IMPACT OF INSTITUTIONS ON FINANCIAL INCLUSION IN AFRICA

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Abstract

Financial inclusion, for which the keystone is access to a bank account, is crucial to overcome the socioeconomic backwardness of African countries and to improve the African societies' well-being. The study concentrates on this continent to better understand the nature of its development in terms of financial inclusion. The research aims to identify the institutions' impact on financial inclusion in 35 African countries in the years 2010-2019. The analysis is based on a panel model with fixed individual effects. Novelty of the study rests in incorporation of four institutional variables: constraints on the executive, resolving insolvency, property rights, and WGI. The results showed a positive and statistically significant impact of resolving insolvency on financial inclusion (a measure covering people with financial institution accounts) across the entire sample. However, this relationship is especially visible in more developed countries, while constraints on the executive turned out to be crucial for low-income countries. Another novelty of the study is creation of an index of financial inclusion covering Mobile Money which was used to verify the obtained results. In this case, no positive impact of any institutional variable was identified which may mean that a favourable institutional environment is not required for the development of Mobile Money.

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Introduction

Financial inclusion, defined by the World Bank (2022a) as a situation in which "individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way" is one of the factors supporting sustainable economic development and improving the well-being of society. This is possible because financial services facilitate many everyday activities and create new opportunities for their users. Basic applications include safe saving, efficient receipt of government aid, simple and cheap transfers, including those between family members who emigrate for work and in the event of negative shocks (such as illness or unemployment), (Suri & Jack, 2011; Suri & Jack 2016). Having a bank account also enables credit assessment based on the data from the bank statement, which allows for better verification of the borrower (Ahmad et al., 2020; Chatterjee, 2020). This should result in lower interest rates and easier access to credit (Banerjee & Duflo, 2011). Flexible payment methods for access to water or electricity are also possible – in the instalment or PAYG (pay as you go) system. Thanks to the latter solution, the user does not have to bear the entire expenditure related to the installation of the infrastructure at once, but only pays for current usage (Ikeda & Liffiton, 2019). Access to financial services is also one of the factors reducing gender inequality in Africa (Xu et al., 2022). A current account is a keystone of financial inclusion and a gateway to other financial services (World Bank, 2019b).

Although this study understands "financial inclusion" (mainly) as having a bank account – which enables subsequent use of other financial services – various definitions of this term occur. Financial inclusion may be defined also as access to other products, such as microcredit. In this case, it may have a negative impact on society, as the growth of microcredit (if not sustainable) leads to the expansion of low-productivity self-employment and increased competition (decreasing profits) in these sectors. This is not conducive to the development of countries, which is generally driven by increased productivity and innovative enterprises (engagement of capital and employment in these sectors). Over-indebtedness of borrowers (whole communities) may also occur, especially when microcredit is used for consumption rather than investment (Bateman et al., 2019).

Regardless of the dynamic development of the financial sector in the last two decades, Africa remains a region with a high level of unbanked population (Demirgüç-Kunt et al., 2022). The situation is improving at a moderate pace, even despite the dynamic development of Mobile Money (MM), which began with the success achieved by M-Pesa founded in Kenya in 2007. At the same time, there is a high diversity of financial inclusion (measured as a percentage of the population with an account) across African countries, and the way in which financial services are delivered to society is also different. In some, especially poorer countries, a significant percentage of the population has only a Mobile Money account. In others, people use the services of financial institutions. which include: banks, credit unions, microfinance institutions, and post offices (Demirgüç-Kunt et al., 2022).

Because of the benefits mentioned above, ensuring broad access to financial services is one of the goals of many development programs for poor countries. It is one of the Sustainable Development Goals, in particular, the tasks related to reducing transaction costs of remittances, empowering economic inclusion and ensuring access to financial services (goals 1.4, 8.3, 10.C) (United Nations, 2015). Also, the World Bank (2018) in its "Universal Financial Access 2020" initiative, strives to increase global financial inclusion by focusing on 25 priority countries, almost half of which (12 countries) are in Africa. The actions are concentrated on improving access to payment infrastructure and reaching disadvantaged populations (women, rural population), as well as institutional issues: creating a favourable regulatory environment and disbursing social benefits from the government into bank accounts.

The article aims to assess how the institutional environment affects the level of financial inclusion in Africa. The approach is based on a new institutional economics framework, which confirmed that institutions strongly influence economic development (Kuncic, 2014). Institutions may be defined in various ways. North (1990, p. 3) defined them as "the rules of the game in a society or (…) the humanly devised constraints that shape human interaction." Institutions must be enforced and commonly used (and can be formal as well as informal) thanks to which they structure and reduce uncertainty in human interaction. Hodgson (2006) pointed out that institutions are both rules (formal) and social norms (informal) which determine people's behaviour in certain situations (in case of X do Y, even if other options are available). Institutions can be defined also as an outcome of the game (e.g. political order and effective state), (Greif, 2006). Glaeser et al. (2004) indicated a mutual relationship between institutions and country development. It is possible, because countries with better education, create stronger institutions – people learn to dispute resolutions peacefully. On the other hand, democratic countries with a strong institutional framework, are more willing to invest more in education. Both relations boost economic development.

Because of the different forms of financial services are provided in Africa, the article presents two different

ways of measuring financial inclusion. The main one, reflecting the percentage of the population having an account in a financial institution; the additional one (used for a robustness check) also includes people having a Mobile Money account. Measure of impact of institutions on financial inclusion was calculated using a panel model covering 35 countries (belonging to all income groups in World Bank classification) in the years 2010-2019.

This period is particularly interesting due to the dynamic development of the financial sector in Africa. The World Bank (2024a) studies conducted in 2011, 2014, 2017 show that the average percentage of the African population with an account more than doubled between the first and last survey – from 20.8% to 42.2%. However, this growth was not even. Among the 27 countries with a level of financial inclusion below 50% of the population in 2011 (only South Africa and Mauritius exceeded this level – due to their high initial position, they could not count on spectacular growth in the following years), there are countries that have financially included from 3% to 40% of their population within 6 years – the average increase in inclusion in this group was 22%, with a standard deviation of 10%. The large variation in the pace of development of the financial system in this period makes it particularly valuable to identify factors that support financial inclusion, as well as those that hinder it.

The article puts forward the following hypotheses:

H_1: Institutions positively affect financial inclusion in Africa,

H_2: Development of Mobile Money reduces the impact of institutions on financial inclusion in comparison to analysis concentrated on the banking sector (and other financial institutions).

The article extends current literature in two aspects. First, it presents a model with a larger and more diverse number of institutional variables. Previous studies incorporated mostly one or two institutional variables, concentrating on Worldwide Governance Indicators (WGI), (Ajide, 2017; Chinoda & Kwenda, 2019; Kebede et al., 2021; Nkoa & Song, 2020; Omar & Inaba, 2020). The methodology used in this research allows for a better estimation of which institutions influence the level of financial inclusion and makes it possible to indicate prioritised actions. Secondly, it presents two ways of constructing the index of financial inclusion, which can be built on an annual basis based on the available data. The first one highly correlates with the percentage of population having an account with a financial institution. The second includes individuals using Mobile Money, it is a novelty in comparison to earlier research (Ajide, 2017; Chatterjee, 2020; Ehigiamusoe et al., 2021; Evans & Adeoye, 2016; Kebede et al., 2021; Nkoa & Song, 2020; Omar & Inaba,

2020; Sawadogo & Semedo, 2021) in which financial inclusion was measured by covering only the banking sector.

LITERATURE REVIEW

The literature examining the determinants of the level of financial inclusion is quite extensive, focusing on institutional or socio-economic factors.

The first type of research consists of studies examining the impact of institutions on the level of financial inclusion using econometric methods. Nkoa & Song, (2020) studied the impact of Worldwide Governance Indicators on the level of financial inclusion using a panel model with sys-GMM. The study also considered infrastructural and socio-economic variables. It showed the positive and significant impact of WGI on financial inclusion in Africa.

Other studies also confirmed the positive impact of institutions and economic freedom (Chinoda & Kwenda, 2019), institutions (Law & Habibullah, 2009), the rule of law (Omar & Inaba, 2020) on the level of financial inclusion. A study presented by Anarfo et al. (2020) showed that excessive tightening of capital requirements may lead to a decrease in financial inclusion in Sub-Saharan African countries. This is the result of limiting the lending possibility of the financial sector, although the negative impact of the above-mentioned regulation does not affect a stable financial system.

On the other hand, research by Sarma and Pais (2011) showed that a large share of foreign capital in the banking sector negatively affects financial inclusion. Because of asymmetries of information, foreign banks use the "cherry-picking" strategy and serve only wealthy and profitable customers. This is one of the effects of globalization and deregulation of global finance, in which banks are moving away from offering services to all customers in a given area (country) to serving the most profitable customers around the world (multinational banks). In the case of the credit market, this means focusing on long-term relationships with customers perceived as safe (even if they live in less "safe" countries) and neglecting other customers – who thus become excluded from the financial system (Dymski, 2005; 2009). Kebede et al. (2021) also observed a negative impact of foreign banks on the level of inclusion when examining only African countries. However, after a detailed analysis of the phenomenon, the authors indicated that this effect is only visible in countries with weak institutions (where banks are uncertain about creditworthiness assessment, so serve only the most trusted/profitable customers). In countries with a favourable institutional environment, foreign banks increase inclusion due to greater efficiency.

Other studies examined the impact of the economic situation on financial inclusion, analysing it from the

economic situation on financial inclusion, analysing it from the demand side (they identify factors that make a given person more likely to have an account). Research by Ehigiamusoe et al. (2021) indicated that GDP growth boosts financial development but only in high and middle-income countries. This means that after reaching a certain level of income, the market is large enough to stimulate the development of financial enterprises. In turn, the study conducted by Yangdol and Sarma (2019) showed a positive impact of GDP size on financial inclusion (measured as having an account in a financial institution) regardless of income. The impact of GDP on having an MM account is negative in poor countries (along with income growth, people replace MM with financial institutions). The study also found that policies should target the poor, the unemployed, the illiterate and women to increase inclusion, as they are less likely to have accounts. However, in some other studies, GDP was not identified as a key factor for the development of the banking sector (Cherif & Dreger, 2016), which was interpreted by engagement of banks in financing public debt, instead of the developing private sector – significant effect was instead observed in the case of the capital market development (Naceur et al., 2014).

Naceur et al. (2015) described structural factors, such as population size and density, as well as informal economic size (People and entrepreneurs in the informal sector do not use financial institutions because they record transactions and require declaration of income/assets. However, development of the financial sector may negatively impact the size of the informal sector – when the benefits of access to financial services (e.g. obtaining a loan) exceed the costs of paid taxes (Blackburn et al., 2012; Njangang et al., 2020), which simultaneously with political factors impact financial inclusion. Their impact, as well as the size of GDP, is important because they affect the efficiency of financial sector operation. In the case of many people living in a small area, providing access to ATMs or banking branches is cheaper and the expected volume of loans/deposits is higher (the level of GDP has a positive impact on the demand for financial services), (Evans & Adeoye, 2016; Fowowe, 2014). It means that some countries may have a lower level of inclusion despite good policies and macroeconomic stability. Therefore, it is valuable to include structural factors while studying financial inclusion.

Other types of research worth mentioning are those analysing impact of institutions on social well-being and economic development in Africa. The study performed by Sawadogo and Semedo (2021) found a negative relation between financial inclusion and income inequalities which occurs only in countries with strong institutions. On the other hand, Kunawotor et al.

(2020) observed a positive impact of institutional variables as rule of law and control of corruption, on equal distribution of income among 40 African countries.

A relationship between GDP growth and institutions was identified by Wandeda et al. (2021). This study discovered that impact varies across the continent and is particularly visible in low income and West African countries. Michalopoulos and Papaioannou (2013) observed the impact of pre-colonial institutions on the current level of countries' development in the studied continent. Frankel (2010) trying to explain the success of Mauritius, discovered institutions and lack of ethnic conflicts as a foundation of the country's (relative) prosperity.

DATA AND METHODOLOGY

DATA

Financial inclusion is determined by various factors. Because institutions are only one of them, socioeconomics and infrastructural measures were incorporated as control variables in the model (the selected variables reflect the factors most frequently studied in the literature, for which it was possible to find complete data). All selected variables are presented in Table 1. According to the literature, they cover the most important factors influencing financial inclusion. Creation of an index of financial inclusion will be presented in the next subsection.

Selection of institutional variables to include in the model requires a choice between different approaches found in the literature. While some researchers use a narrow definition of institutions, recognizing them as rules and constraints shaping interactions between individuals, others include also "outcomes of the game" (Kowalewska et al., 2023). In the case of the latter approach, the possibility of identifying the impact of institutions on the development/income is limited because both measures will change in parallel, due to their mutual dependence. A similar problem applies to the detailedness of institutional measurement. On the one hand, it should be as precise as possible, referring to a specific permanent "rule", which provides an objective and thorough examination of a given institutional area. On the other hand, such an approach means that it is necessary to measure a very large number of variables in order to obtain an overall picture, which poses a risk of omission of important but difficult to measure factors and may not fully reflect people's opinions about the institutional environment (Individuals' decisions, for example regarding investments, depend on subjective opinion about the quality of the institutions – so they may impact economic outcomes), (Voigt, 2013). For this reason, aggregated institutional measures, even if they do not meet all the

above-mentioned requirements, provide a valuable approximation of the overall institutional level (Kowalewska et al., 2023).

Therefore, two types of institutional measures were included in the study. Constraints on the executive, property rights, and resolving insolvency are objective measures which refer to a specific institution, while the World Governance Indicators were used as a synthetic variable reflecting the general institutional environment in the surveyed countries. This indicator is quite popular and has been used in previous studies on similar topics (Kebede et al., 2021; Nkoa & Song, 2020; Omar & Inaba, 2020).

Table 1: Variables used in the model

Variable	Abbreviation	Description	Source
FINANCIAL INCLUSION - ENDOGENOUS VARIABLE			
Index of financial inclusion	FIN	Index created by calculation average of standardized variables of number of ATMs per 100,000 adults, number of bank branches per 100,000 adults, value of outstanding bank deposits to GDP (values from 0 to 1)	(Deposits) FAS, International Monetary Fund (2021); (ATM, bank branches) WDI, World Bank (2022b)
INSTITUTIONAL			
Constraints on the executive	CONSTRAINTS	Index created by calculation average of judicial and legislative constraints (values from 0 to 1)	V-Dem, Coppedge et al. (2022)
Resolving insolvency	RESOLVING	Score Resolving insolvency (cost, time, outcome; values from 0 to 100)	Doing Business, World Bank (2021)
Property rights	PROPERTY	Property rights (right to acquire, possess, inherit, and sell private property; values from 0 to 1)	V-Dem, Coppedge et al. (2022)
World Governance Indicators	WGI	Index created by calculation average of Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, Control of Corruption (values from -2.5 to +2.5)	WGI, World Bank (2022c)
SOCIOECONOMIC			
Education	EDUCATION	Level of education (completion, enrolment, equality, quality, human resources involved; values from 0 to 100)	2020 IIAG, Mo Ibrahim Foundation (2020)
GDP per capita	GDP	Gross domestic product per capita, PPP (constant 2017 international dollars)	WDI, World Bank (2022b)
Inflation	INFLATION	Inflation of consumer prices (annual; percentage)	WDI, World Bank (2022b)
Urbanization	URBANIZATION	Urban population (percentage of the total population)	WDI, World Bank (2022b)
INFRASTRUCTURAL			
Infrastructure	INFRASTRUCTURE	Level of infrastructure (digital communication, access to energy, transport network; values from 0 to 100)	2020 IIAG, Mo Ibrahim Foundation (2020)

Source: Own preparation.

Descriptive statistics of all variables (including those used in index construction) are presented in Table 2, while Table 3 shows correlation among them (because index of financial inclusion – FIN – will be used as a dependent variable in the model, it was added in the correlation matrix). Higher values of all variables, except inflation and urbanization, indicate higher country development or stronger institutions. There-fore, a positive correlation between them is understandable. Inflation (which negatively impacts economic development) has no positive and significant correlation with any other variables. On the other hand, urbanization may boost development, due to lower transport costs and better access to infrastructure in urban areas (Naceur et al., 2015) – thus positive and significant correlation with other variables occurs.

Table 2: Descriptive statistic of variables

Variable	Mean	Standard deviation	Minimum	Maximum
Number of ATMs per capita	14.7	17.4	0.4	90.0
Number of bank branches per capita	8.3	10.0	0.6	55.1
Value of bank deposits to GDP	35.8	28.6	4.9	169.3
CONSTRAINTS	0.6	0.3	0.1	0.9
RESOLVING	34.9	15.5	0.0	69.1
PROPERTY	0.7	0.2	0.1	0.9
WGI	-0.5	0.5	-1.6	0.9
EDUCATION	52.3	14.7	23.2	84.3
GDP	6,357.0	6,852.0	959.0	37,571.0
INFLATION	5.9	14.4	-3.2	255.3
URBANIZATION	43.4	16.6	15.5	73.2
INFRASTRUCTURE	41.3	19.4	6.7	88.3

Note: score resolving insolvency is zero in case of "no practise" of resolving insolvency – zero insolvency cases over past five years. Disregarding these cases, the smallest value of this variable is 15.7

Source: Own preparation.

Table 3: Correlation matrix of variables used in the model

	ATMs	Bank branches	Value of deposits	FIN	CONSTRAINTS	RESOLVING	PROPERTY	WGI	EDUCATION	GDP	INFLATION	URBANIZATION	INFRASTRUCTURE
ATMs	1.00	0.79	0.58	0.90	0.44	0.21	0.10	0.67	0.60	0.64	-0.04	0.43	0.68
Bank branches		1.00	0.61	0.91	0.38	0.06	0.14	0.58	0.61	0.55	-0.08	0.41	0.61
Value of deposits			1.00	0.82	0.35	0.30	0.31	0.57	0.63	0.43	-0.07	0.31	0.72
FIN				1.00	0.44	0.21	0.20	0.69	0.70	0.62	-0.07	0.44	0.76
CONSTRAINTS					1.00	0.23	0.39	0.67	0.41	0.05	-0.01	0.04	0.33
RESOLVING						1.00	0.17	0.37	0.39	0.09	-0.08	-0.08	0.43
PROPERTY							1.00	0.29	0.18	-0.04	-0.09	0.34	0.26
WGI								1.00	0.68	0.35	-0.10	0.21	0.53
EDUCATION									1.00	0.45	-0.02	0.37	0.76
GDP										1.00	-0.05	0.56	0.55
INFLATION											1.00	-0.05	-0.02
URBANIZATION												1.00	0.58
INFRASTRUCTURE													1.00

Note: Correlation coefficient higher or equal to 0.14 is significant at 1%; 0.11 at 5%; 0.9 at 10% (Number of observations: 350), (Obilor & Amadi, 2018)

Source: Own preparation.

Index of financial inclusion

According to Sarma (2008) financial inclusion has three dimensions: penetration, availability, and usage. They may be measured by respectively: number of accounts per capita or percentage of population having an account (penetration); number of bank branches/ATM/bank employees per capita (availability); volume of credit/deposit to GDP (usage). Taking into account all dimensions provides a full picture of the level of financial inclusion. This is possible because the index does not count only people who have an account (and may not use it), but also considers ease of access (e.g., the ability to withdraw/deposit cash to the account) and real use (value of credit/deposit).

Drawing from accessible data, the Index of Financial Inclusion (FIN) built in this study will include only two dimensions (Data on the account ownership are published by World Bank (2024a) in Findex database with a few-year interval. They will be used for index evaluation in in the following parts) availability (bank

branches and ATMs per capita), and usage (volume of bank deposits to GDP). Excluding countries with missing data (In three cases, the data lacked a single value: number of bank branches per 100,000 adults in Equatorial Guinea in 2016, outstanding deposits with commercial banks (% of GDP) in Malawi in 2014, and legislative constraints on the executive in Egypt in 2015. Due to the linear course of the phenomena, in these cases forecast (average value from adjacent years) of missing values was used) the financial inclusion index covers 35 African (Algeria, Angola, Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Chad, Côte d'Ivoire, Egypt, Equatorial Guinea, Eswatini, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Morocco, Mozambique, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Togo, Tunisia, Uganda, Zambia, Zimbabwe) in 2010-2019.

The selected variables are commonly used in the literature, however differences in selection of particular variables can be observed. Many of the researches include ATMs and bank branches per capita (Ajide, 2017; Anarfo et al., 2020; Kebede et al., 2021; Nkoa & Song, 2020; Sawadogo & Semedo, 2021), although frequently used, in some as an additional variable (Anarfo et al., 2020; Kebede et al., 2021; Nkoa & Song, 2020; Sawadogo & Semedo, 2021), in some as the only one (Evans & Adeoye, 2016; Kumar, 2013; Omar & Inaba, 2020) is number of bank accounts or depositors per capita. Studies where the development of the financial sector is measured only by volume of credit to private sector (% of GDP) also occur (Ehigiamusoe et al., 2021; Law & Habibullah, 2009).

The first stage of the index calculation was the standardization of the variables, using Zero Unitarization Method (Formula 1) (Kukuła, 2000; Sarma, 2008).

$$S_i = \frac{X_i - min_i}{max_i - min_i} \qquad (1)$$

Where X_i is the actual value of the variable, min_i and max_i are respectively the lowest and the highest value of the variable. Standardized values are <0;1>.

In the next step, the arithmetic mean of the standardized values (bank branches, ATMs, value of bank deposits) was calculated to obtain the index. A similar approach is used, among others, by the United Nations Development Program (2007) to calculate the Human Development Index. It assumes the possibility of substitution between individual variables (in the case of this index, bank branches can be a substitute for ATMs). The result is the index of financial inclusion (FIN), whose values are in the <0;1> range.

Since an account is the basis of financial inclusion and a gateway to use ATMs or make deposits, it is valuable to present the correlation between index FIN and account ownership 15+. This allows assessing the quality of the created index. However, a 100% correlation is not expected, as the accounts held may be used very rarely, due to the lack of appropriate infrastructure (which FIN reflects). Chart 1 shows the relationship between the percentage of the population having an account with a financial institution and the FIN rate in 2011, 2014, and 2017. The equation of the relationship between the variables is presented in Table 3. It was calculated as follows:

$$Account\ ownership\ in\ fin.\ institution_i = \beta_0 + \beta_1 FIN_i + \varepsilon_i \qquad (2)$$

where "i" denotes country. The error term is signed by "ε".

Chart 1: Correlation between account ownership in financial institution (age 15+) and FIN
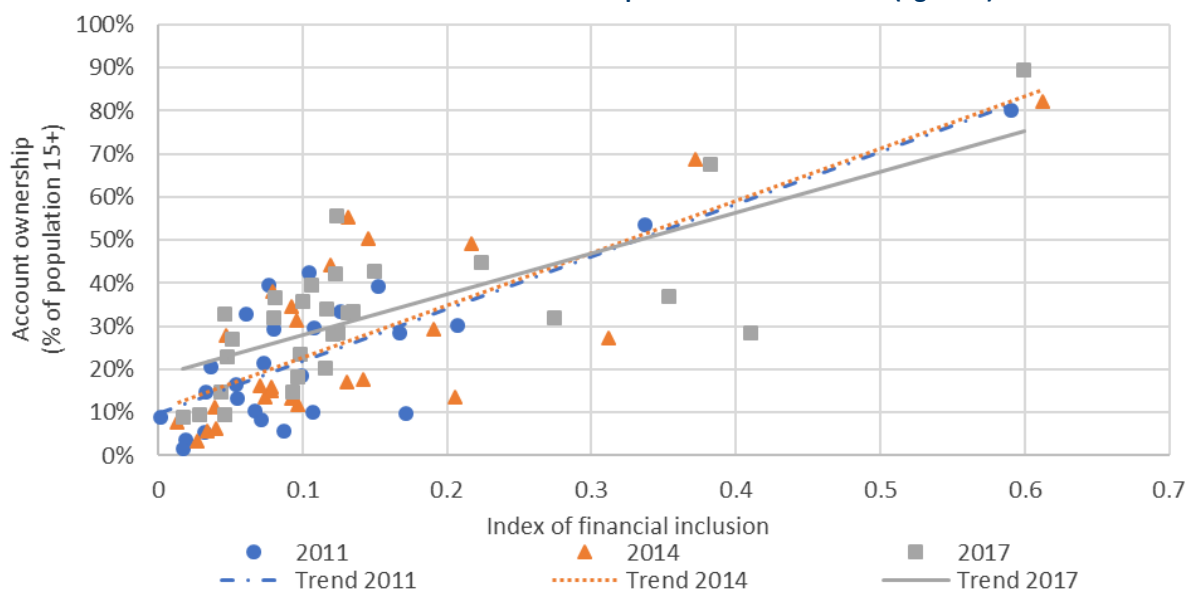
Source: Own preparation.

**Table 4: Results of regression of FIN on account ownership in financial institution (age 15+)
and correlation coefficient**

	2011	2014	2017
Constant	0.0964***	0.1074**	0.1837***
	(0.0288)	(0.0391)	(0.0335)
FIN (Index of financial inclusion)	1.2160***	1.2089***	0.9475***
	(0.1765)	(0.2103)	(0.1678)
R^2	0.6600	0.5800	0.5400
Pearson correlation coefficient	0.8200***	0.7600***	0.7300***

Note: *** means variable/correlation significant at 1%; ** at 5%; * at 10%

Source: Own preparation.

The obtained high correlation proves that the index well reflects the level of financial inclusion in each country. The study does not include the percentage of the population with a mobile money account, as MM is less regulated and provides less security. According to Ahman et al. (2020) in 2017, only Kenyan law provided insurance of deposits in MM. At the same time, deposit insurances are operating in almost half of the analysed countries (International Association of Deposit Insurers, 2022; World Bank, 2019a), and are under development in another six (International Association of Deposit Insurers, 2021). This means that people who have MM accounts in these countries and use them to save, take on greater risk than people saving in banks.

Econometric model consruction

A panel model can be created in a few ways. The most popular are ordinary least squares method, fixed effect, and random effect. Choice of the best one is possible by analysis of data and results obtained using several methods (Maddala, 2001). At the beginning of the model construction, the ordinary least squares method (OLS) was used (this method requires homogenous units). Its equation is given as follows:

$$FIN_{it} = \beta_0 + \beta_1 CONSTRAINTS_{it} + \beta_2 RESOLVING_{it} + \beta_3 PROPERTY_{it} + \beta_4 WGI_{it} + \beta_5 EDUCATION_{it} + \beta_6 GDP_{it} + \beta_7 INFLATION_{it} + \beta_8 URBANIZATION_{it} + \beta_9 INFRASTRUCTURE_{it} + \varepsilon_{it} \tag{3}$$

here ε it is an error term of country i at time t.

Its verification can be performed by the Wald and Breusch–Pagan test. If results of the Wald test indicate the lack of object homogeneity, another model should be calculated (Spierdijk, 2022). Rejection of null hypothesis in the Breusch–Pagan test also suggests esti-

mating a model which includes individual effect due to the occurrence of heteroscedasticity in residuals (Mátyás & Sevestre, 2008). Choice ought to be made between fixed effect (FE) and random effect (RE) models. RE model is given as follows:

$$FIN_{it} = \beta_0 + \beta_1 CONSTRAINTS_{it} + \beta_2 RESOLVING_{it} + \beta_3 PROPERTY_{it} + \beta_4 WGI_{it} + \beta_5 EDUCATION_{it} + \beta_6 GDP_{it} + \beta_7 INFLATION_{it} + \beta_8 URBANIZATION_{it} + \beta_9 INFRASTRUCTURE_{it} + v_{it} \tag{4}$$

Parameter v_{it} is the error term of country i at time t, including the error component and random individual effect. FE model is calculated according to the following formula:

$$FIN_{it} = \beta_0 + \beta_1 CONSTRAINTS_{it} + \beta_2 RESOLVING_{it} + \beta_3 PROPERTY_{it} + \beta_4 WGI_{it} + \beta_5 EDUCATION_{it} + \beta_6 GDP_{it} + \beta_7 INFLATION_{it} + \beta_8 URBANIZATION_{it} + \beta_9 INFRASTRUCTURE_{it} + u_i + \varepsilon_{it} \tag{5}$$

Parameter ε is the error term of country i at time t, ui is the individual fixed effect of country i. Hausmann test, makes it possible to choose between the FE and RE models. No basis to reject the null hypothesis means that the RE estimator is most effective. In another way the FE model should be used (Maddala, 2001).

Results and discussion

The model was estimated as described in the previous section. Rejection of null hypothesis in Wald, Breusch–Pagan and Hausmann tests means that the model with fixed individual effect is appropriate for the collected data. Results of all regressions are presented in Table 5.

Table 5: Results of regression

Variable	OLS	RE	FE
Constant	0.079691**	-0.150096***	-0.188983***
	(0.037144)	(0.046620)	(0.055050)
CONSTRAINTS	0.025549	0.041350**	0.027612
	(0.024478)	(0.017688)	(0.017735)
RESOLVING	-0.002388***	0.000641*	0.000838**
	(0.000347)	(0.000368)	(0.000378)
PROPERTY	0.037867	0.014443	0.022157
	(0.031308)	(0.028389)	(0.028660)
WGI	0.104947***	0.019997*	0.010539
	(0.013452)	(0.011937)	(0.012367)
EDUCATION	0.000224	0.001508**	0.000865
	(0.000510)	(0.000587)	(0.000627)
GDP	6.6E-6***	1.8E-6**	1.4E-6*
	(8.7E-7)	(7.9E-7)	(8.1E-7)
INFLATION	-0.000397	-0.000120	-0.000115
	(0.000295)	(0.000088)	(0.000086)
URBANIZATION	-0.001598***	0.002891***	0.004852***
	(0.000416)	(0.000817)	(0.001241)
INFRASTRUCTURE	0.004775***	0.001276***	0.000808**
	(0.000431)	(0.000330)	(0.000375)
Breusch–Pagan test	1160.100000	1160.100000	
	p ≈ 0.000000	p ≈ 0.000000	
Hausmann test	36.800000	36.800000	
	p ≈ 0.000000	p ≈ 0.000000	
Wald test	123773.000000		69240.000000
	p = 0.000000		p = 0.000000

Note: *** means variable significant at 1%; ** at 5%; * at 10%

Source: Own preparation.

The quality of resolving insolvency positively affects financial inclusion. This is because the faster and higher outcome of bankruptcy proceedings (better judicial system) results in fewer losses due to non-performing loans for lenders (banks). This stimulates the granting of new loans, lowers their interest rates (lower risk costs), and supports the development of the financial sector. This is in line with previous research (Sarma & Pais, 2011) that showed the negative impact of non-performing assets on financial inclusion.

GDP per capita is another variable which positively affects development of the financial sector. It is because increase in income results in higher demand for financial services (Yangdol & Sarma, 2019).

Urbanization has a positive and statistically significant impact on financial inclusion. The obtained result confirms previous research and available data which showed that people living in rural areas are more often financially excluded. One of the reasons for this situation is the difficulty (and higher cost) of providing financial infrastructure in areas with less population. Naceur et al. (2015) showed that structural factors, including higher population density, result in a higher level of financial inclusion ceteris paribus.

The quality of infrastructure also positively affects the endogenous variable. The obtained result is consistent with the theory that a better transport network and remote communication infrastructure facilitate financial inclusion. A well-developed Internet/telephone network enables the use of banking services via Internet (mobile banking) (Evans & Adeoye, 2016). On the other hand, road infrastructure enables the creation of banking branches and ATMs in rural and sparsely populated areas (Sarma & Pais, 2011).

The model showed a positive but statistically insignificant impact of the remaining institutional variables: constraints on the executive, WGI and property rights. Positive impact of constraints on the executive is consistent with theoretical knowledge, as strong institutions and greater predictability of operating conditions positively affect the country's economic development (Allen et al., 2016). Banerjee and Duflo (2011) described how irresponsible decisions of the governors, like the prohibition of the enforcement of debts or

or writing off loans before the elections, indicate a decrease in the financial inclusion of the poor, including their access to credit. The positive impact of the WGI is also consistent with previous studies (Kebede et al., 2021; Nkoa & Song, 2020), but unlike in them, it turned out to be insignificant. This may mean that in the studied group of countries the level of resolving insolvency, a variable that has a positive impact on the quality of bank assets, is more important than the overall institutional level. A similar situation occurs in the case of property rights, the respect of which has a positive effect, but is not a key (or sufficient) factor for financial inclusion.

Education and inflation do not have a statistically significant effect on the endogenous variable, but the direction of their impact is consistent with the theory (Ehigiamusoe et al., 2021; Suri & Jack, 2011; Zins & Weillb, 2016).

Robustness check

Sample and exogenous variables verification

This subsection presents a robustness check by changes in the variables or division of studied countries into separate groups. All results are presented in Table 6. All models were calculated by OLS, RE and FE methods before choice of appropriate method (unpublished results). In all cases (except the first one – with low-income countries – where RE was appropriate) FE was chosen.

To verify whether the results vary by economic development of the countries, they were divided according to their membership in the World Bank's income groups in the first year covered by the study (World Bank, 2010; 2024b). The obtained results (model 3) showed that the impact of resolving insolvency, identified at the level of the entire continent, is visible only in wealthier countries (high and upper-middle income (in 2010 Equatorial Guinea was classified as a high-income country. This country was included in the group of more developed countries, including also those upper-middle income). In this group, there is also a positive and significant impact of the general institutional level measured by the WGI. In the poorest countries (low income – model 1), constraints on the executive were identified as the only one important institutional variable. This means that the lack of possibility for the government to usurp rents from financial transactions or to suddenly change the operating conditions of enterprises (Herger et al., 2008) is the most important factor of financial development in these countries.

Interestingly, in lower-middle income countries (model 2), there was no positive impact of any of the

included institutional variables, but even a statistically significant negative impact of all of them except WGI. The results obtained for this group require further research. They may confirm the thesis about the lack of a linear relationship between institutions and the level of development (Voigt, 2013), or indicate their poor enforcement in less developed countries.

It is also worth paying attention to the impact of inflation on financial inclusion. Although on the scale of the entire continent its impact on inclusion was negative (and insignificant), in the above models such an impact was identified only in the case of the poorest countries (statistically significant), while in the group of lower-middle income countries it was positive (also statistically significant), and in the richer ones, statistically insignificant, but also positive. Differences in the obtained results may come from diverse inflation levels between groups. The highest recorded inflation in the low-income group was 255% percent per year, in the lower-middle 31%, and 9% in the richest. The level of 255% occurred in Zimbabwe in 2019. Apart from this observation, the inflation levels in the first two groups were similar. An (unpublished) model excluding Zimbabwe showed that inflation did not significantly affect the level of inclusion in this group of countries, while the impact of other relevant variables was the same. This may mean that inflation, unless it is hyperinflation that degrades economic life, does not have a negative impact on financial inclusion (and in certain conditions it may even have a positive impact). These results are consistent with those obtained by Ehigiamusoe et al. (2021) who showed that inflation harms financial development only at high levels, which is the case of poorer countries (in developed countries, having a more stable price level, this impact was insignificant).

Additionally, in the next model, countries where over 9% of the total population declared their religion as the reason for not having an account, were excluded from the sample (model 4). A question about this reason for financial exclusion was asked for the first time in the Findex survey in 2021 (World Bank, 2024a) – after the studied period. However, since religion belongs to the group of informal institutions, which take over 100 years to change (Kuncic, 2014), it can be assumed that there have been no significant changes in this reason for being unbanked in the preceding 11 years. This assumption excluded 9 countries in which factors other than those included in the model (religion/Islamic bank presence) may affect financial inclusion. In this case, the results were very similar to those obtained on the entire sample – the positive and significant impact of resolving insolvency was observed.

In the main model, urbanization was used as a variable reflecting "population density" (number of people living in a small area) – which reflects the ease and cost

of providing wide access to financial services. This was done because the study covers countries with significant uninhabited areas (especially the Sachara Desert) (Food and Agriculture Organization of the United Nations, 2023). In the case of these countries, dividing the number of inhabitants by the area of the entire country, "underestimates" population density. However, to check how the incorporation of this variable, instead of urbanization, would affect the results such a model was also calculated (additionally, total population size was added as one of the factors determining the size of the market for financial services; Naceur et al., 2015). In this case, none of the added variables turned out to be statistically significant, while constraints on the executive, turned out to be statistically significant, alongside education (model 5).

Possible measure of financial inclusion covering Mobile Money

Mobile Money plays an important role in low developed countries, where it substitutes for the poorly developed banking sector, especially in rural areas. For this reason, the following subsection presents how to measure financial inclusion including people with an VMM account. Thanks to this, a model with a dependent ariable (a measure of financial inclusion) that also covers people using MM, was calculated to check the obtained results.

The population of a given country can be divided into four groups: people without an account, people with an account only in MM, people with an account only with a financial institution, and people with both an account with MM and a financial institution (Demirgüç-Kunt et al., 2022). Counting people who have both types of accounts does not affect the level of inclusion (measured by having an account with a financial institution in comparison to having any type of account). However, people with only an MM account underestimate the level of inclusion measured by financial institution account. To solve this problem, the index of financial inclusion should consist of variables reflecting the potential of MM. Chart 2 shows how having an MM account depends on the level of income. The available data indicate that the use of MM as the only account occurs in countries with a GDP per capita below USD 5000. Additionally, in none of the surveyed countries, was MM the only account for more than 28% of citizens.

Chart 2: Population with an MM account in 2017
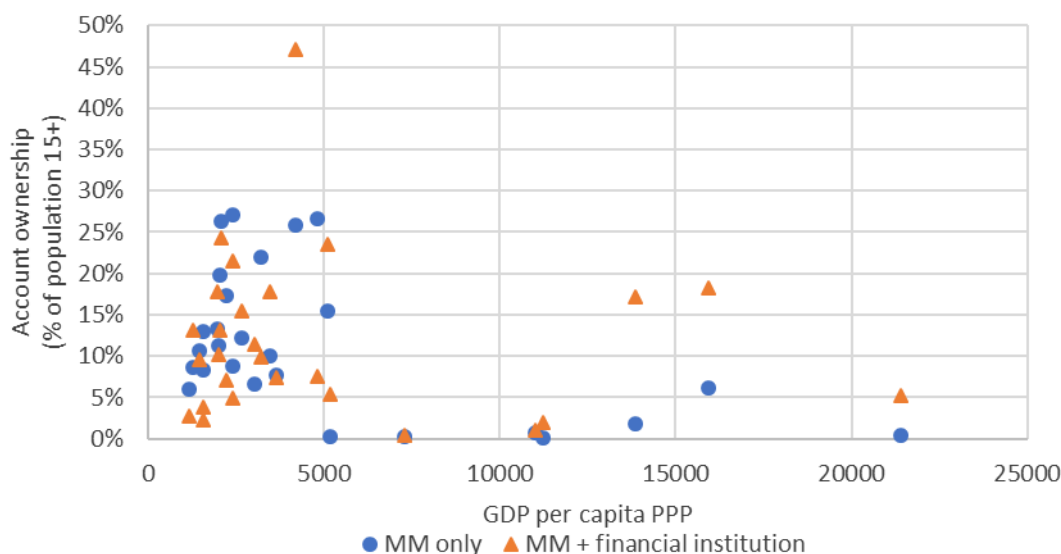
Note: the chart shows 28 countries which were covered by the Findex study. GDP per capita PPP in current international USD. MM only was calculated as "Account (% age 15+)" minus "Financial institution account (% age 15+)". MM + financial institution was calculated as "Mobile money account (% age 15+)" minus MM only

Source: Own preparation.

**Table 6: Results of robustness check regression**

Variable	1 L	2 LM	3 UM+H	4 Ex-religious	5 Incl. pop.	6 FIMM	7 FIN
Constant	-0.0526**	0.1166	-0.8555***	-0.2091***	-0.0405	-0.7087**	-0.2972***
	(0.0241)	(0.0835)	(0.3035)	(0.0679)	(0.0427)	(0.2939)	(0.0787)
CONSTRAINTS	0.0207*	-0.0827**	0.0727	0.0313	0.0416**	0.1320	0.0735**
	(0.0112)	(0.0410)	(0.0495)	(0.0218)	(0.0184)	(0.1261)	(0.0338)
RESOLVING	-0.0001	-0.0009*	0.0042***	0.0009*	0.0008*	-0.0010	0.0001
	(0.0002)	(0.0005)	(0.0014)	(0.0005)	(0.0004)	(0.0012)	(0.0003)
PROPERTY	-0.0113	-0.0776*	0.1391	0.0150	0.0236	-0.0714	0.0247
	(0.0160)	(0.0446)	(0.1847)	(0.0387)	(0.0296)	(0.0887)	(0.0238)
WGI	-0.0031	-0.0202	0.1855**	0.0087	0.0014	-0.0580	-0.0251
	(0.0077)	(0.0147)	(0.0807)	(0.0162)	(0.0126)	(0.0612)	(0.0164)
EDUCATION	0.0011***	0.0016**	-0.0009	0.0009	0.0012*	0.0019	0.0042***
	(0.0004)	(0.0008)	(0.0029)	(0.0008)	(0.0007)	(0.0037)	(0.0010)
GDP	-3E-7	4E-6	-7E-7	1E-6	1E-6	2E-5	-1E-5**
	(4E-6)	(4E-6)	(1E-6)	(1E-6)	(8E-7)	(2E-5)	(6E-6)
INFLATION	-0.0001***	0.0008**	0.0018	-0.0001	-0.0001*	0.0000	-0.0001**
	(0.0000)	(0.0004)	(0.0023)	(0.0001)	(0.0001)	(0.0002)	(0.0000)
URBANIZATION	0.0015***	-0.0009	0.0163***	0.0056***		0.0153**	0.0045***
	(0.0005)	(0.0015)	(0.0047)	(0.0016)		(0.0060)	(0.0016)
INFRASTRUCTURE	0.0009***	0.0026***	-0.0013	0.0009*	0.0019***	0.0029*	-0.0000
	(0.0003)	(0.0005)	(0.0011)	(0.0005)	(0.0003)	(0.0017)	(0.0005)
Total population					2E-10		
					(5E-10)		
Pop. density					-0.0001		
					(0.0002)		
Breusch–Pagan test	268.1000						
	p ≈ 0.0000						
Hausmann test	11.6000						
	p = 0.2400						
Wald test		636.2000	439.9000	41975.0000	135452.0000	267.0000	1360.0000
		p ≈ 0.0000	p ≈ 0.0000	p ≈ 0.0000	p ≈ 0.0000	p ≈ 0.0000	p ≈ 0.0000
Number of countries	16.0000	12.0000	7.0000	26.0000	35.0000	12.0000	12.0000

Note: *** means variable/correlation significant at 1%; ** at 5%; * at 10%. Data on population density and total population collected from World Bank (2022b).

Source: Own preparation.

Chart 3 shows the relationship between the percentage of population having any type of account and the FIN index (used as a dependent variable in the main model) in 2011, 2014, and 2017. Table 4 presents the relationship equation (calculated based on equation 2).

Chart 3: Correlation between account ownership (age 15+) and FIN
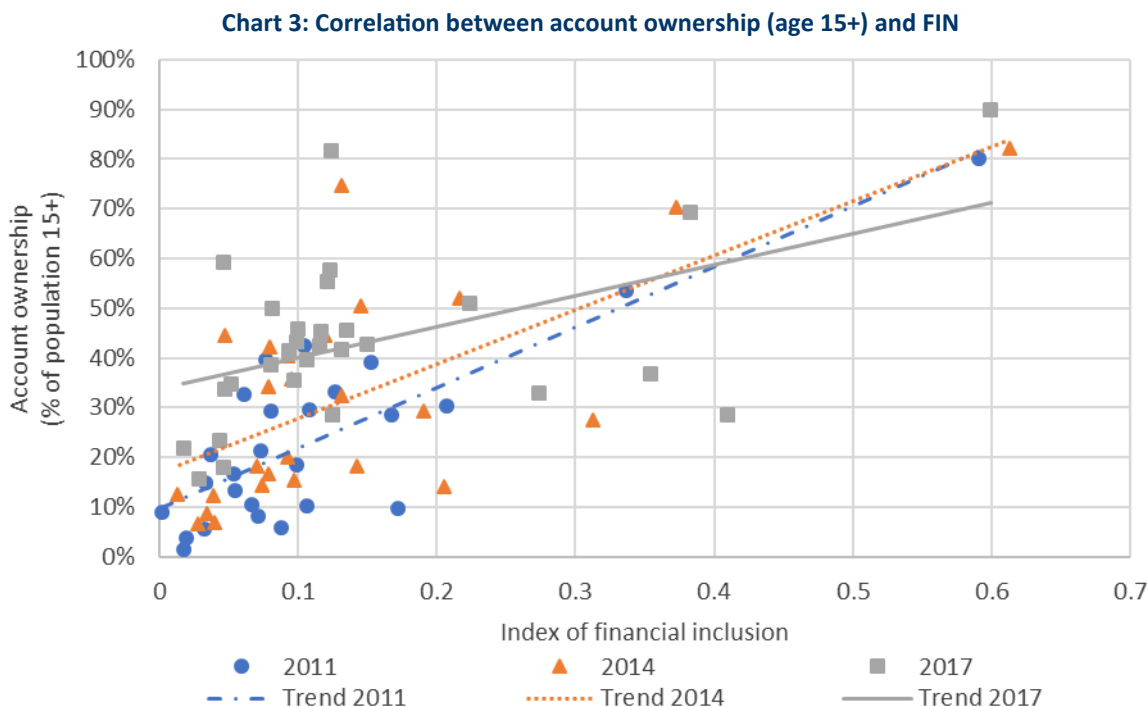
Note: the chart shows the countries that were covered by the Findex study in a specific year (26, 26 and 29 countries, respectively).

Source: Own preparation.

Table 7: Results of regression of FIN on account ownership (age 15+) and correlation coefficient

Variables	2011	2014	2017
Constant	0.0964***	0.1680***	0.3373***
	(0.0288)	(0.0468)	(0.0426)
FIN (Index of financial inclusion)	1.2160***	1.0940***	0.6267***
	(0.1764)	(0.2515)	(0.2143)
R^2	0.6600	0.4400	0.2400
Pearson correlation coefficient	0.8200***	0.6600***	0.4900***
Number of observations	35.0000	35.0000	35.0000

Note: *** means variable/correlation significant at 1%; ** at 5%; * at 10%.
Source: Own preparation.

The above data indicate that the created index of financial inclusion (FIN) imperfectly matches the percentage of the population having an account. With subsequent years (development of MM), the correlation coefficient decreases. In addition, the growing intercept indicates that MM improves financial inclusion (measured as having an account) in the most excluded societies. On the other hand, the decreasing value of β1 (the coefficient standing next to the FIN value) means a decreasing impact of the presented financial inclusion index on the "included" percentage of the population. Thanks to the introduction of MM, regardless of the availability of banking services (access to ATMs and bank branches; as well as the size of deposits), an increasing percentage of the population has an account – by the extensive network of MM outlets. However, countries with a better developed banking sector (ATMs, bank branches and volume of deposits) do not record a much higher level of financial inclusion, because new accounts are opened by people who already use MM (Having an account in a financial institution brings benefits, such as deposit guarantees and access to other financial services, but it does not affect the level of inclusion measured by the percentage of the population

with any type of account. In order to verify the hypothesis that MM reduces the dependence between FIN and account ownership, 11 countries were selected for detailed investigation (for this countries data from the Findex survey were available for 2014 and 2017 and the FIMM index could be calculated). These countries have on average experienced increase in FIN (0.091 to 0.095), FIMM (0.091 to 0.127), account ownership (36% to 47%) and account ownership at financial institution (29% to 33%). A negative correlation was observed with the value of the FIN index in 2014 and the change (within three years) in the percentage of the population that had an MM account as the only one (total rose from 7% to 14%). This means than in backward countries, the number of people with only MM increased the most. While a positive correlation occurred between the FIN and the change in the percentage of the population having both an MM account and a financial institution (total increase from 11 to 17%). Countries with lower FIN and FIMM index values also experienced a faster increase in the value of these indices. However, all calculated Pearson correlation coefficients were statistically insignificant backward countries, the number of people with only MM increased the most. While a positive correlation occurred between the FIN and the change in the percentage of the population having both an MM account and a financial institution (total increase from 11 to 17%). Countries with lower FIN and FIMM index values also experienced a faster increase in the value of these indices. However, all calculated Pearson correlation coefficients were statistically insignificant).

For this reason, an index of financial inclusion (name it FIMM) that also covers the population with only an MM account would be useful. It can consider four variables: number of commercial bank branches per 100,000 adults, number of ATMs per 100,000 adults, number of registered mobile money agent outlets per 100,000 adults and outstanding deposits with commercial banks (% of GDP). Data about MM outlets are collected from Financial Access Survey (International Monetary Fund, 2021), and other data

sources as in Table 1. The index calculation method is the same as for the FIN index. First, the variables are standardized (equation 1), then the average value for a given country each year is calculated. In this case, the arithmetic mean is also used, because there is a substitution between the variables. MM agents provide services in the field of user registration and cash deposits/withdrawals, (Muthiora, 2015) so they can substitute for both bank branches and ATMs. The construction of the index is the author's proposal, based on the literature on financial inclusion measures (presented in the earlier part of the article). To the author's knowledge, a financial inclusion index that covers MM has not been

For this reason, an index of financial inclusion (name it FIMM) that also covers the population with only an MM account would be useful. It can consider four variables: number of commercial bank branches per 100,000 adults, number of ATMs per 100,000 adults, number of registered mobile money agent outlets per 100,000 adults and outstanding deposits with commercial banks (% of GDP). Data about MM outlets are collected from Financial Access Survey (International Monetary Fund, 2021), and other data sources as in Table 1. The index calculation method is the same as for the FIN index. First, the variables are standardized (equation 1), then the average value for a given country each year is calculated. In this case, the arithmetic mean is also used, because there is a substitution between the variables. MM agents provide services in the field of user registration and cash deposits/withdrawals, (Muthiora, 2015) so they can substitute for both bank branches and ATMs. The construction of the index is the author's proposal, based on the literature on financial inclusion measures (presented in the earlier part of the article). To the author's knowledge, a financial inclusion index that covers MM has not been presented in the literature so far. Chart 4 shows the relationship between the FIMM index and the percentage of the population with an account. Table 5 shows the trend equation (calculated according to equation 2).

Table 8: Results of regression of FIMM on account ownership (age 15+) and correlation coefficient

Variables	2011	2014	2017
Constant	0.1011	0.1308*	0.2068***
	(0.0850)	(0.0632)	(0.0420)
FIMM (Index of financial inclusion including MM)	2.1616	2.4416***	1.6967***
	(0.6650)	(0.4957)	(0.2619)
R^2	0.4800	0.7100	0.6600
Pearson correlation coefficient	0.6900*	0.8400***	0.8100***
Number of observations	6.0000	12.0000	23.0000

Note: *** means variable/correlation significant at 1%; ** at 5%; * at 10%

Source: Own preparation.

Chart 4: Correlation between account ownership (age 15+) and FIMM
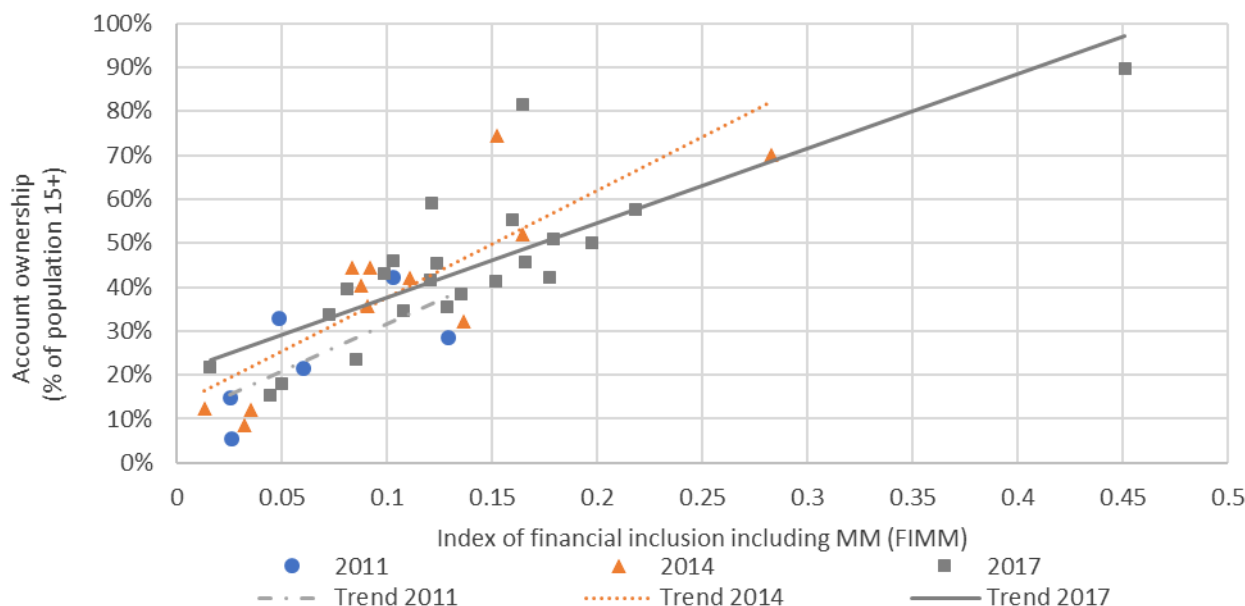
Note: the chart shows the countries that were covered by the Findex study in a specific year (6, 12 and 23 countries, respectively).

Source: Own preparation.

The presented data indicate that the proposed index accurately reflects the percentage of the population with any type of account. The fit is significantly better than the previously presented FIN index.

Due to large data gaps, especially in the first years of the study, 12 countries (from the main sample) in 2013-2019 (Cameroon, Eswatini, Ghana, Kenya, Lesotho, Madagascar, Mozambique, Nigeria, Rwanda, Uganda, Zambia, Zimbabwe. All countries with full data on MM outlets were included. The choice of the years 2013-2019 is dictated by the desire to examine a period as long as possible, without excessively reducing the number of countries included. Previously in this subsection (Tables 7, 8 and Charts 2, 3, 4), all countries for which data were available for a given year were considered) were chosen to create the robustness check model. Table 6 presents the results both for FIMM and FIN (in case of FIN only countries appearing in the FIMM model were included) – models 6 and 7 respectively. Half of the countries covered by the models were classified as low income, half as lower-middle income. Thus, results on the latter regression (FIN as a dependent variable) were similar to those for low-income countries – differences only occur in the control variables: GDP and infrastructure. However, the results for the FIMM model are different. No significant impact of any of the institutional variables was identified, as well as education, GDP per capita and inflation. This may mean that a favourable economic and institutional environment is not required for the development of MM. This may be because MM providers (as their core

business) do not offer the entire range of banking services, do not grant loans (do not bear credit risk) but only deposit their clients' funds in a pooled bank account – however, a stable and trusted banking sector facilitates this activity (Lal & Sachdev, 2015).

Interestingly, even though MM aims to provide access to financial services to people living in rural areas, the positive impact of urbanization was still observed, although at a lower level of significance. Positive and statistically significant impact of infrastructure, is consistent with the theory, because good access to electricity/internet/mobile phones creates favourable conditions for the development of MM.

Conclusion

The conducted research provided an identification and assessment of institutional determinants of financial inclusion, namely constraints on the executive, resolving insolvency, property rights, and WGI. The main part of the study focused on inclusion by access to financial institutional services (banks, credit unions, microfinance institutions, and post offices). Econometric estimation indicated significant impact of resolving insolvency on financial inclusion when studying the entire continent. However, detailed analysis has shown that this effect is particularly visible in wealthier countries (upper-middle and high income), in which WGI also positively affects financial inclusion, while in low-income countries, constraints on the executive were identified as key to financial inclusion. In lower-middle

income countries, no positive impact of any of the examined institutional variables was observed. Thus, the first hypothesis (H$_1$) is partially supported – impact was observed but not in all cases.

In comparison to earlier studies, it allows for constructing more precise recommendations for countries with large "financially excluded" populations. Firstly, it is important to strengthen creditors' protection and reduce the time of insolvency proceedings. This will result in a smaller number of non-preforming assets within the banking sector and boost its development. Secondly, strenuous efforts should be made to conduct a predictable policy with clearly defined power of governors, especially in the least developed countries.

Another outcome of the study is that the results vary depending on how financial inclusion is measured. The article presents a measure of financial inclusion which covers people using only mobile money, which was used for a robustness check. Such a measure shows greater levels of inclusion in countries with GDP per capita below USD 5000, where a substantial part of the population uses MM as the only account. Incorporation of such a measure as an endogenous variable in the model, resulted in identifying a previously significant institutional variable (constraints on the executive) as insignificant – impact of none of the institutional variables was significant. It may mean that the development of mobile money does not require (very) favourable institutional conditions, which would call for re-thinking the impact of institutions on financial inclusion. It supports the second hypothesis (H$_2$).

Additionally, the study included years in which none of the countries in the world had yet implement-

ed the Central Bank Digital Currency (CBDC). In 2021, Nigeria, as the first African country (Africa's most populous economy), launched its digital currency – eNaira. The possibility of issuing CBDCs is being investigated by another 16 countries on this continent (Atlantic Council, n.d.). Currencies issued by central banks are indicated as one of the opportunities to increase access to financial services (Central Bank of Nigeria, n.d; Foster et al., 2021). The potential success of these initiatives will require further research, as well as redefining the ways of measuring financial inclusion (it will need to include people using only CBDC as well as MM). For example, the impact of resolving insolvency, identified especially in upper-middle and high income countries, may lose its importance. It is because commercial banks, in principle, hold loans to enterprises and individuals in assets, while central banks have foreign exchange reserves, loans to commercial banks and government bonds (Bindseil, 2020). For this reason, the indicated positive impact of this institutional variable, affecting the quality of banks' assets, and thus their potential for the development, will probably decrease along with the adoption of CBDC.

Acknowledgements

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