ELIT
Economic Laboratory Transition
Research Podgorica

Montenegrin Journal of Economics

For citation:

Pisker, B., Radman-Funaric, M., Cosic, D. (2026), "Digitalization and Corruption: Global Intersection Matrix", *Montenegrin Journal of Economics*, Vol. 22, No. 1, pp. 7-14.

Digitalization and Corruption: Global Intersection Matrix

BARBARA PISKER[1], MIRJANA RADMAN-FUNARIC[2] and DUNJA COSIC[3]

[1]Assistant Professor, Josip Juraj Strossmayer University of Osijek, Croatia; email: bpisker@ftrr.hr
[2]Assistant Professor, Josip Juraj Strossmayer University of Osijek, Croatia; email: mradmanfunaric@ftrr.hr
[3]Highschool teacher, III Gymnasium Osijek, Croatia; email: dunja0410@gmail.com

ARTICLE INFO

Received August 21, 2024
Revised from September 20, 2024
Accepted October 20, 2024
Available online January 15, 2026

JEL classification: A14, C33, D63, F69, O33, Z13

DOI: 10.14254/1800-5845/2026.22-1.1

Keywords:

Digitalization,
digital payment,
perception,
corruption

ABSTRACT

The research presented deals with the analysis of the relationship, that is, the measurement of the influence of digital (online) payment on the perception of corruption within the national societies of the world. More precisely, the study centres on evaluating the impact of digital payment processes conducted via online platforms to citizens perception of corruption within national jurisdictions worldwide. Data on citizens of national societies aged 15 years of age and above who have either initiated or received digital payment were taken from the World Bank at three-year measurement points: 2014, 2017 and 2021. The data on the Corruption Perceptions Index (CPI) were sourced from Transparency International (TI). In conducting this analysis, the data obtained at the three specified measurement year points for CPI were also included. The correlation and regression analysis conducted clearly demonstrated a strong and statistically significant correlation between digital payments use share and the perception of corruption reduction. Consequently, results obtained indicate that higher share of digital payment usage is associated with a reduced perception of corruption worldwide. Thus, the study conducted confirms the fundamental assumption of the research, which posits that the digitalization of payments implies and potentially facilitates the eradication of corruption.

INTRODUCTION

Digitalization is a comprehensive process of complete social transformation understood as a broader frame of overall sociotechnical changes in adopting and using digital technologies in a broader societal context (Legner et al., 2017). Castells (1997) considers it one of - if not the - fundamental, defining characteristic of contemporary society. He claims that technology is being developed in the new information era, so its various possibilities are tested to improve its qualities and find new applications constantly. This opens up unimagined possibilities and infinitely increases the power of modern digital technology (Castells, 1997). Another specific development tendency is the social application of technology. While technological development has a one-way tendency, ranking communities, institutions and companies according to the level of technological modernization or equipment, societies being at the same or similar level of technological modernization nevertheless differ in other dimensions such as the economy, state and public

institutions, access to public services for citizens, transparency of public administrations and culture, digitally develop in different ways. Since every technology by itself, including digital technology, brings positive and negative aspects about the spectrum of its application in the context of various social institutions, groups and individuals, regulation is necessary, primarily concerning its role, purpose and methods of use, strengthening its positive socio-economic impacts.

Our global community is founded on a harmonized, shared value system established by the Universal Declaration of Human Rights (UN, 1948), upon which norms are built with the primary role of the social system regulation. Although absolute internalization of the established norms (Etzioni, 2000) would benefit the social regulation process, its full adoption is a societal regulation ideal that human societies cannot reach. Corruption, among others, is a difunctional societal phenomenon defined as the abuse of public office for private gain (World Bank, 1997). Corruption forms, shapes, and definitions differ globally as a fluid and evolving concept. Its vital defining elements are universally recognizable. Although different in appearance, causes and factors (Aras, 2007), corruption sameness is highlighted in the consequences of its social rootedness. By undermining the common, general public interest, corruption erodes the community's value system and, by the domino effect principle, collapses entire social structures: from the reduction of economic growth potential, increase of insecurity, reduction of competitiveness, availability of social protection and public services. As a result, the consequences spill into social stratification, deepening inequality and decreasing the level of social capital and trust in social institutions and society as a whole, resulting in social insecurity and a threat to the fundamental democratic principles of the community. On the contrary, by reducing corruption and increasing transparency and accountability, societies strengthen their values and the rule of law and consequently open the possibility for prosperity in all areas of social life.

In the context of universal, globally shared values and goals, taking into account the rule of law as a fundamental value and the prevention and suppression of crime as goals, this paper aims to analyse the relationship between digitalization and corruption, i.e., to measure the impact of digitization of payments on the perception of corruption in the global community.

Starting from the assumption of Berg (2020) that the anonymity of cash (providing a high level of privacy and portability, an easily replaceable form of currency contrasting digital payment systems) contributes to the growth of opportunities and options for various criminal activities, including corruption, the primary hypothesis of the paper is: the share of online payments in total payments is positively related and reduces the perception of corruption.

The paper is structurally composed of the following parts: after the introduction, earlier research on the topic is described through the literature review. This is followed by a chapter in which the data and methods used in the paper are presented. The last two chapters present research results and discussion, followed by a conclusion.

1. LITERATURE REVIEW

Corruption is present in all systems of government that people have ever established, as evidenced by numerous historical sources (Kregar, 1997, 1999; Derencinovic, 2001). Although corruption has been ubiquitous in societies since the beginning of humanity, its perception in the sense of a social anomaly only begins with the establishment of modern republics, that is, the separation of the public (general social, civil state) and private spheres, and consequently the separation of these two spheres of interest. The reach and series of challenges that corruption brings for societies is adequately represented by Lord Acton's famous thesis (1887): "Power corrupts, absolute power corrupts absolutely". The fundamental causes of corruption are attributed to the lack of social (civil) and formal-legal control mechanisms over the actions of the government, the imperfection of the legal system, low wages and inadequate social services, as well as society's tolerance or culture of corruption (Seleim and Bontis, 2009; Husted, 1999). According to V. Terziev et al. (2016), the reasons for corruption are found in the weakness of moral and ethical principles, where legislation and legal prohibitions are not a sufficient obstacle to the acquisition of illegal income in the form of bribes or gifts; low professional qualification of business entities and civil society; lack of

effective control over the actions of civil servants by the public and the media; bureaucracy and excessive power of individuals; and the failure of social systems to establish a balance between law, morality and justice.

R. Ouedraogo and M. Sy (2020) recognize digitization as one of the critical tools in suppressing the incidence of corruption, and they associate the adoption of digital tools with a lower perception of corruption and the growth of trust in society. Additionally, promotion and support, as well as the strengthening of government policies in the field of digitalization, positively influence general public opinion by reducing the perception of corruption. The study by A. Surovicova et al. (2022) proved that the increase in digitization reduces corruption and contributes to economic growth. The influence of digitization on the significant improvement of the quality of public administration and the reduction of corruption in EU member states was also proven by A. Androniceanu et al. (2022). Furthermore, P. Sturges (2004) and J. Bertot et al. (2010) argue that digitization in the field of public administration and the use of social networks can increase transparency and strengthen the civil world, providing citizens with relevant information regarding the responsibility in spending public funds. A. Mungiu-Pippidi (2015) additionally provides insight into the role of social institutions and structures in managing corruption, including the possible implications of digital technologies. Thus, digitalization has a transformative impact on society, creating an atmosphere of openness that identifies and prevents corrupt behaviour.

Although digitalization supports and strengthens transparency, social responsibilities, and citizen participation its influence is manageable and can create and enable new opportunities for corruption. They are mainly related to cybercrime or data misuse (World Bank 1997). For example, J. Wedel (2009) states that informal networks, often supported by digital communication, can contribute to corruption and undermine formal governance structures. S. Zuboff (2019) also highlights how digital technologies extract and adapt personal data, implying an impact on the governance process, power dynamics and potential corruption.

Digitization of society consequently transforms payment transactions, and the anonymity of cash (Berg, 2020) makes it fertile ground for strengthening various criminal activities, including corruption. Thus, the analysis of M. Merhi (2022) at the global level shows that digital transformation can significantly reduce corruption, indicating the importance of socio-economic and socio-political factors in the appropriate and timely support of applying digital technological solutions in reducing corruption.

World Economic Forum (2018) has estimated the costs of corruption for the world economy to be 5% of the global GDP. However, its consequences cannot be reduced to financial costs (Hartmann & Ferreyra, 2022); therefore, controlling corruption (Klitgaard, 1991) is an ultimate societal challenge.

2. DATA AND METHOD

Following the presented research and theoretical contribution, this paper assumes a positive correlation and cause-and-effect relationship between the CPI and the percentage of open accounts that made or received a digital payment, which is on the labour market and/or not on the labour market. Data on the dependent variable, the Corruption Perceptions Index (CPI), is collected from Transparency International (2023) and published annually. The CPI ranks countries according to their perceived level of corruption in the public sector by expert assessments and public opinion surveys. The index ranks 180 countries from 100 (no corruption) to 0 (high corruption). Data on independent variables were collected for people older than 15 years (World Bank, 2022): percentage of open accounts (ACC), percentage made or received a digital payment (MRDP), percentage made or received a digital payment, out-of-labour force (MRDP out LF) and percentage made or received a digital payment, in the labour force (MRDP in LF). Data on independent variables were collected in 2014, 2017 and 2021 or 2022 if not collected in 2021 and refer to the situation from previous years. Therefore, for adequate comparison, data on the CPI index are included in the analysis only for 2014, 2017 and 2021, although the data is published for each year. Also, the analysis should have included data from those years for which data on the percentage of open bank accounts and made or received digital payments were not published, an inevitable shortcoming of the analysis presented.

Ouedraogo and Sy (2020), Surovicova et al. (2022), Androniceanu et al. (2022), and Merhi (2022) research have confirmed numerous ways digitalization positively impacts corruption perception reduction. This paper uses a multiple regression model to examine the correlation between the CPI and independent variables and their relationship worldwide. In the first step of the analysis, Pearson correlation coefficients were calculated to examine the correlations of the Corruption Perceptions Index with the variables percentage of open accounts, made or received a digital payment, made or received a digital payment out of labour force, and made or received a digital payment in the labour force at the world level. The second part is multiple regression analysis, where the Corruption Perceptions Index is a dependent variable, and other variables presented are independent. The formulas for the multiple regressions can be expressed as

$$CPI = a + \beta_1 MRDP + \beta_2 ACC + \beta_3 MRDPoutLF + \beta_4 MRDOinLF + e$$

SE is a dependent variable, and others are independent variables: *e* is the error term involved in using the linear model to predict the value of Y, *a* is the slope's intercept, and β is the coefficient of the independent variable (Kamki, 2016).

3. RESULTS AND DISCUSSION

The results of descriptive statistics show that the range of the percentage of open accounts in banks, taking into account all the world countries, in 2014, 2017 and 2021 ranges from 10% to 100%. The percentage of people who made a digital transaction range from 1% to 100%. On average, the percentage of Made or received a digital payment is 50%, Made or received a digital payment, out of labour force amount 40%, and in labour force 60%. The CPI ranges from 1 to 92, and the average value of the index of the analysed countries is 44.6. Of these, 25% of countries scored below an index of 30, and 25% scored above 57. The CPI of the central 50% of countries ranges from 30 to 57 points.

Table 1. Descriptive statistics

Statistic	*N*	*Mean*	*St. Dev.*	*Min*	*Pctl(25)*	*Pctl(75)*	*Max*
Adult population	401	36256187	117957153	295250	4138999	26216914	1130579584
CPI	401	44.6	19.4	1	30	57	92
Made or received a digital payment (% age 15+)	401	0.5	0.3	0.04	0.3	0.8	1.0
Account (% age 15+)	401	0.6	0.3	0.1	0.4	0.9	1.0
Made or received a digital payment, out of labour force (% age 15+)	401	0.4	0.3	0.01	0.2	0.7	1.0
Made or received a digital payment, in labour force (% age 15+)	401	0.6	0.3	0.04	0.3	0.9	1.0

Source: own

The results of the correlation analysis are shown in Table 2.

Table 2. Correlation matrix

Variable Name	*Variable Label*	*Adult population*	*CPI*	*Account (% age 15+)*	*Made or received a digital payment (% age 15+)*	*Made or received a digital payment, out of labour force (% age 15+)*
Corruption Perception Index (CPI)	CPI	-0.04				
Account (% age 15+)	ACC	0.06	0.76***			
Made or received a digital payment (% age 15+)	MRDP	-0.03	0.77***	0.97***		
Made or received a digital payment, out of labour force (% age 15+)	MRDP out lf	-0.02	0.79***	0.94***	0.97***	
Made or received a digital payment, in labour force (% age 15+)	MRDP lf	-0.04	0.75***	0.96***	0.99***	0.94***

Note: ***significant at 1% level
Source: own

The correlation matrix shows a strong positive association of the dependent variable Corruption Perceptions Index with all independent variables (significant 1% level). CPI is strongly and positively related to the percentage of respondents who report having an account at a bank or another financial institution or report personally using a mobile money service (r = 0.76). Also, CPI is strongly positively related to the percentage of respondents who report using mobile money, a 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 or in a store (r = 0.77). This connection is even higher among users who are out of the labour force (r = 0.79) than in the labour force (r = 0.75).

Positive correlation shows that more open accounts and more digital money transactions are associated with less corruption, as the CPI ranks 180 countries on a scale of 100 (no corruption) to 0 (high corruption). As expected, there is a large and significant connection between the number of open accounts and made or received a digital payment. There is no connection between the number of open accounts and digital payments and the population size in a particular country.

A multiple regression analysis was performed on the variables shown in Table 1, and the results are shown in Table 3.

Table 3. Multiple Regression Results

Variable Name	*Dependent variable:*
	CPI
Adult population	-0.000
	(0.000)
Made or received a digital payment (% age 15+)	-43.662
	(30.967)
Account (% age 15+)	20.917**
	(9.237)
Made or received a digital payment, out of labour force (% age 15+)	60.317***
	(13.046)

Made or received a digital payment, in labour force (% age 15+)	14.186
	(19.986)
Constant	20.338***
	(1.762)
Observations	401
R2	0.632
Adjusted R2	0.627
Residual Std. Error	11.855 (df = 395)
F Statistic	135.455*** (df = 5; 395)
Note:	*p<0.1;**p<0.05; ***p<0.01

Soure: own

The adjusted R^2 shows that the model has high effect sizes (0.627) and explains changes in the outcome variable. The regression model is statistically significant.

Regression coefficients represent the mean change in the dependent variable for one unit of change in the predictor variable.

Regression analysis provided several statistically significant results. Observing all the countries of the world, it showed that having a bank account has a positive impact on the Corruption Perceptions Index (β = 20.917, $p < 0.05$)., i.e., an increase in the number of open citizen accounts is expected to lead to a decrease in corruption in the public sector (since a higher index indicates lower corruption), which is in line with the results by Ouedraogo and Sy (2020), Surovicova et al. (2022), Androniceanu et al. (2022), Merhi (2022). Also, Made or received a digital payment out of labour force has a positive influence on the reduction of corruption (β = 60.317, $p < 0.01$). However, it was found that there is no statistically significant correlation between Made or received a digital payment in the labour force and generally Made or received a digital payment with the level of corruption.

The data show that an increase in open citizen accounts by 1% increases the Corruption Perceptions Index by 20.9 points, and an increase in Made or received digital payment out of the labour force by 1% increases the Corruption Perceptions Index by 60.3 points within the range from 0 to 100.

CONCLUSION

Corruption is undoubtedly harmful and dysfunctional for society as a whole. It poses a threat to security because it enables and supports organized crime, terrorism and other forms of crime, including money laundering or drug trafficking. Corruption deepens inequalities, erodes citizens' trust in public institutions, undermines good governance and social justice, and represents a severe threat to the rule of law, democracy and fundamental social values. Corruption also negatively affects prosperity and economic growth: it creates business uncertainty, lowers investment levels, hinders fair competition and reduces public revenues. It also adversely affects society's goals by increasing income differences and unequal distribution of resources and opportunities, consequently threatening the general stability and security of the social system as a whole.

Digitalization of payments implies a transition to a cashless society, potentially encouraging the reduction of corruption. Therefore, it is a necessary starting point for introducing anti-corruption systems in the digital society of the 21st century. Purposeful use and public control of payment data is undoubtedly a new level of transparency and accountability. It helps identify suspicious patterns, fraud and non-compliance in revenue collection and disbursements, which can contribute to reducing levels of corruption. Using payment data and advanced analytics helps identify suspicious transactions, fraud and non-compliance in

revenue collection and payments, which could save communities up to a trillion dollars worldwide (World Economic Forum, 2018).

However, the digitalization of payments is, of course, not the ultimate cure for absolute corruption eradication. Each society must adapt the regulatory framework and find the most suitable measures and ways to use digitalization in the fight against corruption, according to its national and cultural specificities.

The data used in this research on the relationship between digitization and the impact of digitization of payments on the perception of corruption are limited. The data of the World Bank, although extensive in its scope, do not give a more precise insight into the share of digital data in all transactions, gender, generational and educational differences, or cross-cultural preferences of countries. Furthermore, data on online payment is not available within the national country as digital payment knows no national boundaries in the context of international global online business, which further complicates the availability of relevant data in researching the impact of this phenomenon. As far as corruption is concerned, its measurement was observed through the Corruption Perception Index, which is also limited and subjective in itself (Neiva de Figueiredo, 2013) but is currently the best available measure of the incidence of corruption within national societies. Future research into the relationship between these two relevant social phenomena and their interdependence should combine more significant amounts of relevant data sources (e.g., World Bank's Control of Corruption Index (CCI)) as well as more complex analysis methods in order to recognize patterns of relationships between these two phenomena and put examples of positive practice at the service of the fight against corruption. Additionally, different appearances of the phenomenon are expected regarding the country's development index (Quah, 2001; Hanna and Knight, 2012; Carrera, et al., 2016; European Commission, 2020).

Today's information society focuses on the collection, processing, and application of data for various purposes. Relevant data's importance, role, and value in all aspects of social life in our liquid modernity (Bauman, 2013) are reaffirmed, thus also in assessing the impact of digitization of payments on reducing the perception of corruption worldwide.

REFERENCES

Acton-Creighton Correspondence (1887), https://oll.libertyfund.org/titles/acton-acton-creighton-correspondence# (accessed: 1 March 2024)

Androniceanu, A., Georgescu, I., Kinnunen, J. (2022), "Public administration digitalization and corruption in the EU member states. A comparative and correlative research analysis", *Transylvanian Review of Administrative Sciences*, Vol. 18, No. 65, pp. 5-22.

Aras, S. (2007), "Corruption", Lawyer, Vol. 41, No. 84, pp. 25-59 (in Croatian).

Bauman, Z. (2013), *Liquid modernity*, John Wiley & Sons.

Berg, A. (2020), "The Identity, Fungibility, and Anonymity of Money", *Economic Papers*, Vol. 39, No. 2, pp. 104-117.

Bertot, J.C., Jaeger, P.T., Grimes, J.M. (2010), "Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies", *Government Information Quarterly*, Vol. 27, No. 3, pp. 264-271.

Carrera, S., Guild, E., Vosyliūtė, L., Scherrer, A., Mitsilegas, V. (2016), "The cost of non-Europe in the area of organized crime", *CEPS Paper in Liberty and Security in Europe*, No. 90.

Castells, M. (1996), *The information age: Economy, society and culture*, 3 volumes, Blackwell, Oxford.

Corruption Perception Index. https://mpudt.gov.hr/index-percepcije-korupcije/21517, accessed: 1 March 2024.

Derencinovic, D. (2019), *The myth of corruption*, NOCCI, Zagreb (in Croatian).

Etzioni, A. (2000), "Social norms: Internalization, persuasion, and history", *Law and society review*, Vol. 34, No. 1, pp. 157-178.

European Commission (2020), *The Corruption Perception Index 2019: The EU is the Best Performer in the World*, https://ec.europa.eu/regional_policy/en/newsroom/news/2020/01/27-01-2020-the-corruption-perception-index-2019-the-eu-is-the-best-performer-in-the-world (accessed: 1 March 2024)

Hanna, N.K., Knight, P.T. (2012), *National strategies to harness information technology: Seeking transformation in Singapore, Finland, the Philippines, and South Africa*, Springer, New York.

Hartmann, J.T., Ferreyra, C. (2022), *What are the costs of corruption?* https://blogs.worldbank.org/en/governance/what-are-costs-corruption, accessed: 1 March 2024.
Husted, B.W. (1999), "Wealth, culture, and corruption", *Journal of International Business Studies*, Vol. 30, pp. 339-359.
Klitgaard, R. (1991), *Controlling Corruption*, University of California Press, New York.
Kregar, J. (1997), *Corruption: ignorance is no excuse*(in Croatian), https://tripalo.hr/knjige/KorIPovj/kreg.pdf, accessed: 4 March 2024.
Kregar, J. (1999), *Globalization and corruption* (in Croatian), https://hrcak.srce.hr/file/290908, accessed: 3 March 2024.
Legner, C., Eymann, T., Hess, T., Matt, C., Böhmann, T., Drews, P., Mädche, A., Urbach, N., Ahlemann, F. (2017), "Digitalization: opportunity and challenge for the business and information systems engineering community", *Business & information systems engineering*, Vol. 59, pp. 301-308.
Merhi, M.I. (2022), "The effect of digital transformation on corruption: A global analysis", *Pacific Asia Journal of the Association for Information Systems*, Vol. 14, No. 2, pp. 42-58.
Mungiu-Pippidi, A. (2015), *The quest for good governance: How societies develop control of corruption*, Cambridge University Press.
Neiva de Figueiredo, J. (2013), "Are corruption levels accurately identified? The case of U.S. states", *Journal of Policy Modeling*, Vol. 35, No. 1, pp. 134–149.
Ouedraogo, R., Sy, M.A.N. (2020), *Can digitalization help deter corruption in Africa?* International Monetary Fund. https://www.imf.org/en/Publications/WP/Issues/2020/05/29/Can-Digitalization-Help-Deter-Corruption-in-Africa-49385, accessed: 1 March 2024.
Quah, J. (2001), "Combating Corruption in Singapore: What Can Be Learned?", *Journal of Contingencies and Crisis Management*, Vol. 9, No. 1, pp. 29–35.
Seleim, A. Bontis, N. (2009), "The relationship between culture and corruption: A cross-national study", *Journal of Intellectual Capital*, Vol. 10, No. 1, pp. 165-184.
Sturges, P. (2004), "Corruption, transparency and a role for ICT?", *International Journal of Information Ethics*, Vol. 2, No. 11, pp. 1-9.
Surovicova, A., Bozhenko, B., Boyko, A., Petrenko, K. Ю. (2022), "Assessment of transmission effects between "corruption-digitization-economic growth". *Financial and credit activity problems of theory and practice*, Vol. 3, No. 44, pp. 132-140.
Terziev, V., Nichev, M., Bankov, S. (2016), „Essence and reasons for the manifestation and basic areas of corruption and government structures for corruption counteraction in Bulgaria", *This look. International scientific journal: collection of scientific papers*, Vol. 15, 116-134 (in Bulgarian).
Transparency International (2023), *Corruption Perceptions Index Technical Methodology Note*, https://transparencia.org.es/wp-content/uploads/2023/01/CPI2022_TechnicalMethodology.pdf, accessed: 6 March 2024.
Wedel, J. R. (2009), *Shadow Elite: How the world's new power brokers undermine democracy, government, and the free market*, Basic Books, New York.
World Bank (1997), *Helping Countries Combat Corruption: The Role of the World Bank.* Washington, D.C. World Bank Group. http://documents.worldbank.org/curated/en/799831538245192753/Helping-countries-combat-corruption-the-role-of-the-World-Bank, accessed: 6 March 2024.
World Bank (2022), https://www.worldbank.org/en/publication/globalfindex/Data, accessed: 1 March 2024.
World Bank (2022), *Methodology*, https://thedocs.worldbank.org/en/doc/fe026d04da1eb78f5ce8 bb5e 1529d60b-0430062023/original/Findex2021-22-Methodology.pdf, accessed: 1 March 2024.
World Economic Forum (2018), *Governments can fight corruption by joining the digital payment revolution*, https://www.weforum.org/agenda/2018/04/governments-join-digital-payment-revolution-fight-corruption/, accessed: 6 March 2024.
Zuboff, S. (2019), *The age of surveillance capitalism: The Fight for a Human Future at the New Frontier of Power*, Public Affairs, New York.