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*Cashless Payments and Economic Growth in Selected  
European Countries*

**Keywords:** cashless turnover; economic growth; real GDP per capita

**JEL:** E50; E59; G23

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**Abstract**

**Purpose of the article:** The aim of the paper was to show connections between the instruments of cashless payments and economic growth. The goal was to find the answers to the following research questions: What is the current share of payments with the use of particular forms of cashless payments in total payments?; What forms of cashless payments are connected with economic growth measured by real GDP per capita in the group of countries of Central and Eastern Europe and Western Europe?; What is the relation between the value of cashless payments and economic growth measured by real GDP per capita in the group of countries of Central and Eastern Europe and Western Europe?

**Research methods:** Spearman's rank correlation.

**Research results:** The authors have found that the highest share in terms of the number of payments in total payments in the countries of Central and Eastern Europe constituted payments with the use of payment cards, then, the payments with the use of a transfer order. Whereas, in the countries of Western Europe, apart from the fact that high percentage of payments in total constituted payments with the use of payment cards and transfer orders, more and more payments are made with the use of the instruments of e-money. Examining mutual relationships, information about correlational connections that occur between economic growth measured by GDP per capita and value of payments with the use of some instruments of cashless payments was obtained. The main conclusion that can be drawn after data analysis is positive relationships between the value of payments with the use of a transfer order, payment card and economic growth found both in the countries of Central and Eastern Europe and the countries of Western Europe. In the countries of Western Europe, the payments with the use of a direct debit turned out to be insignificant, whereas the payments with the use of instruments of e-money were significant. Taking into account the force of relationships, it can be said that higher positive correlation is shown by the value of payments with the use of a transfer order with reference to real GDP per capita in the countries of Western Europe (0.80). In the countries of Central and Eastern Europe, it is only 0.48. Mutual connections between the value of payments with the use of payment cards and economic growth are similar in both groups of countries. What is interesting, high impact on real GDP per capita – about 0.80 – is shown by the payments with the use of instruments of e-money. This study may represent a contribution to further research, that is, an analysis of cause-and-effect relationships in the field of cashless payments and economic growth, including division of countries in terms of, for example, the level of wealth.

**Added value:** Analysis of current literature on the impact of cashless payments on economic growth and an empirical analysis.

## Introduction

Cash and cashless payments are complementary elements of the payment system (Bank for International Settlements, 2003). Cashless turnover involves transactions in which both sides – the payer (usually debtor) and the payee (usually the creditor) – have a bank account and no cash is used at any stage of the clearing and settlement process (Narodowy Bank Polski, 2008, p. 9). Paul and Friday (2012, pp. 31–32) formulated a similar definition. Therefore, it might be concluded that cashless settlements are a substitute for cash due to the fact that they correspond to the classic functions of money: measure of value, accumulation, exchange, or unit of account (Arnold, 2007, pp. 574–581).

As a result of technological and IT development, new payment instruments have appeared enabling payments without physical use of cash. The following traditional instruments can be distinguished: transfer order, direct debit, cheques, payment cards, and recently e-money payments are becoming more and more important. Unlike traditional cash, cashless payments have many advantages. One of them is the reduction of thefts and other crimes associated with cash payments (Armey, Lipow, & Webb, 2014, pp. 46–57). What is more, cashless payments are beneficial for contractors. The various available forms of payment increase their income, which improves their operational efficiency and reduces operating costs (*Contactless...*,

2003). The cashless payments were also considered hygienic for food sellers (Paul & Friday, 2012, pp. 31–36). E-money payments are an important factor in the growth of consumption, production, domestic product and employment. The authors of a report commissioned by the VISA organization entitled *The Impact of Electronic Payments on Economic Growth* (Zandi, Koropeczyj, Singh, & Matsiras, 2016) think that e-money payments have positive impact on condition of state finances and creation of more stable and open business environment. They claimed that these payments also contribute to reducing the range of the shadow economy and unregistered cash payments. As a result, an increase in tax revenues may be noticed as well as a decrease in cash handling costs, payment guarantees for retailers and the coverage of financial services by further consumer groups. The international survey on the impact of e-money payments on economic growth carried out in the years 2011–2015 in 70 countries that together account for 95% of global GDP proves that promotion of e-money payments resulted in creation of an average of 2.6 million new jobs annually (Zandi et al., 2016, pp. 3–7).

The goal of the article is the assessment of connections between traditional forms of cashless payments and economic growth measured by GDP per capita in European countries with a division into countries of Central and Eastern Europe and Western Europe. The goal was to find the answers to the following research questions: What is the current share of payments with the use of particular forms of cashless payments in total payments?; What forms of cashless payments are connected with economic growth measured by real GDP per capita in the group of countries of Central and Eastern Europe and Western Europe?; What is the relation between the value of cashless payments and economic growth measured by real GDP per capita in the group of countries of Central and Eastern Europe and Western Europe?

The following 10 countries of Central and Eastern Europe were included in the research: Slovakia, Bulgaria, Poland, Czech Republic, Hungary, Romania, Lithuania, Latvia, Estonia, Slovenia, whereas France, Austria, Belgium, Germany, Holland, Luxembourg, Ireland, and Great Britain were included in the group of West European countries. EU countries were grouped in accordance with UN geographic classification (United Nations, 2019). Research period covers the years 2005–2018. The goal of the article will be achieved through reviewing current literature and conducting empirical research illustrated with an example of the above-mentioned countries. The achievement of formulated goal may constitute a contribution to further research, that is, an analysis of cause-and-effect relationships in the field of cashless payments and economic growth, including division of countries in terms of, for example, the level of wealth.

This article consists of three parts. A review of literature on the impact of cashless turnover on economic growth was presented in the first part. The variables were described in the second part. The third part includes the results of empirical research illustrated with an example of the above-mentioned European countries, and conclusions that can be drawn based on that research.

## Literature review

The impact of cashless payments on the economy may be analysed using the diffusion of innovation theory. This concept emerged in 1962 and was developed by Rogers (1995). The diffusion of innovation theory says that the adoption of a new idea or innovation is caused by the interaction between people through interpersonal networks. In this context, the dissemination of cashless payments should occur where consumers seek improvement, convenience during the time of payments, and companies search for new profit opportunities. The consequences of diffusion in cashless payments depend on willingness of the society to quickly accept cashless payments at various stages of the innovation process, including knowledge of the existence of cashless payments, belief in a positive attitude to cashless payments, the decision to accept cashless payments, implementation of cashless payments and confirmation of accepting a cashless payment on the basis of positive results.

A literature review that includes theoretical studies on the impact of cashless turnover on the economy, as well as the results of current empirical studies on this issue and numerous reports indicate the positive impact of cashless turnover on the economy. Positive relations between cashless payments and economic growth were noticed, *inter alia*, by Hasan, Renzis and Schmiedel (2012, pp. 1–41). They examined the relationship between retail payments and general economic growth based on data from 27 countries over the years 1995–2009. Their research results have shown that electronic retail payments (e-payments) stimulate overall economic growth, consumption and trade (*Ibid.*, pp. 21–22). E-money payment may be defined as a payment that is initiated, executed and received electronically (European Central Bank, 2010). E-payments made using payment cards have become a special feature of modern economics (Arai, 2004, pp. 1–24). The strongest impact on economic growth was observed in the case of card payments and then in the case of credit transfer and direct debit. Furthermore, research results have shown that checks have a relatively small impact on economic growth, as well as on consumption and trade. The hypothesis that the processes of harmonization and integration of retail markets have a positive impact on the development of trade and consumption – mainly due to the creation of the payment-integration area (SEPA) – has been positively verified. In addition, the research shows that the impact of retail payments on economic growth is more evident in euro area countries than in countries not being the part of this zone. Cirasino and Garcia (2008, pp. 1–78) noticed a beneficial effect of cashless payments on economic growth. They think that this system simplifies commercial transactions not only for consumers, but also for businesses, which has a significant impact on economy. The main advantages of using cashless payment methods include: speed of transactions and security (*Ibid.*, p. 21). The positive impact of cashless payments on the economy was also noticed by Slozko and Pelo. In their research, they proved that there is a positive correlation between the growth of e-payments and the growth of GDP. They came to the conclusion that the use of cashless payments is closely

related to the level of economic development of a given country (Slozko & Pelo, 2014, pp. 130–140). On the one hand, the higher level of prosperity and financial system development in richer countries encourages cashless payments, while on the other hand, cashless payments contribute to economic acceleration. Oginni, Gambo, Abba and Onuh are of the similar opinion on this subject. Moreover, they pointed out that only mobile money service had a positive impact on economic growth, while other e-money payment channels had a negative impact (Oginni et al., 2013, pp. 913–918). Tee and Ong analysed the effects of using cashless payments such as: check, payment card, telegraphic transfer – payment via real-time or offline request – and electronic money in five European Union countries: Austria, Belgium, France, Germany and Portugal over the years 2000–2012 (Tee & Ong, 2016, pp. 1–9). They reached the conclusion that the impact of cashless payments on economic growth, expressed by the relation of Gross Domestic Product to the Consumer Price Index (CPI) may only be observed in the longer period. It means that any policy that promotes cashless payments does not have an immediate impact on economy and works only over the longer term.

The latest results on the impact of cashless payments on economic growth have been published in the annual reports of the authors and analysts of the Moody's agency, i.e. Zandi and co-workers (2016, pp. 1–31). On the basis of the research on the macroeconomic data of 70 countries in 2011–2015, it was noted that retail payments contribute to the growth of trade and consumption, which in turn supports production and overall economic growth. In the analysed sample, it was found that there is a positive correlation between the penetration and use of payment cards, and economic growth. The increasing use of e-money payments, especially credit and prepaid debit cards, not only resulted in an increase in consumption by 0.2% in emerging markets and 0.14% in developed countries, but also in an increase in GDP by 0.11% and 0.08%, respectively, which corresponds to the total of USD 297 billion. The increased use of e-money payments makes the economy more efficient, reduces transaction costs and contributes to improving the flow of goods and services. As a result of the growing popularity of e-money payments, the general increase in employment in all 70 countries by 2.6 million was also noticed during the considered period. The largest increases in jobs were found in China – an average of 427,000 new jobs a year and in India – 336,000. The studies have shown that the development of e-money payments itself may not be enough to increase the welfare of the country. In order to receive the best effect, developed financial system and a “healthy” economy are also necessary. In order to promote cashless payments, the authors of the report recommended that state authorities should limit the regulations to the necessary minimum, favour the creation of developed financial infrastructure and support consumption growth. In addition, the adoption of e-money payments is significant for the transparency of settlements between the contractors and also encourages the reduction of the frauds in the payments with the use of cash (Mieseigha & Ogbodo, 2013, pp. 11–16).

The research results presented above were mainly based on the analysis of the impact of cashless payments – mostly by cards – on the components of global demand. A slightly different approach in the analyses of economic growth was applied by the researchers, among others, by Jaliil or Idrees, who based their economic growth study on an analysis of supply and transformations of the production function of Solow or Cobb-Douglas (Jalil & Idrees, 2013, pp. 383–388). They analysed the scale of the impact of education and technical progress on the creation of national income in various economies.

Despite the fact that cashless payments have a positive impact on the business activities, it should also be remembered that they may also create various types of threats. Although technological progress has enabled improvement and innovation in the electronic payment system from a basic ATM card transaction to Internet transfer, there are still current problems related to the security of users of these instruments. Phishing emails are just some of the shortcomings of cashless payments (Oginni et al., 2013). The risk of losing money weakens consumer confidence in making e-money payments. Park, using macroeconomic data from 70 countries, from the least developed Bangladesh to the developed United States over the years 2002–2004 proved that the development of cashless payments contributes to the phenomenon of corruption, which reduces the quality of private investment, and that leads to a reduction of economic growth (Park, 2012, pp. 907–929). Ezuwore-Obodoekwe, Eyisi, Emengini and Chukwubuzo discovered, based on the example of Nigeria, that the transition from cash to cashless forms of payment causes the loss of autonomy of that central bank (Ezuwore-Obodoekwe et al., 2014, pp. 30–42). If the central bank loses its ability to control money supply, then inflation in the economy increases (Al-laham, Altarawneh, & Abdallat, 2009, pp. 339–349).

There is no unambiguous evidence on how adoption of cashless payments would affect economy. The research on the analysis of mutual relationships between economic growth and instruments of cashless turnover were usually focused only on payments with the use of a payment card or with the use of instruments of e-money. The research usually included all European countries, without dividing them in terms of, for example, the level of economic development. Examining relationships between instruments of cashless payments and economic growth may be a basis for further, more deepened, analyses.

### **Description of variables**

To achieve the goal, an analysis of data for countries of Central and Eastern Europe and Western Europe was conducted. Data for 10 countries of Central and Eastern Europe and for 8 countries of Western Europe in the years 2005–2018 were used in the research. The variables applied to verify research hypotheses were described in Table 1.

**Table 1.** Description of variables

| Variable            | Source                         | Description of a variable  |
|---------------------|--------------------------------|--|
| Real GDP per capita | Eurostat, Database             | Real GDP, that is, nominal GDP/GDP deflator per one person (in euro)   |
| Credit transfer     | ECB Statistical Data Warehouse | Value of payments with the use of a transfer order (in million euro per 1 million inhabitants)   |
| Direct debits       | ECB Statistical Data Warehouse | Value of payments with the use of a direct debit (in million euro per 1 million inhabitants)   |
| Cheques             | ECB Statistical Data Warehouse | Value of payments with the use of cheques (in million euro per 1 million inhabitants)  |
| Card payments       | ECB Statistical Data Warehouse | Value of payments with the use of a payment card: debit, credit or charge card American Express or Diners (in million euro per 1 million inhabitants)                                  |
| E-money payments    | ECB Statistical Data Warehouse | Value of payments with the use of instruments of e-money, in which e-money is a cash value stored on the electronic device: server or card (in million euro per 1 million inhabitants) |

Source: Authors' own study.

Economic growth is understood as a process, which results in, from period to period, an increase of basic economic sizes. It mainly refers to the size of potential domestic product, potential real national product or increasing of manufacturing capabilities of economy. Economic growth means the change in the flows of goods and services, economic resources and improvement of quantitative relations of production and division of goods and services, which leads to the improvement of their quality and increasing the amounts per every resident of the country (Stachowiak, 1996, p. 64). The basic measure of economic growth is GDP, and for comparisons between the countries, GDP per capita. Central Statistical Office defines gross domestic product as a result of activity of all entities of national economy. In order to calculate the values of annual GDP, there must be estimated three, equal in terms of value, macroeconomic categories determining the GDP through (Central Statistical Office, [www.stat.gov.pl](http://www.stat.gov.pl)):

- the size of production activity; GDP is equal to the sum of added value of all institutional sectors or all sections of Polish Classification of Activities (PKD), domestic production units increased by taxes on products and decreased by subsidies to products,
- the final result of production activity; GDP is calculated as a sum of domestic demand, that is, consumption, accumulation and balance of foreign trade,
- the sum of expenses on the account of creating income of economy in total (the costs connected with employment, taxes connected with production and import decreased by subsidies, gross operating surplus and mixed income of economy in total).

Therefore, it can be said that the growth of GDP and GDP per capita is the result of quantitative changes in economy. For further analysis, as a measure of economic growth, real gross domestic product will be applied that is a result of dividing gross

domestic product (PLB) by its consumer price index (CPI) (Apergis & Payne, 2010, p. 3; Slesman, Baharumshah, & Ra'ees, 2015, pp. 214–226; Wang, Li, Fang, & Zhou, 2016, Cevik, Dibooglu, & Kenc, 2016, pp. 360–371; Conti, 2014, pp. 199–211). Real GDP in the years 2005–2018 was obtained from international financial statistics of Eurostat.

Data about the value of payments with the use of a transfer order, direct debit, payments by card, cheques and e-money payments in the years 2005–2018 were taken from the ECB Statistical Data Warehouse.

### **Empirical research and conclusions**

An empirical analysis was started from examining the share of payments with the use of specific cashless instruments in the number of payments in total in 2018. Table 2 shows that the highest percentage in the countries of Central and Eastern Europe of payments in total constituted payments with the use payment cards, then, the payments with the use of a transfer order. Over 60% of total payments were payments with the use of payment cards in the countries of Central and Eastern Europe (e.g. Hungary, Estonia, Latvia, Romania). The cheques, payments with the use of e-money or other payments constituted small share of payments in total. The payment cards were the least significant in Bulgaria. When it comes to the countries of Western Europe, it was observed that payments with the use of payment cards were the most popular – especially in Great Britain – more than 70%. The lowest percentage of payments with the use of payment cards was in Luxembourg in 2018 – only 5.27%. The decrease of share of payments with the use of payment cards results from increased demand for payments with the use of e-money and its instruments, to more than 90% in 2018. In the countries of Western Europe, the cheques are rarely used (mainly in France and Ireland), but despite that share of payments with the use of this payment instrument is larger than in the countries of Central and Eastern Europe.

**Table 2.** The share of the number of payments with the use of various instruments of cashless payments in total payments in 2018

| Country                                 | Transfer order                    |        | Direct debit                      |        | Payment cards                     |        | Cheques                           |       | E-money                           |        | Other payment services            |        | In total number of payments (in thousands) |
|---|-----------------------------------|--------|-----------------------------------|--------|-----------------------------------|--------|-----------------------------------|-------|-----------------------------------|--------|-----------------------------------|--------|--|
|   | number of payments (in thousands) | share  | number of payments (in thousands) | share  | number of payments (in thousands) | share  | number of payments (in thousands) | share | number of payments (in thousands) | share  | number of payments (in thousands) | share  |  |
| Countries of Central and Eastern Europe |                                   |        |                                   |        |                                   |        |                                   |       |                                   |        |                                   |        |  |
| Slovakia                                | 423,844                           | 99.55% |                                   |        |                                   |        | 27                                | 0.01% | 1,875                             | 0.44%  |                                   |        | 425,746                                    |
| Bulgaria                                | 295,043                           | 63.86% |                                   |        | 160,888                           | 34.75% |                                   |       | 6,403                             | 1.38%  |                                   |        | 462,934                                    |
| Poland                                  | 2,818,967                         | 37.28% | 29,425                            | 0.39%  | 4,713,169                         | 62.33% | 82                                | 0.00% |                                   |        |                                   |        | 7,561,643                                  |
| Czech Republic                          | 860,873                           | 43.11% | 45,491                            | 2.28%  | 1,090,480                         | 54.61% | 143                               | 0.01% |                                   |        |                                   |        | 1,996,987                                  |
| Hungary                                 | 337,705                           | 26.30% | 77,366                            | 6.02%  | 834,410                           | 64.98% |                                   |       |                                   |        | 34,698                            | 2.70%  | 1,284,179                                  |
| Romania                                 | 289,374                           | 30.88% | 12,766                            | 1.36%  | 634,847                           | 67.75% |                                   |       |                                   |        | 57,539                            | 10.10% | 936,987                                    |
| Lithuania                               | 183,823                           | 32.28% |                                   |        | 328,135                           | 57.62% |                                   |       | 70                                | 0.01%  |                                   |        | 569,497                                    |
| Latvia                                  | 175,404                           | 36.05% |                                   |        | 311,029                           | 63.93% |                                   |       |                                   |        |                                   |        | 486,503                                    |
| Estonia                                 | 159,842                           | 31.69% |                                   |        | 340,367                           | 67.48% |                                   |       |                                   |        | 4,176                             | 0.83%  | 504,385                                    |
| Slovenia                                | 157,672                           | 36.32% | 41,836                            | 9.64%  | 202,781                           | 46.71% | 11                                | 0.00% |                                   |        | 31,792                            | 7.32%  | 434,092                                    |
| Countries of Western Europe             |                                   |        |                                   |        |                                   |        |                                   |       |                                   |        |                                   |        |  |
| France                                  | 4,037,381                         | 17.18% | 4,211,089                         | 17.92% | 13,290,762                        | 56.56% | 1,746,881                         | 7.43% | 61,544                            | 0.26%  | 150,383                           | 0.64%  | 23,498,040                                 |
| Austria                                 | 578,664                           | 29.65% | 457,600                           | 23.45% | 863,869                           | 44.26% | 673                               | 0.03% | 4,422                             | 0.23%  | 46,465                            | 2.38%  | 1,951,693                                  |
| Belgium                                 | 1,604,117                         | 37.68% | 500,077                           | 11.75% | 2,094,870                         | 49.20% | 1,104                             | 0.03% | 48,652                            | 1.14%  | 8,856                             | 0.21%  | 4,257,676                                  |
| Germany                                 | 6,452,653                         | 28.48% | 10,616,449                        | 46.86% | 5,297,232                         | 23.38% | 10,479                            | 0.05% | 33,494                            | 0.15%  | 245,727                           | 1.08%  | 22,656,034                                 |
| Holland                                 | 2,567,911                         | 29.49% | 1,406,193                         | 16.15% | 4,731,988                         | 54.35% | 75                                | 0.00% | 556                               | 0.01%  | 311                               | 0.00%  | 8,707,034                                  |
| Luxembourg                              | 77,523                            | 2.38%  | 19,149                            | 0.59%  | 171,878                           | 5.27%  | 262                               | 0.01% | 2,993,827                         | 91.76% |                                   |        | 3,262,639                                  |
| Ireland                                 | 311,481                           | 66.07% | 132,298                           | 28.06% |                                   | 0.00%  | 27,645                            | 5.86% |                                   | 0.00%  |                                   |        | 471,424                                    |
| Great Britain                           | 4,673,000                         | 14.53% | 4,355,840                         | 13.55% | 22,782,000                        | 70.85% | 346,000                           | 1.08% |                                   | 0.00%  |                                   |        | 32,156,840                                 |

\*the division of instruments of cashless payments conforming with EBC

Source: Authors' own study based on (ECB Statistical Data Warehouse, <http://sdw.ecb.europa.eu/>).

Then, mean, median, minimum, maximum, standard deviation, coefficient of variation and skewness coefficient were determined for selected variables (Table 3).

**Table 3.** Statistical parameters of variables

| Variable                                | Unit of measure                        | Mean       | Median     | Minimum   | Maximum      | Standard deviation | Coefficient of variation | Skewness coefficient |
|---|--|------------|------------|-----------|--------------|--------------------|--------------------------|----------------------|
| Countries of Central and Eastern Europe |  |            |            |           |              |                    |                          |                      |
| Credit transfer                         | million euro per 1 million inhabitants | 159.209,77 | 142.433,13 | 9.207,11  | 1.059.348,79 | 132.752,69         | 83.38                    | 3.90                 |
| Direct debits                           | million euro per 1 million inhabitants | 3.485,60   | 215.43     | 18.23     | 75.389,30    | 11.911,12          | 341.72                   | 4.80                 |
| Cheques                                 | million euro per 1 million inhabitants | 102.52     | 11.74      | 0.00      | 1.196,00     | 228.76             | 223.14                   | 3.27                 |
| Card payments                           | million euro per 1 million inhabitants | 1.240,79   | 954.63     | 50.46     | 4.843,25     | 971.71             | 78.31                    | 1.05                 |
| E-money payments                        | million euro per 1 million inhabitants | 23.57      | 2.11       | 0.00      | 836.37       | 116.94             | 496.18                   | 6.86                 |
| Real GDP per capita                     | euro per capita                        | 11.221,43  | 10.800,00  | 4.200,00  | 20.200,00    | 3.785,33           | 33.73                    | 0.23                 |
| Countries of Western Europe             |  |            |            |           |              |                    |                          |                      |
| Credit transfer                         | million euro per 1 million inhabitants | 770.531,50 | 384.627,78 | 31.432,80 | 3.032.558,43 | 726.995,92         | 94.35                    | 1.42                 |
| Direct debits                           | million euro per 1 million inhabitants | 27.652,78  | 18.854,17  | 4.275,19  | 165.537,91   | 32.357,83          | 117.01                   | 3.28                 |
| Cheques                                 | million euro per 1 million inhabitants | 21.647,55  | 5.132,57   | 41.06     | 215.672,85   | 42.677,77          | 197.15                   | 3.35                 |
| Card payments                           | million euro per 1 million inhabitants | 6.594,47   | 5.757,60   | 1.771,56  | 17.973,07    | 3.681,14           | 55.82                    | 1.24                 |
| E-money payments                        | million euro per 1 million inhabitants | 12.703,36  | 18.87      | 0.63      | 213.993,50   | 40.180,45          | 316.30                   | 3.61                 |
| Real GDP per capita                     | euro per capita                        | 40.758,93  | 35.150,00  | 29.200,00 | 84.400,00    | 15.481,61          | 37.98                    | 1.97                 |

Source: Authors' own study with the use of Statistica software.

All variables selected for the countries of Central and Eastern Europe and Western Europe are characterized by right-sided asymmetry. The highest value of payments in both groups of countries was made with the use of transfer orders, whereas the lowest value with the use of e-money payments, and then cheques. The average value of payments with the use of payment cards, just like the value of payments with the use of direct debits, cheques ore-money payments was higher for countries of West-

ern Europe than for countries of Central and Eastern Europe. Only average value of payments with the use of transfer orders turned out to be higher in the countries of Central and Eastern Europe (EUR 159.209,77 million per capita).

Then, the level of correlation of real GDP per capita was verified with specific instruments of cashless payments, as well as correlation between cashless instruments (Table 4). In order to determine relationships between economic growth measured by real GDP per capita and value of payments with the use of specific instruments of cashless payments, Spearman's rank correlation coefficients were calculated ( $r_s$ ) (Aczel, 2000, p. 742). This coefficient may have the values within the range  $[-1, 1]$ , however, the closer  $r_s$  value to 1, the stronger the positive relationship, and the closer to -1 – the stronger the negative relationship.  $r_s$  value close to zero means the lack of relationships or very weak relationship between variables.

Table 4. Spearman's rank correlation coefficients

| Variables                               | Credit transfer  | Direct debits    | Cheques          | Card payments    | E-money payments | Real GDP per capita |
|---|------------------|------------------|------------------|------------------|------------------|---------------------|
| Countries of Central and Eastern Europe |                  |                  |                  |                  |                  |                     |
| Credit transfer                         | 1.000000         | <b>0.362893</b>  | <b>-0.343030</b> | <b>0.448888</b>  | 0.096235         | <b>0.479045</b>     |
| Direct debits                           | <b>0.362893</b>  | 1.000000         | -0.185376        | <b>0.720079</b>  | -0.273752        | <b>0.855875</b>     |
| Cheques                                 | <b>-0.343030</b> | -0.185376        | 1.000000         | <b>-0.396216</b> | <b>-0.545034</b> | -0.096099           |
| Card payments                           | <b>0.448888</b>  | <b>0.720079</b>  | <b>-0.396216</b> | 1.000000         | 0.186414         | <b>0.797276</b>     |
| E-money payments                        | 0.096235         | -0.273752        | <b>-0.545034</b> | 0.186414         | 1.000000         | 0.007644            |
| Real GDP per capita                     | <b>0.479045</b>  | <b>0.855875</b>  | -0.096099        | <b>0.797276</b>  | 0.007644         | <b>1.000000</b>     |
| Countries of Western Europe             |                  |                  |                  |                  |                  |                     |
| Credit transfer                         | 1.000000         | 0.004050         | <b>-0.294649</b> | <b>0.767132</b>  | <b>0.892039</b>  | <b>0.804357</b>     |
| Direct debits                           | 0.004050         | 1.000000         | -0.148842        | <b>-0.422619</b> | -0.098350        | -0.179284           |
| Cheques                                 | <b>-0.294649</b> | -0.148842        | 1.000000         | -0.027105        | -0.173201        | -0.223632           |
| Card payments                           | <b>0.767132</b>  | <b>-0.422619</b> | -0.027105        | 1.000000         | <b>0.784736</b>  | <b>0.731574</b>     |
| E-money payments                        | <b>0.892039</b>  | -0.098350        | -0.173201        | <b>0.784736</b>  | 1.000000         | <b>0.796813</b>     |
| Real GDP per capita                     | <b>0.804357</b>  | -0.179284        | -0.223632        | <b>0.731574</b>  | <b>0.796813</b>  | 1.000000            |

\*correlation coefficients in bold are significant for  $p < 0.05$

Source: Authors' own study.

Examining mutual relationships, information about correlational connections that occur between economic growth measured by real GDP per capita and instruments of cashless payments were obtained. The main conclusion that can be drawn after data analysis is that positive relationships between the value of payments with the use of a transfer order, payment card and economic growth can be found both in the countries of Central and Eastern Europe and countries of Western Europe. In the countries of Western Europe, there is no statistical significance for payments with the use of a direct debit and cheques, whereas the payments with the use of instruments of e-money turned out to be statistically significant. In the countries of Central and Eastern Europe, there is no statistical significance between the value of payments

with the use of instruments of e-money and cheques. Whereas, taking into account the force of relationships, it can be said that higher positive correlation is shown by the value of payments with the use of a transfer order with reference to GDP per capita in the countries of Western Europe (0.80) than in the countries of Central and Eastern Europe – only 0.48. Mutual relationships between the value of payments with the use of payment cards and economic growth are similar in both groups of countries. What is interesting – high impact on real GDP per capita is shown by the payments with the use of instruments of e-money – coefficient ( $r_s = 0.80$ ).

### Summary

Cashless turnover is a significant rate of economic development of a given country. Strong correlation between the value of payments with the use of a transfer order and payment cards results, to a large extent, from the number of payments made using these payment instruments. The use of direct debits is decreasing – mainly in the case of mass payments, which shows small share of the number of payments with the use of this payment instrument in total payments. Transfer order is a payment instrument that is significant mainly for entrepreneurs. The lack of correlation relationship between the value of payments with the use of cheques and real GDP per capita results from decreasing interest in this payment instrument and resigning from this form of payment. Relatively low level of using instruments of e-money in the countries of Central and Eastern Europe can be caused by demographic factors, costs or access to technical infrastructure. Therefore, the level of GDP per capita – to some extent – explains relatively lower levels of using these instruments in particular countries. Strong correlation between real GDP per capita and value of payments with the use of payment instruments such as transfer order, payment cards, e-money may represent a contribution to further research, that is, an analysis of cause-and-effect relationships in the field of cashless payments and economic growth, including division of countries in terms of, for example, the level of wealth.

In the countries of Western Europe, average real GDP per capita was higher than in the countries of Central and Eastern Europe. The average value of payments with the use of a transfer order, direct debit, payment card or e-money was also higher. Although Central and Eastern Europe is developing faster in comparison with the countries of Western Europe, it is still perceived as less developed. However, its advantage is not gradual, but abrupt growth than can help them to quickly catch up with the West. In the countries of Central and Eastern Europe, the changes occur much faster, which ultimately means that these countries are heading directly from the past to the future faster than the countries of Western Europe. In the countries of Western Europe, developing payment infrastructure makes the payments with the use of instruments of e-money more and more popular. The countries of Western Europe have more consolidated networks of payments, more developed infrastructure – pay-

ment cards are accepted by the majority of retailers. In these countries, the average level of value of payments in the analysed period was five times higher than in the countries of Central and Eastern Europe. It is not surprising, taking into account that cash payments are still common in the countries of Central and Eastern Europe. In more developed economies, in which the use of cards has reached a high level, the use of cards is growing slower. Recession inhibited the growth of use of the cards, however, this growth was slower in the developed countries and had no significant impact on the economies of Central and Eastern Europe. It explains the fact that the countries of Central and Eastern Europe may have higher impact on GDP through increasing the rate of penetration of cards, and – as a result – growth of value of payments by cards. It can be achieved through development of infrastructure of retail payments to equal economies of higher level of GDP – dissemination of mechanisms of payments, enabling acceptors to adopt e-money payments.

The impact of adoption of cashless payments on economic growth can be observed only in the longer period. Hence, the actions promoting cashless payments in many countries will not have an immediate impact on economy. Moreover, the impact of cashless turnover on economic growth can be different depending on the form of making cashless payments. Although positive relationship has been proven, we still do not know its force, which is hard to determine. Various models applied in current research showed a positive impact of cashless turnover on economic growth. There is still no answer to the question of what determines the direction and force of impact of cashless turnover on economic development in various countries. In this case, research results are ambiguous. This study represents a contribution to further research, among others, aiming at improvement of existing panel models, which has already been attempted in literature (*Electronic ...*, 2013, p. 50; Tee & Ong, 2016, p. 4).

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