as IT Skills.

The conducted analyses have shown that one standard deviation increase in Factor 1 (Prosperity, Investing in Education and IT Infrastructure, and Awareness), without changing Factor 2 (IT Skills), will lead to 0.88 standard deviations increase in the regression value of the Y_{PU} variable. The regression coefficient close to Factor 2 shows that an increase of one standard deviation in IT Skills, holding Factor 1 constant, will increase the regression value of the Y_{PU} by 0.37 standard deviations. On that way the research hypothesis, that the chosen economic and information and communications technology development level variables have a positive impact on e-commerce developments, which is observed as the Internet purchases conducted by individuals, can be accepted. However, it has to be emphasized that the research was conducted on a small sample of countries in only one year. In the further research more countries should be observed in longer period.

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Statistična analiza vplivov kazalnikov razvoja na e-trgovino posameznikov v izbranih evropskih državah

Izvleček

Namen tega prispevka je analizirati vpliv kazalnikov ravni razvoja na e-trgovino, tj. na spletni nakup posameznikov v izbranih evropskih državah leta 2013. V analizo vključene spremenljivke so standardizirane. Najprej je bila na podlagi devetih spremenljivk opravljena analiza glavnih komponent z rotacijo Varimax; dobljena faktorja sta uporabljena kot regresorja v multipli regresijski analizi. V regresijskem modelu je pri obeh dobljenih faktorjih – novih spremenljivkah, ki izražata blaginjo, osveščenost in investiranje v izobraževanje in IT-infrastrukturo (faktor 1) in znanje in veščine na področju IT prisotna velika statistična značilnost. Oba dejavnika kažeta pozitivno korelacijo s spletnim nakupom posameznikov. Nov prispevek tega članka sta vključitev in analiza distribucij in vplivov devetih neodvisnih spremenljivk, ki tvorijo dva različna faktorja, ki vplivata na e-trgovino.

Ključne besede: e-trgovina, širokopasovni dostop do interneta, faktorska analiza, multipla regresijska analiza

Students' Behavioral Intentions Regarding the Future Use of Quantitative Research Methods

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Abstract

Changes regarding the importance of graduates' competences by employers and changes of competences themselves are to a great extend driven by the technological changes, digitalization, and big data. Among these competences, the ability to perform business and data analytics, based on statistical thinking and data mining, is becoming extremely important. In this paper, we study the relationships among several constructs that are related to attitudes of economics and business students regarding quantitative statistical methods and to students' intention to use them in the future. Findings of our research provide important insights for practitioners, educators, lecturers, and curricular management teams.

Keywords: students' behavioral intentions, quantitative statistical methods

Introduction

The global changes, characterized by the digitalization of everyday life, the use of mobile devices, and the characteristics of the fourth industrial revolution, are also changing the competences that are demanded by employers when hiring new employees (World Economic Forum, 2016). The consequence of these changes

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Vol. 64 No. 2 2018

pp. 25 – 33

is the high velocity, high volume, and high variety of big information assets (known as "big data") that demand cost-effective, innovative forms of information processing for enhanced insight and decision-making. In these changed circumstances, businesses today are seeking new and better ways to remain competitive, profitable, and prepared for the future; for achieving this, companies are aware of the importance of information hidden in the big data. Thus, it is not surprising that, among top competences that are the most important for employers, according to different authors, the statistical analysis and data mining ability, along with data visualization, are found within top-10 places (LinkedIn, 2016, 2018; World Economic Forum, 2018).

Our research stems from the fact that, nowadays, management in enterprises is faced with the amount of data, growing at a rapid rate, i.e., the analysis of insights of data must be used with the purpose to lead to better decisions and strategic business activities, if companies want to adapt to rapid and constant market changes. Managers in companies are often lacking detailed knowledge and understanding of data and business analytics skills, and their application in strategic and operational decision-making, which is associated with advanced statistical methods by using statistical software support.

Among the important characteristics of efficient educational institution and its study programs is the ability to continuously (re)design study programs' learning outcomes according to the demands of the labor market: moreover, higher educational institutions must have the ability to anticipate, which are going to be competences of graduates, that companies will be looking for at their future employees. The above-mentioned competence of data and business analytics skills is in the forefront of these efforts.

The aim of our paper is to shed light on the development of the ability (competence) to perform quantitative research by students. Quantitative research is to a great extent associated with statistics; statistics contents are usually included in the quantitative courses of study programs, regardless of the study cycle and the field, thus expressing the growing importance of statistical knowledge in natural, social, and physical sciences. On the other hand, students at different levels are facing difficulties in learning statistics and quantitative methods in general; it was found that students see statistics and quantitative topics in general as being more difficult than other domains, with negative attitudes often being the main obstacle (Murtonen & Lehtinen, 2010). Several studies have shown the relationship between students' attitudes toward quantitative methods and their performance as well (Mondejar-Jimenez & Vargas-Vargas, 2010; Murtonen & Lehtinen, 2010). Another characteristics of the quantitative courses including statistics is that, at least for last 20 years, the use of statistical software support is included (Biehler, 1997; Bovas, 2007). The technological development had a real impact on the statistics discipline in general and on the training of professional statisticians and users of statistics in particular.

Our research model is based on the previous researches' results utilizing the technology acceptance model (TAM) (Davis, 1986) with included external variables to the model, which were proven to be important (Šebjan & Tominc, 2015; Marjanovič Umek et al., 2004; Hsu et al., 2009; Macher et al., 2012; Krueger et al., 1993; Yousafzai et al., 2007; Linan & Alain, 2015). The main goal of our research is to test if the external factors analyzed are associated with students' perceived ease of use of quantitative methods and students' perceived usefulness of them. We assume that perceived ease of use and perceived usefulness of quantitative methods are related to the attitudes of students toward quantitative methods and their behavioral intention to use these methods in the future. Our research is not aimed at testing the TAM model but is limited to the analysis of relationships among variables of the research model, presented in the paper.

Research is based on a survey among master's degree students in economics and business who had the course of quantitative methods in their study program. The random sample was obtained with the purpose to test hypotheses formed. Multidimensional variables/constructs were formed by factor analysis. Pearson correlation coefficients were used to test the significance of relationship among constructs.

The paper is structured as follows. After the introduction, the literature review is presented. After methodology and data section, results and conclusion with discussion are presented. A plan for further research is offered as well.

Theoretical Background

Model TAM

The TAM is one of the most frequently used models for researching the usefulness of technology, program supports, and information solutions. The work of Davis (1986) may be viewed as the beginning of the development of TAM. It is based on the theory of reasoned action (TRA) (Fishbein & Ajzen, 1975), which is built on the belief–attitude–intention–behavior relationship. This model has been further developed using the theory of planned behavior (TPB) from social psychology (Ajzen, 1991). According to this theory, behavioral intentions indicate a person's intention to carry out the specific behavior.

According to the TPB, individual's behavioral intentions are shaped by the three antecedents: attitude toward the behavior, subjective norm, and perceived behavioral control. Beliefs, attitudes, and intentions are also important factors in the adoption of computer technologies (Bagozi et al., 1998). TAM has been successfully used in the past to study different aspects of students' acceptance of technology (Sabalic & Schoener, 2017) of information communication technologies (Ali et al., 2016; Abdulah et al., 2016) and software acceptance (Antonius et al., 2015; Šebjan & Tominc, 2015; Brezavšček et al., 2017), etc.

Venkatesh and Davis (1996) summarize TAM as consisting of four main constructs that influence the behavioral intentions of future use: perceived ease of use, perceived usefulness, external variables (a group of constructs), and attitudes toward future use. Perceived usefulness is defined as the degree to which a person believes that using a particular system would improve his or her work efficiency, while perceived ease of use relates to the degree to which a person believes that the use of a particular system would be effortless (Davis, 1993).

The model TAM has been continuously studied and expanded. Among the models, a well known and widely used extended version is TAM 2 (Venkatesh & Davis, 2000; Venkatesh, 2000). Venkatesh et al. (2003) proposed a unified model called the unified theory of acceptance and use of technology (UTAUT), as well. UTUAT states that "Performance Expectancy which is an extension of Usefulness from TAM, Effort Expectancy which is an extension of Ease of Use from TAM, Social Influence and Facilitating Conditions are determinants of Behavioral Intention or Use Behavior, and that Gender, Age, Experience and Voluntariness of use have moderating effects on the acceptance of IT" (Terzis et al., 2012). A TAM 3 has also been proposed in the context of e-commerce with an inclusion of the effects of trust and perceived risk on system use (Venkatesh & Bala, 2008).

External factors in TAM

In the past, TAM was expanded to include several external variables; researches that were based on TAM and were analyzing different aspects of acceptance of statistical software and/or quantitative methods by students included different external technological, social, psychological, and individual and behavioral factors. Researchers who studied the use of the SPSS statistical support program have expanded the TAM model to also include components such as computer attitude, statistics anxiety, statistical software self-efficacy, statistics learning self-efficacy, statistics learning value, and satisfaction with achievements (Brezavšček et al., 2014; Hsu et al., 2009), whereby they have tied these to two key components of the TAM model: the perceived usefulness and the perceived ease of use of SPSS.

Šebjan and Tominc (2015) used the TAM model for research related to the applicability of statistical software support (SPSS program) for economics and business students. The purpose of their research was to test the importance of two external constructs, namely, pedagogical support and compliance with the study needs. Research revealed that the pedagogical support of teachers significantly contributes to the perceived ease of use of SPSS. Specifically, their findings showed that teacher support has a positive and important influence on the perceived ease of use of SPSS and a positive but insignificant effect on the perceived usefulness of the software. Other researchers have reported similar findings (e.g., Lai et al., 2012). Therefore, we assumed that a comparable relationship applies to modeling intentions about the future use of quantitative methods.

It was also found (Šebjan & Tominc, 2015) that there is a link between the perceived alignment with the field of study, the use of SPSS, and future intention to use SPSS. In other words, the perceived value of SPSS usage within one's study positively affects his/her perceived usefulness of SPSS and the perceived intention of using the software in the future (cf. Emmioğlu & Capa-Aydin, 2012).

Anxiety can also affect the ability to acquire knowledge and skills in statistics (Hsu et al., 2009; Macher et al., 2012); thus, it is possible that this variable impacts the behavioral intention to use statistics in the future. Anxiety is an undefined experience of endangerment, discomfort, or disturbance that develops out of fear and anxiety, not stemming from an existing but rather anticipated situation. It is a generalized emotional state arising from a subjective problem (Marjanovič Umek et al., 2004).

Individual personal characteristics (more widely described as "personal-level characteristics") have been identified as important antecedents of certain behavioral intentions as well (Krueger et al., 1993; Yousafzai et al., 2007; Linan & Alain, 2015).

Research Model and Hypotheses

Our research model is based on the results of previous researches utilizing the TAM model and its extensions, which are described in the previous chapter. As already mentioned, the aim of this paper is not to test dependencies among constructs of extended TAM but to study the relationships among multidimensional variables/constructs

included into the research model: perceived ease of use of quantitative methods, perceived usefulness of quantitative methods, perceived attitudes toward quantitative methods, and behavioral intentions to use quantitative methods in the future. Based on the research results and arguments, as presented in the literature review, the external variables that are also included into our model are (a) pedagogical support in the study process; (b) perceived alignment of statistical methods with the level of study; (c) statistics anxiety and personal characteristics of individuals; and three variables for personal characteristics, namely (d) ambition and innovativeness; (e) engagement and motivation; and (f) research orientation and analytical thinking.

The research model with the relationships among multidimensional variables is summarized in Figure 1.

Hypotheses of the model are formed with the purpose to test relationship among multidimensional variables:

H1: The correlation between perceived pedagogical support and perceived usefulness of quantitative methods is significant and positive.

H2: The correlation between perceived pedagogical support and the perceived ease of use of quantitative methods is significant and positive.

H3: The correlation between perceived alignment of quantitative methods with the demands of the study program and perceived usefulness of quantitative methods is significant and positive.

H4: The correlation between perceived alignment of quantitative methods with the demands of study program and the perceived ease of use of quantitative methods is significant and positive.

H5: The correlation between statistics anxiety and the perceived usefulness of quantitative methods is significant and negative.

H6: The correlation between statistics anxiety and the perceived ease of use of quantitative methods is significant and negative.

H7,i: The correlation between *i*-th personal characteristics and the perceived usefulness of quantitative methods is significant and positive; *i*=1,2,3.

H8,i: The correlation between *i*-th personal characteristics and the perceived ease of use of quantitative methods is significant and positive; *i*=1,2,3.

H9: The correlation between perceived ease of use of quantitative methods and their perceived usefulness is significant and positive.

H10: The correlation between usefulness of quantitative methods and students' attitudes towards them is significant and positive.

H11: The correlation between perceived ease of use of quantitative methods and and students' attitudes towards them is significant and positive.

H12: The correlation between usefulness of quantitative methods and students' intentions to use them in the future is significant and positive.

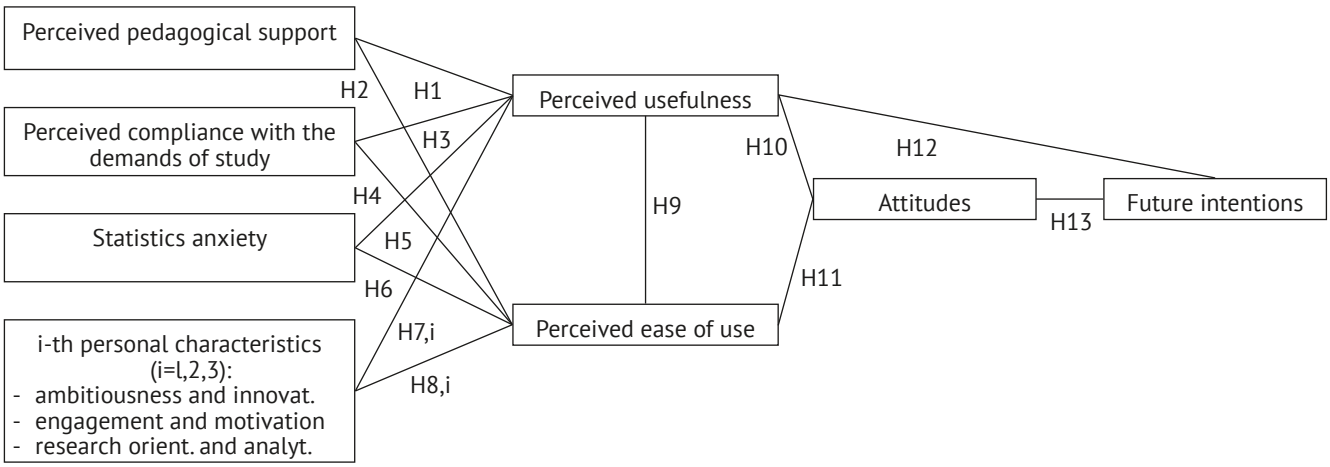
H13: The correlation between students' attitudes towards quantitative methods and students' intentions to use them in the future is significant and positive.

Methodology and Data

The survey was conducted among students (full- and part-time) of the master cycle study program Economics and Business at University of Maribor, Faculty of Economics and Business, in January 2017 (*n*=101).

All variables included in the model presented by Figure 1 are multidimensional variables/constructs. A questionnaire

Figure 1. Research Model



(Source: Authors)

for measuring multidimensional variables of the model was employed. Items of the constructs' perceived ease of use, perceived usefulness of statistical methods, attitudes toward statistical methods, and intentions to use statistical methods in the future were formed based on Davis's prior studies (Davis et al., 1989), with slight wording modifications made for studying quantitative methods (cf. Park, 2009; Letchumanan & Muniandy, 2013; Šebjan & Tominc, 2015). Items of constructs referring to the pedagogical support, statistics anxiety, perceived alignment of quantitative methods with the demands of study and personal characteristics were included in the paper based on Arthur and Yuet Wong (2000); Pierce, Stacey, and Barkatsas (2007); Ameen and Loeffler-Cobia (2010); Vos, van der Meijden, and Denessen (2011); and Nikou and Economides (2016). In the questionnaire, each multidimensional variable was expressed by several statements/items, i.e., students assessed the level of agreement with each statement, from 1 (completely do not agree) to 5 (completely agree).

To establish the structure of the multidimensional variables/constructs of the research model, factor analysis was used. Bartlett's test of sphericity (BTS), applying the 0.05 significance level and Kaiser–Meyer–Olkin statistics (KMO), applying the treshold > 0.7 (Field, 2009), were calculated. In the case of more than one factor, a simpler factor structure was obtained using the principal component analysis (PCA) and the Varimax rotation. The criteria that factor loadings of each variable must exceed 0.5 were used to guarantee the reliability and validity of the questionnaire scales (Nunnally, 1978).

Correlation analysis was used to test hypotheses regarding the relationships among multidimensional variables, using the 0.05 significance level.

Structure of the sample is presented in Table 1. Respondents averaged 23.79 years old with 27.7% of students being male and 72.3% being female.

Table 1. Structure of the Sample Regarding Age and Gender

Sample Structure		f%
Gender	Male	27.7
	Female	72.3
Age	21 – 22 years	29.7
	23 – 24 years	49.5
	25 – 26 years	12.8
	27 – 28 years	3.0
	29 and older	5.0

Results

In the first stage of the analysis, the factor analysis was used to obtain the multidimensional variables of the model. Results of the factor analysis are presented in Table 2, where, for all constructs of the research, single factor solutions were obtained, except for the *i*-th personal characteristics, (i = 1, 2, 3) of students, where the two factors solutions were obtained.

Cronbach's alpha coefficients confirm the reliability of the measurement scales for each construct, while KMO statistics and the significance of Bartlett's test for each multidimensional construct confirms that using factor analysis is justified.

Multidimensional variables, i.e., factors obtained, explain the high percentage of the variance of original variables

Table 2. Results of the Factor Analysis for Multidimensional Variables of the Research Model

Constructs of the research model	Cronbach's Alpha	% of Variance Explained	KMO	Bartletts Test X2 / Sig.
Perceived usefulness of quantitative methods	0.92	77.725	0.856	412.902 / <0.01
Perceived ease of use of quantitative methods	0.86	72.657	0.757	214.728 / <0.01
Attitude toward quantitative methods	0.94	86.582	0.859	397.076 / <0.01
Future intention to use quantitative methods	0.92	81.191	0.848	305.664 / <0.01
Perceived pedagogical support	0.83	72.358	0.753	224.384 / <0.01
Perceived alignment with study	0.86	79.306	0.723	149.201 / <0.01
Statistics anxiety	0.91	79.983	0.766	342.131 / <0.01
Personal characteristics				
Ambition	0.85	69.767	0.809	327.828 / <0.01
Innovativeness				
Engagement	0.877	64.603	0.839	476.981 / <0.01
Motivation				
Research orientation	0.752	62.736	0.739	196.559 / <0.01
Analytical thinking				

(items in the questionnaire); for all factors, the percentage of variances explained is higher than 60%.

In the second stage of research hypotheses, H1–H13 were tested.

Table 3. Results for Hypotheses Testing

Hypotheses	Correlation Coefficients
H1: Perceived pedagogical support; Perceived usefulness	0.332**
H2: Perceived pedagogical support; Perceived ease of use	0.290**
H3: Perceived alignment with study; Perceived usefulness	0.414**
H4: Perceived alignment with study; Perceived ease of use	0.625**
H5: Statistics anxiety; Perceived usefulness	-0.429**
H6: Statistics anxiety; Perceived ease of use	-0.338**
H7,1: Ambition; Perceived usefulness Innovativeness; Perceived usefulness	0.032 -0.008
H7,2: Engagement; Perceived usefulness Motivation; Perceived usefulness	0.172 0.205*
H7,3: Analytical thinking; Perceived usefulness Research orientation; Perceived usefulness	0.095 0.150
H8,1: Ambition; Perceived ease of use Innovativeness; Perceived ease of use	0.440 -0.001
H8,2: Engagement; Perceived ease of use Motivation; Perceived ease of use	0.105 -0.003
H8,3: Analytical thinking; Perceived ease of use Research orientation; Perceived ease of use	0.306** -0.089
H9: Perceived ease of use; Perceived usefulness	0.338**
H10: Perceived usefulness; Attitudes	0.564**
H11: Perceived ease of use; Attitudes	0.591**
H12: Perceived usefulness; Intentions	0.489**
H13: Attitudes; Intentions	0.777**

*Significant at 0.05 level; **Significant at 0.01 level.

Several statistically significant correlations were found. Perceived pedagogical support is positively related to perceived ease of use and perceived usefulness of quantitative methods, thus confirming H1 and H2. The same is true when students perceive quantitative methods as aligned with their study program's content and objectives, thus confirming H3 and H4.

Statistics anxiety is significantly negatively related to perceived ease of use and usefulness of quantitative methods, thus confirming H5 and H6, as well.

Among students' personal characteristics, the motivation of students was significantly and positively related to perceived usefulness of quantitative methods, thus partly confirming H7,1. Analytical thinking was significantly and positively related to the perceived ease of use of quantitative methods, as expected, thus partly confirming H8,3. Other relationships between personal characteristics and perceived ease of use, as well as with the perceived usefulness of quantitative methods, are not significant. Hypotheses H7,2; H7,3; H8,1; and H8,2 were rejected.

Students who perceive quantitative methods as easy to use generally perceive that quantitative methods are useful as well. Perceived ease of use and perceived usefulness of quantitative methods are significantly and positively related to positive attitudes toward them. Those with more positive attitudes toward quantitative methods, on average, intend to use quantitative methods in the future to a greater extent, which holds true for the perceived usefulness, as well. Therefore, the hypotheses H9, H10, H11, H12 and H13 are confirmed.

Conclusions

This research brings important information for practitioners, e.g., educators, lecturers, and curricula management teams. Because the importance of statistical knowledge and broader quantitative methods in business and industry has been recognized, graduates have to be equipped with the relevant statistical knowledge before entering the work place. This relevant knowledge and its practical value include the ability to handle massive data sets, where use of statistical software to perform statistical analyses is vital. Efforts to influence positive attitudes may include several counselling activities, encouragement of positive attitudes toward this knowledge by lecturers, case studies, etc. Our research has important implications for higher educational institutions that want to equip their graduates with the competences of conducting quantitative research methods and to enhance their intentions to use these methods in the future.

Teachers of quantitative statistical courses often believe that the majority of students share negative opinions about statistics during and prior to matriculating into the course. Indeed, students often develop negative attitudes toward quantitative methods and statistics and often see the statistical course as an obstacle in their path to graduation. Research results, as listed in the literature, show that a fear

of statistics is often associated with the students' lack of interest in using statistics and quantitative methods, and their perception that competence in conducting quantitative research is relatively unimportant in employability compared with other competences (e.g., communication skills, critical thinking, etc.) (Chamberlain et al., 2015). Differences exist in the effect sizes of these relationships across different fields and across countries (Emmioğlu & Capa-Aydin, 2012).

This research suggests that reinforcing the value of quantitative statistical methods for academic programs and in a professional career may be associated with a higher students' intention to use them. It is suggested that the quantitative methods are included into certain academic subjects' research projects where students participate, so that students will have more analytical work with the collection and processing of data, which they therefore learn in the context of their respective study programs.

Researchers have also pointed out that student attitudes toward statistics are often based on students' previous experiences with statistical and mathematical courses (Zhang et al., 2012). Some authors argue that the key factor for negative attitudes toward statistics and for statistical anxiety is the mathematical background of the student. Students, who are worried about a statistics course often feel that that they are not good enough in mathematics and often this harkens back to experiences in primary or secondary education. Teachers should be aware of this problem and should introduce a quantitative statistics course at the beginning of studies and illustrate the difference between quantitative statistics and mathematics (Chamberlain et al., 2015), especially because statistics in management and business studies largely is about information and the interpretation of data rather than mathematical proofs.

Results presented here are preliminary, and several extensions of our research are possible. The next steps in research could be to use structural equation modelling to assess the dependencies among constructs. If the causal effects are confirmed, our results will provide additional insight for teachers of statistical courses.

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Pričakovane namere študentov glede prihodnje uporabe kvantitativnih metod

Izvleček

Spremembe, povezane s pomenom kompetenc diplomantov za delodajalce, in spremembe kompetenc samih so v veliki meri posledica tehnoloških sprememb, digitalizacije in pojava velikih podatkov. Med temi kompetencami postajajo izjemno pomembne sposobnosti opravljanja poslovne in podatkovne analitike, ki temelji na statističnem razmišljanju in podatkovnem rudarjenju. V tem članku proučujemo odnose med več konstrukti, ki so povezani z odnosom študentov ekonomskih in poslovnih ved do kvantitativnih statističnih metod in njihovimi nameni, da jih bodo uporabljali v prihodnosti. Ugotovitve naše raziskave prinašajo pomembne vpoglede za strokovnjake, pedagoge, predavatelje in oblikovalce kurikuluma.

Ključne besede: pričakovane namere študentov, kvantitativne statistične metode

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Characteristics of Innovation in Regions with Small- and Medium-Sized Towns

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Abstract

Globalisation "takes" its victims, which the authors believe means that the future of small- and medium-sized towns has become uncertain in Europe. The role of centres is continuously increasing, and most researchers prefer to analyse the competitiveness and innovativeness of metropolitan areas. In this study, we characterise the small- and medium-sized towns in the central–eastern European region as well as explore their possible development path. The authors are convinced that one way for these towns to survive is through strengthening of innovation abilities, which means increasing the innovation performances of economic stakeholders and new forms of interaction among other institutions in order to handle social problems. The theoretical starting point is the interpretation and presentation of the micropolitan (without big towns) regions as well as understanding the concept of technological and social innovation. As the result of the research, the innovation measurements carried out in some of the settlements will be represented. These experiences can help the small- and medium-sized towns keep up with global competition and cancel migration and erosion of intellectual potential.

Keywords: micropolitan region, innovation in regions, technological and social innovation, competition

Introduction

Do small- and medium-sized towns have a future in the central–eastern European region? Does it make sense to compile urban- and economy-development strategies and establish relations for the sake of accessing subsidies, or do we have to

accept the fact that, in the twenty-first century, only large centres have the chance of serious development? It would be an easy task to quickly answer these questions, as it is easy to reason in both directions. We believe that many processes influence the exodus of the youth into centres, and capitals and towns become the centres of economy, traffic and knowledge, but local players are more and more self-confident in the areas of innovation, which are answers to processes of centralization (Ernszt et al., 2017, pp. 39).

The present study wishes to present two surveys conducted in the micropolitan regions in central–eastern Europe (according to EUROSTAT, micropolitan regions are considered areas where small- and medium-sized towns are dominate, and the population of towns is typically between 10,000 and 50,000), which have the measurement of innovation abilities of enterprises in their focus. Why are these surveys important? The authors believe that only those regions prevail in the competition where there are interesting and novel workplaces offering high salaries and which are about the future and innovativeness, and the ability to renew is inevitable for all this. Our research question is: What is the role of small- and medium-sized enterprises in creating the innovation environment? During our investigations, we analysed the fields of innovation in a given area; thus, connection systems, the role of local higher education institutions, and the appearance of technological and social innovation at municipalities and enterprises were researched. Our hypothesis is that the studied enterprises (in small- and medium-sized towns in West Hungary) have an average renewal ability, and their environments are not remarkable from the perspective of innovation, i.e., there are no large universities in these towns; therefore, the future of this region is uncertain, and it will lag behind in the competition. We carried out quantitative and qualitative research where the enterprises were in the focus, as they can play a prominent role in innovation. The first survey was about general innovative abilities, but the attention shifted more and more to the renewal abilities of the environment and relation systems. The authors do not wish to present all details of the conducted survey but to highlight those ones that can justify or disprove the hypothesis.

Literature Review

ESPON (2013) surveyed 32 countries in Europe and defined small- and medium-sized towns as entities with a population density between 300 and 1500 inhabitants/km² and a number of inhabitants between 5000 and 50,000. A part of the researchers defines small- and medium-sized towns on the number of inhabitants (Balchin–Bull, 1987; Clark, 2000; Korcelli, 2000; Benedek, 2006). Of course, the definition can be based on the functionality, the regional role, economic activity, and development, but the present researches consider the number of inhabitants as the foundation, and the researched settlements belong to the category of small- and medium-sized towns in the West Hungarian region, and their population characteristically ranges between 10,000–50,000 people; in addition, vocational literature calls it a micropolitan region (OMB, 2000; Eurostat, 2005; Lukovics, 2008).

Urban development in central–eastern Europe shows a unique path (Enyedi, 1998). From the point of view of the settlement network, a dominance of towns (especially of capitals) is a major feature, and there are no real counter-poles. (Michalko, 2001) *The Green Book of the European Union* on territorial cohesion calls small- (and medium-sized) towns as "links," which have all the features that can be expected from basic functions of a town: they provide the basic criteria of living, but at the same time they are also a link between towns and surrounding villages (Horeczki, 2016, pp. 255-256).

The need to improve the competitiveness of rural micropolitan regions is rising more and more in central–eastern European countries ruled by their capitals, as the majority of the population (often 50%) is living in this environment, and there is a large number of enterprises. Although some viable concepts had been worked out targeting sustainable rural lifestyle (which is the most significant pillar of tourism, too), a general, country-wide model of "rural welfare" still remains to be developed (Zsarnoczky, 2016). The focus of innovation research is shifting toward local players, and the unsuccessful Lisbon Strategy (innovation development of large companies, national programs) showed the necessity of a new, bottom-up innovation model (interpretable in a local space—on the level of municipalities and aimed at developing SMEs). The role of SMEs in the case of foreign and domestic companies can be traced in several case studies (Malota, 2015; Malota & Kelemen, 2011); thus, the framework of global innovation is elaborated on in Rekettye et al. (2015).

Innovation is, according to the literature, the ability of doing things in another way (Schumpeter, 1939), i.e., a change that unveils a new dimension of performance (Drucker, 2003) or an implemented creative idea (Karlsson-Johansson, 2004). Vecsenyi (2003) believes that innovation is nothing else but a recognized and exploited business possibility. Drucker (1985) draws attention to the fact that innovation is a knowledge-based activity; therefore, the experience-based and codified knowledge are necessary for its existence, application, and spread. Knowledge can better be perceived on local and regional levels, as the knowledge potential of a region is made up of the knowledge-wealth of enterprises and other institutions in a region as well as the human and social capital of the population in the region. One of the key

factors of success is education: It has strategic importance to keep the youth in the town, thereby ensuring a qualified labour force and grounding the basis of the creative development of the town (Ernszt et al., 2017, p. 146.).

The OECD and EUROSTAT developed a community innovation survey (CIS) for the sake of the measurability of innovation. The terms used in the survey are based on descriptions in the *Oslo Manual* (third edition); thus, their interpretation is unified: "Innovation is the introduction of a new, or greatly improved product (service or good), or process, new marketing method, or new organisational method into the business practice, the work-place organisation, or the external relations" (*Oslo Manual*, 2005, p. 30). The CIS is the only harmonised data source of measuring innovation (Szunyogh, 2010), which is used by many authors (Leeuwen et al., 2009; Markov–Dobrinsky, 2009; Birkner–Mahr, 2016). This questionnaire was used as the basis during the quantitative research.

Regionalism is an integral part of innovation processes (Gál, 2013), as there are major differences because of the regional imparity of the access to knowledge (Vas–Bajmócy, 2012). According to the concept of innovation systems, all regional stakeholders and factors can be considered parts of the innovation potential that define, support, or even hinder the existence and spreading of innovation. Thus, the innovation system does not only include universities, research institutions, and innovative enterprises, which are considered the elements of the technology supply, their activities, and the relation among them (Dőry–Rechnitzer, 2000; Németh–Pintér, 2014). Various "bridge-building" and transfer organisations and innovation services apart from vocational workshops creating knowledge and technological skills can also be listed here. These active bridge-building institutions are innovation agencies (the so-called "passive bridge-builders"), technology (scientific) parks, technopolises, incubation institutions (business incubators), enterprise development institutions (Chambers, industrial parks). Enterprises can have access to innovation services via them; thus, the aim was to become familiarised with these institutions and measure them.

The environment (culture, education, self-government, non-governmental sphere, media) is another important element framing the existence of innovation, and their unit can be called social innovation, i.e., the cooperation of university, business, and environment, which has the primary aim of social well-being (Mulgan et al., 2007; Németh, 2017).

Since its foundation, the European Union devotes considerable attention to the cooperation between regions. These initiations support the innovation, integration, and competitiveness, especially by financing the cross-border projects (Kaszás et al., 2016). The EU places special emphasis on research, development, and innovation and the bolstering of the socio-economic utilisation of the relevant results in its planning period 2014–2020. It is therefore important that all regional units elaborate their own research and innovation strategies in close cooperation with each other (specification – S3). S3 and regional development can strengthen the processes tied and not tied to a place for the sake of economic development and a higher life-quality (Mark Tissen et al., 2013). Smart specialisation is actually finding a way to be special in a highly competitive, global world. In order to guarantee this specialisation, Foray (2015) suggests regional economies to consider this specialisation as an evolution that builds on the strengths of the given region or traditional economy while complementing it with new, knowledge-based processes. McCann and Ortega–Argilés (2016) observe that SMEs are major stakeholders of the smart specialisation policy. In certain regions of Europe, the focus is on the start of new enterprises, while other European regions favour the growth of existing enterprises, and others prefer the development of the supply chain. Wherever the priorities may be, it must be clear that the degree of the participation, mobility, and dynamism of enterprises occupies a special role among the indices of these new policies.

During the second qualitative research (Research 2), we conducted interviews with the institutions involved in the new innovation strategy, i.e., S3, in the aforementioned micropolitan regions.

Research Framework and Method 1

We conducted the first major entrepreneurial innovation research in the east–central European region in 2009. In the frame of that research, a county, Zala (NUTS 3), was studied (Birkner, 2010, pp 111-114). We chose this region because there are only small- and medium-sized towns in this county. It is a classic micropolitan region with seven towns all together; there are no major universities in the settlements; there are just a few faculties or campuses; and there is not even a centre of a multinational corporation. Overall, it can be stated that it is an average area where there are no conditions to support innovation. The significance of the research is emphasized because, in this micropolitan region, there has been no previous research in the subject of innovation of this magnitude involving so many stakeholders in such a wide area. Our objective was to learn about the factors (the demands) affecting entrepreneurial innovation. The present services and future plans, as well as the existing relations to enterprises of innovation providers, were surveyed. In the quantitative research, the questionnaire was sent to the small- and medium-sized enterprises operating in the

county. The questionnaire assistants helped us to receive answers from 9% of all the involved companies, collecting 213 completed questionnaires as a result of the survey. In the qualitative research, we addressed all the knowledge centres, innovation agencies, and chambers of support in the region. We finally made 14 interviews. The research is considered representative.

Results and Discussion 1

Any occurrence of the process, product, and organisational and marketing innovation was considered as a result of entrepreneurial innovation. The cluster analysis was conducted in more steps along the parameters and resulted in three groups significantly different in size (Table 1).

Finally, the third column (Analysis Conducted with Three Clusters) was considered to be investigated. We named the first cluster "Followers," the second one "Innovators," and the third group "Laggers." The third group consists of the Laggers (158 companies) who had hardly any R+D activities and even less willingness to innovate. There was a small entrepreneurial layer (45 companies), mostly among the domestically owned small entrepreneurs who had a long-standing presence in the market, and they were open to innovation because of their own strength to improve their competitiveness. There was also a group of major capitalized companies interested in R+D but who were rather followers when it came to innovation (10 companies). The results were adequate to the Hungarian average at that time, so 26% of the enterprises participating in the representative survey conducted some innovation activity.

The cluster groups were compared in various areas. The R+D activities, the implemented innovations (based on the three cluster groups: 158 companies, laggers; 45 companies, followers; 10 companies, innovators [see Figure 1]); other innovation areas and future activities show a clear difference among the enterprise groups; however, the hindering factors and regional traits were evaluated in a similar way.

In the case of innovation services, there are striking differences among the three company groups from the quantitative perspective: The followers and innovators used these services twice as often. In the case of planned services, the demands greatly vary from the previous ones, a growth from the quantitative perspective in the case of enterprises Laggers could be perceived. The ranking of importance changed as well, and the special demands "faded away."

There was no close tie between the regional arrangement of R+D innovative providers and the enterprises of the given small- and medium-sized towns. This could be explained with the lack of a major innovation institution (university, research center, technopolis, scientific and technology park) and improper cooperation.

The qualitative research (14 interviews were conducted with leaders of institutions and organisations offering services for enterprises, e.g., chambers, venture capital investors, innovation agencies, research laboratories) showed that R&D and innovation service providers are diverse organizations that, alongside the services that support general business operations, are also active in the fields of innovation. They did not properly indulge in the possibilities of innovation services, and they were not exactly familiar with the needs; therefore, the harmony between the needs and demands could not be shown, meaning that service providers offered something else than what companies were looking for.

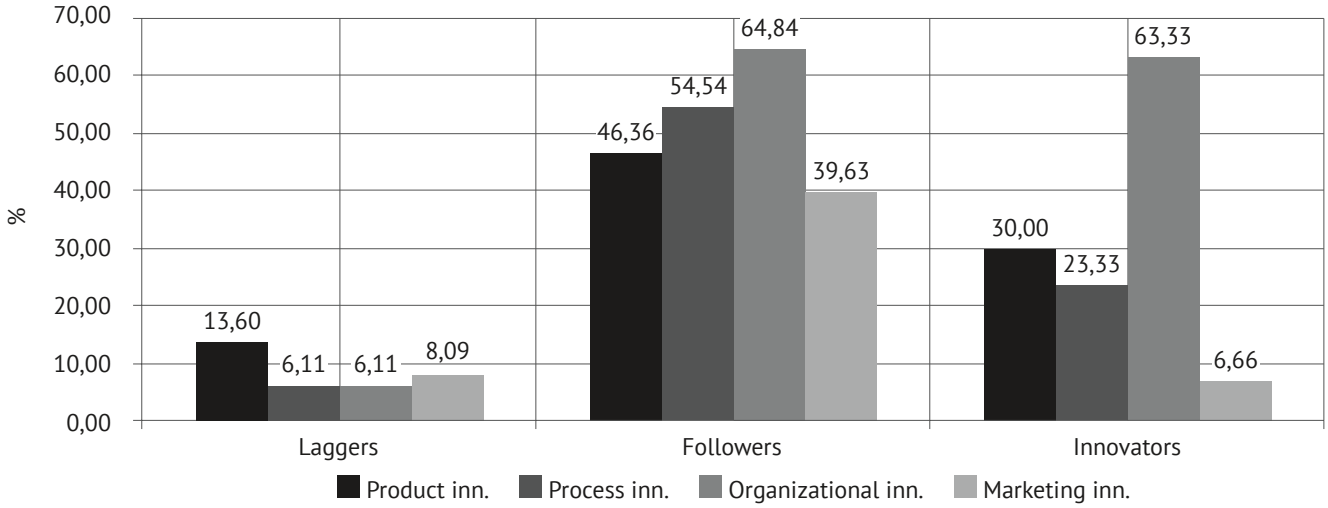
The analyses proved that the innovation potential of enterprises is affected by the external environment and internal innovation features. The companies found the higher education and research capacity of the investigated region weak; it was proved by statistical data as well, and the innovation needs of the companies have not inspired the development of major R+D and innovation, either. A review of factors hindering innovation showed that enterprises did not consider

Table 1. Analysis Conducted with Five, Four and Three Clusters

Analysis Conducted with Five Clusters			Analysis Conducted with Four Clusters		**Analysis Conducted with Three Clusters**	
Cluster	1	14,000	1	2,000	**1**	**45,000**
	2	161,000	2	9,000	**2**	**10,000**
	3	2,000	3	161,000	**3**	**158,000**
	4	7,000	4	41,000	Valid	213,000
	5	29,000	Valid	213,000	Missing	0,000
Valid		213,000	Missing	0,000		
Missing		0,000				

Source: Authors

Figure 1. Implemented Innovations on the Basis of the Cluster Groups



Source: Authors

the existence of such capacities to be important; according to their opinion, the link between these two groups is so weak that companies did not even come as far as realising the underlying potentials.

The results helped to improve the innovation performance of companies in the county. Informing the service providers was considered to be the most urgent among the practical steps. We addressed the service providers who have supported the operation of the companies so far (such as chambers) and have tried to take practical steps in order to strengthen innovation processes (e.g., consulting, handling patents), but these earlier steps were not in line with the real needs of the companies. Another important step was the support of the cooperation between higher education institutions and enterprises, and the attention of intermediary organizations had to be drawn to the fact that the companies involved are not familiar with the existing research capacity in the higher educational sector. The grouping of enterprises bears the chance of targeted developments; the satisfaction of the needs of "innovators" and "followers" helped the case of innovation also in this county (Birkner, 2010, pp. 111-114).

Research Framework and Method 2

In the summer of 2015, we carried out a new innovation survey in almost the same micropolitan region, and, similar to the previous research, we selected two small towns and a middle-sized one (Birkner-Mahr, 2016). Compared with the previous research, this time no entire counties were researched, and more target-oriented questions were asked, as the research was aimed at questioning the individuals involved in the S3 areas (automotive industry, touristic enterprises). The question was asked whether the innovation charisma of a major university (the Pannonian University) can be seen in the above-mentioned three towns, irrespective of the fact that a major development centre of the university is not located in the towns (but there are campuses and departments here). In the course of the research, the social and economic systems supporting the innovation chances of companies; thus, the criteria of social innovation was also dealt with indirectly.

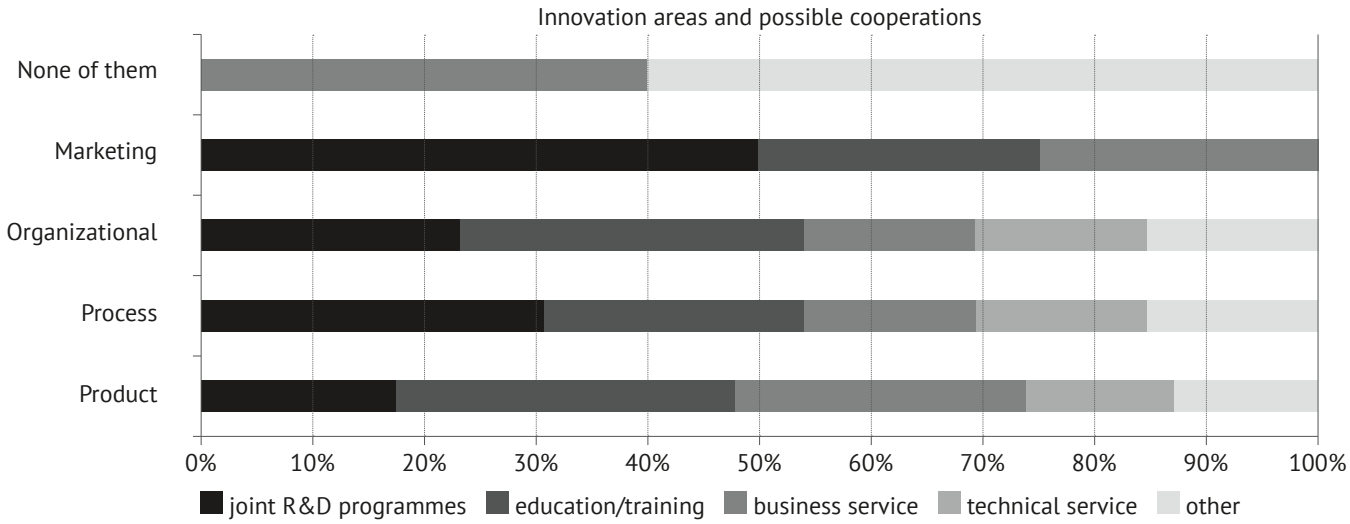
A total of 51 organisations were addressed, i.e., 31 were operating in medium-sized towns and 10-10 in small towns, respectively. The companies were randomly selected and sampled (from the mentioned branches), and the measuring was mainly done by structured interviews. The data were collected during the summer and early spring of 2015.[1]

Results and Discussion 2

The innovation performance of entrepreneurs in all three towns was, despite minor differences, around the Hungarian average (30%); thus, the size of the town did not influence the renewal ability of enterprises. The Hungarian average is a drawback compared with developed West European regions; thus, it is worthy to continue the search and identification of enterprises willing to think in another ways in all three regions. How can the spreading of innovation be accelerated in the companies? The authors believe there are two ways: one is the finding of strong,

[1] The research, founded in Péter Erzsébet's publication, was supported by the ÚNKP-17-4 New National Excellence Program of the Ministry of Human Capacities.

Figure 2. Innovation Areas and the Possible Cooperations



Source: Authors

innovative enterprises within the branches/service sectors who are trying to reach global levels or who can be made suitable for supplier levels. Companies who successfully renew become examples for others. On the other hand, it is necessary to develop higher education and research portfolios as the existing university capacities did not have a major impact on the innovation performance of companies (Birkner–Mahr, 2016, pp. 47-49).

The focus during analysis of the cross-table related to the links was put on the correlation between innovation areas and the cooperation. There was cooperation in 58 cases for the sake of a certain aim. There were links where innovation was not implemented. It can be said that there is no major correlation between innovation areas and the cooperation aims (Figure 2). It was a bit surprising that the most striking joint R+D demand arose in case of the marketing innovation, which is much more typical for product innovation. There should be more cooperation with universities; the chambers are not able to provide serious assistance in this field.

Towns must strive to establish a much more complex cooperation system than the present one, as civic organisations, the bureaucracy, and the educational and cultural systems can greatly support the innovative possibilities of enterprises. If only the attractiveness of a municipality for a young person/group is regarded, then it is easy to realise that an impulsive, free, and creative community is important, and its creation is a common task. Therefore, it was suggested that the self-government of the given towns create regular meetings between employers and educational and cultural institutions, where participants receive the chance to formulate the social aspects of creativity and liveability together with self-government.

The question of the lack of various experts (ranging from craftsmen to those with higher education) was one of the first to be raised. One of the possible regional solutions to this problem can be the launching of dual education programs on secondary and tertiary levels (long practical periods, even up to 50%, during the trainings). The obvious use of dual programs apart from practical information is the established relation between youth and the enterprises, which supports the remaining *in situ*. The other chance is the striking raise of loans, which is a Hungarian (even central–eastern European) affair, and creating the necessary resources is one of the major political and economic tasks; without this, it is impossible that a part of young employees seek their well-being in Hungary. An innovation bolstering without young people open to new technologies is difficult.

There are many tasks for university organisations (campuses, faculties), e.g., sharing knowledge, building paths of trust, organising vocational meetings and launching dual trainings, and providing spaces of innovation. The municipalities are in a fortunate position in that all three campuses/faculties are working within the framework of the same university; therefore, it is easier to harmonise arising development needs and to find common methods that can be applied anywhere (Birkner–Mahr, 2016, pp. 47-49).

Conclusions

The most important conclusion of the two researches was that, although small- and medium-sized enterprises can play a role in creating the innovation environment, the innovation performance of the enterprises in the region where we carried out the research could not be raised significantly,

as the companies demonstrated results around the national average. Practical suggestions were formulated after the measurements conducted in 2009, which were not accepted by regional actors. If this case remains, this area will become part of the losers in the longer term, and, probably due to this, young people will leave these municipalities. It can generally be said that, although higher educational capacities developed to a certain extent, it did not have a positive impact from the point of view of enterprises; however, this has to be dealt with in the future as one of the most important bases of innovation is knowledge and knowledge sharing.

The researches were new, as the features of local SMEs were investigated in 2009 at a time when this was scientifically not typical. The time between the two measurements did not result in changes in the scientific practice of innovation (this was observed in the approach of the two researches), the diffuse organisations considered to be important disappeared from the research focus, and it became evident that institutions supporting enterprises, e.g., the chambers, are not able to generate serious innovations by themselves. It is evident that the environment, i.e., the educational, leisure-time, and public administration institutions (and also the chambers) have a a major impact on establishing a creative atmosphere. This means that local politics must place a lot of energy into establishing cooperation among the above-mentioned protagonists. The aim is liveability and restoration and the creation of a young atmosphere; if this does not happen, then modern enterprises do not appear in the given region, and the mental potential will deteriorate.

It can be confirmed that the hypothesis is correct, i.e., the enterprises in the investigated area (small- and medium-sized towns in West Hungary) have an average renewal ability; their environment is not striking from the point of view of innovation. Thus, the future of this region is uncertain, and it will most probably fall behind in the competition. Based on the results, the processes helping the spreading of innovation must be assisted, and further individual ideas are necessary, which can be interpreted in this region.

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Značilnosti inovacij v regijah z majhnimi in srednje velikimi mesti

Izvleček

Globalizacija zahteva svoje žrtve, kar po mnenju avtorjev pomeni negotovo prihodnost majhnih in srednje velikih mest v Evropi. Vloga centrov se nenehno povečuje, večina raziskovalcev raje analizira konkurenčnost in inovativnost metropolitanskih območij. V tej študiji nameravamo opredeliti majhna in srednje velika mesta v regiji Srednje in Vzhodne Evrope ter raziskati njihovo možno pot razvoja. Avtorji so prepričani, da je eden od načinov preživetja teh mest krepitev inovacijskih sposobnosti, kar pomeni povečanje inovacijske uspešnosti gospodarskih subjektov in nove oblike interakcij med drugimi institucijami za reševanje družbenih problemov. Teoretično izhodišče sta interpretacija in predstavitev mikropolitanskih regij (brez velikih mest), pa tudi razumevanje koncepta tehnoloških in družbenih inovacij. Kot rezultat raziskave bo predstavljeno merjenje, povezano z inovacijami, v nekaterih naseljih. Te izkušnje lahko pomagajo majhnim in srednje velikim mestom, da lahko sledijo globalni konkurenci in prekinejo migracije ter erozijo intelektualnega potenciala.

Ključne besede: mikropolitanska regija, inovacije v regijah, tehnološke in družbene inovacije, konkurenca

VAT Gap Dependence and Fiscal Administration Measures

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Abstract

The paper examines the VAT gap estimated on the basis of VAT tax returns. The assessment of tax gap dependence is examined based on macroeconomic influences and the measures of the Slovenian fiscal administration. Regarding the latter, the number of audits being performed and the effects of audit activity (tax yield) have been considered. The results of the analysis support the thesis that the tax gap is reduced in conditions of economic growth. The fiscal administration measures showed the desired effect. An important factor lowering the gap was proven to be the number of (VAT) audits. A similar impact on the tax gap, although considerably smaller, was found to have effects of an audit. Audit planning might be considered as guidance for fiscal policies to lower the tax gap.

Key words: tax gap, VAT, tax gap dependence

Introduction

Tax noncompliance appears in different forms. The best known is the nonpayment of tax obligations on the basis of tax returns being filed arising as tax debt. The latter is considered to be a relatively restricted form of tax noncompliance. Less known, but much broader, is the tax gap, which is the larger aspect of tax noncompliance defined as the difference between the taxes that could potentially be collected[2] and the actual tax receipts.

The OECD (2008, p. 15) defines the gross and net tax gap; the gross tax gap can be seen as having three components:

"1) Filing noncompliance (failure to file a tax return): The dollar amount of taxes not paid in time on delinquent and nonfiled returns.

[1] The views and opinions expressed in this article are those of the author and do not necessarily reflect the opinion of the Financial Administration of the Republic of Slovenia.

[2] Similarly, OECD (2008, p.14) defines it as the »amount of tax that taxpayers should pay under the law« or as stated by TGPG (2016, p. 42) »theoretically collectable based on the applicable tax law (i.e., including exemptions and lower rates).«

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OUR ECONOMY

Vol. 64 No. 2 2018

pp. 43 – 51

(1) Reporting noncompliance (understating income or overclaiming tax deductions and credits): The total tax that should be reported on a promptly filed return minus the total tax actually reported on those returns.
(2) Payment noncompliance (failure to fully pay the reported taxes owed): This is the difference between the total tax liability actually reported on promptly-filed returns and the total amount of timely payments associated with those reported liabilities."

Tax debt is connected with tax noncompliance under three of the above-mentioned definitions. The difference between tax debt and the tax gap is not only in terms of content but also in the manner of recording. While the tax debt is measurable, the accountancy category of the tax gap can only be estimated (Lešnik, 2014).

Because there is no common definition of a tax gap, consequently, methodologies for estimating it differ (Fiscalis Risk Management Platform Group, 2013). The two main methodologies are top-down and bottom-up (OECD, 2017, p. 182). Estimating VAT gaps gains importance in the European Union (EU) in order to fight against the increasing tax fraud, as it indicates the size of potential VAT evasion, although it also includes nonfraudulent nonpayments as the insolvency. Besides fraudulent or defaulted taxpayers, the VAT gap arises also from inefficiency of the tax authorities (Zidkova, 2014; OECD, 2017, p. 184). Besides the size of the VAT gap, it is of great importance to learn the factors that influence the VAT gap in order to change the VAT policy in a way that would reduce the gap (Zidkova, 2014).

While there is extensive literature about different methods of tax gap estimation (e.g., IMF 2013, IMF 2014, CASE 2013, HM Revenue & Customs 2013, Tax Gap Project Group 2016, and others), we were only able to find a few studies that empirically assess the tax gap dependence (e.g., Reckon, 2009; CASE, 2013; Zidkova, 2014). Although theoretical research lists different factors with regard to the impact on the level of tax gap, there is a distinct lack in the empirical confirmation of such factors, especially with respect to the fiscal administration measures.

While for Slovenia, the Statistical Office of the Republic of Slovenia (SURS) estimates the VAT gap on the basis of national accounts data (SURS 2013), which is a top-down approach; in this study, we use a bottom-up approach. Our analysis gives an econometric explanation of VAT gap dependence on some relevant factors with an emphasis on the Slovenian fiscal administration measures (FURS).

First, the literature review is presented. In the third section, the used methodology of a bottom-up approach is presented together with our estimations on the VAT gap for the period 2010–2013. In the fourth section, we present the model of VAT gap dependence, where we applied our estimations on VAT gap. In addition, the results of the model, discussion, and concluding remarks are given.

Literature Review

Reckon (2009) studied the VAT gap estimations for EU member states. Broad studies on tax gaps have been conducted by the Centre for Social and Economic Research (CASE) and The Netherlands Bureau for Economic Policy Analysis (CPB) in 2013, presented the VAT gap estimations for EU member states for the 2001–2011 period. The estimations were obtained with the top-down method on the national accounts data. A final report with the VAT gap estimates for the period 2010–2014 was published in 2016 (CASE, 2016). Also the International Monetary Fund (IMF) prepares VAT gap estimations within its assistance program for the tax gap. Some examples of the IMF VAT gap estimations are estimations for the United Kingdom (IMF, 2013), Estonia (IMF, 2014), and Uganda (IMF, 2014), where a sophisticated model for the estimation of the potential VAT revenue was applied.[3] The methodology used might be numbered among the top-down methods.

Bottom-up methods rely on data on individual taxpayers (by means of surveys, audits, or enquiries into randomly selected taxpayers) provide an estimate for the tax gap (Fiscalis Risk Management Platform Group, 2013; OECD, 2017, p. 183). Well known is the method on random audits data where the effects from random audits are generalized to the whole population of taxpayers. The basic presumptions are the random nature of the audit selections and the forming of the sample, which should be precise and should reflect the nature of the entire taxpayer population. A detailed methodology description can be found in HM Revenue & Customs (2013), Swedish National Tax Agency (2008), and Danish Tax and Customs Administration (2010). In the study by the Tax Gap Project Group (2016), an overview of different methods for assessing the VAT gaps applied by member states is given.

Many studies have examined proxies for noncompliance that are less reliable or much smaller than the top-down estimates of the VAT gap based on national accounts data, performed by CASE (CASE, 2013). Agha and Haughton (1996, cit. in CASE, 2013) found in a study of 17 OECD countries in 1987 that noncompliance was higher in countries with higher standard VAT rates, and those with more departures from uniform taxation. Christie and Holzner

[3] See also Heather Whicker's comment in OECD (2017), p. 181-187.

(2006, cit. in CASE, 2013) suggest a proxy for the level of tax enforcement in a country because they found that lower compliance is associated with higher rates of VAT and with lower levels of judicial and legal effectiveness. Besides, their results suggest that compliance is positively correlated with the share of tourism in GDP.

Instead of measures of VAT noncompliance, other studies have examined empirical determinants of VAT revenues (CASE, 2013). Aizenman and Jinjirak (2008, cit. in CASE, 2013) found in a study of 44 countries that the VAT revenue ratio is positively associated with a country's openness to trade. Matthews (2003, cit. in CASE, 2013) in a study of 14 EU members found that the base-eroding effects of a tax rate increase are strong.

Reckon (2009) noted that an important explanatory variable with a statistically significant influence on VAT gaps was the corruption perception index (CPI) and the position of the legal institutions in the country. A more detailed overview was provided by the CASE (2013) study with an econometric analysis that regressed the calculated VAT gaps as a percentage of theoretical liability on a number of explanatory variables, across EU countries. The key explanatory variables in the analysis are (CASE, 2013, p. 93): the output gap, defined as the percentage difference between GDP and its long-run trend component, as estimated by official sources and the standard rate of VAT, to measure the potential gains to VAT evasion. All specifications included additional control variables (CASE, 2013, p. 94): The CPI compiled by Transparency International, to control the effect of public sector corruption; an indicator for years following the accession of the country to the EU; the logarithm of real GDP per capita, to capture the changes in economic activity. Zidkova (2014) applied a regression analysis of potential variables explaining the VAT gap for 24 EU member states in two selected years (2002 and 2006). Two factors common for both examined years that affected the VAT gap in the surveyed countries were found, namely, the final consumption of households and nonprofit organizations in each state, which had a positive impact on the VAT gap, and the share of VAT in GDP, which reduced the VAT gap. Other identified variables that would explain the size of the VAT gap were the share of the shadow economy and the standard VAT rate, with a positive impact, and GDP per capita, the share in intra-community trade, final consumption of restaurant and hotel services, and the number of VAT rates, all having a negative impact on the VAT gap.

Methodology of the VAT Gap Estimation and the Estimation for the 2010–2013 Period

One way of estimating the VAT gap with a bottom-up approach is the application of the data on VAT returns being filed. The Estonian Tax and Customs Board developed a VAT gap estimation on the basis of nonviable value-added margins declared by taxpayers in their VAT returns (IMF 2014). This methodology was described in detail within the Tax Gap Project Group report on tax gaps (2016). We used the described approach to Slovenian case.

The applied methodology is founded on the comparison between the sum of turnover (sales) and the sum of purchases on the basis of VAT returns within a one year's period. Namely, a business subject (taxpayer) should create a positive difference between the turnover and the purchases (the added value in terms of the data on VAT returns). The problem is in determining the theoretical added value, which indicates the (theoretically defined) excess of turnover over purchases and presents an important factor in VAT gap estimation. The more accurate comparison[4] between turnover and purchases (the added value) with respect to different economic sectors in Slovenia has shown that the average added value could also include negative values (power and gas supply, financial and insurance activities, public administration and defence and obligatory social security contributions). While this negative relationship reflects the particularities in respective sectors, the average added values regarding other economic sectors amount to values that are between 10% and up to 200% (e.g., health and social care). We have decided, for the sake of simplicity, to apply the uniform theoretical added value in amount of 10% equally for all sectors. Thus, taxpayers are expected to declare turnover in their VAT returns that exceed purchases by at least 10%. We believe that the respective theoretical added value can be the object of discussion; however, the 10% number is rather conservative. Certainly there is a possibility that purchases exceed turnover within a certain period. However, such a relationship cannot be valid over a longer period of time. In our opinion, the one-year period constitutes an appropriate time period for the consolidation of the expected business course, which should reflect in the VAT returns being filed, as well.

Before performing the estimation we considered the following issues[5]:

(1) Excluded were
- Large taxpayers. This is because large taxpayers do not engage in tax avoidance in the way that small or medium businesses do.
- Taxpayers who registered in the VAT tax system within the year of the tax gap estimation.

[4] The respective comparison was performed on the basis of VAT returns being filed.

[5] Compare country report for Slovenia in Tax Gap Project Group (2016), p. 88.

- Taxpayers who have a smaller possibility of VAT avoidance (municipalities, local communities, primary and high schools, gymnasiums, public institutions, etc.).
- Taxpayers in insolvency proceedings because such taxpayers do not achieve the expected relation between turnover and purchases.

(2) The comparison between turnover and purchases was made within a relevant time period (one year). It means that a too short period is not appropriate in this context, whereas the relation between turnover and purchases cannot be considered as relevant when the period of observation is too short. It is believed that one year is an appropriate time period for the relevant comparison of data on VAT returns.

(3) The amount of purchases was reduced for the purchasing of fixed assets and real estate. This is due to the fact that the purchase of fixed assets and real estate constitute large sums and therefore such purchases could deform the comparison between turnover and purchases.

Considering the above-mentioned presumptions, it follows[6]:

$$VA_t = \sum_t TO_t - \sum_t PUR_t$$

$$TVA_t = 0{,}1 \cdot \sum_t PUR_t$$

$$VA_t \geq TVA_t$$

VA_t – added value in the period t
$\sum_t TO_t$ – sum of turnovers in the period t
$\sum_t PUR_t$ – sum of purchases in the period t, while the purchase of fixed assets and real estate are excluded
TVA_t – theoretical added value in the period t

If

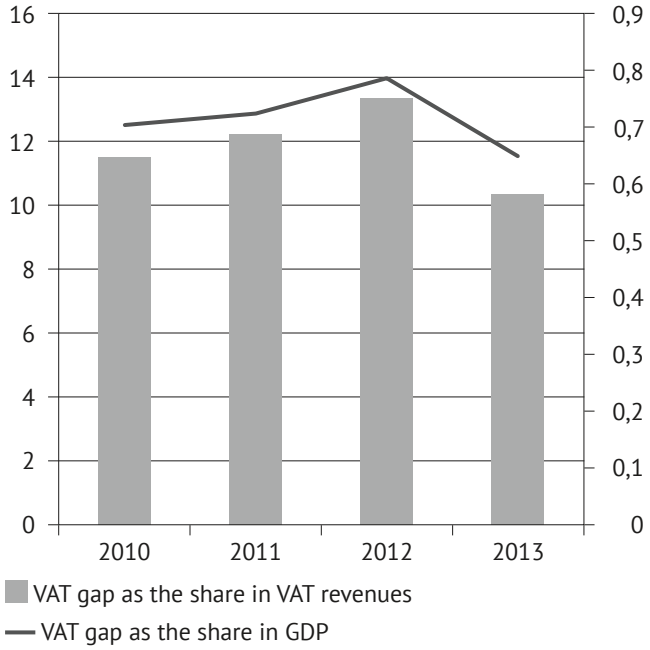
$VA_t < TVA_t$, then $Tax\ gap = (TVA_t - VA_t) \cdot 20\ \%$.

In the above formula, 20% is taken because the general VAT rate within the period of VAT gap estimation in Slovenia was 20%.

It is necessary to emphasise that, according to the OECD definition of the tax gap, our estimation refers only to reporting noncompliance (understating turnover or overclaiming purchases).

VAT gap for the 2010–2013 period is shown in Figure 1 as the share of total VAT revenues (left ordinate) and as a share in GDP of Slovenia (right ordinate). The VAT gap increased until 2012 and then declined in 2013. We believe that this course of the VAT gap could be due to the changes in the macroeconomic environment.

Figure 1. Share of VAT Gap in the VAT Revenues and in GDP (Both in %)



Source: Author's calculations

Data and Methodology of the VAT Gap Dependencies

We will use the estimates of the VAT tax gap presented in the previous section. To obtain the appropriate sample of observations regarding the VAT gap, from the aggregate VAT gap for a given year, the VAT gaps for local (regional) tax offices (TO) were calculated. Thus, we obtained a large enough sample based on the VAT gaps for 15 local TOs within the four-year time period. The VAT gaps were expressed as shares of the GDP from statistical regions. Due to the introduction of some explanatory variables in the model, which took their values according to the statistical regions (data of SURS, 2014), whereas the dependant variable got its values with regard to the territorial (regional) principle of the TO; the dependant variable was reasonably adapted to the explanatory variables on the basis of statistical regions. With respect to the available data, a regression analysis of the VAT gap dependence from the following categories was applied:

1.) The changes in the macroeconomic environment
2.) The fiscal administration (FURS) measures
3.) The VAT gap from the previous period (year)
4.) The regional differences

[6] Compare country report for Slovenia in Tax Gap Project Group (2016), p. 88.

Table 1. Statistical Properties of Selected Data

	GAP	GAP_LAG	GDP	AUD_NUM_LAG	AUD_YIE	D1	D2	AUD_YIE_LAG
Mean	0.446832	0.443410	96.39433	19.42613	141.2450	0.066667	0.066667	36.15249
Median	0.359391	0.385738	96.54493	18.81537	92.30605	0.000000	0.000000	36.92460
Maximum	1.163698	1.163698	100.8120	44.69274	445.5732	1.000000	1.000000	64.11725
Minimum	0.018522	0.023365	90.54568	6.392694	16.07097	0.000000	0.000000	3.974721
Std. Dev.	0.324256	0.304543	2.568748	7.071129	104.9936	0.253708	0.253708	17.24759
Skewness	0.741743	0.733997	-0.322341	1.426265	1.261429	3.474396	3.474396	-0.028758
Kurtosis	2.731212	2.885233	2.620020	6.912546	3.914258	13.07143	13.07143	2.102369
Jarque-Bera	2.841224	2.710219	0.700001	29.30618	9.000856	187.1492	187.1492	1.011312
Probability	0.241566	0.257919	0.704688	0.000000	0.011104	0.000000	0.000000	0.603110
Sum	13.40496	13.30231	2891.830	582.7839	4237.350	2.000000	2.000000	1084.575
Sum Sq. Dev.	3.049116	2.689639	191.3555	1450.025	319685.8	1.866667	1.866667	8626.903
Observations	30	30	30	30	30	30	30	30

Source: Author's calculations

As a macroeconomic variable, the data on GDP per capita by individual statistical region was applied, while the nominal values were deflated by the consumer price index, and yearly changes of deflated data were calculated. Also, as an explanatory variable, the VAT gap from the previous year was introduced. With regard to FURS measures, the data on the number of audits being performed with respect to the VAT area as the share of the total number of audits being performed were applied, as well as the yield (effects) from audit activities with respect to the VAT area as the share of the total audit yield. In connection with both of the FURS measures, the lagged variables were also tested as well as the dummy variables regarding the regional differences.

A cross-section model with the following specifications was formed:

$$GAP_{t,i} = \beta_0+\beta_1 GAP\_LAG_{t,i}+ \beta_2 GDP_{t,i}+ \\ +\beta_3 AUD\_NUM\_LAG_{t,i}+\beta_4 AUD\_YIE_{t,i} + \\ +\beta_5 AUD\_YIE\_LAG_{t,i}+\beta_6\, D1_{t,i}+ \beta_7\, D2_{t,i}+u_{t,i}, \quad (1)$$

where *GAP* stands for the VAT gaps of a local TO as the share in GDP by individual statistical region, *GAP_LAG* stands for the VAT gaps of a local TO as the share in GDP by individual statistical region as a lagged variable, *GDP* captures the yearly changes of GDP per capita by individual statistical region, *AUD_NUM_LAG* stands for the ratios of "the number of audits being performed with respect to the VAT area divided by the total number of audits being performed" as the lagged variable, *AUD_YIE* captures the ratios of "the yield from audit activities with respect to VAT area divided by the total audit yield," *AUD_YIE_LAG* stands for the ratios "the yield from audit activities with respect to VAT area divided by the total audit yield" as lagged variable, *D1* and *D2* stand for dummies with respect to the two of the local TO, index *t* stands for time, and *i* for the local tax office. The statistical properties of the selected data are presented in Table 1.

As shown in Table 1, four out of eight time-series exhibit empirical distributions, which differ from a normal distribution (standard JB for normal distribution was applied). But, as we will see in diagnostic tests for the model, this finding did not influence the properties of the model, particularly as the dependent variable is distributed normally.

Results

The model estimation is given in Table 2. The parameters of the model were estimated using the OLS method and using White heteroskedasticity-consistent standard errors and covariance. After adjustments due to lagged variables, the sample size was 30 observations. Before we comment on the results, we will present the results of the tests that were applied in order to check the robustness of the model. We performed a Ramsey RESET test in order to check if the model was correctly specified. As we can see in Table 3, the RESET

Table 2. Results of the Model for the Dependent Variable Gap

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.889259	1.865374	3.157147	0.0046
GAP_LAG	0.785296	0.114913	6.833805	0.0000
GDP	-0.053251	0.017861	-2.981375	0.0069
AUD_NUM_LAG	-0.013084	0.004711	-2.777297	0.0110
AUD_YIE	-0.001556	0.000531	-2.928782	0.0078
D1	-0.123199	0.058793	-2.095484	0.0479
D2	-0.142788	0.062772	-2.274697	0.0330
AUD_YIE_LAG	-0.004590	0.002314	-1.983726	0.0599

R-squared	0.824782	Mean dependent var	0.446832
Adjusted R-squared	0.769031	S.D. dependent var	0.324256
S.E. of regression	0.155835	Akaike info criterion	-0.656860
Sum squared resid	0.534260	Schwarz criterion	-0.283207
Log likelihood	17.85289	Hannan-Quinn criter.	-0.537325
F-statistic	14.79398		
Prob (F-statistic)	0.000001		

Source: Author's calculations

test shows no indication of any possible misspecification. This is also confirmed by the Likelihood ratio test statistic.

Table 3. Ramsey Reset Test

	Value	df	Probability
t-statistic	0.585540	21	0.5644
F-statistic	0.342857	(1, 21)	0.5644
Likelihood ratio	0.485840	1	0.4858

Source: Author's calculations

The correlation matrix in Table 4 indicates that a multicollinearity problem in the model isn't important. Thus, from Table 4 we can observe a strong negative correlation between the explanatory variables AUD_YIE and AUD_YIE_LAG. However, the relative correlation has no undesired impact on the results of the model.

The results of the model were in line with our expectations; we believe the model confirms the VAT gap dependence from the introduced explanatory categories. We can observe a negative regression coefficient with respect to changes of GDP per capita, which suggests that an increase in a respective variable has a negative influence on the VAT gap and vice versa. A similar relationship between the tax gap and GDP has also been established by previous studies. Both of the FURS activities were proven to be statistically significant with the negative regression coefficients, which suggests that an increase in the intensity of FURS activities

Table 4. Correlation Matrix of Explanatory Variables

	GAP_LAG	GDP	AUD_NUM_LAG	AUD_YIE	D1	D2	AUD_YIE_LAG
GAP_LAG	1.000000						
GDP	0.066780	1.000000					
AUD_NUM_LAG	-0.254759	-0.066604	1.000000				
AUD_YIE	0.019571	-0.267844	-0.166163	1.000000			
D1	0.084746	-0.075144	0.093820	-0.175498	1.000000		
D2	-0.282771	-0.008496	-0.178795	0.107595	-0.071429	1.000000	
AUD_YIE_LAG	0.105718	-0.028157	0.172157	-0.734576	0.163620	-0.169421	1.000000

Source: Author's calculations

reduces the VAT gap. The two local regions (the two local TO areas) were proven as statistically significant as well. In our opinion, such a result might be explained with the sharp decline of the VAT gap as the share of GDP in 2013 with respect to both of the local TOs, whereas the respective decline was more outstanding than the average. The lagged dependant variable reveals a positive regression coefficient, which suggests that the higher VAT gap from the previous year increases the current VAT gap.

To determine the significance of the individual explanatory variable, the product of the average value of the explanatory variable and the regression coefficient was calculated for each of the explanatory variables, and the absolute values of the respective products were then compared. In terms of the most important variables, we can point to the yearly changes of the GDP per capita and the lagged dependant variable followed by the FURS measures with respect to the number of audits being performed as a lagged variable and the yield from audit activities.

Discussion and Conclusions

The presented methodology for the VAT gap estimation should be listed among the bottom-up methods. It might be considered as a useful and practical approach as well as a supplement to the methods of tax gap estimation already in existence. The main issue of the respective methodology is based on the assumption of the rational economy of taxpayers, which is to create a positive difference between turnover and purchases. Those taxpayers who do not declare at least a minimal, theoretically setting a positive difference in their VAT returns, might be considered as potential candidates for VAT gap estimation, of course while still considering the above-mentioned assumptions.

The VAT gap estimations as a result of the respective method are lower than the VAT gap estimations acquired via the top-down methods. Also, according to the OECD definition of the tax gap, the respective VAT gap comprises only a part of the entire VAT gap, namely, the lack of VAT due to the reporting noncompliance.

Review of the bottom-up methods, which are used by fiscal administrations for tax gap estimation, indicates that the random audit method and its varieties are the most commonly used. The comparison between turnover and purchases on the basis of VAT returns with respect to the VAT gap estimation might present a supplement to the existing methods of VAT gap estimation that are used by fiscal administrations. Certainly, the comparisons of tax gaps according to different estimation methods as well as the trends of tax gaps and the analyses of the causes for tax gap fluctuations are relevant.

We believe that the results of the econometric analysis of the VAT gap dependence should be considered from different aspects. Although the effects of enforcement measures (the measures of fiscal administrations, e.g., audits, fines, enforcement debt collection) on the level of tax compliance are well known and have been investigated in existing literature, there are nevertheless only a few studies that have empirically assessed the correlation between the tax gap and fiscal administration measures. Reckon (2009) and CASE (2013) assessed the correlation between VAT gap and fiscal administration measures indirectly, with the application of the CPI, which, among other factors, reflects the efficiency of the tax regime enforcement in countries. The influence of audits on tax compliance regarding VAT was studied by Bergmann and Nevarez (2006), where they investigated the differences in the net VAT obligation before and after an audit was performed. In this sense, our analysis of VAT gap dependence from the audit activities of FURS might be considered to be a contribution to studies with respect to tax compliance dependence as well as the empirical confirmation of the impact of direct fiscal administration measures as important tax gap determinants. The lower values of regression coefficients and the smaller significance regarding the FURS explanatory variables should be interpreted in connection with the method of present analysis and the applied data. Namely, the dependant variable VAT gap is expressed as the share in the GDP of an individual statistical region (local TO); thus, the data are in an aggregate form on the regional level. The explanatory variables are designed similarly, all on the aggregate level. In this aspect, the performing of an analysis of VAT gap dependence regarding the sample of individual data on taxpayers would be meaningful, as more significant influence of the explanatory variables regarding FURS measures might be expected.

The regression model of the VAT gap dependence can also be employed as a measure for the fiscal administration efficiency, where the influence of relative measures on the tax gap reduction in different time periods would be observed. In this regard, the planning of audits and the consideration of arguments for the strengthening of the fiscal administration function are possible to discuss as well. Such analysis might appear as particularly meaningful regarding the fiscal policy choices for the systematic tax gap reduction, as the costs of the tax gap reduction (e.g., with more intensive audit programmes and other verification activities) on the one hand and the expected reduction of the tax gap on the other hand would have been compared.

However, we are aware of the limitations of our research, which derive primarily from the fact that the level of tax gap cannot be exactly defined; however, there are estimations available. Moreover, in our analysis, we followed the presumption regarding the 10% theoretical difference between turnover and purchases, which is applied for the tax gap estimation, subsequently. The respective simplification

in the analysis was applied due to the large extent of data on the basis of VAT returns being filed (more than 100,000 VAT returns are filed in a single year). The estimation of the VAT gap, when considering the actual average added values, according to individual sectors (or in some other relevant manner) would have resulted in different values of VAT gap estimation. In addition, we only observed a short period of tax gap fluctuations, whereas a relatively small number of observations was available.

The econometric explanation of VAT gap dependence is of importance as one of the first empirically established influences of direct fiscal administration measures on the VAT gap. The results of the regression model might be applied as an index of the fiscal administration efficiency as well as a tool with respect to planning the focus and intensity of audits. In addition, the relative regression model (or even more improved) might be employed as guidance for the fiscal policy choices about closing the tax gap, particularly in the sense of a cost-benefit analysis. Namely, the question is whether it is reasonable to plan the tax gap reduction with the application of enforcement measures (audits and fines), as there is an existing possibility of an excessive amount of costs from respective enforcement measures over the desired effect. The fiscal policy should consequently focus to a higher degree on all the other known determinants of the tax gap and recognize their benefits in considering the efforts for a higher level of tax compliance.

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Odvisnost vrzeli DDV in ukrepi finančne uprave

Izvleček

Prispevek analizira DDV-vrzel, ki je bila ocenjena na osnovi izpolnjenih davčnih napovedi za DDV. Ocena odvisnosti davčne vrzeli je analizirana na osnovi makroekonomskih vplivov in ukrepov Finančne uprave RS. V zvezi s slednjimi je upoštevano število izvedenih pregledov ter učinki aktivnosti pregledov (pobrani davek). Rezultati analize podpirajo tezo, da se davčna vrzel zmanjšuje v pogojih ekonomske rasti. Ukrepi finančne uprave so pokazali želeni učinek. Izkazalo se je, da je pomemben dejavnik zmanjševanja vrzeli prav število (DDV) pregledov. Podoben, vendar pomembno manjši učinek imajo učinki pregledov. Načrtovanje pregledov bi se lahko štelo kot smernica za fiskalno politiko s ciljem zmanjševanja davčne vrzeli.

Ključne besede: davčna vrzel, DDV, odvisnost davčne vrzeli

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Employees: Invisible Added Value of a Company

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Abstract

In developed economies, where the work input exceeds the physical input, the lack of harmonised and standardised rules of human capital assessment is visible. The mentioned indicates the deficit of an important part of the comprehensive value-added assessment. What do we lose by ignoring the important part of the employee's value added in the working process? Companies underestimate the employee's human capital input. Consequently, society typically does not recognize invisible sources of value added in companies. The goals of this article are to highlight the missing human capital (HC) element at the company level assessment and to raise the awareness about its importance. By analysing existing methods of coping with the mentioned challenge, no harmonised solution is evident. By the increasing share of the service sector, emphasis on the HC element should be monitored more closely. The article focuses on the missing and invisible human capital elements in the framework of the value added; it offers suggestions for inclusion of the human capital factor in the process of company's value added assessment as well as reflections on further steps in this direction.

Keywords: employee, value added, human capital, assessment

Introduction

The researched problem arises from the neglected role of the HC in a company's value-added assessment. Structural changes require that HC is used in the best possible way to improve productivity and competitiveness at the company level. The mentioned human factor is still not recognised as the key factor in the knowledge society; therefore, it is not managed properly.

Fast technological changes and new business models within dynamic economies influence diverse managerial decisions, including purchases, mergers, and acquisitions of companies. While the business value, according to accounting standards (pure monetary value), is easy to assess, the human capital assets evaluation is in many cases neglected or even omitted (Dean et al., 2012). At the same time, the global economy development focuses on service activities, where the role of human capital is required more than the physical capital once used to be. Human capital is therefore becoming a major source of productivity and, consequently, the major driver of competitiveness. On the other hand, post-crisis evaluations indicate a continuation of a long-term slowdown in the productivity growth, along with a weak level of investments growth. The mentioned might indicate weak human capital management or even neglect of the human factor in the production

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pp. 52–61

process. Furthermore, analysis confirmed that gaps in labour productivity levels among micro, SME, and large firms are relatively high (OECD, 2017a). Due to strong global pressure to keep companies competitive, to attract investors and shareholders, the neglected role and value of human capital within companies' financial reports is worrisome and not socially responsible. Employers often do not consider HC adequate relevant to be reported in balance sheets (Dean, 2012). This article describes the theoretical background of the topic, existing situation of the human capital assessment at the company level and in the society, reasons to intensify and highlight the role of the human capital, and possible approaches to tackle challenges and conclusions.

Theoretical Background

Modern globalisation trends, higher competitiveness pressures, and changes in business models create intensive dynamics in management and ownership relations within individual enterprises. There already exists a framework of more–less established and standardized methods of value-added assessment, serving as a basis for diverse transactions, purchases, and sales as well as stock evaluations of a company. However, the value added of the employee within the working process is rarely assessed. In general, economic theory identifies major obstacles to improved human capital information, mostly linked to the issue of intangibility and measurement (OECD, 1996). The mentioned facts cause the deficit of an important part of the comprehensive value-added assessment, excluding the value of knowhow, patents, licences, and goodwill. In any case, the human capital value-added cannot be denied. The World Bank defines a wealth accounting method by measuring human capital (as intangible assets) as the difference between the total wealth and the sum of produced and natural capitals (World Bank, 2006). Another new approach to assess the human capital contribution was published in 2012 by UNU-IHDP and UNEP, based on the "inclusive wealth index." According to the publication, inclusive wealth is the social value of an economy's capital assets, which includes, among other components, human capital as a sum of skills, education, and health (UNU-IHDP & UNEP, 2014).

Nevertheless, prevailing methods of monetary measurements related to human capital rely on cost-based and (lifetime) income-based approaches, covered also by SNA and, to certain extent, are comparable. As it is more difficult to find reliable indicators to measure human capital at the national level, the human capital stock assessment at the company level is more visible and provable, last but not the least, by diverse measurement mechanisms, as by human resource accounting (HRA) (OECD, 1996). The company level is also one of places where the human capital potential can be expresses more clearly than simply by formal education as a competence level approximation.

According to the European Commission Annual Report (2017) and due to the crisis, the unemployment gap in the age bracket of 25–39 years is bigger than in the age group 40–64. The mentioned fact might cause a potential decline in the productivity in the future. In the next 25 years, the EU working age population will decline by 0,35%, resulting in lower productivity (EC, 2017). Furthermore, demand and supply mismatches on the EU labour markets indicate insufficient use of the human capital, defined as knowledge, skills, competences, and attributes embodied in individuals (Keeley, 2007). According to Eurofound, 43% of workers in the EU-28 are either under-skilled or over-skilled, and 29% have skills to cope with more demanding tasks (Eurofound, 2016a). Therefore, lower participation in the labour market requires use of existing and not utilised human capital. The main goal of the paper is to highlight the importance of human capital in the working process, to explore existing tools to evaluate wealth of employees at the company level, and to offer further reflections on possible solutions, which would improve the position of human capital as intangible and therefore invisible assets. Slovenia belongs to countries with above-average educational attainment of the younger generation. Despite the mentioned fact, valuation and potential of human capital are deeply underestimated.

Human Capital: A Neglected Component of the Company's Assets

The role of labour productivity, which is also due to observed slowdown of productivity in many countries, is strongly emphasized in major economic researches. This trend might predict long-term difficulties to regain higher productivity growth. Analysed in the context of structural weaknesses on the labour market (as demographic changes and skills mismatches), human capital should receive a more serious role in accountancy and financial reports, to be able to offer comprehensive insight into companies' assets and (long-term) prospects for growth. On the other hand, it is recognised that acquiring knowledge is profitable, as longer life expectancy increases the profitability of the accumulated knowledge (*Economist*, August 5, 2017). Slovenia is facing labour market weaknesses, declining working age population, and increasing skills mismatches. The need to update existing policies on human capital in Slovenia was stressed recently by the OECD skills strategy (OECD, 2017b).

According to the OECD (2017a), business sector activities (excluding real estate) account for 35–50% of total value

added and of total employment across OECD countries. Increased labour productivity in services requires extensive and permanent investments into the human capital; different levels of investments across countries are observed in increased gaps as a slowdown in a pace of convergence, particularly in the Eastern Europe (GDP per capita convergence). Differences in GDP per capita result from differences in the labour productivity growth and, to a certain extent, from different human capital investments across Europe. The increasing mobility of high-skilled individuals requires socially responsible companies, which enable career progress, lifelong learning, and remuneration for intellectual contributions.

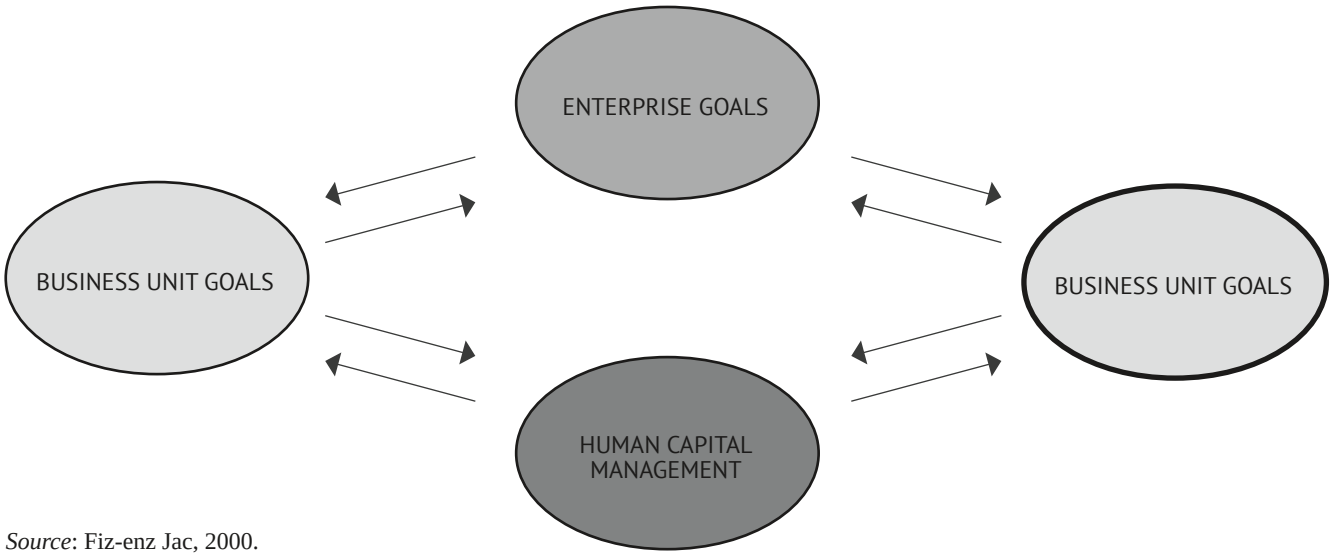
The mentioned process requires progress monitoring and human capital measurement tools. It is necessary to know which individuals contribute most in the working process, which less, to find solutions, how to retain the best employees. If not, a decline in the quality workforce due to unrecognised potentials can lead to lower productivity and lower competitiveness at the company and national levels, to lower motivation for work and to less achievable business goals. The quality of human capital assets is invisible and, in most cases, not appreciated in companies but is taken for granted. In fact, productivity is about how to work "smarter" rather than to work "harder," as stated by OECD (2015). "Smart" work is considered to be driven by knowledge and innovation and not by intensity of work done.

The management mostly ignores the interconnection between human capital and enterprise outcomes. In the best cases, the human capital remuneration is considered as a cost, being equal to the material cost or service performed (and easy to reduce, when needed). However, this opinion is outdated. The nature of work has changed drastically in the last decades; the role of human capital is increasing and available workforce decreasing. Further on, equalising costs of work with costs of production or services performed cannot be correct; costs cannot be compared. Labour costs do not enable the economy of scale; they cannot be applied to existing standard accountancy framework. In reality, human capital and enterprise goals are interconnected and affect one other (Figure 1). Figure 1 clearly shows that "the management oscillates across processes between corporate goals and human capital management. Therefore, strategic metrics are needed to show the effects of the HC in corporate goals" (Fiz-enz Jac, 2000).

The interdependence between human capital and business goals requires understanding of each important component. It is true that the human capital is difficult to evaluate, but it should not be ignored due to measurement problems. According to Fitz-enz (2000), employee costs can exceed 40% of corporate expenses. Therefore, the return on investments (ROI) of human capital should become an integral and required part of companies' financial statements and calculated through the new innovative framework. It is important to preserve the best performers in the working process and to identify gaps at the productivity level, also due to the shrinking working age population in Europe, as evident from EUROSTAT databases (EC, 2015). The mentioned is even more important for small economies such as as Slovenia's, where human capital stock and its efficient use should prevail upon outdated production to fill outsourcing capacities or declining industries.

The monitoring of human capital in companies and assessment of possible future negative consequences of skills

Figure 1. Human Capital and Business Goals



Source: Fiz-enz Jac, 2000.

mismatches/deficiencies are further requirements for sustainable productivity growth in Slovenia. In general, the importance of human capital measurement was expressed already in the 1960s and 1970s. However, no unique harmonised and internationally comparable measurement of human capital assets in companies exists. Even worse, according to the survey (Dean, 2012), there exists a broad number of respondents, who consider that human capital should not be accounted for and reported on in balance sheets. Limited literature is available about the human capital assessment challenges at the company level. Existing authors confirm the weak recognition of the HC role, which might cause long-term negative consequences for workers and for the company level efficiency. Do we really live in the twenty-first century and strive to acquire the knowledge economy? It seems that the crisis measures and the economic growth only blur the importance of the human factor in economic growth. Even if the crisis circumstances admitted investments into HC, the crisis was sometimes just an excuse for omitted but necessary investments into skills.

Diffusion of existing and new experimental knowledge and technology is considered one of important channels, through which policies can shape aggregate productivity, also through knowledge transfer and spillovers (OECD, 2015). The comparability of an existing knowledge base should be provided to gain synergies of comprehensive human capital potential. The OECD report from 1998 offered interesting insights about international comparison of human capital investment (OECD, 1998). Lundwall and Johnson (1994) presented interesting and innovative classification of knowledge, divided into four categories of knowledge, namely,

I) Know what (refers to facts);
II) Know why (refers to knowledge in general, principles and laws in nature, human mind, society);
III) Know how (refers to ability); and
IV) *Know who* (refers to social ability to cooperate, communicate with different people and experts).

The most interesting category and the least explored in practice is the last one. Knowing "who knows what" can generate multiplication of knowledge and progress at the company level. Register of the existing knowledge base in HR management is rare, but it can offer an alternate human capital measurement tool. Capability (or attempt) of the human capital monitoring and use of accumulated knowledge within a company indicates adequate managerial practice along socially responsible investments into the human capital. On the other hand, it can prove consequences of human capital investments neglect. In time, companies with a lack of human capital assessment or with human capital gaps will become uncompetitive and not attractive for investors or stakeholders—nor interesting for the best minds and innovative brain circulation. Inadequate investments into skills namely decrease the motivation of existing employees and deter potential job applicants. According to Berkowitz (2001), absence of the modern approach to human capital as valuable assets at the company level is a consequence of the rooted thinking somewhere between the outdated evaluation of industrial work and today's modern human capital management development. In other words, management and the accounting systems often have an unconscious and tacit mindset that is coloured by the values of yesterday's industrial age (Berkowitz, 2001). Newer data report that the contribution of the human capital to the organizational success reaches 85%, while the contribution of the financial/material capital reaches only 15% (Bohinc, 2016; Gostiša, 2017). Neglecting human capital no longer makes sense, although it still prevails.

Why Measure the Human Capital Contribution?

Without knowing "who possesses what knowledge," the diffusion of skills and knowledge is underutilised and wasted. The mentioned fact is especially important when talking about working force through the whole life cycle. Individuals change jobs, achieve new skills and competences, many times also in an informal way (as invisible knowledge, soft skills...). Accumulated additional knowledge is often not reflected in educational credentials and therefore does not reflect the actual value of an individual in the working process (OECD, 2001). On the other hand, the mentioned OECD publication emphasizes that a pool of people with low skills remains substantial and includes individuals with relatively high formal educational qualifications (OECD, 2016). In this context, the introduction of "the skills audit" should serve as the first attempt of assessing an individual's human capital potential. To sum up, skill mismatches without detailed competency analysis hinder productivity growth and efficient skills allocation.

From this point of view, along with a trend of a higher workforce fluctuation in companies, the monitoring and assessment of the existing human capital, possessed in an individual, is even more in demand. The article refers especially to the service sector, where the HC factor is a much more important contributor to company efficiency than the physical capital. In comparison with the past, the knowledge society and its development relies increasingly on human capital.

Human capital stock in individual workers is, namely, not static but changes with different tasks and up-skilling. Further on, according to Liu and Fraumeni, human capital in a wider context also recognises noncognitive skills as intra- and interpersonal skills that have an assumed and increasingly

important role in modern societies (Liu & Fraumeni, 2014). Workers need different skills—not just more skills (OECD, 2016). Additionally, investments into human capital of employees in time present an opportunity cost, which is, in many cases, not rewarded, causing less motivation at work and lower work outcomes. Consequently, human capital as a dynamic element generates upgrading or obsolesce. Demographic changes and less available workforce will make any talent valuable already in the near future. The case of Slovenia with its fast ageing population is even more worrisome, taking into account the neglected role and inefficient use of available human capital (Zupančič, 2016).

The more modern approach to the human capital investment taxation might generate more interest for companies to invest into people and more sensitive workforce treatment. Years ago, Slovenia introduced tax deductions for companies and individuals to promote investments into life-long learning. After abolishing the measure, the significant decrease in investments into skills was noticed. However, in 2012, Slovenia re-introduced tax deductions for R&R investments with a positive trend in investment growth.

Together, with the increased role of the social capital (as mature social relations), human capital is multiplying effects to reach required economic goals. Many elements, linked with human capital and being crucial for company growth, still do not receive equal footing or are not even visible in financial reports/statements. Invisible assets, hidden in individuals can make a substantial difference in productivity growth, if properly identified and used in the working process. Without recognising the insufficient knowledge and inadequate skills in individuals, necessary for productivity boost in the company, the results cannot bring satisfaction to employees or a company. Business goals are lower than they could be with wider insight into all essential components, contributing to the productivity growth and to a healthy economy at the company level. "Knowing who knows what" makes a difference. Measuring knowledge makes the performance improvement possible.

Not to forget, there exist diverse tools to measure human capital to enable analysis and measurements. Most measurement models are partial, not harmonised, with the exception of some widely introduced human capital measurements attempts, as OECD comparable statistics on human capital and individual authors draws attention to human capital measurement needs. In practice, human capital analytics does not exist in the majority of companies, hindering cross-company and cross-sector comparisons of human capital capacities. One way to assess the added value of an individual is a comparison between investments into an individual's human capital in time and productivity growth, taking into account the costs of investments. The simplified comparison can provide insight into the quality change in human capital use. Alternatively, the comparison can confirm the negative consequences of the knowledge atrophy (neglected value-added creation) when not updated. In most cases, the monetary value does not recognise the human capital contribution in the company as an asset; neither the national accounting nor financial statements do either. In reality, nowadays the essential part of the company's value is present skills and accumulated knowledge. EUROSTAT data confirm the prevailing share of services as a knowledge-intensive sector in the EU (EU-28 73, 9% of the GDP in 2016).

Recognising only one side of the workforce costs analysis, for example, the total cost of workforce metrics (TCOW), as the full cost for people who contribute knowledge to the organization, clouds the clear picture of the workforce's value added. The same goes to the ratio of the GDP to the public spending on formal education. The foreseen return namely depends on utilization of the human capital and can increase or decrease in time. The fact that a workforce is a company's most important asset is not reflected in measuring its value added to the company's wealth. Rewarding human capital at the company level affects productivity of an individual and vice versa. This justification of investments was proved by Woodhall (2001), confirming that investments into human capital is more effective than into the physical capital. A display of the human capital dimension is shown in Table 1.

Table 1. Human Capital Performance Matrix: Examples

	ACQUIRING	MAINTAINING	DEVELOPING	RETAINING
COST	Cost per hire	Cost per paycheck Cost per employee assistance program	Cost per trainee	Cost of turnover
TIME	Time to fill job	Time to respond Time to fulfill request	Cost per trainee hour	Turnover by length of service
QUANTITY	Number hired	Number of claims processed	Number trained	Voluntary turnover rate
ERROR	New hire rating	Process error rate	Skills attained	Readiness level
REACTION	Manager satisfaction	Employee satisfaction	Trainee responses	Turnover reasons

Source: Fiz-enz, 2000.

The proved importance of the human capital in the working process is still not the confirming part of balance sheets. The interesting approach to the human capital performance matrix is presented by Fiz-enz (2000) and includes four main elements: acquiring people, maintaining and developing them, and, the most important, retaining them as valuable assets (Table 1).

Often, monitoring the future workforce and skill gaps is missing in HR management strategies as well. No systematic analysis of existing or utilized skills and competences is registered in many companies, thus decreasing the motivation of those who possess more than acknowledge used in the working process. Even companies, which recognise the role of human capital value in the company, even started to insource instead of outsource; the contribution and dedication of employees are significantly higher than in the case of an outsourcing practice. Without systematic measurements of human capital efficiency, one cannot identify the human capital gaps nor the optimal rate of investments into employees. The mentioned deficiency can lead to lower productivity and weaker competitiveness in general.

Cost optimization was a fashionable tool "to heal the crisis scars." Do we actually have data on the human capital pool in Slovenia? No exact calculations are available about damage caused by redundancies and low investments in people in the recent decade. No correlation exist between the existing human capital potential and the industrial policy vision in Slovenia. The shift into the knowledge society with the prevailing service sector requires more attention given to human capital, as financial results depend more and more on the human factor.

How To Approach "Smart" Human Capital Management?

By "smart" human capital management, I understand recognizing the needs and potentials of one's employees. According to Eurofound, 38% of workers believe that their job offers good career prospects; on the other hand, 46% of workers over 50 years feel their career prospects are poor (Eurofound, 2016a). These facts indicate the wrong perception of the needs and potential from employers' side. Even more worrisome is visibly lower attention, given to older workers, who possess adequate skills and knowledge. Experienced workers usually acquire transferable skills, which generate with tenure. The mentioned Eurofound data indicate that, in many countries, external mobility is gradually replaced by internal mobility. Further, the most stable employment relationships in all EU countries were observed in the age group of 40–44 years, with a tenure of more than 15 years. Most people retire from their job after 20 years. The historical retention rate confirms that two out of three workers are still with the same employer 10 years later, having a total tenure of over 25 years (Eurofound, 2016b). Do employers actually recognize the wealth of their employees, accumulated in years of work?

Recognizing the human capital "wealth" in one's company requires knowledge of the employees. Besides the indicator-based approach to human capital measurements, e.g., PISA, PIAAC (developed by the OECD), or the Human Development Index (HDI). The HDI, developed by the economist Makbub Ul Haq in 1990, represents a composite index of life expectancy, education, and per capita income indicators, which are used to rank countries according to the human development. The UNDP Human Development Report (UNDP, 2017) uses the HDI ranking annually.

Human capital dynamics hide the capture of the holistic human capital wealth in time. As already said, only formally recognized education does not include possible spillover effects, arising from nonformal or informal education achieved. The OECD stressed that the ability to create economic value from intellectual assets is highly contingent on management capabilities of individual firms and on the implementation of business strategies (OECD, 2006). Recognizing human capital stock therefore demands clear management vision, recognition of potential human capital gaps, and assessment of the existing one, including the unutilized potential.

The mentioned preconditions enable retaining the best workers and to improve productivity, consequently, to increase a company's efficiency. On the other hand and otherwise, neglected human capital (causing from too little investments into skills and training), i.e., recognizing the low employees' perception of career perspective, can lead to devastating company outcomes (Zupančič, 2016). Brain circulation as a result of transferable skills can be partially recognized as a loss for one employer while enriching another, therefore multiplying general skills level in the society. More worrisome is a high fluctuation and brain drain, causing long-lasting negative consequences for the company, even more worrisome in the future, which is facing a shrinking working age population. The situation is even worse, taking into account that 30% of people in the EU in age group 20–64 are not in employment (EC, 2017). In general, the knowledge base identification in companies is required to receive a full picture of the human capital potential. Human capital management steps should reveal existing managerial gaps or preventative actions (Figure 2).

Figure 2. Steps in Human Capital Management in Companies

HUMAN CAPITAL MANAGEMENT STEPS

▼

Recognising matching of demand and supply and gaps

Assessment of human capital potential and realising goals

Importance of retaining and upgrading productivity

▼

Recognising »the wealth« within employees

INVEST INTO WHOM AND WHAT TO AVOID…

Fluctuation

Brain Drain

Source: Author's work

Figure 2 describes the necessary managerial steps to improve one's HC stock within companies. It is necessary to identify skills matches/mismatches to assess HC potentials and to find solutions that motivate employees to remain in the company. By recognising the HC "wealth," one might avoid unnecessary fluctuation flows and brain drain by creation of satisfaction at work and strengthened brain gain.

In this context, one should not exclude the role of the social capital, being complementary to the human capita, as "social capital promotes the development of human capital, and human capital promotes the development of social capital" (Keeley, 2007). Social capital (as shared values and understandings in the society) represents an essential part of management in complex societies. Trust between employers and employees is built by respected mutual contributions. Realising employees' potential is crucial for increase in creativity. Increase in the "creative class" (as defined expression in the study) enabled more criterion for competitiveness or creativity indicator (Florida, 2005). Creativity is, namely, an essential element of human nature; more creativity and freedom generate more multiplications of the innovation culture. If companies find appropriate ways to extract the best from their employees, they will increase the motivation to contribute most to the company, thus increasing economic outcomes as well. Fostering creativity and autonomy at work, thus assessing and recognising potentials of each individual employee can lead to smart human capital allocation and to an efficient working environment.

As human capital is quite mobile, quality management is becoming a more important factor, contributing to the value-added creation. As the OECD emphasizes, empirical studies provide evidence that stock market valuations are influenced by the extent and type of information on intellectual assets that is publicly disclosed (OECD, 2006). Financial statements without inclusion of the human capital lose a part of the value for the shareholders, leading to wrong recognition of the value at capital markets. Appropriate satellite accounts should raise the invisible company efficiently in the human capital. Therefore, nonfinancial disclosure might promote good managerial practice, inclusive social responsibility, and promising future of the individual company.

Further Research and Challenges Ahead

There exist only limited available and relevant literature, covering the challenge of human capital assessment at the company level. The increasing share of services confirms the important role of the human capital, which should be monitored and assessed to contribute better to business goals.

Further research should explore the following challenges, linked to the human capital dimension and its contribution to company growth:

- Traditional economic performance indicators do not reveal the human capital contribution and distort the picture of the human capital contribution to the company's outcomes.
- The existing company assessment does not incorporate the human capital factor and therefore does not identify actual human capital deficiencies or unutilised potentials, thus hindering productivity growth at the company level.
- Labour productivity growth in the EU is decreasing; therefore, assessing the human capital component is necessary to evaluate impacts of adequate human capital management.
- Consequently, balance sheets should be modernised and adapted in line with the role and contribution of human capital to recognise the holistic wealth of the company.
- Human capital should not be considered as the company's cost but as assets, which contribute to business goals, raises innovation, and generates productivity.
- Companies should collect human capital stock information, statistics, and productivity growth reports to better manage investments into the human capital.
- Company success depends in a large part on people with higher levels of individual competence (Kwon, 2009). It is necessary to evaluate the human capital stock in companies, as the human capital is prevailing capital in modern service economies.

Limitations to the topic arise mostly from the HC invisibility and underestimation of its impacts at the company level. Further research possibilities therefore are being directed toward higher awareness raising of employers and national authorities and how to successfully integrate the HC factor and assessment into the harmonised framework. Further, comparisons between socially responsible companies and those neglecting the HC should be highlighted.

Conclusions

Invisible advantages of investments into individual's human capital often prevent employers from investing in employees, thus causing serious managerial risks. Managerial competences should include also "smart human capital management" together with a "smart human capital allocation." The first step in this direction requires identification of one's workforce capacities (potential, actual, or still unutilised one). The mentioned is a prerequisite for increased labour productivity. Knowing a company's human capital value is important; employing the best performers raises the value added and increases reputation. Monitoring and assessment of human capital positively affects all stakeholders in the working environment. As a result, an employee is appreciated and paid according to the real contribution at work; the company is more competitive and attractive in the business environment; the company is regarded as a socially responsible actor and promoter of knowledge.

Identification of the existing and available workforce enables assessing the potential of companies and better coping with labour skill mismatches, with constraints to higher productivity, with barriers to innovations and with better suitability of skills. A satisfied workforce, which uses human capital in line with capabilities, also means the element of comparative advantage in times of global workforce mobility. The innovation process is increasingly based on collaboration, rapid learning, and networking. In this context, the productivity can be linked with social capital, embedded in norms and institutions, which include public and legal entities (OECD, 2001). Nevertheless, one has to note that measuring social capital is even more complicated than in investing in human capital. Last, but not least, a shift in human capital recognition improves not only productiveness and competitiveness but also higher social inclusion and well-being (OECD, 2001). Human capital and investments into it are recognised as an act of social responsibility toward one's people and valuable investment for all.

Positive externalities of knowledge and human capital contribute to personal and social improvements. The OECD work has confirmed that improvements in human capital have been one of the key factors behind the growth process in the past decades in all OECD countries, especially in Germany (OECD, 2001). The publication stressed that "there is a need for a call to policy makers to adopt a broader, more inclusive approach to productivity growth that considers how to expand the productive assets of an economy by investing in the skills of the people and providing an environment where all firms have a fair chance to succeed, including in lagging regions" (OECD, 2016).

Therefore, policies at the company level should address potential skill gaps and unutilised potential within companies to improve one's business performance. The only way to receive relevant information includes quantitative and qualitative monitoring and assessment of human capital the company possess but is, in some cases, unaware of its existence.

Without taking into account the whole context of growth parameters, how does one assess future business growth, along with mid- and long-term business plans? Without a doubt, the human capital in the knowledge economy is becoming a substantial precondition of economic growth. It is socially responsible to recognise the human capital contribution to the economic growth. It is important to include human capital into innovatively adapted balance sheets and to reward its contribution to economic growth.

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Zaposleni – nevidna dodana vrednost podjetij

Izvleček

V razvitih državah, kjer doprinos človeškega dejavnika presega fizični kapital, je razvidno pomanjkanje harmoniziranih ter standardiziranih pravil, vezanih na ocenjevanje vloge človeškega kapitala v družbi. Omenjeno dejstvo se navezuje na pomanjkanje vrednotenja človeškega kapitala kot pomembnega dela ocene dodane vrednosti podjetja. Kaj izgubljamo z neupoštevanjem pomembnega dela dodane vrednosti zaposlenega v delovnem procesu? Podjetja podcenjujejo vložek

človeškega dejavnika. Posledično družba ne prepoznava nevidnih virov dodane vrednosti v podjetjih. Cilj članka je poudariti manjkajoči element človeškega kapitala v procesu vrednotenja podjetij in dvigovanje zavedanja o pomenu človeškega kapitala. Ob analizi obstoječih metod vrednotenja človeškega kapitala je očitno, da v svetu ne obstaja enotna rešitev. Ob naraščajočem deležu storitev, kjer prevladuje človeški kapital, je omenjeni tematiki nedvomno treba posvetiti več pozornosti. Članek se osredotoča na manjkajoči in nevidni element človeškega kapitala v okviru dodane vrednosti podjetja. Podaja predloge za vključitev človeškega kapitala v proces ocenjevanja dodane vrednosti podjetja kot tudi razmislek o nadaljnjih korakih v tej smeri.

Ključne besede: zaposleni, dodana vrednost, človeški kapital, vrednotenje

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