



Focus on *inclusion*

MEASURING FINANCIAL INCLUSION IN THE EU: THE NEW “FINANCIAL INCLUSION SCORE”

SUMMARY

This paper proposes a synthetic measure of financial inclusion. A new “Financial Inclusion Score” (or FIS) will use endogenous weights for inputs and outputs, using a data envelopment analysis (DEA) method. Using these FIS scores, this paper discusses the financial inclusion ranking of 27 EU countries, and suggests how this measure can be used by national and EU policy-makers for advancing financial inclusion.

FINANCIAL INCLUSION: OVERVIEW

Determining appropriate financial inclusion policies starts with accounting for numerous complex factors that influence access to, and use of, financial services. Within this, a key challenge is to define and measure financial inclusion in a way that can be operationalized and supported through appropriate programs and policies.

However, the concept of financial inclusion does not lend itself to precise measurement; it encompasses many aspects of supply, demand and policy. Any measure of EU financial inclusion should satisfy several conditions, including:

- Capturing all relevant aspects of financial inclusion
- Allowing comparison of financial inclusion levels across member countries
- Highlighting unique distinct features or pathways to financial inclusion in the different social and economic environments of EU member states.
- Using available data, without the need for additional research.

While a number of attempts to define and measure financial inclusion exist, we still lack a comprehensive measure to capture salient supply-side aspects, as well as actual financial service use (demand side). This Policy Note offers a macro-level measure of financial inclusion that links both sides of the market, and offers a composite inclusion score comparable across EU countries based on available data.

The proposed approach treats financial inclusion as the capacity of the financial system to offer appropriate products and services to all individuals who want to use them. An inclusive financial system functions as an open system, in the sense that it allows anyone to use it (if and when needed) under equal terms and conditions. Therefore, financial inclusion describes the ability of a financial system (including its institutions, products and services, processes and policies) to achieve this on terms and conditions that are affordable, equitable and transparent.

A COMPOSITE MEASURE

The financial inclusion of a system can be represented as a set of:

Outputs: the actual use of basic financial services, including current accounts, consumer credit, savings accounts and life insurance

Inputs: including (1) supply factors – infrastructure of financial service delivery, (2) demand factors – the quality of products and services, or how well they meet the expectations of consumers, and (3) pro-

Figure 1: Financial inclusion as an input-output system



inclusion policies – government actions and regulations that advance financial inclusion in a country.

The measure of financial inclusion should reflect the multi-dimensional aspect of this phenomenon, and should combine all three aspects of access. In addition, the measure should not rely on an arbitrary assignment of weights for components (for example, by assuming that all three aspects of access conditions contribute equally to financial inclusion). Rather, weights should be assigned endogenously to avoid arbitrary choice, which can skew results. In our approach, weights are computed using data envelopment analysis (DEA), a linear programming method used in optimization research that assigns weights endogenously without prior specification of values of the weights.¹

The Financial Inclusion Score (FIS) describes financial inclusion as the ability of a financial system to offer services in relation to the available inputs, and as such it is a performance measure, rather than an outcomes measure. The FIS score as calculated here is a relative measure, ranking a country's financial system in relation to the "best in class", as identified by the DEA optimization method.

An FIS score of "1" means that the system transforms access factors into usage in the most efficient way, and it is an efficiency standard or benchmark for other countries to follow. An FIS score of less than 1 means that a particular financial system is less inclusive (in relative terms) by comparison with the best in class performer. However, in both cases (FIS=1 and FIS<1), it is still possible that some individuals may be excluded from financial service use, and additional measures should be developed to capture the specific nature and scale of this exclusion. The FIS is a useful general method of measuring and comparing financial inclusion among EU member states.

Method

The FIS is calculated using data envelopment analysis, or DEA,² a non-parametric method used for comparing the efficiency of various decision-making units, or DMUs. The definition of the DMU is flexible; they can individuals, branches of an organization, or entire organizations (of financial systems as in our case). What is important is not the scale, but that all DMUs exist in the same basic environment and convert the same set inputs into the same set of outputs. Given the similarity of financial systems in the EU member states, this method is appropriate to track the performance of financial systems in terms of their inclusiveness.

Variables and data

Data for FIS calculation comes from various sources:

Inputs

Financial infrastructure: the measure of financial infrastructure is a composite index of the density of outlets where people can use financial services (including bank branches, ATMs and other points of sale³ where financial transactions are carried out). The index score ranges from 1 (worst) to 5 (best).

Demand conditions: a composite index averages scores for the quality of products and services, and the perceptions and attitudes of consumers towards financial markets. The index score ranges from 1 (worst) to 5 (best).

¹ For an alternative approach to developing endogenous weights of a financial inclusion index using parametric methods see: Noelia Cámara and David Tuesta, *Measuring Financial Inclusion: A Multidimensional Index*. BBVA Research, Working Paper 14/26, September 2014.

² Charnes, A., Cooper, W., and Rhodes, E. "Measuring the Efficiency of Decision Making Units." *European Journal of Operational Research*, 2.6 (1978): 429-444.

³ Financial Access Survey of International Monetary Fund (bank branches and ATMs) and Statistical Data Warehouse of European Central Bank (POS terminals)

Pro-inclusion policies: the measure of the policy sphere was calculated from data collected through the bank regulation and supervision survey⁴ carried out by the World Bank in 2012, the Doing Business 2014 survey and other research studies.⁵ The composite index takes values from 1-5, and reflects achievements in: financial inclusion as an important policy issue; active government policies to increase access to (and use of) financial services; promotion of access to the national payment system and other forms of payment; interest rate policies; transparency and disclosure requirements; consumer protection; policies and regulations promoting financial sector competition; credit bureau; and deposit insurance.

Outputs

Outputs reflect the use of four basic types of financial services:

Bank accounts: share of the adult population with a bank account

Consumer credit: share of adult population repaying consumer credit

Deposits: share of the adult population saving with a financial institution

Insurance: share of the adult population with life insurance

Data from two sources was used: the Global Index (2011), and the Special Eurobarometer 373 (2011).

EU FINANCIAL INCLUSION: ANALYSIS

Financial Inclusion Score (FIS)

Table 1 presents the FIS scores of 27 EU countries (calculated using the DEA method), and their FIS ranking.⁶ Using these FIS scores, countries can be grouped into four categories:

Leaders: FIS = 1 (11 countries)

High Performers: 1.00 > FIS > 0.90 (8 countries)

Aspiring Performers: 0.90 > FIS > 0.70 (6 countries)

Laggards: FIS < 0.70 (2 countries)

The results of **Table 1** are shown graphically in **Figure 2** (overleaf), which presents an EU financial inclusion map according to the FIS scores. **Figures 3 and 4** show country groupings according to their relative financial inclusion performance.

Table 1: Financial inclusion score and rankings for 27 EU Countries

Category	Country	Rank	FIS Score
Leaders	Sweden	1	1.000
	Denmark	2	1.000
	Finland	3	1.000
	Ireland	4	1.000
	France	5	1.000
	Cyprus	6	1.000
	Slovenia	7	1.000
	Germany	8	1.000
	Latvia	9	1.000
	Spain	10	1.000
	Netherlands	11	1.000
High performers	Malta	12	0.999
	Austria	13	0.996
	Belgium	14	0.987
	Estonia	15	0.964
	UK	16	0.962
	Slovakia	17	0.930
	Czech Rep.	18	0.921
	Luxemburg	19	0.904
Aspiring performers	Portugal	20	0.876
	Hungary	21	0.841
	Greece	22	0.840
	Italy	23	0.800
	Lithuania	24	0.753
	Poland	25	0.747
Laggards	Bulgaria	26	0.567
	Romania	27	0.554

As these illustrate, there is substantial variation among member states in terms of their FIS, although overall the majority of countries are fairly advanced in their efforts to make the financial system inclusive. The following are some of the notable aspects of the comparison of the member states:

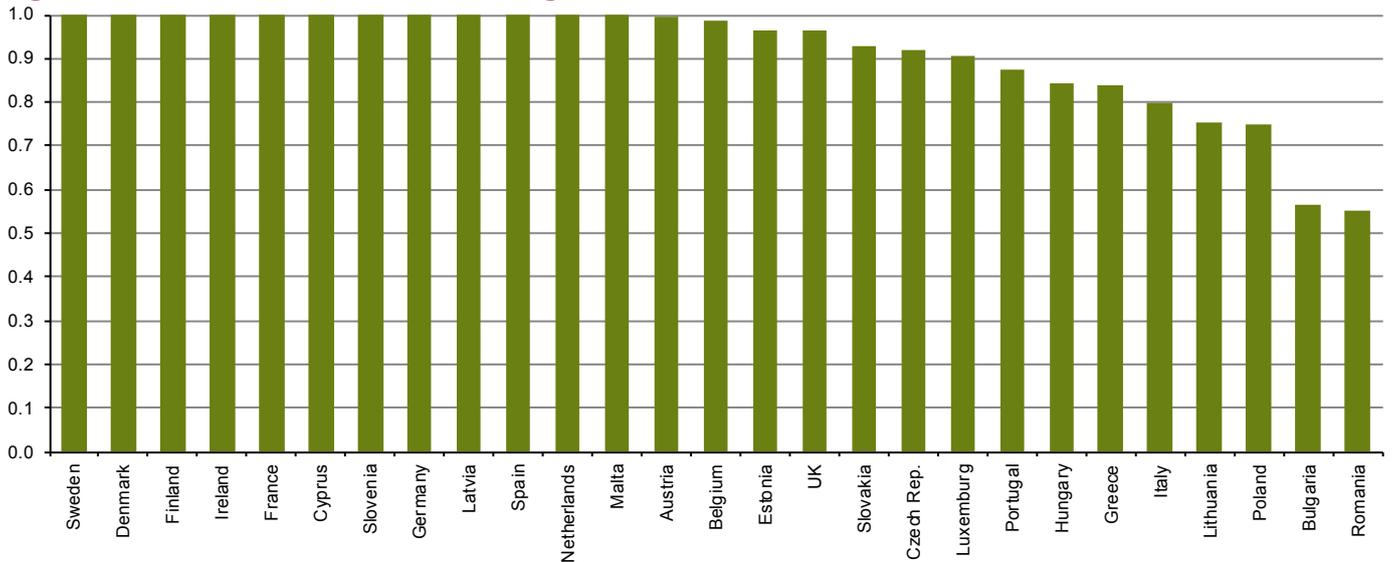
- The EU-27 has a high average FIS of 0.91 indicating an overall high level of inclusion
- 11 countries out of 27 (41%) have FIS score of 1, indicating that their systems are inclusive to the extent that the available inputs allow

⁴ James R. Barth, Gerard Caprio, Jr., Ross Levine 'Bank Regulation and Supervision in 180 Countries from 1999 to 2011', 2013

⁵ 'Strategy for Financial Inclusion. Country Report' Ireland 2011; Study on the position of savers in private pension funds', Oxaera, 2013; 'Final report on interest rate restrictions in the EU', iff/ ZEW 2010

⁶ Croatia is excluded, as it lacks of much the data needed for index calculation.

Figure 2: Financial inclusion score ranking for the EU-27



- Of these 11 countries, three (Sweden, Finland and Denmark) achieved a score of 1, indicating few differences between them in terms of financial inclusion outcomes
- Among the best performers, three (Latvia, Slovenia and Cyprus) joined the EU as recently as 2004, indicating that financial inclusion is not limited to “Old Europe”
- 70% of member states (19) have a financial inclusion score exceeding 0.9, indicating high levels of financial inclusion (the average score for this group is 0.97)
- The remaining 8 countries have an average score of 0.75
- Two countries (Bulgaria and Romania) have significantly lower FIS scores (0.57 and 0.55 respectively), which are half those of the best performers.

It is also interesting to compare FIS scores for old EU members with those of new entrants (see **Table 2**). While the average score for the former is higher than for the latter (0.93 vs. 0.81), some new states perform as well (and even better) than their older counterparts. Three countries (Cyprus, Slovenia and Latvia) have an FIS of 1, and one country (Malta)

Figure 3: EU countries according to FIS scores (from 1 to 0.55)

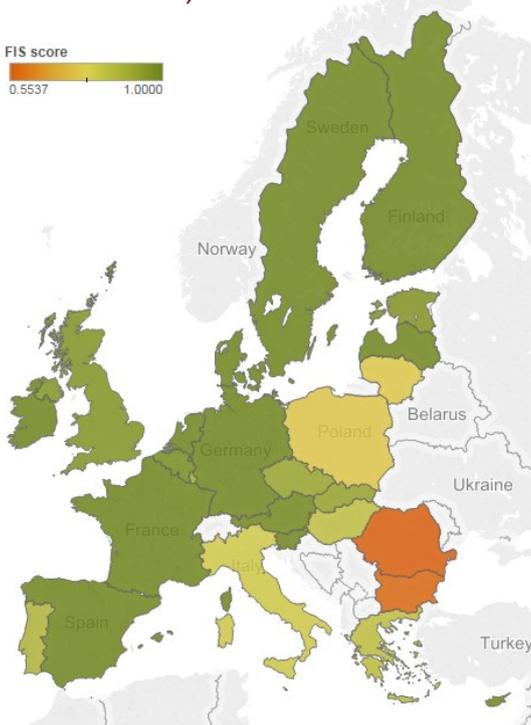
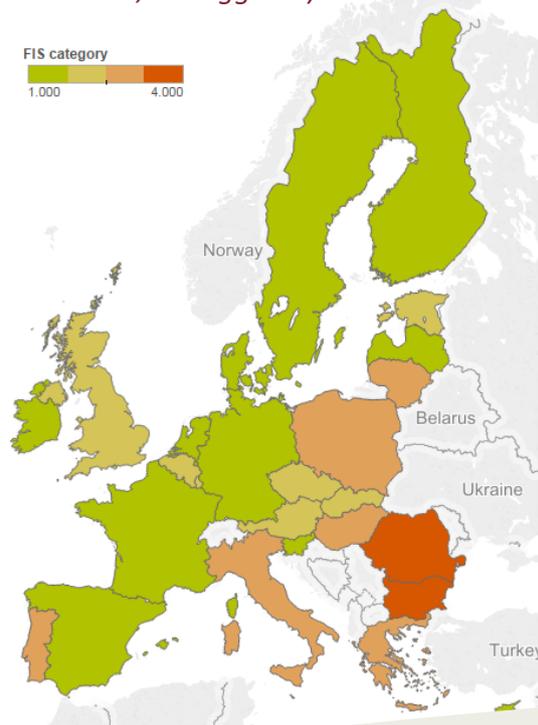


Figure 4: EU countries by FIS clusters (1 - leaders, 4 - laggards)



records an FIS of 0.99. Two-thirds of new entrants perform better than the weakest of the old member state group. However, new states show a greater disparity between countries in terms of their scores: smaller countries appear to outperform larger ones such as Poland and Romania.

FIS by component

Analyzing variations in FIS inputs (supply, policy and demand) provides additional granularity to the rankings. The rankings are derived using the concept of “slack”, or the amount of inputs in excess of that of the best performer, in order to accomplish the current outputs (use of financial services). Slack highlights the inefficiency of each input to the FIS score: the lower the rank, the more inputs are used to accomplish what the best-performing financial system presently achieves. **Table 3** compares the overall FIS Score with a ranking of FIS individual inputs, and Figure 5 illustrates the variability of FIS inputs across EU states.

As the table shows, Sweden (as the best performer among all EU countries according to its FIS score)⁷ serves as the benchmark for all other countries. The table also demonstrates that there is great variation in the ranking of inputs for each country, which indicates that there are differences in levels of inefficiencies that contribute to overall FIS ranking. Some of these results are surprising. For example, the Netherlands, with its high overall ranking (number 11) shows two inputs ranked the lowest of all countries, indicating that fewer resources could be used without compromising financial inclusion outcomes. The lowest-ranked state (Romania), by contrast, appears to be applying financial access inputs fairly efficiently, although the overall outcome is still quite inefficient. For some states, the FIS score and input ranking are quite similar (UK, Greece) while for others there are significant differences.

Table 2: FIS Scores for old and new member states

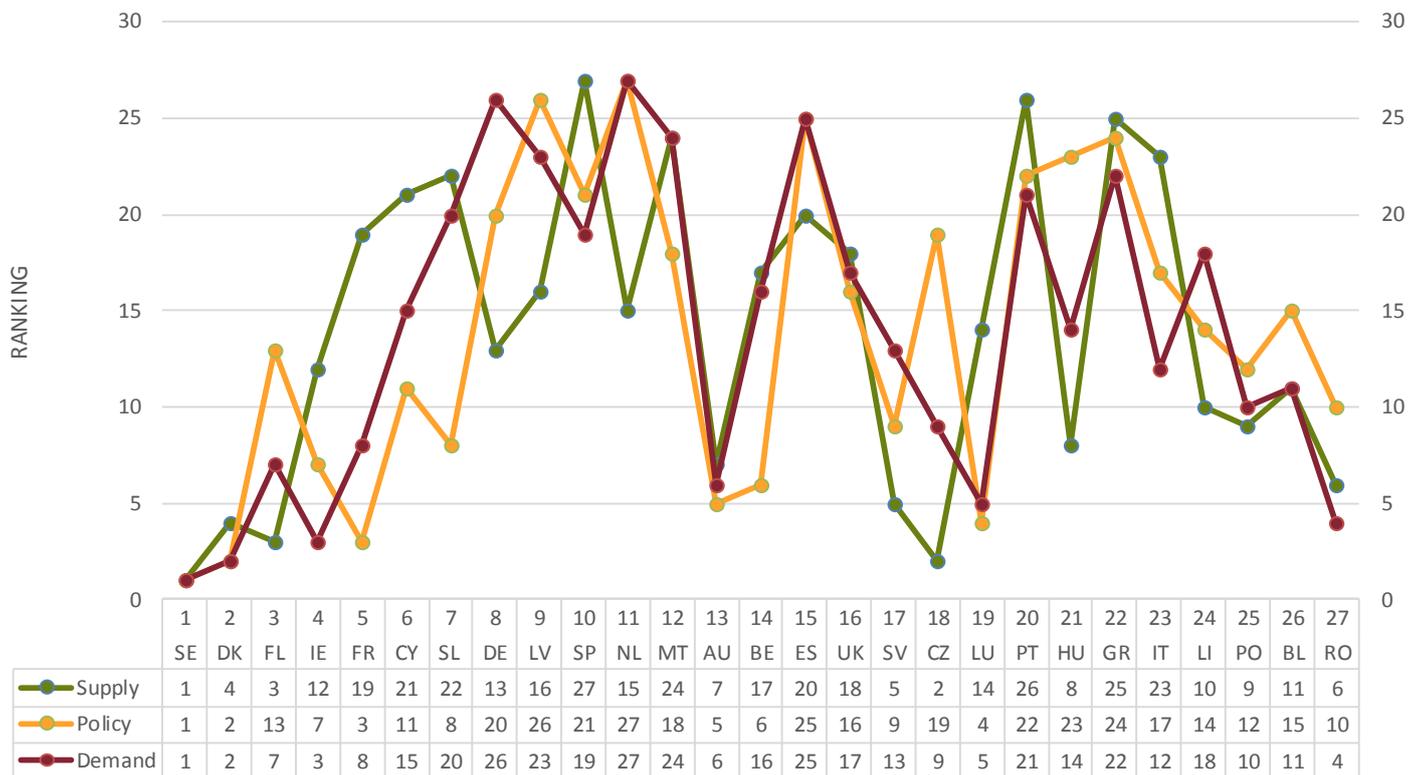
Old member states			New member states		
Country	Rank	FIS	Country	Rank	FIS
Sweden	1	1.000	Cyprus	6	1.000
Denmark	2	1.000	Slovenia	7	1.000
Finland	3	1.000	Latvia	9	1.000
Ireland	4	1.000	Malta	12	0.999
France	5	1.000	Estonia	15	0.964
Germany	8	1.000	Slovakia	17	0.923
Spain	10	1.000	Czech Rep.	18	0.921
Netherlands	11	1.000	Hungary	21	0.841
Austria	13	0.996	Lithuania	24	0.753
Belgium	14	0.987	Poland	25	0.747
UK	16	0.962	Bulgaria	26	0.567
Luxemburg	19	0.904	Romania	27	0.554
Portugal	20	0.876			
Greece	22	0.840			
Italy	23	0.800			

Table 3: FIS score and FIS input rankings

Country	FIS rank	Supply	Policy	Demand
Sweden	1	1	1	1
Denmark	2	4	2	2
Finland	3	3	7	13
Ireland	4	12	3	7
France	5	19	8	3
Cyprus	6	21	15	11
Slovenia	7	22	20	8
Germany	8	13	26	20
Latvia	9	16	23	26
Spain	10	27	19	21
Netherlands	11	15	27	27
Malta	12	24	24	18
Austria	13	7	6	5
Belgium	14	17	16	6
Estonia	15	20	25	25
UK	16	18	17	16
Slovakia	17	5	13	9
Czech Rep.	18	2	9	19
Luxemburg	19	14	5	4
Portugal	20	26	21	22
Hungary	21	8	14	23
Greece	22	25	22	24
Italy	23	23	12	17
Lithuania	24	10	18	14
Poland	25	9	10	12
Bulgaria	26	11	11	15
Romania	27	6	4	10

⁷ Even though three countries achieved a score of 1, the statistical program ranked Sweden first.

Figure 5: Ranking of FIS inputs by country



Policy implications

The FIS score shows the relative performance of financial systems in terms of financial inclusion, and allows EU states to measure themselves against the best-performing markets. At the same time, FIS input analysis highlights where countries use more inputs than necessary to accomplish their current financial inclusion outcomes. This highlights instances where financial inclusion results could be better given the amount of inputs presently expended. It also points to which inputs could be adjusted in order to make gains in financial inclusion outcomes.

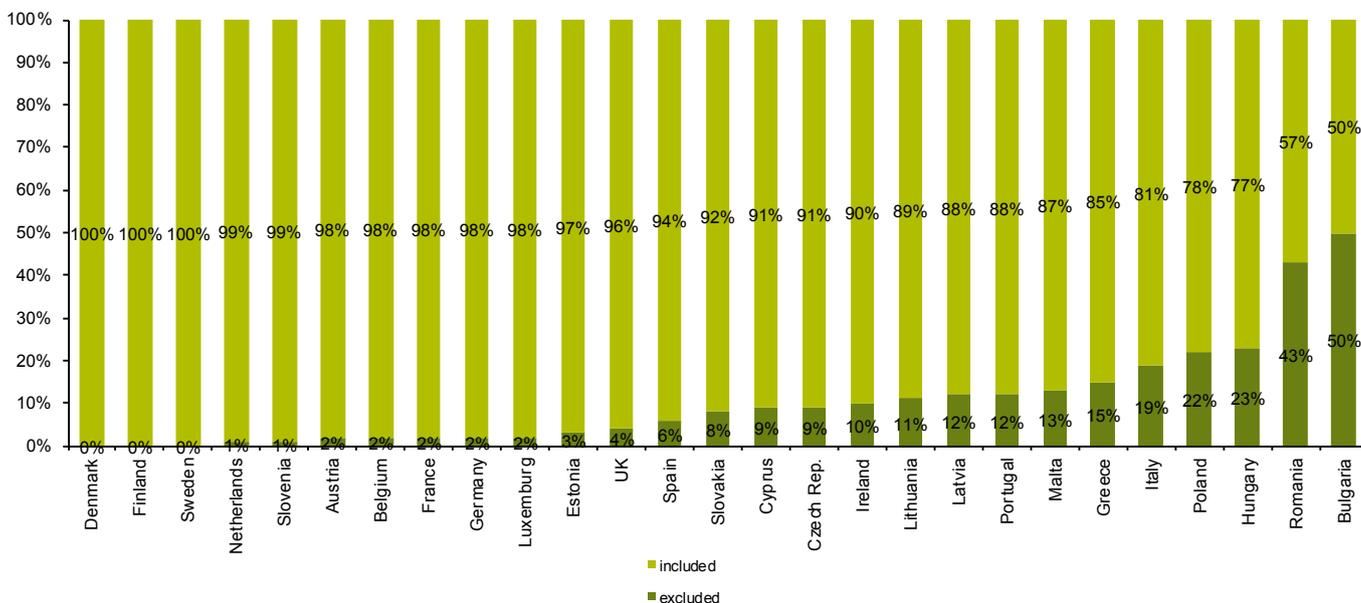
Comparison with other results

The country ranking in terms of financial inclusion using FIS should be compared to other methods of calculating financial inclusion, to ascertain how the proposed measure compares with other measures of financial inclusion.

FIS vs. TFI scores

First let's compare FIS to the Total Financial Inclusion (TFI) Index (see **Figure 6**) which is a simple measure of the use of financial services calculated as a percentage of adults using at least one main financial product/service. **Table 4** compares EU

Figure 6: Total Financial Inclusion (TFI) Index



member state ranking in terms of financial inclusion using FIS and TFI measures.

While the ranking is not the same for both measures, it is broadly consistent, with a strong correlation between the two (with a correlation coefficient of 0.88). This affirms that the FIS score performs quite well in relation to a more simple measure, in that it retains the overall ranking for most countries. The scores are similar for the best and the worst performers, with some variation for the rest. The biggest discrepancies are for Malta (15) and Cyprus and Ireland (10), for which the FIS denotes a higher level of financial inclusion than the TFI Index alone.

Alternatively, we might conclude that the TFI can provide a reasonably good approximation for financial inclusion, and could be treated as a simple “rule-of-thumb” approach to measuring financial inclusion if no other data is available.

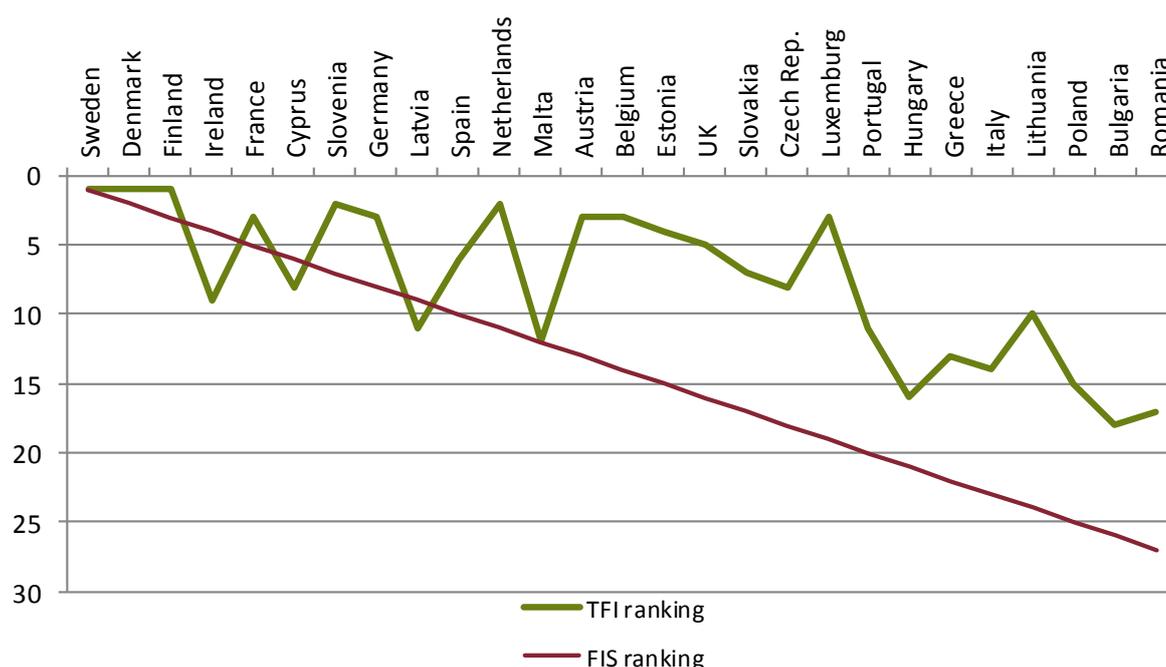
FIS vs the PSA method

It is also interesting to compare the performance of the FIS-based ranking with the ranking proposed by Cámara and Tuesta,⁸ where the authors used two-step principal component analysis (PCA) to endogenously determine the weights. It should be noted that their definition of financial inclusion is different from the one proposed here, and some of

Table 4: FIS-TFI country ranking comparison

Country	FIS Score	Country	TFI
Sweden	1	Sweden	1.00
Denmark	2	Denmark	1.00
Finland	3	Finland	1.00
Ireland	4	Slovenia	0.99
France	5	Netherlands	0.99
Cyprus	6	France	0.98
Slovenia	7	Germany	0.98
Germany	8	Austria	0.98
Latvia	9	Belgium	0.98
Spain	10	Luxemburg	0.98
Netherlands	11	Estonia	0.97
Malta	12	UK	0.96
Austria	13	Spain	0.94
Belgium	14	Slovakia	0.92
Estonia	15	Cyprus	0.91
UK	16	Czech Rep.	0.91
Slovakia	17	Ireland	0.90
Czech Rep.	18	Lithuania	0.89
Luxemburg	19	Latvia	0.88
Portugal	20	Portugal	0.88
Hungary	21	Malta	0.87
Greece	22	Greece	0.85
Italy	23	Italy	0.81
Lithuania	24	Poland	0.78
Poland	25	Hungary	0.77
Bulgaria	26	Romania	0.57
Romania	27	Bulgaria	0.50

Figure 7: FIS-TFI ranking comparison



⁸ Noelia Cámara and David Tuesta, Measuring Financial Inclusion: A Multidimensional Index. BBVA Research, Working Paper 14/26, September 2014.

the inputs are different. The authors define an “inclusive financial system” as one that maximizes usage and access, while minimizing involuntary financial exclusion, whereby involuntary financial exclusion is measured by a set of barriers perceived by those individuals who do not participate in the formal financial system. The degree of financial inclusion is determined by three dimensions: usage, barriers and access. These dimensions are, at the same time, determined by several demand-side individual level indicators for the cases of usage and barrier, and supply-side country level indicators for access.

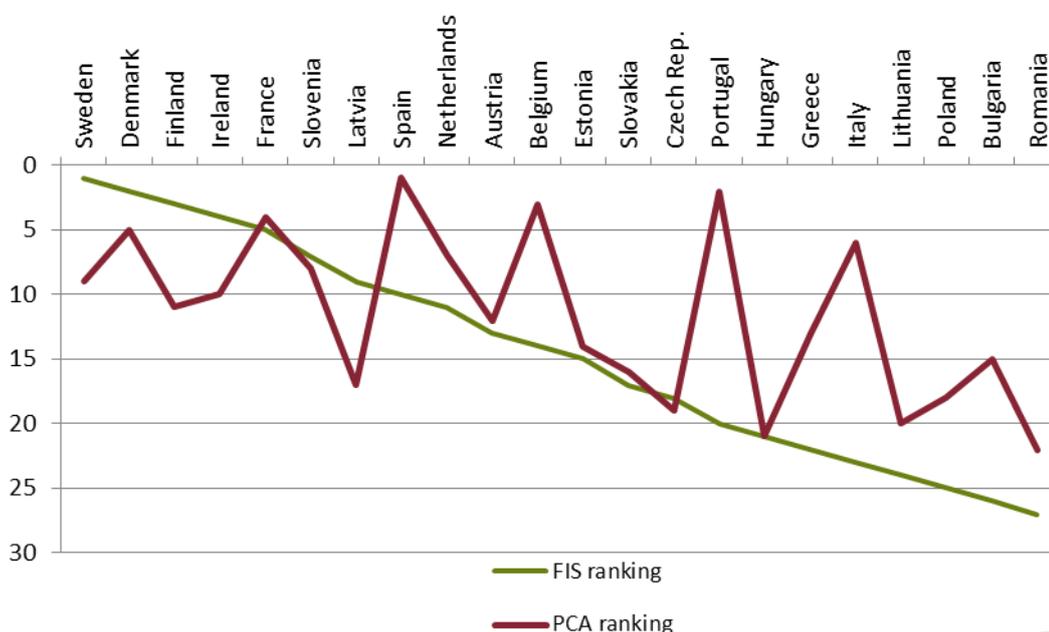
As **Table 5** shows, there are significant differences in the measurement of financial inclusion offered by these two methods. The PCA approach does not correspond to the rankings suggested by the FIS or TFI methods – most notably in the cases of Portugal, Italy and Bulgaria.

Figure 8 contrasts the results of the two methods. Arguably, some of these differences arise from the different sets of variables considered by each; for example, distance to a point of sale plays an important role in the PCA-based approach, whereas in the FIS method distance is one aspect of demand, but presented as part of a broader demand index. These differences only serve to underline the point that measures of financial inclusion are very sensitive to the definition of financial inclusion,

Table 5: FIS-PCA country ranking comparison

Country	FIS	Country	PCA ⁹
Sweden	1	Spain	1
Denmark	2	Portugal	2
Finland	3	Belgium	3
Ireland	4	France	4
France	5	Denmark	5
Cyprus	6	Italy	6
Slovenia	7	Netherlands	7
Germany	8	Slovenia	8
Latvia	9	Sweden	9
Spain	10	Ireland	10
Netherlands	11	Finland	11
Malta	12	Austria	12
Austria	13	Greece	13
Belgium	14	Estonia	14
Estonia	15	Bulgaria	15
UK	16	Slovakia	16
Slovakia	17	Latvia	17
Czech Rep.	18	Poland	18
Luxemburg	19	Czech Rep.	19
Portugal	20	Lithuania	20
Hungary	21	Hungary	21
Greece	22	Romania	22
Italy	23	Cyprus	.
Lithuania	24	Germany	.
Poland	25	Malta	.
Bulgaria	26	UK	.
Romania	27	Luxemburg	.

Figure 8: FIS-PCA ranking comparison



⁹ The Cámara and Tuesta study only included 22 EU countries.

variables included in index calculation, and the calculation method applied. It appears that, at least for the subset of EU countries, the FIS proposed in this Policy Note may better define the state of financial inclusion than the PCA method because it better correlates with the crude measure of financial inclusion (TFI).

CONCLUSIONS

This Policy Note proposes a working definition of financial inclusion, based on the observation that inclusion can be treated as a financial system's efficiency in transforming access inputs (financial infrastructure, demand factors and pro-inclusion policies) into actual use of financial services. The comparable measure of financial inclusion, and the resulting country rankings, can be derived using data envelopment analysis which calculates the relative efficiency scores based on internally-generated (endogenous) weights of inputs and outputs. All data needed for FIS index calculation is available from existing public sources, and therefore there is no need for additional data. The DEA is easy to apply, using a statistical package such as STATA, and fairly intuitive to interpret, since it benchmarks member states in terms of financial inclusion. It identifies the leaders, which could be used to set the

bar for other countries (barring economic, social and cultural differences between them). Generating relative scores and rankings allows easy comparison, and offers a more dynamic view of financial inclusion, namely a process of improving financial systems to provide financial services for all citizens. An absolute measure or benchmark, on the other hand, could imply that once that arbitrary benchmark or target is met, there is no more scope for improvement. In summary, the proposed Financial Inclusion Score satisfies the basic requirements set out above for an effective measure of financial inclusion.

As with every method, the FIS has its limitations. It is sensitive to inputs and outputs, and other versions of the index should be tested to find the most accurate measure of financial inclusion within the EU context. It also provides a synthetic measure of financial inclusion that shows how the financial system as a whole performs, but it does not specify which individuals or groups may be excluded, to what extent, or why such exclusion occurs. Therefore a composite measure should be treated as a general indicator that needs to be supplemented with more specific review of potential exclusion cases.

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ANNEX A: THE DEA METHOD

DEA is concerned with measuring the relative efficiency of various DMUs as they convert their inputs into outputs.

As a non-parametric method, DEA does not require or assume any functional relationship between the inputs and outputs, and instead applies a weighing scheme. To achieve this, each DMU is used in turn as the focal DMU while separate optimizations are performed. The objective of these sequential optimizations is to select the weights used when calculating the DMUs' relative efficiencies.

A DMU's efficiency is defined as the sum of weighted outputs divided by the sum of weighted inputs. Each optimization selects the set of weights that results in the highest possible efficiency for the focal DMU associated with that optimization. These separate optimizations share a common set of constraints: when the set of weights are applied to any DMU, it must not result in an efficiency rating greater than one.

The iterative formulation for the case of s outputs, m inputs, and n DMUs where the y terms represent output levels, the x terms represent input levels, and the u and v terms represent the weights associated with outputs and inputs respectively, as shown below.

$$\begin{aligned} \text{Maximize} \quad & \frac{\sum_{r=1}^s u_r y_{r1}}{\sum_{i=1}^m v_i x_{i1}} \\ \text{subject to} \quad & \frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1 \text{ for } j = 1, \dots, n, \text{ and} \\ & u_r, v_i \geq 0, \text{ for } r = 1, \dots, s \text{ and } i = 1, \dots, m. \end{aligned}$$