

Measuring Financial Inclusion in Southeast European Countries Using Multidimensional Index of Financial Inclusion

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Abstract

This paper provides an insight into measuring financial inclusion through a multidimensional index of financial inclusion in Southeast European countries (SEE). We used a two-stage principal component analysis to extract dimensions of financial inclusion. Data were obtained from two sources, the World Bank Global Findex Survey (WB-GFS) data base and the International Monetary Fund Financial Access Survey data (IMF-FAS), for twelve SEE countries for the years 2011, 2014, 2017, and 2021. The research confirms that financial inclusion can be measured using two dimensions in terms of access as one factor and usage and availability as the second factor. Practical implications of this research are in ensuring an adequate measure of the level of financial inclusion for SEE countries that can be used for further research related to understanding the underlying factors contributing to financial inclusion, barriers to financial inclusion as well as the impact of financial inclusion on economic growth and poverty alleviation.

Keywords: index of financial inclusion, Southeast European countries, principal component analysis

1. Introduction

Financial inclusion and inclusive financial systems have been perceived as sine qua non for sustainable economic development, decrease in inequality, and poverty alleviation for several decades now. The World Bank (2018) declared that universal financial inclusion needs to be achieved by 2020, yet countries still struggle to create financial ecosystem that is accessible for all. According to the latest World Bank Global Findex Survey (WB-GFS) from 2021, account ownership around the world increased by 25% in the 10 years spanning 2011 to 2021, from 51% of adults to 76% of adults (Demirgüç-Kunt et al., 2022). From 2017 to 2021, account ownership in developing economies increased by 8%, but still there are more obstacles to achieving universal financial inclusion in developing economies due to a number of barriers and lower efficiency of financial system.

A precondition for fostering financial inclusion is understanding the driving factors of financial inclusion and providing adequate measures. There is extensive academic literature providing methodological approaches to measuring financial inclusion. The most prominent authors are Sarma 2008, 2012 and 2014 and Amidzic et al., 2014. Methodological approaches are based on using factor analysis or principal component analysis for index construction. Based on these approaches, this paper provides comprehensive literature review on existing methodologies for measuring financial inclusion, in order to develop the index of financial inclusion (IFI) for Southeast European (SEE) countries. The main research idea is to create the benchmark for future investigation on the level of financial inclusion in SEE countries and to better understand the driving factors of financial inclusion in SEE countries.

Based on the previous research, this paper lays out the methodological approach to constructing a multidimensional financial inclusion index that can be used in future research to track progress and impact of financial inclusion on sustainable economic development, energy efficiency, environment quality, and other Sustainable Development Goals SDG goals among SEE countries.

The rest of the paper is structured as follows. In the second part, the literature review on measurements of financial inclusion is provided focusing on the methods and variables (dimensions) used to measure financial inclusion. In the third part, the methodological framework is given – data source, the variable used and method for index construction. The fourth part presents the results and discussion while in the fifth part the conclusion is

given as well as suggestions for further research.

2. Literature Review on Financial Inclusion Measurement

Financial inclusion is a rather broad socio-economic concept. Early attempts to define financial inclusion focused on financial exclusion as an antipode to financial inclusion, referring to the process where poor and disadvantaged are prevented to access financial system (Leyshon & Thrift, 1996) and the inability to access necessary financial services in an appropriate form (Sinclair, 2001). The World Bank (WB) (2022) provides the most comprehensive definition of financial inclusion in which financial inclusion means that 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.

Recognizing the need for addressing the issue of financial inclusion, academic literature focused on measuring financial inclusion and identifying key drivers for building inclusive financial system has been growing in the last two decades. Early attempts to measure financial inclusion focused on defining a single indicator or a set of indicators to describe financial inclusion. The data measuring financial inclusion can broadly be divided into two groups: supply-side and demand-side data.

The supply-side data collected from regulatory banking authorities, such as the number of commercial bank branches per 100,000 adults, number of ATMs per 100,000 adults, number of depositors with commercial banks per 1,000 adults, and the aggregate number and value of bank loans and deposits were firstly used by Back et al. (2007). Today, these data are collected by the International Monetary Fund (IMF). The IMF Financial Access Survey (IMF FAS) covered the set of indicators focusing on the supply side, such as: number of bank accounts, number of commercial bank branches per 100,000 adults, number of ATMs per 100,000 adults, outstanding deposits with commercial banks (% GDP), outstanding loans from commercial banks (% GDP), and small and medium sized enterprise (SME) outstanding loans from commercial banks (% GDP). With the increase of electronic banking and development of FinTech companies, today the IMF (2019) also collects the data on the number of registered mobile money agent outlets per 1,000km², number of registered mobile money accounts per 1,000 adults, and value of money transactions as % of GDP, as core indicators measuring financial access.

The most commonly used demand-side indicator of financial inclusion is a simple measure of the proportion of adult population (or households) within a country that have access to formal financial product(s)/service(s), usually a bank account at formal financial institution. Honohan (2008) introduced this indicator as the estimation of the proportion of households having access to financial services from secondary data. As Sarma (2012) suggests, the main limitation of this indicator is that it does not take into account the actual usage and quality of financial product(s)/services(s).

To further describe financial inclusion and to follow up on financial inclusion development, the set of new micro-level demand-side indicators was developed, which are systematically being collected nowadays by the WB. The WB initiated data collection in 2011 through its GFS. These indicators include demand side level data on account ownership and usage, borrowing and savings practices, quality of financial products/services, mobile payments, barriers to having account, etc.

Even though a significant number of both supply and demand side indicators have been developed over the years, there is still an ongoing debate if one single indicator or set can adequately capture financial inclusion complexity. Following that argument, Sarma (2008, 2012) was first to develop the methodology for creating the IFI. Sarma proposed creating a multidimensional index that would be based on both supply side data - macroeconomic parameters related to banking sector outreach and demand side data – micro level indicators related to access, usage and obstacles to using financial products/services by the general population.

Building on Sarma's work, methodological approaches to construct an IFI can be divided into two groups. One group follows the adapted methodology used by the United Nations Development Program (UNDP) for computation of Human Poverty Index, Human Development Index, Gender Development Index (Gupte, Venkataramani & Gupta, (2012); Sarma (2012); Park & Mercado, (2015); Sarma, (2016); Goel & Sharma (2017); Nguyen, (2021). The other group uses Principal Component Analysis (PCA) or factor analysis to extract factors of financial inclusions (Chakravarty & Pal (2013); Amidzic et al. (2014); Camara & Tuesta, (2018); Park & Mercado, (2018); Borhan et al. (2021); Dircio, M °C., at al. (2023); Tram et al. (2023)).

Most of the above-mentioned researches uses similar sets of variables grouped into two or three dimensions to construct the financial inclusion index. Grouping is done prior to deploying factor analysis. The majority of researchers (Sarma 2008, Sarma 2012, Amidzic, et al. 2014, Sarma 2016, Camara & Tuesta (2018), Goel & Sharma (2017) Park & Mercado (2018), Nguyen, (2021) use three dimensions: access (or penetration),

availability and usage, Borhan et al., (2021) use two dimensions (access and usage) while Gupte, et al. (2012) use as many as four: outreach (penetration and accessibility), usage, ease of transactions, and cost of transactions. Camara & Tuesta, (2018) even introduce the barriers dimension. Approaches differ due to the availability of indicators and data.

3. Methodology

3.1 Sample and Data

The initial set of variables was identified based on the literature review and data availability for SEE countries, namely: Albania, Bosnia and Herzegovina, Bulgaria, Montenegro, Greece, Croatia, Kosovo, Romania, North Macedonia Slovenia, Serbia, and Turkiye. While there are many indicators describing financial inclusion, data availability was the main limitation to include a larger number of financial inclusion indicators. The full list of variables is given in Table 1. The data sources are the WB-GFS data base and the IMF-FAS for twelve SEE countries for the years 2011, 2014, 2017, and 2021.

Table 1. List of variables used for computing the IFI

Variable label	Variable	Description	Data source
racun	Account at financial institution	Percentage of respondents having a bank account at financial institution (% +15 age)	WB-GFS
n_racun	Deposit accounts	Number of deposit accounts at commercial banks per 1,000 adults	IMF-FAS
posudba	Borrowing from financial institution	Percentage of respondents who borrowed money from financial institution (% +15 age)	WB-GFS
kor_deb	Use of debit or credit card	Percentage of respondents who used debit or credit cards (% +15 age)	WB-GFS
stednja	Savings at financial institution	Percentage of respondents who saved money at financial institution (% +15 age)	WB-GFS
ne_depo	Outstanding loans	Outstanding loans from commercial banks % GDP	IMF-FAS
filijala	Number of branches	Number of commercial bank branches per 100,000 adults	IMF-FAS
bankomat	Number of ATMs	Number of ATMs per 100,000 adults	IMF-FAS

3.2 Method for Constructing a Multidimensional IFI

For constructing a multidimensional IFI for SEE countries, the exploratory two-stage PCA was used as suggested by Amidzic et al. (2014), Canara & Tuesta (2018), Park & Mercado, (2018), Nguyen (2021), and Borhan et al. (2021).

Prior to performing two-stage PCA, the variables used for index construction were normalized using min-max normalization method, as proposed by Sarma (2008) and used by Amidzic et al. (2014), Nguyen (2021) and others, to scale data in the range between 0 and 1 using the following formula:

$$d_i = \frac{A_i - m_i}{M_i - m_i} \quad (1)$$

where:

d_i – the normalized value of indicator i ,

A_i – the actual value of indicator i ,

m_i – the observed minimum value of indicator i ,

M_i – the observed maximum value of indicator i .

The first-stage PCA was used for identifying and grouping the variables in relevant dimensions. Then, the weights of the indicators representing dimensions were extracted and estimated. The estimation of factors loading was obtained using rotation of the axes using the varimax technique. Based on the results of the first-stage PCA, two dimensions (factors) were extracted.

In the second-stage PCA, the weights for each dimension were calculated using unrotated matrix and the overall financial inclusion index by using the dimensions as explanatory variables were created.

IFI was then created based on the following formula:

$$IFI_1 = w_i Y_i^{d1} + w_i Y_i^{d2} + e_i, \quad (2)$$

where :

IFI_i – composite index of financial inclusion of country i,

w_i – relative weights of each dimension,

e_i – variation due to error, and

Y_i^{d1} and Y_i^{d2} – two dimensions of financial inclusion of country i.

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was tested before conducting Factor Analysis to further verify adequate correlations between the indicators.

4. Results and Discussion

Table 2 provides descriptive statistics of the indicators used for constructing the index for the overall sample. The data show that on average, 64% of adults in SEE countries have an open account at financial institutions, over 39% of them use debit cards, while just above 20% borrow and 14% save money. The average number of deposit accounts for SEE countries per 1,000 adults is 1,845 accounts, which means that on average one person has more than one account opened at financial institutions. There are approximately 29 bank branches and 66 ATMs per 100,000 inhabitants in SEE countries.

Table 2. Descriptive statistics of indicators used for the construction of IFI – original data

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Account at financial institution	47	64.11277	22.5944	10.57	99.05	0.2893	0.4307
Deposit accounts	33	1,845.737	965.4469	596.33	3,926.25	0.0297	0.8201
Borrowing from financial institution	47	20.5666	10.39704	4.55	42.84	0.0311	0.8208
Use of debit or credit card	35	39.454	20.42749	5.81	89.83	0.1418	0.6764
Savings at financial institution	47	14.86617	9.257208	3.17	39.85	0.0082	0.6893
Outstanding loans	48	56.57188	14.68935	31.02	97.6	0.1503	0.6961
Number of branches	44	28.87545	11.17838	11.63	60.4	0.0067	0.1082
Number of ATMs	44	66.50477	28.67434	25.68	140.7	0.0368	0.4909

Source: Authors' calculations

Table 3 provides descriptive statistics of the indicators used for the construction of the IFI per years, aggregated for all SEE countries. As it can be observed, the value of the indicators increases over the years for all selected indicators, except for the number of bank branches which is consistent with a general trend in the banking industry related to a shift towards electronic banking.

Table 4. Descriptive statistics of indicators used for the construction of IFI per years for SEE countries aggregated

Variable label	Year	Obs	Mean	Std. Dev	Min	Max
racun	2011	12	55.875	24.12993	10.57	97.14
	2014	12	63.14583	21.66908	25.05	97.24
	2017	12	64.925	21.10417	20.49	97.53
	2021	11	73.26818	23.67078	22.1	99.05
n_racuna	2011	8	1,924.412	947.7432	935.69	3826.17
	2014	8	1,932.675	967.9838	943.61	3758.79
	2017	9	1,849.46	1,062.469	653.41	3780.77
	2021	8	1,675.934	1,042.582	596.33	3926.25
posudba	2011	12	10.6	4.671385	4.55	21.8
	2014	12	24.06583	9.259943	13.49	41.78
	2017	12	23.065	11.07302	11.19	42.84
	2021	11	24.89636	9.058118	13.39	42.35

kor_deb	2011	n/a				
	2014	12	33.31167	18.0688	5.81	71.01
	2017	12	38.27333	19.9206	7.68	81.85
	2021	11	47.44273	22.48756	8.43	89.83
stедnja	2011	12	9.375833	7.712986	3.17	28.85
	2014	12	13.36583	8.311408	5.29	32.51
	2017	12	17.53583	9.519771	8.66	35.79
	2021	11	19.58	9.01207	9.55	39.85
ne_depo	2011	12	50.64	14.26539	31.02	81.82
	2014	12	54.81833	15.20684	32.14	86.2
	2017	12	55.865	12.06963	32.52	73.98
	2021	12	64.96417	14.9135	37.95	97.6
filijala	2011	10	33.797	12.99866	17.36	60.02
	2014	12	31.13	11.69406	15.28	60.4
	2017	12	28.5575	10.49373	13.29	51.01
	2021	10	21.63	5.844987	11.63	29.85
bankomat	2011	11	64.05727	28.87687	25.68	109.79
	2014	12	65.745	26.43127	27.47	116.77
	2017	12	69.9125	30.99614	28.59	140.01
	2021	9	65.96555	32.68931	28.57	140.7

Source: Authors' calculations

Table 5 shows the results of the first-stage factor analysis - weights derived from matrix of rotated factor loadings. In contrast to Sarma (2008, 2012 & 2016), Amidzic, et al. (2014), Camara & Tuesta, (2018), Goel & Sharma, (2017) Park & Mercado, (2018), Nguyen, (2021) who extracted three dimensions of financial inclusion, based on the data for SEE countries, two sub-dimensions were estimated in our study. Dimensions extracted for SEE countries, "access" and "usage and availability", are consistent with the dimensions extracted by Borhan et al., (2021).

Table 5. First-stage factor analysis – factor correlation (varimax rotation)

Variable label	Variable	Factor 1 loadings (availability and usage)	Factor 2 loadings (access)	Uniqueness
s_racun	Account at financial institution	0.5228	0.4349	0.5376
s_n_racuna	Deposit accounts		0.5375	0.6998
s_posudba	Borrowing from financial institution	0.7807		0.3485
s_kor_dep	Use of debit or credit card	0.7516	0.4130	0.2645
s_stednja	Savings at financial institution	0.7991	0.3448	0.2426
s_ne_depo	Outstanding loans		0.8340	0.2792
s_filijala	Number of branches	0.3741		0.8210
s_bankomata	Number of ATMs	0.9621		0.0734

Source: Authors' calculations

As it can be observed, the access dimension is represented by three indicators: percentage of individuals with an opened account at financial institutions, number of deposit accounts per 1,000 inhabitants, and outstanding loans. The other dimension is comprised from the set of two indicators related to availability (the number of branches and the number of ATMs per 100,000 inhabitants) and usage (usage of debit account, borrowing, and saving).

In the second-stage PCA, the weights for two obtained factors were calculated in order to construct the index. Table 6 shows the results of the second-stage factor analysis and obtained factor loadings. It was expected to obtain equal weights since the first-stage PCA analysis extracted two factors. This result also shows that Sarma's (2008) approach to equal weighting is appropriate, since the load factors obtained for two dimensions were equally weighed as well.

Table 6. Second-stage factor analysis – factor correlation

Variable label	Factor label	Factor loadings	Uniqueness
s_FII_f1	Usage and availability	0.5249	0.7245
s_FII_f2	Access	0.5249	0.7245

Source: Authors' calculations

The KMO statistics for the first-stage PCA was 0.573, which was more than the minimum required threshold (0.50). This confirms that the indicators were correlated and suitable for structure detection using factor analysis. owest, with the value of 0.084.

Table 7 presents the computed IFI values for SEE developing economies for the years 2011-2021. As it can be observed from the Table, Slovenia has the highest level of financial inclusion with the average value of 0.903 and Kosovo's level is the lowest, with the value of 0.084.

Table 7. Values of the IFI for SEE countries, 2011-2021

SEE country	2011	2014	2017	2021	Avg.	Std. dev.	Rank
Slovenia	0.800	0.883	0.928	1.000	0.903	0.084	1
Greece	0.855	0.734	0.682	0.991	0.815	0.138	2
Croatia	0.620	0.841	0.889	0.859	0.802	0.123	3
Bulgaria	0.592	0.704	0.761	0.785	0.711	0.086	4
Turkiye	0.214	0.471	0.689	0.607	0.495	0.208	5
Montenegro	0.374	0.445	0.515	0.598	0.483	0.096	6
Serbia	0.255	0.361	0.356	0.566	0.385	0.131	7
North Macedonia	0.179	0.366	0.366	0.409	0.330	0.103	8
Bosnia and Herzegovina	0.192	0.233	0.264	0.457	0.287	0.117	9
Albania	0.288	0.319	0.221	0.258	0.272	0.042	10
Romania	0.019	0.251	0.239	0.431	0.235	0.169	11
Kosovo	0.000	0.077	0.063	0.196	0.084	0.082	12

Source: Authors' calculations

SEE countries are further divided into three categories based on the calculated IFI, namely low, medium and high level of financial inclusion. As proposed by Sarma (2008), the country membership to one of these three categories depends on the value of the IFI and it is given in a scale below:

1. $0 \leq \text{IFI} < 0.3$ - low financial inclusion,
2. $0.3 \leq \text{IFI} < 0.5$ - medium financial inclusion, and
3. $0.5 \leq \text{IFI} \leq 1$ - high financial inclusion.

Based on the scale provided above, in the observed period Slovenia, Greece, Croatia and Bulgaria on average had a high level of financial inclusion, but also these countries retained the high level of financial inclusion during the whole-time period. Turkiye, Montenegro, Serbia, and North Macedonia on average had a medium level of financial inclusion, but in 2021, three countries – Turkiye, Montenegro and Serbia had a high level of financial inclusion. On average, Bosnia and Herzegovina, Albania, Romania, and Kosovo had a low level of financial inclusion, but Bosnia and Herzegovina and Romania scored over 0.3 on the financial inclusion scale, which put them among the countries with a medium level of financial inclusion.

Overall, the improvement of financial inclusion in SEE countries can be observed during the ten-year period. Figure 1. shows that the number of countries with high financial inclusion increased from 4 to 7, while at the same time, only two SEE countries in the SEE region had a low level of financial inclusion in 2021. These results are consistent with the previous research on financial inclusion worldwide (Sarma, 2016; Park & Mercado, 2018; Bohran et al, 2021), which also found that the number of countries with a high level of financial inclusion is on the increase while at the same time, the number of countries with low financial inclusion is on the decrease.

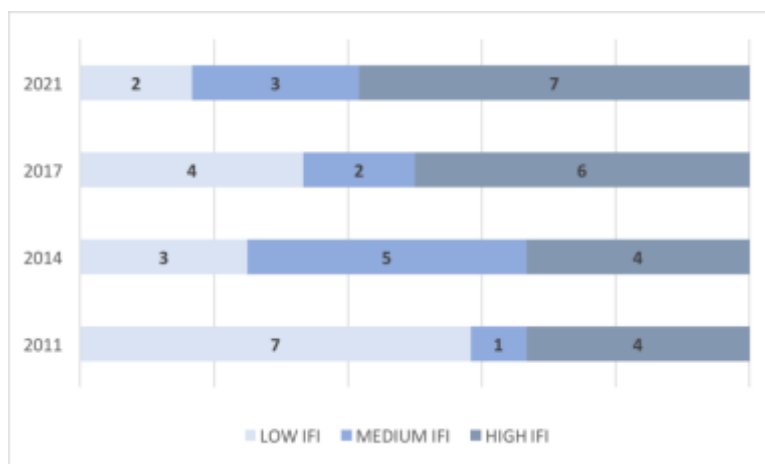


Figure 1. Countries in respect to the level of financial inclusion index per years (number of counties)

Note: The total number of SEE countries = 12

Source: Authors' calculations

5. Conclusions and Future Research

There is a consensus among scholars and policy makers that financial inclusion is one of the key drivers of economic development. In that respect, efforts to increase financial inclusion need to be in line with the empirical evidence of the underlying factors driving the increase of financial inclusion. During the last several decades, many different indicators, both supply and demand side, were collected. These data need to be analyzed so as to provide actionable guidelines for financial inclusion policies. Therefore, the IFI has proven to be an adequate measure of financial inclusion, but academic papers provide different methodologies for its calculation.

Based on the existing methodological framework, using the WB and IMF collected data for four time points (2011, 2014, 2017 and 2021) and the weights extracted from a two-stage PCA method, we created an overall IFI for SEE countries. This index is comprehensive as it uses demand and supply side data to track the progress of financial inclusion in SEE countries. To our knowledge, this paper presents the first IFI calculated for SEE countries.

Two-stage PCA method proves to be an adequate statistical approach for the construction of IFI, showing that financial inclusion in SEE countries is determined by two factors, one related to access as the dimension of financial inclusion and the other related to availability and usage of financial products/services. Furthermore, PCA confirms that equal weighting of the factors for constructing the index can be used, as previously proposed by Sarma (2008).

The most obvious contribution of this paper is that it uses both supply side and demand side data for computing the IFI. Also, this research contributes to existing literature on the development of IFI, confirming earlier studies that financial inclusion is determined by access, availability and usage of financial products/services offered by formal financial institutions. It contributes to better understanding of the efforts to increase financial inclusion in the SEE region in terms of simply capturing the progress measured by IFI or investigating the relationship between IFI and the relevant macroeconomic variables such as GDP, GDP per capita, unemployment or inflation. It is also a useful tool for policymaking and policy evaluation of financial inclusion initiatives, but also for financial institutions and Fintech companies to improve their efforts in promoting financial inclusion.

Building on the developed IFI, future research will use the constructed index to analyze contribution of financial inclusion to economic development, unemployment rates, inflation and poverty alleviation among SEE countries. Furthermore, the index will be used to better understand the barriers to financial inclusion in order to provide recommendation to policymakers for building more inclusive financial systems in SEE countries.

The main limitation of this research and, in general, the researches on construction of IFI are limited data series and limited number of indicators used for the construction of the index over several years.

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