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Financial Inclusion, Inequality in Financial Access and Income Inequality – Evidence from European Countries

Panchanan Das
(University of Calcutta)
panchanandaswbes@gmail.com

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Panchanan Das
University of Calcutta

This study provides an objective measure of financial inclusion, and its inequality in examining the variation in financial inclusion among top 15 poorest countries in Europe using micro level data from the *Global Findex* for 2011 and 2021. The major concern is on involuntary exclusion from financial services and the responsible factors for such type of exclusion. The study also investigates the role of income inequality in explaining inequality in financial inclusion based on a composite financial inclusion index. As most of the information on financial inclusion are categorical, the study uses correspondence analysis to construct the composite index of financial inclusion. A sharp contrast is observed between the rich and poor countries in Europe in intensity in financial services. The principal inertia of the first dimension of access to finance for the whole sample in 2021 captures more than 98 per cent of the total variation in the data. We observe a wide gap in financial inclusion in terms of access to and use of financial services among the 15 less developed European countries. Tobit estimation suggests a strong association between inequality in financial access and income inequality after controlling for the effects of education, age and gender

Keywords: Financial inclusion, Inequality
JEL Classification Numbers: G19, J16, O11

1. Introduction

Financial non-inclusion and financial illiteracy are basically the problems of economically vulnerable population. A notable share of the population in the developing regions in Europe and also in other continents still are unbanked and the major part of them are women even in the era of highly technology driven globalised world. While in the high-income regions of Europe most adults have access to bank and other financial institutions, the less developed parts of the continent have much lower levels of banked adults. Several Reports based on Global *Findex* database reveal that lack of trust in institutions is one of the major issues for many people remain unbanked. Gender gap in financial inclusion is another issue particularly in countries like Turkey where just above 50 per cent of women have bank account. Financial non-inclusion is associated with non-inclusion in labour market contributing to income inequality and slow economic growth. If financial development is non-inclusive and financial institutions are not accessible to larger part of the economic agents, its contributions to economic growth will be be limited (Jinjarak, and Park 2015). These facts motivate to look into the extent of inclusiveness of financial services in the less developed parts of Europe.

Financial inclusion is a complex process that accounts for both the supply side as well as demand side factors of the financial market in analyzing the ability of the financial system in an economy to provide access to and use of financial services. If financial inclusion is treated as a choice problem, individuals will take decision whether to participate in the formal financial system by maximizing utility given their budget constraints. While, in some cases, individuals do not prefer formal financial services, by their choice because of cultural reasons, or ignorance about the benefits of these services, in many cases financial inclusion is involuntary in nature and major cause for exclusion is lack of access to formal financial services. Barriers in access to financial services create a limit in use of them.

The major concern of this study is on involuntary exclusion from financial services and the responsible factors for such type of exclusion. In this context, this study provides an objective measure of financial inclusion, and its inequality in examining the variation in financial inclusion among top 15 poorest countries in Europe using micro level data from the *Global Findex*. While a number of attempts exists in the literature, measuring financial inclusion in an operational manner still remains a challenging task. In this study, we construct scores of two dimensions of financial inclusion: access to finance, and usage of financial services. A composite index is constructed by taking these two dimensions together at micro level by applying correspondence analysis with the *Findex* survey data. The study also investigates the role of income inequality in explaining inequality in financial inclusion based on a composite financial inclusion index constructed by using correspondence analysis in low income European countries during 2011-2021.

The rest of the study is organized as follows. Section 2 briefly discusses the relevant literature and scope of the present study. Section 3 provides methodological issues in measuring financial inclusion and suggest an alternative approach. Section 4 is a short description of data used in this study. Section 5 highlights the contrast in financial inclusion between the developed and less developed parts of Europe. Interpretation of empirical results are displayed in section 6. Section 7 concludes.

2. Literature

Theoretical models predict that financial inclusion enhances growth and reduces income inequality in presence of financial frictions (Galor and Zeira 1993; Aghion and Bolton 1997; Galor and Moav 2004). The low-income people, particularly the poor, have very limited access to finance because of their binding constraints in information and transaction costs. Thus, the inclusion of these people in financial development will facilitate funding to them that will reduce income inequality. Some scholars like Greenwood and Jovanovic (1990) argued that the relationship between financial inclusion and inequality is inverted U shaped implying that at the early stage of financial development only the rich people can afford to financial market raising inequality, while in the later phase of financial development inclusion becomes widely distributed reducing inequality. In a theoretical model, Dabla Norris et al. (2015) has shown that although financial inclusion in the shape of increasing access of the poor reduces income inequality, inclusion in the form relaxing borrowing constraint can benefit wealthy agents disproportionately that will increase inequality. Thus, the theory is inconclusive on the direction of causality between financial development and income inequality.

Numerous studies estimate the relationship between financial inclusion, growth and other macroeconomic factors and observed positive relationship between financial inclusion and growth, but negative relation between financial inclusion and income inequality (Sarma 2008, Camara et al. 2014). However, studies on the link between financial inclusion and income inequality are very much limited in the literature. Tsouli (2022) investigated the impact of financial inclusion on poverty and income inequality in 30 European countries during 2004-2019 based on a composite financial inclusion index constructed by using principal component analysis with macro level data from the Financial Access Survey of International Monetary Fund (FAS-IMF) the World Development Indicators (WDI) database of the World Bank (WDI). By following this tradition of empirical research, this study estimates the relationship between financial inclusion score and personal as well as household specific factors for analyzing the link between inequality in financial inclusion and inequality in income in low income countries in Europe by using survey data from *Global Findex*.

3. Measuring financial inclusion: an alternative approach

In this study, financial inclusion is defined in a multidimensional approach and the weights of different dimensions are determined endogenously. A number of approaches have been proposed in the literature to look into financial inclusion, and accordingly several methods and indicators are used in measuring it. Conventionally, the approach developed by UNDP in calculating human development index is used to measure a composite index of financial inclusion by considering equal weights for all indicators (Mehrotra et al. 2009, Amidzic et al. 2014). In calculating financial inclusion index, Sarma (2012) computed the sub-index of different dimensions and aggregated each index as the normalized inverse of the Euclidean distance, where the distance is calculated from a reference point and normalized by the number of dimensions included in the composite index. However, in this study, the weights assigned for each dimension are subjectively chosen based on the author's intuition. Amidžić et al. (2014) constructed a financial inclusion index using factor analysis (FA) to determine dimensions and weights. Cámara and Tuesta (2014), applied two-stage principal component analysis (PCA) for the construction of a multidimensional financial inclusion index. In the first stage, PCA is used to estimate the weights of three sub-indices or dimensions of financial inclusion. In the second stage, again PCA is applied to estimate the overall financial inclusion index by using the previous sub-indices as causal variables.

We have considered two basic dimensions of financial inclusion: access to finance, and usage of financial services as used in majority of studies like Sarma (2012) and Amidzic et al. (2014)[1]. Access to finance like expansion of bank branches particularly in rural areas indicates depth of financial services, usage like number of transactions per bank account provides the incidence of use of financial services. Access to finance is one of the important issues in the financial system. Greater access is expected to foster financial inclusion when access levels are below the threshold. Also increasing access creates financial system more competitive. However, greater access does not necessarily imply greater use of financial services. Usage depends on income and other socio-economic factors, regulatory framework or cultural habits.

As most of the information on financial inclusion are categorical, the use of PCA may not be appropriate to construct the composite index. Categorical variables often do not have

[1] Camara et al. (2014) considered barriers in getting financial services by those who are not in the formal financial system as an additional dimension of inclusion. Korynski (2013) added policy dimension with the supply and demand side dimensions of financial inclusion.

comparable scale and distance properties, and these variables cannot be analysed with simple frequencies. Correspondence analysis (CA) resolves the problem by providing nominal measure for each categorical variable in terms of the notion of distance. In this study, CA is used to calculate scores of financial inclusion. The CA is helpful in understanding the similarities between the categories of variables and the association between the variables. In some sense, CA is similar to principal components for nominal variables. In CA, the aim is to maximize the correlation between the scored row and column of a contingency table. The optimal scores are the coordinates on the first dimension. The coordinates on the second and subsequent dimensions maximize the correlation between row and column scores subject to orthogonality constraints. By using singular value decomposition, all categorical variables can be treated simultaneously in the form of a point cloud.

Suppose that the multidimensional data set is given in the form of a numerical matrix Z(n, m), where n is the number of observation units, and m is the number of variables measured on each observation unit. Each unit in the sample space is represented by a vector of order m. In CA, the dissimilarities between sample units is measured by a metric, called distance, on the population space. The distance between units in the sample space is measured by inertia, a measure of the information contained in the data set. The concept of inertia is derived from static mechanics and is geometric in nature. Inertia is Pearson's χ^2 statistic divided by sample size. The inertia approach of CA relies on within-distribution distances in the sample space. In this approach, the sample space of n units is looked at as a cloud of points in the m dimensional space, with a mass, called weight, associated to each point. The cloud has a centroid measuring weighted mean. The weighted sum of distances to the centroid gives the total inertia of the cloud of observation-points.

The CA provides an optimal space of low dimension p ($p<m$), where the projected cloud of sample units keeps as much as possible of the inertia of the source cloud or by minimising the inertia loss. Similar to PCA, it is a data reduction technique that minimizes the unavoidable information-loss generated by representing the observation units in a lower dimension space. In this method, each sample unit is represented by a set of coordinates in the optimal p-dimension space called its scores which is a linear combination of the original m observed variables. In measuring financial inclusion the multiple correspondence analysis (MCA), an extension of CA for more variables, may be the appropriate one. The MCA is a special case of generalized canonical analysis, and is applied to categorical data.

Let x_1, x_2, x_3, ……, x_m be m categorical variables on n observations in a sample. Each variable x_j is assumed to have k_j distinct categories and is looked at as an $n \times k_j$ orthogonal binary matrix $Z^{(j)}$, called the indicator matrix which is generated from the categorical indicators. As the columns of $Z^{(j)}$sum to 1, the Mahalanobis metric in canonical analysis is equivalent to the χ^2 metric in the case of MCA.

In MCA, the weight of a categorical variable is obtained by quantifying each primary qualitative indicator in a non-linear way without imposing any constraint on a functional form. Thus, MCA is a CA based on the Burt matrix of all the 2-way contingency tables generated from k_j primary indicators.

We define $Z = (Z^{(1)} \quad \ldots \quad Z^{(m)})$ as the $n \times k$ indicator matrix of the set of x variables,

where $k = k_1 + k_2 + \cdots + k_m$

An observation unit with k indicators is a line-vector of numbers 1 to k, and the value of the composite indicator is simply the average of category-weights.

Let the h_{th} category of j_{th} variable for i_{th} observation be denoted as

$$Z_{ih}^{(j)} = 1 \; if \; x_{ij} = h$$

Here, i=1, 2, …n denotes observation; j= 1,2,…k denotes variable; and h = 1, 2,…. n_j denotes category.

With n observation units, the profile of category h of variable j is a column-vector of numbers 1 to $Z_h^{(j)}$, $Z_h^{(j)} = \sum_{i=1}^{n} Z_{ih}^{(j)}$.

A category weight is the average of the normalized scores of the population units belonging to this category.

On the basis of the indicator matrix Z we can define the Burt matrix as

$$B = Z'Z = Z'D(w)Z$$

Where $D(w)$ is $n \times n$ square matrix with weights on the diagonal and 0 off diagonal.

The diagonal block of B associated with variable x_j is a diagonal matrix with the frequencies of x_j on the diagonal. The off-diagonal block of B associated with variables x_j and x_l is the two-way cross-tabulation of x_j and x_l.

We define another Burt matrix by taking cross tabulation of supplementary variables with more rows:

$$B^* = Z^{*\prime}Z$$

where Z^* is the indicator matrix with more columns for the supplementary variables.

Define $B_{++} = \sum_{l=1}^{k}\sum_{m=1}^{k} B_{lm}$

$P = \frac{B}{B_{++}}$

$c = \sum_{l=1}^{k} P_{l*} = P_{+*} = P'I$

$S = D(c)^{-1/2}(P - cc')D(c)^{-1/2}$

Here, c is the column mass, $D(c)^{-1/2}$ is the diagonal matrix with elements $\frac{1}{c_t}$, c_t is an element of c

The spectral or eigen decomposition of the square symmetric matrix S is

$$S = V\Phi V'$$

This is the singular value decomposition in correspondence analysis. The standard column coordinates A is

$$A = D(c)^{-1/2}V$$

In the indicator approach to MCA, the inertia of column j is

$$In_h^{(j)} = \sum_{i=1}^{n} w_i \frac{\left(Z_{ih}^{(j)} - mc_h^{(j)}\right)^2}{m^2 c_h^{(j)} w_+}$$

where $Z_{ih}^{(j)}$ is the (i,h) th element of the indicator matrix for variable j, w_i is the weight for observation i, m is the number of active variables, $c_h^{(j)}$ is the column mass of variable j for category h, and w+ is the sum of the weights over the observations.

If t_{th} principal inertia is λ_t, the t_{th} diagonal element of Φ, the total inertia will be $\sum_t \lambda_t$

In the Burt approach to MCA, the unadjusted principal inertia is λ_t^2, and the total unadjusted inertia is $\sum_t \lambda_t^2$

The adjusted principal inertia,

$\lambda_t^{adj} = \left(\frac{m}{m-1}\right)^2 \left(\lambda_t^2 - \frac{1}{m}\right)^2$ provided $m\lambda_t > 1$

Total inertia = $\left(\frac{m}{m-1}\right) \sum_t \lambda_t^2 - \frac{q-m}{m^2}$

The standard coordinates are independent of the principal inertia; with or without adjustment, these are defined as before

$$A = D(c)^{-1/2}V$$

The principal coordinates F are defined as

$$F = AD\Lambda^{\frac{1}{2}}$$

where Λ is a vector of adjusted or unadjusted principal inertias and $D\Lambda^{\frac{1}{2}}$ is the diagonal matrix with elements $\lambda_t^{1/2}$ on the diagonals.

The coordinates of supplementary variables are computed as weighted averages of the column coordinates by using the CA transition formula. As outlined by Greenacre (2006), standard coordinates may be used for averaging, with the profiles of the indicator representation of supplementary columns as weights. Supplementary principal column coordinates are computed as weighted averages of the standard active column coordinates, and then supplementary standard coordinates are computed by division by the principal inertias.

The first step of this method is to construct a contingency table to find out the association between qualitative responses. Correspondence analysis utilizes the association between rows and columns. The weighted χ^2 distances between two individual columns can be found by applying the following formula:

$$D_{\chi^2}(C, C') = \sqrt{\sum_{r=1}^{R} \frac{N_{++}}{N_{r+}} \left(\frac{N_{rc}}{N_{+c}} - \frac{N_{rc'}}{N_{+c'}}\right)^2}$$

	Q21	Q22	Q23	Row total
Q11	N11	N12	N13	N1+
Q12	N21	N22	N23	N2+
Q13	N31	N32	N33	N3+
Q14	N41	N42	N43	N4+
Column total	N+1	N+2	N+3	N++

4. Data

This study uses different financial indicators provided in the Global Findex micro level data. It provides information on financial services and the intensity of their use based on a worldwide survey of representative samples of around 1000 individuals from each country focusing on demand side of financial services. The information are available on account ownership, payments, saving, credit, and financial resilience by country, region, and income group for 2011, 2014, 2017 and 2021. This dataset is used for demand side analysis of access to finance for individuals with age 15 and above. Global Findex 2021 survey data covers 127,854 adults in more than 120 economies during the COVID-19 pandemic. In 2011 and 2014, this survey covered information about 150,000 randomly selected adults from 140 and 137 countries around the world. The survey has been conducted by following multi stage stratified random sampling. Primary sampling units are stratified by population size, or geographical locations or both, and selection is made on the basis of probabilities proportional to population size, or by using simple random sampling. Appropriate weighting is used to ensure a nationally representative sample for each economy.

This study concentrates on financial inclusion in 15 poorest countries of Europe in terms of GDP per capita. Access to finance and use of financial services are the major dimensions of financial inclusion. Ownership of bank account, debit card, credit card, and access to internet for financial transaction are taken as indicators of access to finance. Use of bank account, debit card, credit card, and other online transactions are considered as use indicators. This study uses the Global Findex micro level data for 2011 and 2021. The number of sample adults for 2021 is 12893 after deleting no response and refuse to response units for 15 poorest sample countries of Europe, while the effective sample size for 2011is 15650.

5. Gap in inclusion between the rich and poor

Access to bank, measured by the proportion of bank account ownership[2], is the fundamental measure of financial inclusion, particularly in the developing world. The Report based on *Global Findex* 2021 survey data highlights that the share of adults with bank account increased globally from 51 percent in 2011 to 76 per cent in 2021. The gender gap in account holding declined from 9 per cent to 6 per cent in developing economies during this period. In developing economies around 18 per cent of adults used bank transfer for paying utility bill in 2021, and one third among them used such type of transfer first time after the onset of the COVID-19 pandemic. Despite the increase in bank account for all adults, women, and those outside the workforce are lagging behind the men who are in the workforce and earn higher income. In 2021, 74 percent of men and 68 percent of women in developing economies had an account.

Expansion of account ownership in formal financial institutions is not sufficient for financial inclusion. Another dimension of financial inclusion is the increase in use of accounts for digital transaction, saving, borrowing and other financial services. The *Global Findex* 2021 survey highlighted that 84 percent of account owners in the globe used their accounts for digital payment at least once, the respective proportions in high income countries and developing countries were 98 per cent and 80 per cent. The increase in account ownership can enhance financial empowerment of individuals, particularly among women. It is observed that the women enjoy greater control over their income which increases household bargaining power for them because of the use of bank account in salary payment (Field et al. 2021).

Table 1 shows the percentage share of adult people in 15 top rich countries and 15 top poorest countries in Europe in 2011 and 2021. A sharp contrast is observed between the rich and poor countries in Europe in intensity in financial services. The intensity of access to financial services in terms of percentage share of adults was nearly half or less than half in the poorer part of Europe as compared to the richer part in 2011. Although the situation improved over

[2] The Global Findex 2021 defines account ownership of an individual or jointly owned account at a regulated financial institutions like bank, credit union, microfinance institution, post office, or mobile money service provider.

the 10 year period, the people living in the less developed part are still lagging behind those in the developed part in inclusiveness of financial services. Thus appropriate policies, and incentives are needed to increase the use of accounts for payments, savings, and credit.

Table 1 Percentage of European people in financial services

	2011		2021	
	Rich countries	Poor countries	Rich countries	Poor countries
Access indicators				
Ownership of account at a financial institution	94	52	99	79
Ownership of debit card	77	39	92	60
Ownership of credit card	48	16	55	28
Use indicators				
Use electronic payment	69	21	75	56
Use account at a financial institution for saving	79	43	61	18
Borrow from a financial institution	16	10	16	15
Use Debit Card			93	76
Use Credit Card			82	78
Quality indicators				
Made any deposit into the account			89	82
Withdrew from the account			91	84
Made bill payments online using the Internet			65	40
Bought something online using the Internet			67	37

Source: Author’s calculation with Global Findex micro level data

6. Empirical findings

6.1 Determination of financial inclusion index

Adults with age 15 and above from 15 poorest European countries for 2011 and 2021 are the sample units of this study. As the access and use indicators are categorical variables, we have converted all indicators in binary form with 1 for having access and 0 for not having access. The financial inclusion index is calculated by using the following 2 step method. Access to finance and use of finance are considered as two major dimensions of financial inclusion. In step 1, access index scores and use index scores are calculated by using MCA. Ownership of account at any financial institution, ownership of debit card and ownership of credit card are used to calculate the composite scores for access indicators. Use of bank account for savings and borrowings, use of debit and credit cards for financial transactions are the components of the composite index scores of use indicators. Weights of different components are expected to be different and are estimated by applying MCA. Since countries could be different in access to and use of financial services, we have calculated these index scores separately for each country. In step 2, financial inclusion index is calculated by taking access index scores and use index scores as two major dimensions of it. Weights of these two dimensions are endogenously determined. As the scores are the predicted values and are quantitative in nature, PCA is used in this step to calculate financial inclusion index score. The PCA is calculated for each country in the sample separately. The first principal component capturing the maximum variance is considered for calculating the composite index. At the final stage, the composite financial index scores are grouped into 5 equal parts with values 1, 2, 3, 4, and 5. The higher the index, higher is the inclusiveness.

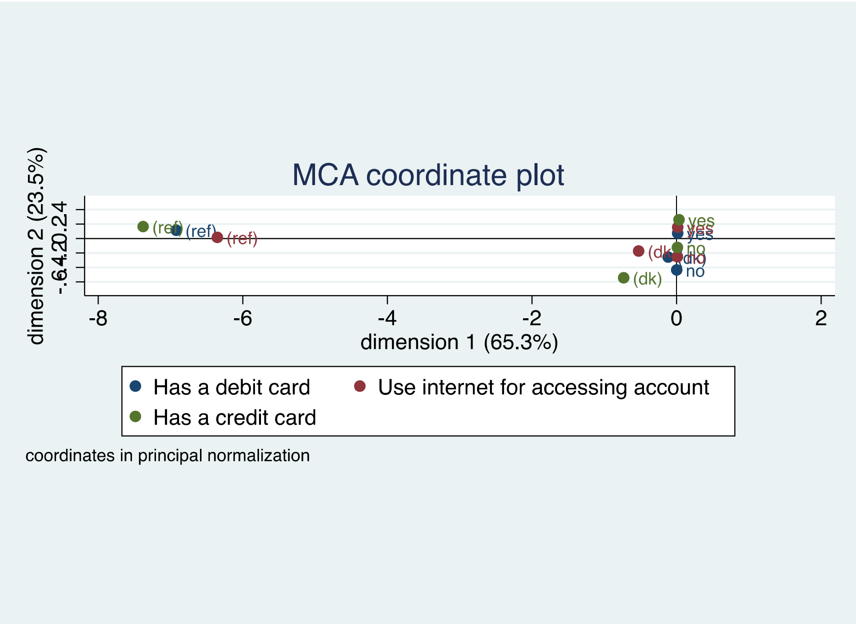
In MCA, the Burt matrix or indicator matrix artificially inflates the chi-square distances between profiles and the total inertia (Gower 2006). Joint correspondence analysis (JCA) can eliminate this inflation of the total inertia by the block diagonal submatrices of the Burt matrix. We use MCA of the Burt matrix for three categorical variables, namely, ownership of debit card, ownership of credit card and use of internet to access account by considering scale adjustments with the principal normalization, which scales the coordinates by the principal inertias. Principal normalization does allow studying the row categories or column categories separately from each other.

6.2 Access to finance

Access to finance is mostly a supply side phenomenon and constructed conventionally by taking number of bank branches, availability of automated teller machine (ATM) per 100000 adults at the country level. In this study, we have used demand side indicators like bank account ownership, ownership of debit or credit card by a person with age 15 and above to measure access to finance. In addition, any type of barrier like distance of a formal financial institution from residence, lack of the necessary documentation, affordability and lack of trust in the formal financial system are considered as components of access to formal financial services.

Figure 1 shows the association between ownership of debit card, credit card and internet access for financial transactions in 2021. It displays chi-square distances, and distances between points describing qualitative differences. The origin is the center of gravity of the point-cloud indicating the location that represents the average response. The main axis is the horizontal one, in which the different questions are spread around the center. Responses that indicate having financial access of some kind are clustered around the centre, while no responses are clustered on the left-hand side. This principal, horizontal axis helps explain about 65.3 percent of the variation in the data. On the other hand, the second principal axis explains an additional 23.5 percent of the variation, and is less relevant for our analysis. A clear pattern is seen in the plot. Results from questions on ownership of debit card, credit card and internet access for financial transactions are clustered together.

Figure 1 Components of access to finance in poor European countries: 2021



Source: Global Findex 2021

In MCA, the principal inertias are the squares of the singular values. It quantifies the amount of variation accounted for by the corresponding principal dimension. The principal inertia of the first dimension of access to finance for the whole sample in 2021 is found to be .034 capturing more than 98 per cent of the total variation in the data. It varied from nearly 0 contributing 71 per cent in Moldova and 78 per cent in Latvia to .06 in Albania and Turkey contributing 98 and 96 per cent respectively to the total variation (Table 2). In 2011, the principal inertia of the first dimension of access to finance was 0.23 explaining 94 per cent of the variation in the sample. During this period, it was the least in Greece contributing 97 per cent variation and was the highest in Turkey capturing nearly 99 per cent of total variation.

Table 2 Access indicators of financial inclusion

	Principal inertia			
Countries	2011		2021	
Albania	0.21	(97.21)	0.06	(97.84)
Armenia	0.13	(89.14)	0.05	(99.69)
Bulgaria	0.22	(90.72)	0.02	(92.80)
Bosnia	0.19	(94.63)	0.04	(99.35)
Georgia	0.16	(89.39)	0.03	(76.80)
Greece	0.09	(97.23)	0.02	(94.36)
Croatia	0.11	(83.88)	0.04	(99.68)
Hungary	0.22	(86.74)	0.01	(98.84)
Kazakhstan	0.30	(89.27)	0.02	(90.06)
Latvia	0.15	(74.45)	0.01	(78.36)
Moldova	0.17	(86.91)	0.01	(71.13)
Romania			0.02	(97.07)
Russia	0.10	(85.3)	0.03	(99.05)
Serbia	0.21	(98.22)	0.03	(98.55)
Turkey	0.68	(98.86)	0.06	(96.05)
Ukraine	0.27	(96.28)	0.02	(86.37)
All	0.23	(93.91)	0.03	(98.41)

Note: Figures shown in parentheses are percentage contribution
Source: AS for Table 1

The score of index of financial access measures the intensity of getting access to formal financial institutions. In calculating score of access to finance index we have used ownership of account, debit card and credit card by an individual. Table 3 displays mean scores of the index of access to finance across 15 poorer European states in 2011 and 2021. The mean score increased in every country in our sample during this period, but not uniformly. In 2011, some countries like Croatia and Latvia experienced negative score implying that the financial institutions of these countries were much lagging behind in providing financial access to the people. Armenia registered the highest degree of inclusion in terms of access. In 2021, Albania got the top followed by Armenia and Latvia was still at the bottom among these 15 countries.

As shown by standard error, inequality in access to finance increased in each country over the decade.

Table 3 Mean scores of access to finance index

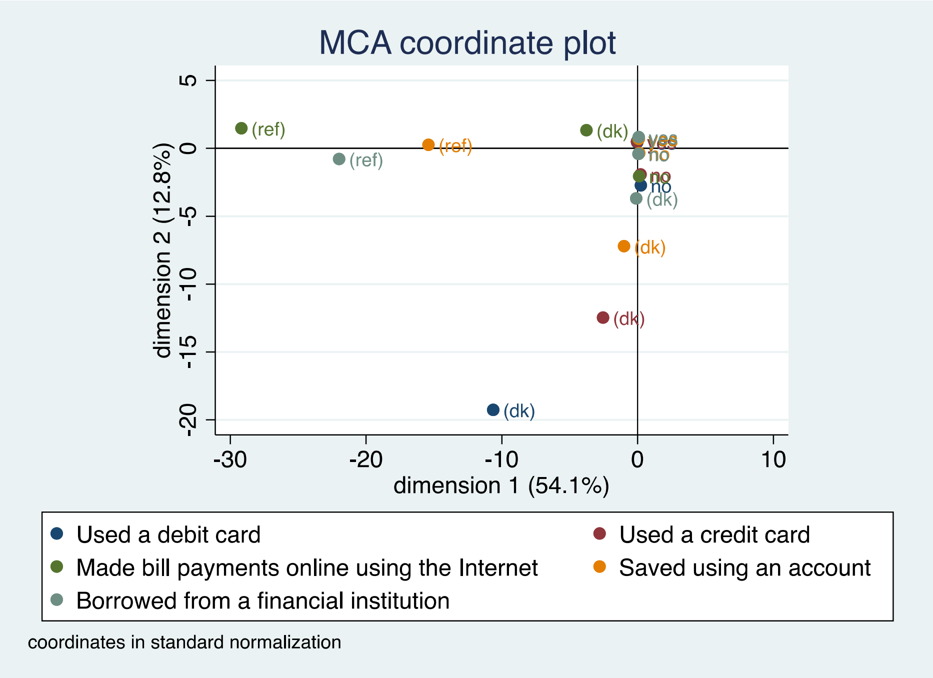
Countries	2011		2021	
Albania	0.45	(0.03)	2.66	(0.05)
Armenia	0.69	(0.02)	2.56	(0.05)
Bulgaria	0.01	(0.04)	1.28	(0.06)
Bosnia	0.03	(0.04)	1.73	(0.05)
Georgia	0.38	(0.03)	1.98	(0.05)
Greece	-0.22	(0.03)	0.66	(0.06)
Croatia	-0.79	(0.03)	1.03	(0.06)
Hungary	-0.39	(0.03)	0.92	(0.06)
Kazakhstan	0.22	(0.03)	1.20	(0.06)
Latvia	-0.69	(0.03)	0.47	(0.04)
Moldova	0.64	(0.02)	2.02	(0.05)
Romania			1.67	(0.06)
Russia	0.15	(0.02)	1.00	(0.04)
Serbia	-0.13	(0.04)	1.59	(0.06)
Turkey	-0.46	(0.04)	1.37	(0.07)
Ukraine	0.14	(0.04)	0.92	(0.07)

Note: Figures shown in parentheses are standard errors
Source: As for Table 1

6.3 Use indicators of finance

Use of financial services is basically demand side indicators which are available in the Global Findex data. We measure use dimension of financial services by taking the use of savings account in making and receive payments, and use of debit or credit card for financial transactions by a person. The use indicator is built to account for people using at least one formal financial service that allow to make money deposit or receive wage, or payment of loan, utility bills, or school fees. Figure 2 displays how the components of use indicators are correlated. Here, the first principal axis is able to explain around 54 percent of the total variation in the sample used for 2021.

Figure 2 Components of use of finance in poor European countries: 2021



Source: As for Figure 1

The principal inertia for use indicators of financial inclusion is much less as compared to those for access indicators of inclusion explaining roughly the same portion of variation in the sample data (Tables 2 and 4). Also, a very little change or no change is observed during 2011-2021.

Table 4 Use indicators of financial inclusion

	Principal inertia			
Countries	2011		2021	
Albania	0.03	(90.68)	0.04	(72.83)
Armenia	0.01	(75.00)	0.03	(58.7)
Bulgaria	0.03	(85.98)	0.02	(78.36)
Bosnia	0.03	(87.54)	0.03	(72.37)
Georgia	0.02	(41.59)	0.04	(78.14)
Greece	0.01	(73.87)	0.01	(84.32)
Croatia	0.03	(88.35)	0.01	(83.9)
Hungary	0.01	(64.56)	0.01	(87.61)
Kazakhstan	0.00	(96.67)	0.02	(80.97)
Latvia	0.01	(77.04)	0.00	(56.95)
Moldova	0.02	(94.35)	0.01	(59.16)
Romania			0.02	(81.87)
Russia	0.02	(78.55)	0.01	(66.07)

Serbia	0.00	(88.01)	0.01	(86.02)
Turkey	0.01	(99.94)	0.01	(59.38)
Ukraine	0.01	(97.97)	0.03	(78.06)
All	0.01	(93.93)	0.01	(73.3)

Note: Figures shown in parentheses are percentage contribution
Source: As for Table 1

We observe a wide gap in financial inclusion in terms of use of financial services as well among these 15 less developed European countries (Table 5). Latvia, Hungary and Armenia were much lagged behind the others in terms of the share of people using financial services from formal financial institutions. However, the incidence of use of bank accounts, debit card or credit card for financial transactions improved significantly in 2021 as compared to the rates 10 years back. A dramatic increase in use of financial services may be because of some restrictions on physical transactions prevailed during 2021 because of the health shock COVID 19. Albania showed the highest rate and Latvia remained the least performer in using as in the case of access to financial services in 2021.

Table 5. Mean score of use index of financial services

Countries	2011		2021	
Albania	0.29	(0.04)	1.83	(0.03)
Armenia	-0.04	(0.05)	1.36	(0.04)
Bulgaria	0.36	(0.03)	1.29	(0.04)
Bosnia	0.22	(0.04)	1.55	(0.04)
Georgia	0.29	(0.04)	1.33	(0.04)
Greece	0.28	(0.03)	0.69	(0.05)
Croatia	0.10	(0.03)	0.97	(0.04)
Hungary	-0.07	(0.04)	0.71	(0.04)
Kazakhstan	0.19	(0.04)	0.89	(0.05)
Latvia	-0.36	(0.04)	0.31	(0.04)
Moldova	0.40	(0.03)	1.44	(0.03)
Romania			1.19	(0.04)
Russia	0.26	(0.03)	0.71	(0.03)
Serbia	0.28	(0.03)	1.28	(0.04)
Turkey	0.39	(0.03)	1.00	(0.04)
Ukraine	0.37	(0.03)	0.94	(0.05)

Note: Figures shown in parentheses are standard errors
Source: As for Table 1

6.4 Financial inclusion index

Financial inclusion index computed in this study is the composite index of access and use dimensions of financial inclusion. As mentioned above, at the first step we have calculated index scores of access to and use of financial services for adults living in the sample countries by taking weighted combination of access indicators and use indicators respectively by applying correspondence analysis. Financial inclusion index score is calculated at the second step by following the same methodology by taking access index and use index as the dimensions of financial inclusion. The methodological steps adopted in this study is roughly similar as in Park and Mercado (2018). Mean individual scores of financial inclusions by country are shown in Table 6. Higher score represents higher financial inclusion. Inclusiveness of financial services was very poor in Latvia, Croatia, Hungary, Turkey and Greece showing negative score of inclusion index in 2011. However, the intensity of financial inclusion improved in each sample country in 2021. In Albania, the intensity of financial inclusion was the highest and in Latvia it was the lowest during this period. At the country level, the intensity of financial inclusion is clustered at countries' income levels, with low-income countries at lower financial inclusion scores, and high-income countries at higher levels of financial inclusion.

Table 6 Financial inclusion index

	Mean score			
	2011		2021	
Albania	0.30	(1.02)	1.65	(0.62)
Armenia	0.21	(1.20)	1.33	(0.91)
Bulgaria	0.05	(1.02)	0.70	(1.11)
Bosnia	-0.06	(1.12)	1.07	(1.00)
Georgia	0.25	(1.05)	1.04	(1.08)
Greece	-0.18	(0.98)	0.06	(0.99)
Croatia	-0.73	(1.15)	0.39	(1.12)
Hungary	-0.58	(1.24)	0.19	(1.06)
Kazakhstan	0.05	(1.22)	0.42	(1.28)
Latvia	-1.03	(1.19)	-0.26	(0.86)
Moldova	0.52	(0.88)	1.13	(1.00)
Romania			0.82	(1.11)
Russia	0.07	(1.06)	0.22	(1.15)
Serbia	-0.12	(1.17)	0.83	(1.10)
Turkey	-0.27	(1.16)	0.57	(1.34)
Ukraine	0.14	(1.11)	0.33	(1.28)

All	-0.08	(1.17)	0.63	(1.19)

Note: Figures shown in parenthesis are standard errors
Source: As for Table 1

6.5 Inequality in financial inclusion

It is not difficult to perceive the persistence of inequality in financial inclusion as defined in this study. The extent of financial inclusion is not uniform across these countries and even highly unequal within a country at least in terms of standard errors of score of financial inclusion index (Table 6). To have better idea about the extent of inequality, we have calculated Theil's T index of scores of inclusion index in measuring inequality in financial inclusion for 2011 and 2021.

Theil's T index is the entropy class of inequality index at $\alpha = 1$ and it gives an inequality by the extent to which an actual society deviates from a perfectly equal society:

$$GE(1) = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}\ln\left(\frac{y_i}{\bar{y}}\right)$$

It is based on computing for everyone the ratio of their score to the population share. A zero value of the index indicates perfect equality, with higher values of the index indicating greater inequality. Theil's T index (GE(1)) is additively decomposable into within group and between group components.

Table 7 displays Theil's T index of financial inclusion scores in the sample countries in 2011 and 2021. The inequality index jumped up for the full sample, and it increased at faster rate in some countries than in other countries considered in this study during this period. It is observed the major part of overall inequality in financial inclusion is the within country inequality and this part increased significantly during this decade. Turkey registered as the least unequal country and Greece was the most unequal in financial inclusion among the 15 poorest European regions in 2011. In 2021, inequality was the highest in Latvia followed by Hungary, and it was the least in Albania.

Table 7 Inequality in financial inclusion: Theil's T index

	2011	2021
Albania	0.03	0.04
Armenia	0.02	0.07
Bulgaria	0.04	0.22
Bosnia	0.06	0.15

Georgia	0.04	0.11
Greece	0.08	0.29
Croatia	0.07	0.25
Hungary	0.04	0.34
Kazakhstan	0.02	0.21
Latvia	0.04	0.59
Moldova	0.02	0.12
Romania		0.20
Russia	0.06	0.26
Serbia	0.06	0.21
Turkey	0.01	0.15
Ukraine	0.04	0.23
All	0.043	0.18
Within group	0.038	0.16
Between group	0.004	0.02

Source: As for Table 1

6.6 Factors explaining financial inclusion

By taking financial inclusion index score calculated from Global Findex data 2021 for 15 poorest European countries as a dependent variable (y_i), we have estimated financial inclusion function as given below:

$$y_i = \beta_0 + \beta_1 age_i + \beta_2 age_i^2 + \sum_{j=1}^{2} \gamma_j D_{ji}^{edu} + \sum_{k=1}^{4} \delta_k D_{ki}^{inc} + \mu D_i^{sex} + \varepsilon_i$$

In Findex database education of the respondent is a categorical variable with primary, secondary and tertiary level of education. We have used 2 education dummies by taking primary level as a base category. Income of a respondent is given in 5 quantiles, and 4 income dummies are used by taking poorest 20 per cent group as a base category. Female is taken as a reference group in the sex dummy. As the estimated financial inclusion index score varies from -4.34 to 1.59 in 2011, and from -1.93 to 3.10 in 2021, OLS will not be an appropriate method of estimation. In finding out the effects of income distribution on financial inclusion we have used Tobit model by imposing lower and upper thresholds properly. The relationship is estimated after controlling the effects age of a person and its square value, along with sex dummy and education dummies. The estimated coefficients and associated t statistics for 2011 and 2021 are shown in Table 8. All regression coefficients are significant at less than 1 per cent level. The value of F statistics suggests the overall significance of the model.

The negative sign of income quantile dummies suggest that the change in financial inclusiveness of a person is reduced with the higher quantile implying that the people in the right tail of the income distribution are more inclusive in getting financial services than the people in the left tail. As a result the scope to include more additional people in the financial system would be less among the higher income people. The estimated coefficients of income quantiles suggest that financial inequality and income inequality are interlinked. Different coefficients at different quantiles account for differential effects of income inequality on inequality of financial inclusion. The responsiveness of income change on the change in financial inclusiveness reduced as we move from low income group to high income group, and the rate of reduction is significantly high in 2021 as compared to the rate in 2011. This is because the extent of inclusiveness increased during this decade in the poorer part of the European nations. It is expected that older person is more inclusive in the formal financial system, so a less change is expected. Similarly, a highly educated people has lower scope of improvement in financial inclusion because higher is the level of education higher is the chance for inclusion as compared to low educated people. The sign of the estimated coefficient of sex dummy gets revered in 2021 as compared to 2011. The conditional mean score of financial inclusion index for male was positive in 2011, while it becomes negative in 2021. So women become better off than men during the decade.

Table 8 Tobit estimation of inclusion index score

	2011		2021	
age	-0.06	(-20.72)	-0.04	(-13.17)
age^2	0.001	(21.77)	0.001	(17.47)
Sex dummy				
male	0.10	(4.72)	-0.11	(-5.27)
Education dummy				
Secondary school	-0.25	(-10.09)	-0.60	(-20.54)
Tertiary education or more	-0.66	(-18.88)	-1.08	(-33.07)
Income quantile				
second 20%	-0.10	(-2.96)	-0.17	(-5.01)
middle 20%	-0.14	(-4.38)	-0.30	(-8.91)
fourth 20%	-0.24	(-7.33)	-0.42	(-12.43)
richest 20%	-0.39	(-11.79)	-0.54	(-15.93)
Intercept	1.36	(22.82)	2.07	(28.72)
Number of observation	15,915		16,853	

Uncensored observation	15,909	16,853
F(11, 15904)	151.78	319.28
Prob > F	0.00	0.00
Pseudo R2	0.0347	0.0714

Note: Figures in parentheses indicate t statistic
Source: Author's estimation using micro level data from Global Findex 2011 and 2021

7. Conclusions

This study provides an objective measure of financial inclusion by taking two broad dimensions, namely access to and use of financial services available in the formal financial institutions and financial markets[3] in the less developed part of Europe by using micro level data from Global Findex. The study estimates the indices of access to and use of financial services by using the major indicators as available in the survey data and then estimates a composite index for financial inclusions in terms of these two dimensions. The ultimate objective is to analyse inequality of financial inclusions in terms of income inequality.

We find a strong association between inequality in financial access and income inequality after controlling for the effects of education, age and gender. The study observes that economically vulnerable populations are significantly more likely to be financially included because the major part of them are in exclusion. Households with higher levels of literacy are more likely to have access to and use of financial services and less likely to improve their inclusiveness. Inequality in financial access and gender gaps in financial inclusion affect income inequality indirectly through enabling economic participation, providing access to productive tools, and helping to improve economies of scale. This study observes that financial inclusion is more powerful in alleviating income inequality in the poorer part of European countries.

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[3] Formal financial institutions include banks, insurance companies, mutual funds, and pension funds. Financial markets include stock and bond markets.

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