Are digital financial payments constrained by the country's income? Evidence from the Global Findex database[1]

Да ли су дигитална финансијска плаћања ограничена дохотком земље? Искуства на основу базе података Global Findex

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Abstract: The combined effect of ICT improvement, digitalization and change in clients' habits lead to changes in the financial sector worldwide. Increased use of digital financial services (DFS) is a change that might help to increase financial inclusion, which is particularly important for developing countries. As income is considered a critical driver of digital payments, this study aims to determine whether there is a linear relationship between a country's income measured by the level of Gross National Income per capita (GNI p.c.) and the use of digital payment services, i.e., making and receiving digital payments. We used data from the Global Findex and World Bank databases for 2017 to conduct the research, which covered 141 countries. The presence of a linear relationship between the level of GNI p.c. and the use of digital payments was tested using correlation analysis. The results of the correlation analysis show that there is a significant strong positive linear relationship between the level of GNI p.c. and the use of digital payment services in both segments, i.e., making and receiving payments. Findings are consistent with previous research and confirmed the important role of income as a driver of the use of DFS.
Keywords: digital payments, digital financial services, income, The Global Findex database, development
JEL classification: G20, O00

Сажетак: Комбиновани ефекат побољшања ИКТ, дигитализације и промене навика клијената довео је до промена у финансијском сектору широм света. Повећана употреба дигиталних финансијских услуга је промена која би могла помоћи у повећању финансијске инклузије, што је посебно важно за земље у развоју. Како се приход сматра критичним покретачем дигиталних плаћања, ова студија има за циљ да утврди да ли постоји линеарна веза између прихода земље мерена нивоом бруто националног дохотка по глави становника и употребе дигиталних платних услуга, тј. извршавања и примања дигиталних плаћања.

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За спровођење истраживања које је обухватило 141 земљу, коришћени су подаци из *Findex* базе и базе података Светске банке за 2017. годину. Присуство линеарне везе између нивоа БНД-а по глави становника и коришћења услуга дигиталних плаћања тестирано је помоћу корелационе анализе. Резултати корелационе анализе показују да постоји значајна јака позитивна линеарна веза између нивоа БНД-а по глави становника и коришћења услуга дигиталног плаћања у оба сегмента, тј. извршавања и примања дигиталних плаћања. Налази су у складу са претходним истраживањима и потврдили су важну улогу прихода као покретача употребе дигиталних финансијских услуга.
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Кључне речи: дигитална плаћања, дигиталне финансијске услуге, доходак, *Findex* база података, развијеност

ЈЕЛ класификација: G20, O00

Introduction

Ongoing technology progress has significantly changed the landscape of global finance. Rapid technological development results in the availability of a large amount of information in digital form (Spalević et al., 2019). Better Internet accessibility and an increase in the use of mobile devices (computers, mobile phones and tablets) have imposed a redefinition of financial institutions business strategies, shifting the focus to digital payments and platforms. The data from the World Bank show the growing trend in the global number of Internet users. Around 6.5 percent of the world's population used the Internet in 2000; by 2005, that number had risen to 15.8 percent, and by the end of 2018, it had increased to 51 percent (https://data.worldbank.org/indicator/IT.NET.USER.ZS). On the other hand, the number of owners of smartphone increased by as much as three times in 2018 (3.2 billion) compared to 2012 (1.06 billion) (https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/).

Also, the percentage of households that have a personal computer increased from 27.3% in 2005 to 48.8% in 2018. In addition, predictions about the number of mobile devices suggest a growing trend, as it is expected that by 2024 there will be about 17 billion mobile devices worldwide or around 2.1 devices per person. That is an increase of as many as 3 billion devices compared to 2020. Based on the available projections (https://www.statista.com/statistics/245501/multiple-mobile-device-ownership-worldwide/ ; https://www.worldometers.info/world-population/world-population-projections/), we can conclude that the average annual growth rate of the number of mobile devices in the period 2020-2024 will be higher than the average annual growth rate of the world population. All of the above points to the fact that smart and mobile devices are becoming increasingly important in everyday life, which indicates that changes in the distribution of financial services are inevitable and are already happening. As the data presented so far suggest greater opportunities and use of digital payments, we should emphasize the estimates of the International Telecommunication Union - ITU (2018) showing that slightly less than 50% of the population in developing countries do not own mobile phone. This issue prevents them from accessing any digital services using mobile devices.

The above mentioned trends change the nature of the distribution of financial services and contribute to the development of modern solutions that can satisfy clients' financial needs. Bank clients can use the Internet and mobile devices to take an insight into

the account balance, make digital payments, transfer funds between accounts, receive payments, etc. This has led to a change in bank clients' behaviour reflected in a reduction in the number of their physical visits to branches. A basic prerequisite for using financial services is owning an account in a financial institution, most often a bank. The distribution of the number of financial accounts differs between countries and depends on numerous factors, country's income status being one of the important ones among them. Having in mind that according to the Global Findex database, 87% of respondents from low-income countries did not have financial institution account in 2011, it is obvious that this is one of the greatest barriers for using digital financial services. This negative trend is changing, and according to the same source, the number of account owners is increasing, and 76% of individuals from low-income countries did not have an account in 2017. On the other hand, residents from high-income countries showed significantly higher interest in using bank accounts given that 88% (in 2011) and 94% (in 2017) of respondents, respectively, stated that they had a financial account during the research period (Demirgüç-Kunt et al., 2018).

Recently, there has been a growing interest in conducting transactions digitally. In this regard, it is important to create appropriate digital security mechanisms for our society (Aryamov et al., 2019) given the dangers of crime in the digital space. According to the Bank for International Settlement (BIS), the average number of digital payments in the member countries of the Committee on Payments and Market Infrastructures (CPMI) increased from 176 per capita in 2012 to 303 per capita in 2019. Parallel to this, the value of digital payment transactions amounted to 3,859 billion dollars globally in 2019, with China being the largest market in the world in the field of digital payments (41.36% of total transactions value). During the same period, cash payments decreased by about 30% in developed countries, while in the case of developing countries they continued to grow.

The reduction of physical visits to bank branches is confirmed by several surveys conducted in the different economic surroundings. Research conducted on the US bank clients during 2019 revealed that they preferred mobile banking services (42% of respondents) and digital experience via computer (27%), while about 30% of respondents preferred going to a bank branch (Coconut Software and WBR Insights, 2019). Another study covering seven CEE countries showed that clients preferred the combination of digital channels and bank visits. In Serbia and Croatia, where bank visits predominated, the combination of digital and branch communication with the bank is the fastest-growing approach (Erste Group, 2019).

This paper is structured as follows. After the analysis of the relevant literature related to digital financial services (DFS), including income as a vital factor that influences the use of DFS, we examined the relationship between the use of the digital payment services and the level of GNI per capita using correlation analysis. The results of our analysis confirmed that income plays an important role in the use of DFS given that the authors found a strong positive correlation between the country's income measured by GNI p.c. and the use of digital payment services. The last segment of this paper includes the main conclusion and recommendations for further research.

1. Literature review and hypotheses

Digital financial services (DFS) can be defined as financial services which are based on digital technologies (Pazarbasioglu, 2020). DFS include products and services that allow users to have a transaction account and make payments, savings, loans, and insurance. Digital channels include mobile banking (m-banking), online banking (e-banking), mobile wallet (mobile money), ATMs (only funds transfer and bill payment), POS terminals, and other digital systems (Alliance for Financial Inclusion, 2016; Kambale, 2017). According to Jokić et al. (2019) one of the greatest IT achievements related to financial services is mobile banking. In this research, we use the definition of digital payments by Agur et al. (2020) as a non-cash transaction performed through digital channels. Depending on local regulations, providers of digital financial services can be banks, other financial institutions, and licensed non-banking intermediaries. In many countries, banks are the key actors in providing digital financial services (International Telecommunication Union – ITU, 2017). DFS's potential is built on multiple advantages, including lower costs, faster transactions, overcoming geographical barriers to access services, offering security and transparency, and the possibility to customise and construct services adapted to the clients' needs. DFS are also significant in overcoming barriers that exist on the bank side (e.g., high operating costs, limited competition, geographic barriers, etc.) (Pazarbasioglu, 2020; Klapper & Singer, 2014).

Financial inclusion refers to accessing and using formal financial services (Ljumović & Pavlović, 2021). It is related to the provision of affordable, accessible, and relevant financial products and services to individuals and firms (Kumar & Mohanty, 2011), regardless of age, gender, social status, net worth, or company size. Many countries now consider digital financial services to be the most important method for financial inclusion (ITU, 2017; World Development Report, 2016; Demirgüç-Kunt et al., 2018). The development of fintech ecosystems is important for improving financial inclusion in emerging economies. However, there are significant heterogeneities in terms of gender, age, education, and socioeconomic status across populations (Lyons et al., 2020:1), which should also need to be considered when analysing the use of digital financial services. Financial inclusion is one of the critical elements to ending poverty (Oz-Yalaman, 2019), where digital financial services represent a key factor that can stimulate economic growth and reduce income inequality. Countries with a higher level of financial system development are considered to have a greater poverty reduction and lower income inequality (Pazarbasioglu, 2020). Income inequality varies among countries. Findings from a study observing 105 countries showed that, in general, developing countries are high inequality countries, while typically developed countries represent low inequality countries (Keskin, 2017). In addition, Aad & Young (2020) stated that the share of digital payments is an important indicator of economic development.

According to the OECD, key factors that influence the development of the digital economy (digitalization) in developing countries are ICT infrastructure, ICT skills, finance, regulation, and the interaction between them (Dahlman et al., 2016). Digitalization has not bypassed the banking sector, with the highest level of activities in the most developed

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economies (Druhov et al., 2019). The affordability of the Internet plays an important role in digitalization and thus in accessing digital financial services. The combined effect of geographical, physical, and economic constraints has resulted in problems with the Internet in developing countries. Hence, the Internet should be cheaper and more available (Dahlman et al., 2016) to achieve greater use of DFS.

Digitalization and innovations are related concepts, as financial innovations characterized and shaped the banking sector as we know it today. The pioneer in innovations across the globe were actors from the developed countries, and consequently, developing countries have a longer time-lag in adopting innovations (Bara, 2016). Even though this lag was reduced over time, the developing countries are still behind in terms of widespread technological diffusion (Comin & Mestieri, 2018). Developed countries are at a more advanced development stage of digital channels such as e-banking and m-banking compared to the developing countries, consequently, it is considered that there are differences in acceptance of these services by citizens (Abdinoor & Mbamba, 2017; Bryson & Atwal, 2013). In terms of countries' geographical distribution vis-à-vis individuals' engagement in m-banking, Asia-Pacific region stands out in both usage and intention to use mobile service (Nielsen, 2016). In Serbia, m-banking usage and payments show a strong and persistent rise in recent years (Lukić & Živković, 2017). In Serbia, perceived security represents one of the major factors which significantly influence the intention to use m-banking (Antonijević et al., 2021) as well as the attitudes towards internet banking (Filipović, 2019).

The primary reason influencing the time-lag and slower diffusion of innovation is the country's income level. Baliamoune-Lutz (2003) revealed more than two decades ago that ICT diffusion in developing countries is limited by income per capita. Earlier studies found that income increase is usually positively associated with the adoption of innovation (Karjaluoto et al., 2002; Lee et al., 2002). These findings are confirmed by Kolodinsky et al. (2004, p. 250) who found that those with higher income had a higher intention probability to adopt e-banking technologies and Sulaiman et al. (2007, p. 163) who stated that income level is significantly associated with the adoption of mobile banking. Also, an increase in per capita income can be considered as one of the crucial drivers of digital payments (Herwadkar et al., 2019).

Based on all the above, the following hypotheses were developed:

H1: There is a significant positive relationship between the level of GNI p.c. and the use of digital payment services

H1a: There is a significant positive relationship between the level of GNI p.c. and the percentage of those who made digital payments

H1b: There is a significant positive relationship between the level of GNI p.c. and the percentage of those who received digital payments

2. Methodology and results

To identify the differences between a country's income and using DFS, we used the World Bank Global Findex database. This database provides publicly available data related to savings, lending, payment, and risk management of adult residents (aged 15 and over). Data are collected every three years, starting from 2011. The research was initiated by the foundation of Bill & Melinda Gates (https://globalfindex.worldbank.org/). The research is based on the World Bank Global Findex database for 2017 since the latter is not available. The analysis covered 141 countries around the world. Based on collected data, we calculated that the global average percentage of inhabitants who made digital payments in the past 12 months from the day of the survey was 46.41%, while 40.08% received digital payments.

To examine the association between the country's income, i.e., the level of GNI p.c. and the use of digital payment services, we used information on the percentage of individuals who made/received digital payments in the past 12 months from the day of the survey. The variable *made digital payments* shows the percentage of respondents who report using mobile money, debit or credit card, or a mobile phone to make a payment from an account or report using the Internet to pay bills or to buy something online, in the past 12 months from the day of the survey. It also includes respondents who report paying bills or sending remittances directly from a financial institution account or through a mobile money account. The variable *received digital payments* shows the percentage of respondents who report using mobile money, debit or credit card, or a mobile phone to receive payment through an account in the past 12 months from the day of the survey. It also includes respondents who reported receiving remittances, receiving payments for agricultural products, receiving government transfers, receiving wages, or receiving a public sector pension directly into a financial institution account or through a mobile money account. We expect these variables to be positively correlated to the level of country GNI p.c.

Following the literature review, our basic assumption is that the use of digital services to a certain extent depends on the development of a particular country i.e., income, the availability of the Internet, as well as on the information and acceptance of digital technologies by the population. Therefore, if the population is poor and cannot satisfy even the existential needs, has a low level of education, insufficiently informed, incompatible with new technologies, we can expect that they will not be users of modern devices and digital services. Consequently, it can be assumed that the development of the country encourages the use of digital technologies to some extent.

In this paper, we used the World Bank classification for income groups i.e., low, lower-middle, upper-middle, and high-income. The classification is determined using thresholds based on the amount of gross national income per capita in US dollars, whereby every first July of the year, the classification is updated because the GNI p.c. is influenced by changes in income growth, inflation, exchange rates and population changes. Countries that belong to the category of high income are observed as developed countries, while middle- and low-income countries are observed as developing countries (Nielsen, 2011). A

more detailed insight into the classification of the World Bank and the codes used in this paper can be found in Table 1.

Table 1: Classification of countries by income group

Income level	GNI per capita (USD)	The codes of the income group
Low income	≤ 1,005	1
Lower-middle income	1,006 - 3,955	2
Upper-middle income	3,956 - 12,235	3
High income	≥ 12,236	4

Source: World Bank, available on https://blogs.worldbank.org/opendata/new-country-classifications-income-level-2017-2018 (31/12/2020)

The largest number of countries (30.49%) belong to the category high-income, followed by the category lower-middle income (26.95%). Upper-middle income countries constitute 26.24% of the sample, while the share of countries belonging to the category low-income countries amounts to 16.31% (Table 2). The low share of low-income countries in the sample of 141 countries can be explained by the fact that there are no available data for some countries characterized by a lower level of economic development. As expected, the average percentage of those who made digital payments is the highest in group 4, while it is the lowest in the first group.

Table 2: Descriptive statistics - Percentage of residents who made digital payments

Income group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	23	23.17%	13.03%	2.72%	17.54%	28.81%	3.76%	51.27%
2	38	26.16%	16.42%	2.66%	20.76%	31.56%	3.56%	79.39%
3	37	39.51%	18.40%	3.02%	33.38%	45.65%	9.27%	79.39%
4	43	82.67%	14.56%	2.22%	78.19%	87.15%	50.02%	98.88%
Total	141	46.41%	29.41%	2.48%	41.51%	51.31%	3.56%	98.88%

Source: the authors' calculation

Observing borderline countries in respective income groups, the lowest percentage of individuals who made digital payments reside in Afghanistan (group 1), Myanmar (group 2), Turkmenistan (group 3), and Trinidad and Tobago (group 4). The highest percentage of individuals who made digital payments live in Uganda (1), Mongolia (2), Iran (3), and Norway (4). In Serbia, 49.79% of individuals made digital payments in the past year i.e., in the past 12 months from the day of the survey (data collection in Serbia started on May 15, 2017, and end on June 27, 2017). The percentage of those who made digital payments in Serbia is above the average of the income group to which Serbia belongs i.e., upper-middle income group. Analysis of the relationship between GNI p.c. and the percentage of residents who made digital payments shows that a higher level of GNI p.c. corresponds to a higher percentage of residents who made digital payments. Although Figure 1 shows the relationship between income and making digital payments, other

factors, such as the level of financial literacy, type of financial system, the level of technological capabilities, infrastructure, education, etc., may influence the use of these digital services. Dots in Figure 1 represent pairs of GNI p.c. and the level of making digital payments with the corresponding number of income group next to the dot.

Figure1: Scatter plot for the percentage of residents who made digital payments and GNI p.c. (US$)
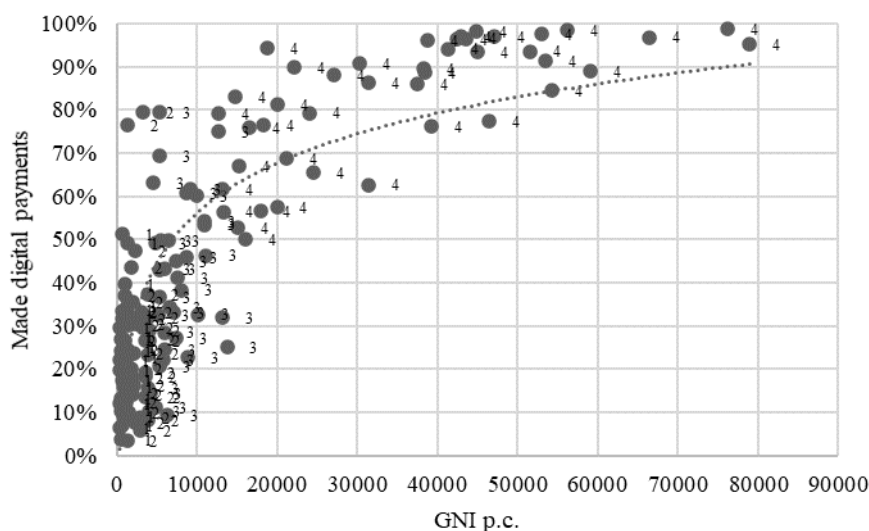
Source: the Global Findex Database and World Bank

Observing borderline countries in respective income groups, the lowest percentage of individuals who received digital payments reside in the Central African Republic (1), Myanmar (2), Iraq (3), and Saudi Arabia (4). The highest percentage of residents who received digital payments live in Uganda (1), Mongolia (2), Belarus (3), and Norway (4). In Serbia, 57.05% of individuals received digital payments in the past year i.e., in the past 12 months from the day of the survey. The percentage of those who received digital payments in Serbia is 18.46 percentage points higher than the average of the income group to which Serbia belongs i.e., upper-middle income group. As in the case of a percentage of residents who made digital payments, the highest percentage of those who received digital payments belong to the richest countries. The presented statistic shows that in all income groups, on average, there is a higher percentage of digital payments made compared to digital payments received. We also noticed that the spread between the richest and poorest countries is higher in making digital payments.

Table 3: Descriptive statistics - Percentage of residents who received digital payments

Income group	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
1	23	18.42%	9.47%	1.97%	14.32%	22.52%	6.23%	39.67%
2	38	23.22%	13.35%	2.16%	18.83%	27.61%	5.66%	61.16%
3	37	38.59%	16.41%	2.70%	33.11%	44.06%	10.72%	73.36%
4	43	67.86%	12.98%	1.98%	63.86%	71.86%	33.97%	89.86%
Total	141	40.08%	23.94%	2.02%	36.10%	44.07%	5.66%	89.86%

Source: the authors' calculation

Analysing the relationship between GNI p.c. and the percentage of residents who received digital payments, we can conclude that a higher level of income corresponds to a higher percentage of residents who received payments (Figure 2). Dots in the Figure represent pairs of GNI p.c. and the level of receiving digital payments with the corresponding number of income group next to the dot.

Figure 2: Scatter plot for a percentage of residents who received digital payments in the past year and GNI p.c. (US$)
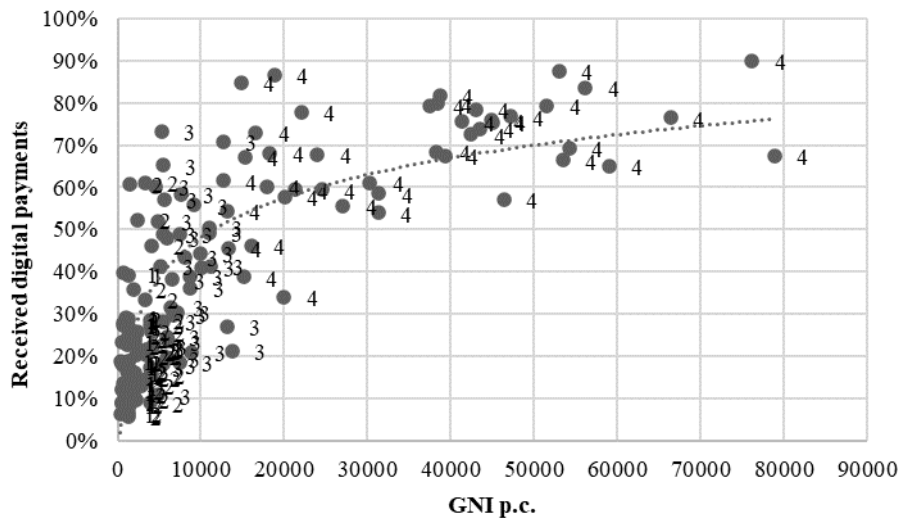
Source: The Global Findex Database and World Bank

To confirm that there is a statistically significant correlation between the GNI p.c. and the use of digital payment service, we conducted a correlation analysis based on the Pearson coefficients. We found a statistically significant ($p < 0.01$) strong positive linear relationship between the GNI p.c. and making and receiving digital payments with values 0.810 and 0.759, respectively. Hence, we reject the null hypothesis that there is no linear

relationship between a country's income and the level of making and receiving digital payments. Parallel to this, we noticed an even stronger linear relationship between the making and receiving digital payments with a value of 0.951. We interpret this as a causal link because most individuals who adopt digital technologies simultaneously make and receive payments. Furthermore, the increased availability of financial instruments such as payment cards (debit or credit) enables making and receiving digital payments and provides a convenient way to conduct them.

Table 4. Pearson correlation coefficients for the whole sample

	Total sample		
	Received	GNI	Made
Received	1	0.759**	0.951**
Sig. (2-tailed)	0	0	0
GNI	0.759**	1	0.810**
Sig. (2-tailed)		0	0
Made	0.951**	0.810**	1
Sig. (2-tailed)	0		0
N	141	141	141

** - Correlation is significant at the 0.01 level (2-tailed)

Source: the authors' calculation

Generally, study results indicate that the use of digital financial services, i.e., making and receiving digital payments, is to some extent determined by the country's income. Results may be due to many factors. One of the barriers to using and accessing digital financial services is the lack of bank accounts, which is particularly evident in less developed countries. One of the most common reasons for not having a bank account is the lack of money (Global Partnership for Financial Inclusion, 2020), which indicates the importance of the country's development in terms of income. To overcome this problem, governments must take appropriate measures to enhance financial inclusion in the form of sending social funds to vulnerable groups through digital services.

The obtained results are in line with previous studies and research that showed that developing countries lag in terms of widespread technological diffusion (Comin & Mestieri, 2018), i.e., that developing countries have a longer lag in the adoption of innovations compared to developed countries (Bara, 2016). Also, the research is in line with a study by Abdinoor & Mbamba (2017) and Bryson & Atwal (2013), who stated that there are differences in the acceptance of e-banking and m-banking services by citizens according to the country's development. Also, Kolodinski et al. (2004, p. 250) confirmed that those with higher income are more likely to adopt e-banking technologies as well as Sulaiman et al. (2007, p. 163) who found that the level of income is significantly related to the adoption of m-banking.

Conclusion

The financial services industry has been changing rapidly in recent decades due to the digitalization of services and modernization and advances in technology, as well as to the

changing needs of customers in accessing financial services. The financial sector is exposed to constant changes; therefore, a quick and timely response following the client's requirements is needed. Bank clients need faster, more efficient, and convenient ways of delivering services and conducting transactions. As mobile devices have become an indispensable part of most people's daily lives, the traditional way of conducting transactions has been supplemented by a new, digital approach. Making payments that previously involved a physical visit to the bank, post office or other payment service providers is now replaced by digital service.

Previous studies have shown that income, i.e., development, plays an important role in widespread technological diffusion, i.e., the adoption of innovation, where an increase in per capita income can be considered as one of the crucial drivers of digital payments. Findings of certain studies indicate that income is related to the adoption of both e-banking and m-banking. In addition, an inevitable condition for the use of DFS is having a bank account.

In this paper, we provided the empirical analysis on the question of the relationship between the level of GNI p.c. and the use of digital payment services. Given the importance of these issues, especially related to the improvement of financial inclusion, we analysed data from 141 countries from the Global Findex database and World Bank database.

In conclusion, we found a strong statistically significant positive correlation between the country's income measured by GNI p.c. and the use of digital payment services, measured by the percentage of individuals that made and received digital payments. The results of our analysis are consistent with previous research and confirmed that income plays an important role in the use of DFS. Additionally, we noticed a strong statistically significant positive linear relationship between the making and receiving digital payments, concluding that the adoption of digital technologies is the most important process in increasing the level of the use of digital payment services.

Although this study contributes to the literature on financial inclusion, several limitations exist. We interpret the results of correlation only as an association, as it is a measure of the extent to which two variables are related, rather than examining causal relationships including other explanatory variables of the use of digital financial payments. Future research should include additional variables, such as ICT adoption, financial literacy and digital skills, macroeconomic and financial system stability, and other similar variables.

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