Is Financial Inclusion beneficial for Banks?

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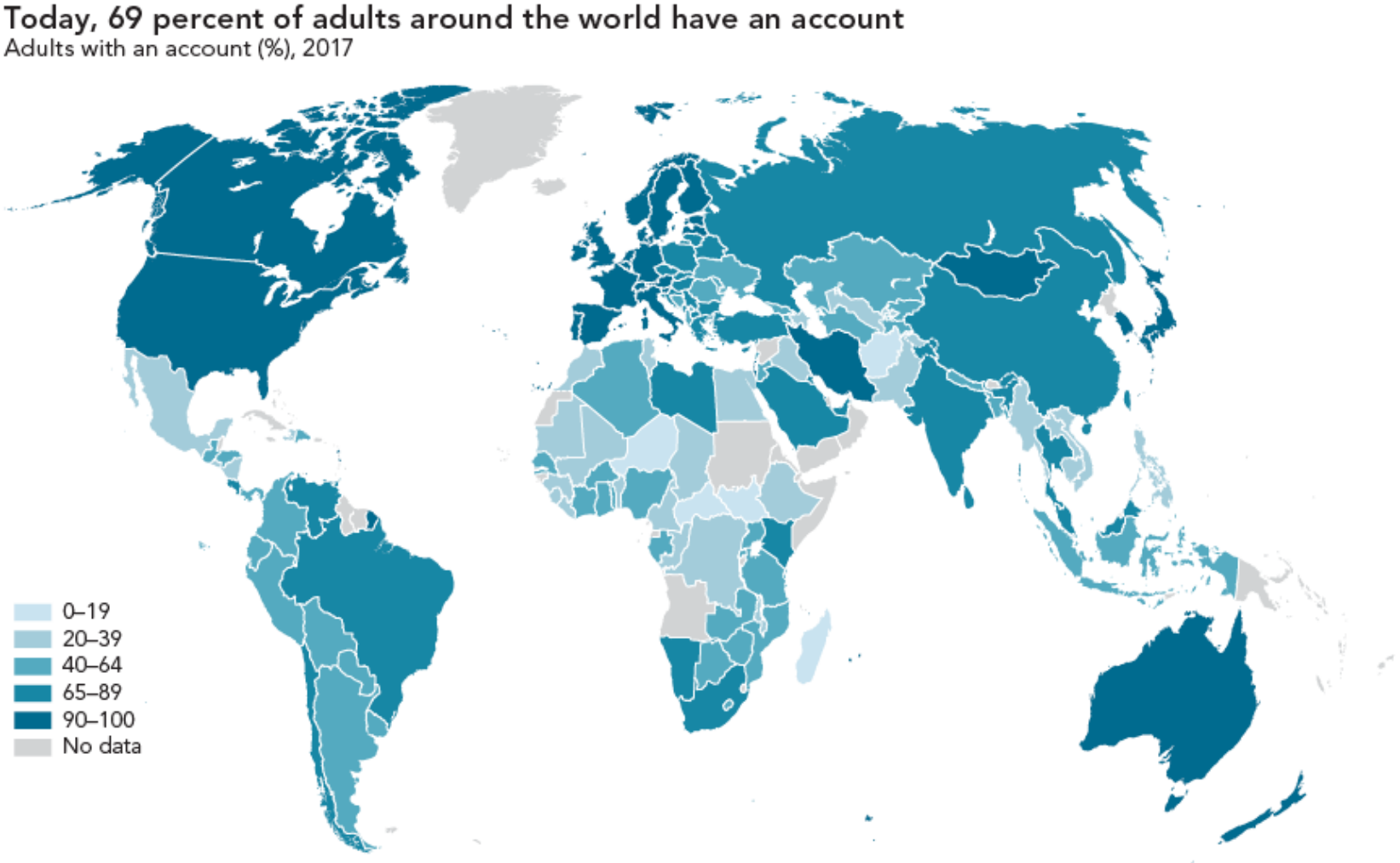
Outline

- Taking stock of the key issues on financial inclusion
  - Despite financial inclusion being an important public policy priority, we know very little of how it impacts the soundness of the providers of financial services.
- To assess whether financial inclusion can be a channel to improve bank performance

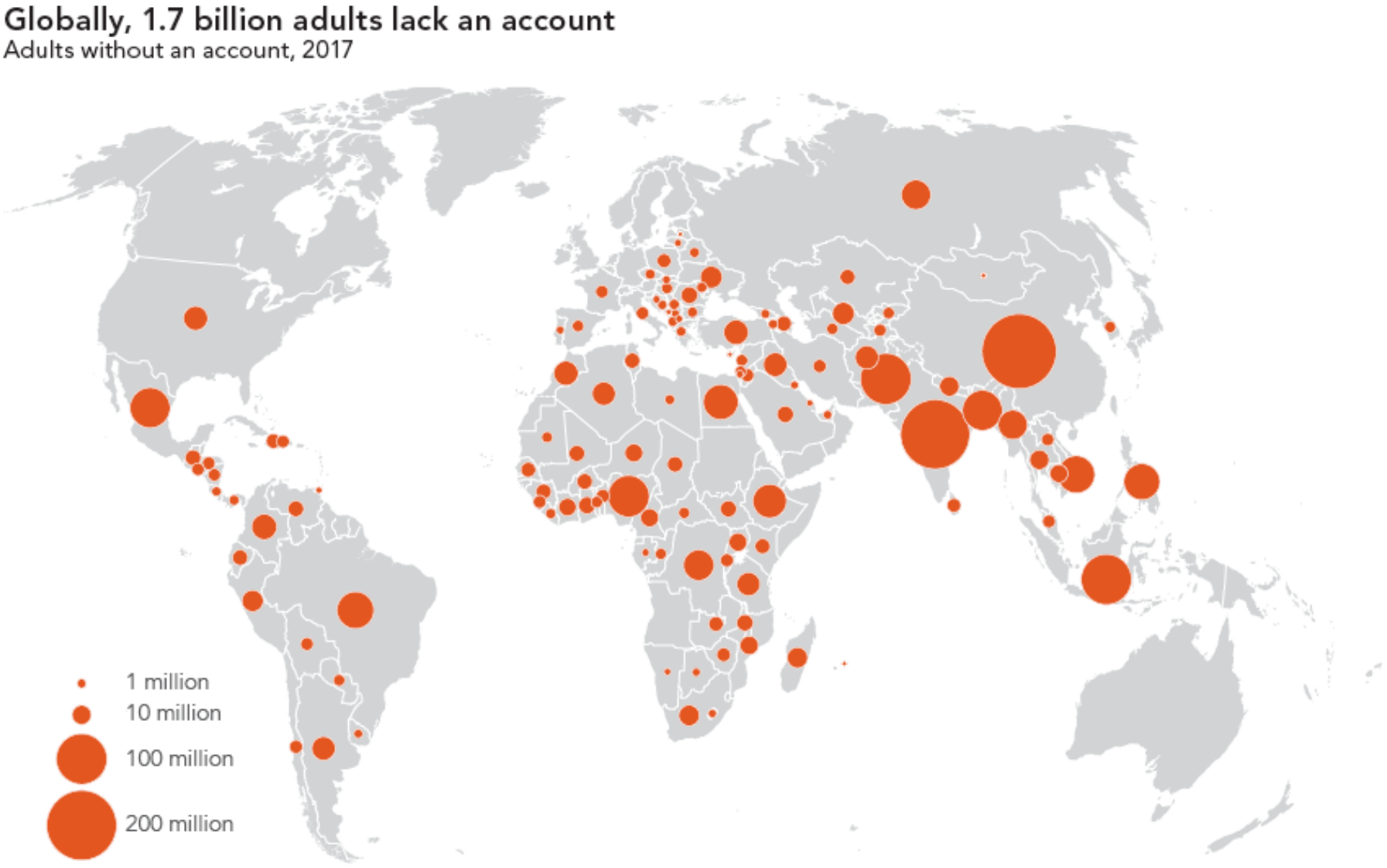
- Ahamed, M. M., and Mallick, S.K. (2019) Is financial inclusion good for bank stability? International evidence, *Journal of Economic Behavior & Organization*, 157: 403-427, January.
- Ahamed, M.M., S.J. Ho, S.K. Mallick, and R. Matousek (2019) Inclusive Banking, Financial Regulation and Bank Performance: Cross-Country Evidence, *Working Paper*.

What is financial inclusion?

–Any member of the economy, irrespective of background, should enjoy the ease of access of the basic financial services provided, and can use such services effectively.



Recent updates on financial inclusion



Source: Global Findex database.
Note: Data are not displayed for economies where the share of adults without an account is 5 percent or less.

- Existing evidence shows that greater access to finance: **increases savings; reduces income inequality and poverty; increases employment; and improves overall well-being**.

- As banks provide the bulk of the financial services to households/firms, a clear understanding of the impact of such inclusiveness on the soundness of banks is of immense importance for inclusive financial development and growth.

- We use two classes of outreach of banking services i.e., **demographic and geographic penetration** of bank branch and ATM.
  - For **demographic outreach**, we use the number of bank branches and number of ATMs per 100,000 people
  - For **geographic outreach**, we use the number of bank branches and the number of ATMs per 1,000 square kilometres.

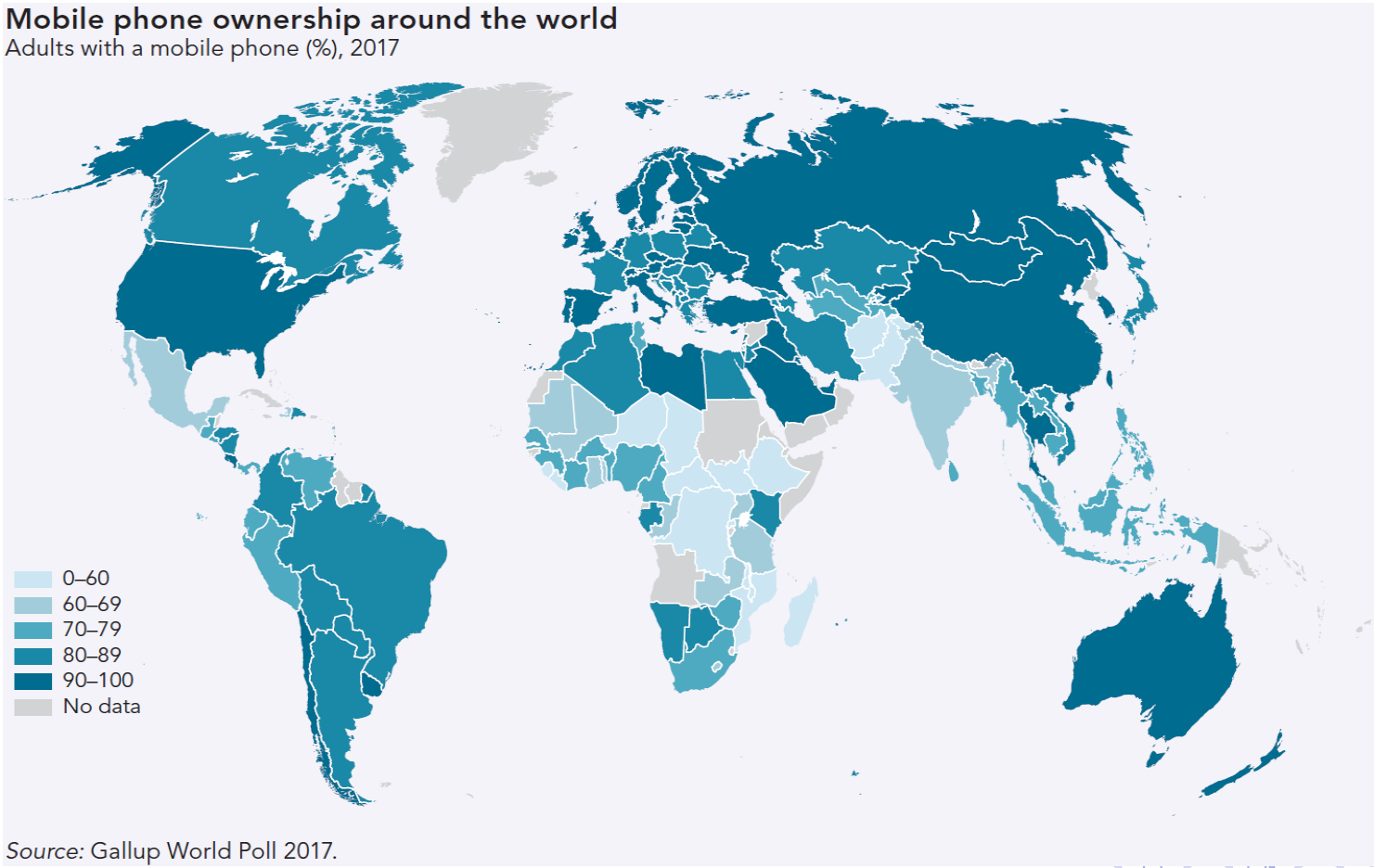
- For **usage dimension**, we use the number of bank accounts per 1,000 population to integrate the depth of the financial access.

Recent updates on financial inclusion

Source: CGAP

Access to Mobile Phones and the Internet around the World

- Mobile phones and the internet have created new opportunities for providing financial services. Having access to the internet as well as a mobile phone brings a wider range of financial services within reach.



- People's ability to use **digital financial services** like using mobile money accounts and making transactions depends on their having access to the necessary technology.

- How many people around the world **own a mobile phone** and **have access to the internet**?

- According to 2017 Gallup World Poll data, **93 percent of adults in high-income economies** have their own mobile phone, while **79 percent do in developing economies**.

- In India **69 percent of adults** have a mobile phone, while it is 85 percent in Brazil and **93 percent in China**.

Financial inclusion program of Government of India

- Most of the emerging economies are continuously adopting pro-access policies to broaden financial inclusion.
- Indian government launched a scheme called the '*Pradhan Mantri Jan Dhan Yojana*' (Prime Minister's People Money Scheme) on 28 August 2014 - the largest financial inclusion drive in the world (according to the World Bank).
- Within two weeks of launch of this scheme, banks were able to accumulate retail deposits of INR 15 Billion (US$ 240 million), with around 30.2 million new accounts.
- Over the last 5 years, over **375 million** unbanked adults have now access to banking services, and banks have been able to mobilize over **INR 1069 billion** (US$ 15 billion) - https://pmjdy.gov.in/

Motivation: is broadening access to finance good for banks?

How multilateral agencies are pushing financial inclusion agenda?

- Many multilateral agencies such as IMF, G20, the Alliance for Financial Inclusion (AFI), and the Consultative Group to Assist the Poor (CGAP) are continuously creating enabling inclusive financial environment in conjunction with Governments.

Post global financial crisis regulatory/supervisory changes

- After global financial crisis, most of the countries around the world, especially, developing countries' government renewed their focus on inclusive finance agenda, and thus enacted many pro-access laws/regulation.

Banks are seeing the benefits of micro-finance style of operations.

- Banks used to shy away from extending access to finance to poor, but now to rise up to competitive force: banks are continuously searching for new markets, opportunities, and new segments of customers.

Existing literature on financial inclusion/access to finance

Evidence suggests that in an inclusive financial system, banks can:

- reduce information asymmetry and agency problems between borrowers (Beck et al., 2014).
- garner retail deposits (e.g., Allen et al., 2016), and reduce volatility of funds.
- reduce risk as retail deposits are sluggish and insensitive to risk and provide stable cheaper source of long-term funding compared to wholesale funding, which is risky and volatile.
- also reduce bank risk taking through geographic diversification (e.g., Goetz et al., 2015; and Deng and Elyasiani, 2008).

Evidence also suggests that in an inclusive financial system, banks face:

- problems in monitoring branches efficiently that are farther away from the headquarters (Brickley et al., 2003).
- complex organisational and product structure associated with financial inclusion, and thus reduce operating efficiency.

Hypotheses, channels, and contributions

What we are up to...

- Hypothesis 1: Financial inclusion is positively associated with bank efficiency.
- Hypothesis 2: Do bank activities restrictions/overall capital stringency influence the relation between financial inclusion and bank efficiency?

We contribute to the literature by adding:

- First, new evidence on the nexus between financial inclusion and bank efficiency taking international bank-level sample.
- Second, to the contemporary policy issue related to financial development and financial inclusion.
- Finally, to the literature that explores the determinants of banking efficiency (e.g., Barth et al., 2013).

Data: we draw data from number of sources

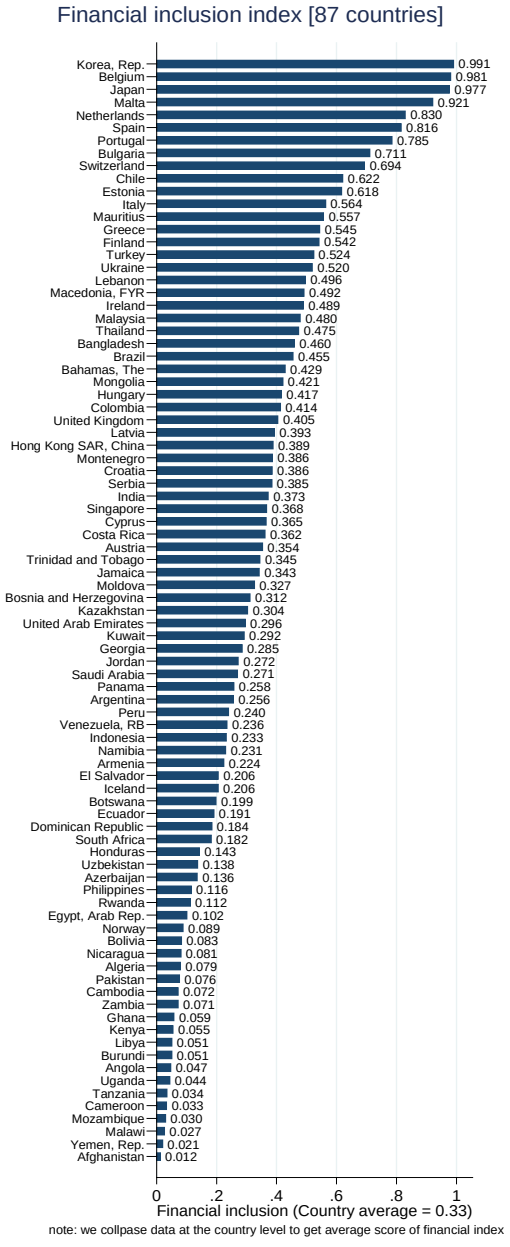
1. the bank level dataset is compiled from BankScope database provided by Bureau van Dijk and Fitch Ratings;
2. the country-level data compiled from the World Bank World Development Indicators (WDI);
3. the country-year level data on bank regulation and supervision compiled from Barth et al. (2004); Barth et al. (2008); and Barth et al. (2013);
4. the instruments for IV regressions are collected from WDI of World Bank;
5. the indicators used to measure financial inclusion index are collected from the International Monetary Fund's (IMF) Financial Access Survey (FAS) database. ▸ Summary statistics & Variable definitions

Constructing multidimensional Financial Inclusion Index (FII)

- Following Ahamed and Mallick (2017), we use *Principal Components Analysis* (PCA) to capture the common variation among two dimensions (X_i) -Financial outreach and Usage-that are taken from Finncial Access Survey (FAS). Component loadings (w_{ij}) are derived and use them in the following equation:

$$FII = \sum_{i=1}^{n} w_{ij} X_i$$

Financial inclusion index



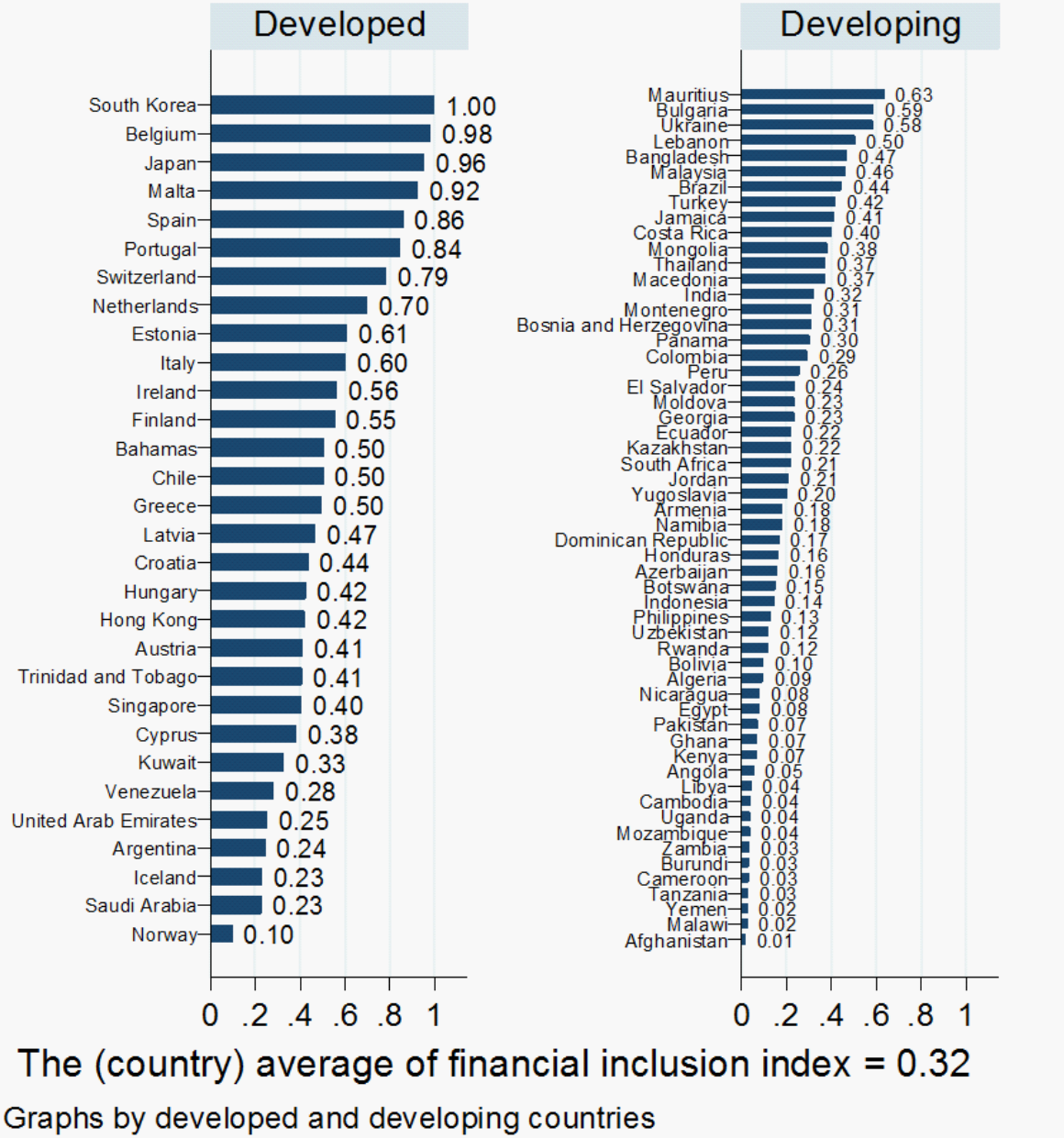
The most/least inclusive financial sectors

Highest:

1. South Korea
2. Belgium
3. Japan

Lowest:

87. Afghanistan
86. Yemen
85. Malawi


Developed
South Korea 1.00
Belgium 0.98
Japan 0.96
Malta 0.92
Spain 0.86
Portugal 0.84
Switzerland 0.79
Netherlands 0.70
Estonia 0.61
Italy 0.60
Ireland 0.56
Finland 0.55
Bahamas 0.50
Chile 0.50
Greece 0.50
Latvia 0.47
Croatia 0.44
Hungary 0.42
Hong Kong 0.42
Austria 0.41
Trinidad and Tobago 0.41
Singapore 0.40
Cyprus 0.38
Kuwait 0.33
Venezuela 0.28
United Arab Emirates 0.25
Argentina 0.24
Iceland 0.23
Saudi Arabia 0.23
Norway 0.10
0 .2 .4 .6 .8 1
Developing
Mauritius 0.63
Bulgaria 0.59
Ukraine 0.58
Lebanon 0.50
Bangladesh 0.47
Malaysia 0.46
Brazil 0.44
Turkey 0.42
Jamaica 0.41
Costa Rica 0.40
Mongolia 0.38
Thailand 0.37
Macedonia 0.37
India 0.32
Montenegro 0.31
Bosnia and Herzegovina 0.31
Panama 0.30
Colombia 0.29
Peru 0.26
El Salvador 0.24
Moldova 0.23
Georgia 0.23
Ecuador 0.22
Kazakhstan 0.22
South Africa 0.21
Jordan 0.21
Yugoslavia 0.20
Armenia 0.18
Namibia 0.18
Dominican Republic 0.17
Honduras 0.16
Azerbaijan 0.16
Botswana 0.15
Indonesia 0.14
Philippines 0.13
Uzbekistan 0.12
Rwanda 0.12
Bolivia 0.10
Algeria 0.09
Nicaragua 0.08
Egypt 0.08
Pakistan 0.07
Ghana 0.07
Kenya 0.07
Angola 0.05
Libya 0.04
Cambodia 0.04
Uganda 0.04
Mozambique 0.04
Zambia 0.03
Burundi 0.03
Cameroon 0.03
Tanzania 0.03
Yemen 0.02
Malawi 0.02
Afghanistan 0.01
0 .2 .4 .6 .8 1
The (country) average of financial inclusion index = 0.32
Graphs by developed and developing countries

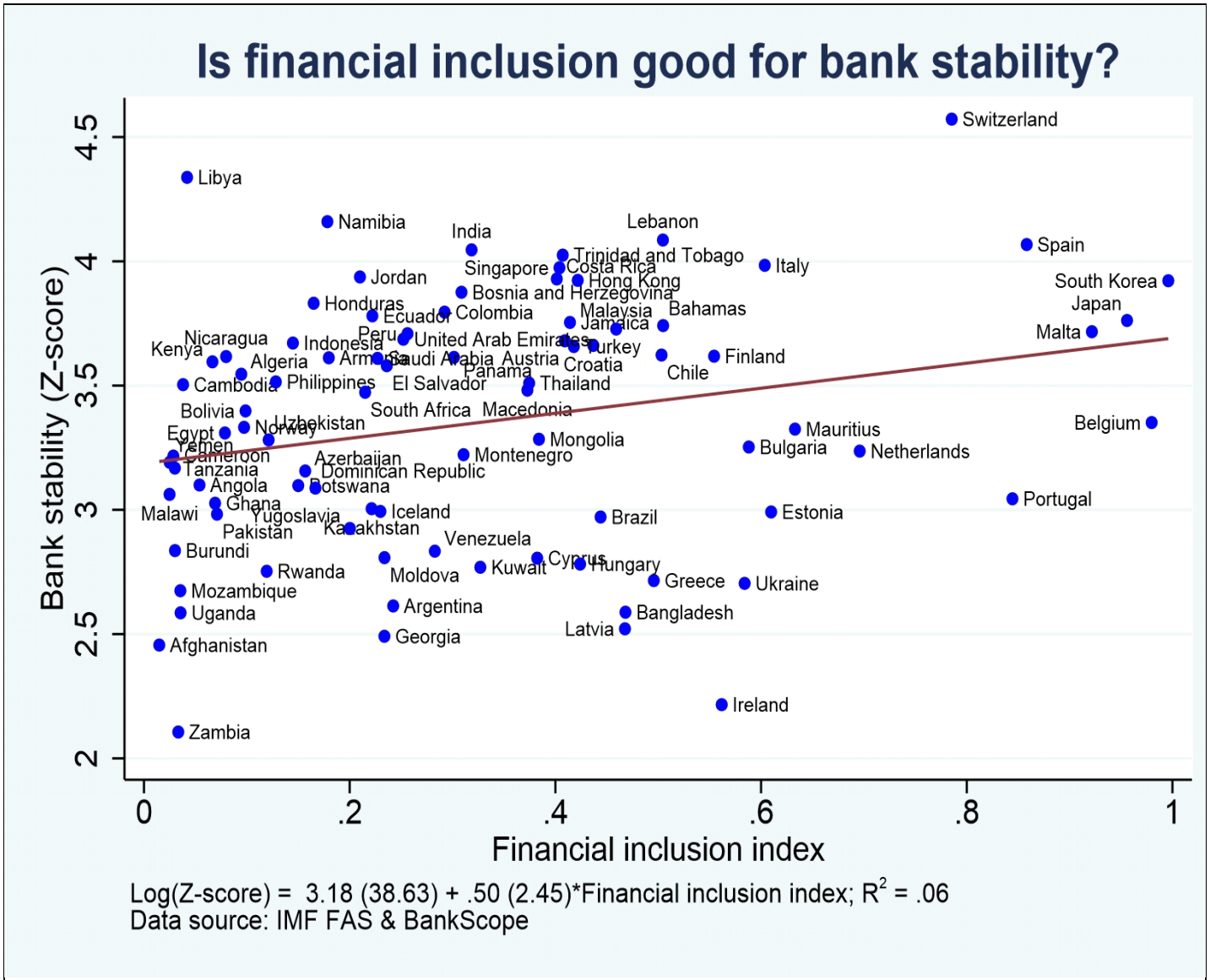
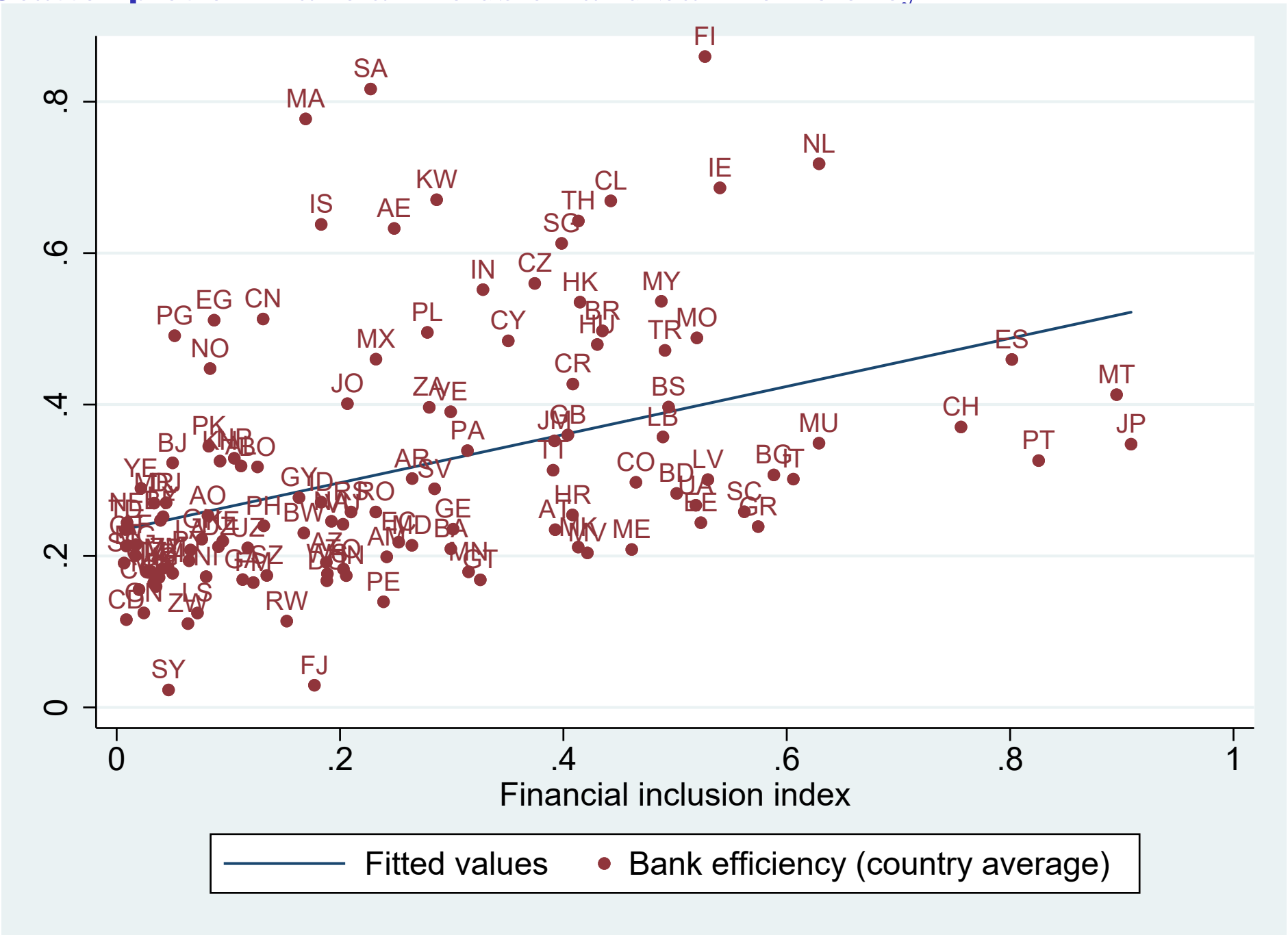


Fig. 1 Scatterplot of financial inclusion and bank stability

Note: Financial inclusion and bank stability are plotted for 86 countries. Bank stability is proxied by z-score[3], which is the sum of return-on-assets and equity-asset ratio, divided by standard deviation of return-on-assets of each bank.

Scatter plot of financial inclusion and bank efficiency



$$Eff_{ijt} = \beta_0 + \beta_1 Financial\ Inclusion_{jt} + \beta_2 BC_{ijt} + \beta_3 KC_{jt} + Year_t + \varepsilon_{ijt} \quad (1)$$

- *Eff* is efficiency scores of individual bank measured by Data Envelopment Analysis (DEA) considering three inputs (Total deposits; Personnel expenses; and Fixed assets) and three outputs (Total loans; Total earning assets; and Total non-interest income).
- Average Eff = .35
- Bank-level *Standard control* variables are: Bank size, Loan ratio, Loan loss provision, Capitalisation. Country characteristics are: GDP growth rate, Population growth.

The effect of financial inclusion on bank efficiency

	Simar and Wilson (2007)			Papke and Wooldridge (1996)		
Variables	Financial inclusion index	Financial outreach	Usage	Financial inclusion index	Financial outreach	Usage
	1	2	3	4	5	6
Financial inclusion	0.077***	0.075***	0.037***	0.448***	0.293***	0.329***
	[0.009]	[0.008]	[0.007]	[0.047]	[0.043]	[0.037]
LogTA	0.073***	0.074***	0.073***	0.274***	0.280***	0.273***
	[0.001]	[0.001]	[0.001]	[0.006]	[0.006]	[0.006]
LIQ	0.009*	0.0002	0.009*	0.065***	0.017	0.088***
	[0.005]	[0.005]	[0.005]	[0.024]	[0.024]	[0.025]
EQA	0.702***	0.718***	0.669***	3.784***	3.762***	3.642***
	[0.027]	[0.029]	[0.028]	[0.138]	[0.141]	[0.135]
LLP	-0.351***	-0.348***	-0.424***	-1.131**	-1.347***	-1.316***
	[0.103]	[0.101]	[0.100]	[0.478]	[0.482]	[0.472]
GDP	0.114	0.286***	-0.169***	1.836***	1.931***	0.315
	[0.072]	[0.085]	[0.063]	[0.380]	[0.436]	[0.323]
Pop_gr	0.006***	0.004**	0.002	0.029**	-0.003	0.021*
	[0.002]	[0.002]	[0.002]	[0.012]	[0.011]	[0.011]
Constant	-0.322***	-0.327***	-0.279***	-3.360***	-3.218***	-3.210***
	[0.015]	[0.016]	[0.014]	[0.077]	[0.077]	[0.069]
Observations	11,576	11,576	11,576	11,576	11,576	11,576
# of countries	86	86	86	86	86	86
Year	Yes	Yes	Yes	Yes	Yes	Yes

Exploiting bank unobserved heterogeneity (Random-effects Panel Tobit regressions)

Variables	Financial inclusion index	Financial outreach	Usage
	1	2	3
Financial inclusion	0.028**	0.001	0.043***
	[0.014]	[0.012]	[0.012]
LogTA	0.053***	0.055***	0.052***
	[0.002]	[0.002]	[0.002]
LIQ	-0.017***	-0.016***	-0.015***
	[0.005]	[0.005]	[0.005]
EQA	0.453***	0.444***	0.453***
	[0.033]	[0.033]	[0.033]
LLP	0.206***	0.195***	0.203***
	[0.069]	[0.069]	[0.069]
GDP	-0.042	-0.073	-0.041
	[0.054]	[0.054]	[0.052]
Pop_gr	0.006**	0.004*	0.006***
	[0.002]	[0.002]	[0.002]
Constant	-0.054***	-0.044**	-0.053***
	[0.019]	[0.019]	[0.018]
Observations	11,576	11,576	11,576
# of countries	86	86	86
Bank fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes

The effect of financial inclusion on bank efficiency using IVtobit

Panel A: First stage regression - dependent variables ⇒	Financial inclusion index	Financial outreach	Usage
Variables	1	2	3
Share of informal economy	-0.003***	-0.004***	-0.003***
	[0.000]	[0.000]	[0.000]
Average-deposit-balance-mfi	-0.005***	-0.003***	-0.008***
	[0.001]	[0.001]	[0.001]
Constant	0.329***	0.330***	0.319***
	[0.021]	[0.019]	[0.028]
Observations	2,580	2,580	2,580
Bank and Macro controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
# of countries	45	45	45
Adjusted R^2	0.64	0.61	0.56
Panel B: Dependent variable - **EFF**	Financial inclusion index	Financial outreach	Usage
Variables	1	2	3
Financial inclusion	0.853***	0.846***	0.857***
	[0.125]	[0.125]	[0.133]
LogTA	0.080***	0.086***	0.073***
	[0.003]	[0.003]	[0.004]
LIQ	0.0004	0.019	-0.019
	[0.013]	[0.012]	[0.016]
EQA	0.686***	0.725***	0.643***
	[0.055]	[0.055]	[0.060]
LLP	-0.367**	-0.198	-0.542***
	[0.182]	[0.173]	[0.206]
GDP	1.569***	1.446***	1.686***
	[0.224]	[0.218]	[0.245]
Pop_gr	0.072***	0.065***	0.077***
	[0.013]	[0.012]	[0.014]
Constant	-0.607***	-0.605***	-0.606***
	[0.042]	[0.042]	[0.044]
Observations	2580	2580	2580
Wald χ^2 test: exogeneity	13.86***	15.65***	22.38***
Anderson canonical correlation LM statistic	47.7***	45.7***	47.8***
Anderson canonical correlation LM statistic (p-value)	0.00	0.00	0.00
Amemiya-Lee-Newey test	0.01	0.73	1.19
Amemiya-Lee-Newey test (p-value)	0.98	0.39	0.28

Channels: volatility of retail deposits and income volatility

Variables	Financial inclusion index	Financial outreach	Usage
Panel A: Volatility of customer deposit funds	1	2	3
Financial inclusion	0.086***	0.070***	0.037***
	[0.010]	[0.010]	[0.009]
σ_{CDEP}	-0.272***	0.039	-0.259***
	[0.084]	[0.064]	[0.066]
Financial inclusion X σ_{CDEP}	1.022***	0.300***	1.340***
	[0.124]	[0.082]	[0.154]
Constant	-0.344***	-0.332***	-0.278***
	[0.016]	[0.017]	[0.016]
Observations	11,101	11,101	11,101
# of countries	84	84	84
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes
Panel B: Return volatility (σ_{roa})			
Financial inclusion	0.060***	0.063***	0.019***
	[0.009]	[0.011]	[0.006]
σ_{roa}	-3.005***	-2.135***	-3.499***
	[0.304]	[0.505]	[0.362]
Financial inclusion X σ_{roa}	3.813***	2.589***	4.360***
	[0.739]	[0.839]	[0.530]
Constant	-0.307***	-0.316***	-0.262***
	[0.010]	[0.014]	[0.012]
Observations	11,169	11,169	11,169
# of countries	84	84	84
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes

Quantile regression approach

VARIABLES	Bank performance								
Quantile →	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Financial inclusion	0.012	0.026***	0.041***	0.042***	0.038***	0.019**	-0.003	-0.014	-0.025
	[0.008]	[0.007]	[0.007]	[0.007]	[0.008]	[0.009]	[0.011]	[0.016]	[0.024]
LogTA	0.053***	0.055***	0.058***	0.060***	0.065***	0.071***	0.077***	0.085***	0.094***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.003]
LIQ	0.046***	0.037***	0.027***	0.013***	-0.001	-0.009	-0.021***	-0.034***	-0.056***
	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]	[0.006]	[0.009]	[0.013]
EQA	0.277***	0.393***	0.506***	0.601***	0.776***	0.947***	1.110***	1.381***	1.933***
	[0.025]	[0.023]	[0.023]	[0.023]	[0.026]	[0.030]	[0.035]	[0.052]	[0.077]
LLP	-0.336***	-0.338***	-0.259***	-0.177**	0.005	0.245**	0.434***	0.630***	0.432
	[0.088]	[0.080]	[0.080]	[0.080]	[0.089]	[0.104]	[0.120]	[0.179]	[0.267]
GDP	-0.538***	-0.441***	-0.340***	-0.344***	-0.326***	-0.309***	-0.202***	0.124	0.854***
	[0.051]	[0.046]	[0.046]	[0.046]	[0.052]	[0.060]	[0.070]	[0.104]	[0.154]
Pop_gr	-0.002	0.001	0.004**	0.004**	0.003	-0.001	-0.002	-0.002	-0.011*
	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]	[0.004]	[0.006]
Constant	-0.236***	-0.228***	-0.232***	-0.220***	-0.230***	-0.234***	-0.233***	-0.250***	-0.239***
	[0.011]	[0.010]	[0.010]	[0.010]	[0.011]	[0.013]	[0.015]	[0.023]	[0.034]
Observations	11,576	11,576	11,576	11,576	11,576	11,576	11,576	11,576	11,576

Financial inclusion in the developing and emerging market economies

Variables	Financial inclusion index	Financial outreach	Usage
Panel A: Developing market economies	1	2	3
Financial inclusion	0.449***	0.385***	0.423***
	[0.024]	[0.031]	[0.025]
Observations	2,127	2,127	2,127
# of countries	57	57	57
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes
Panel B: Emerging market economies			
Financial inclusion	0.207***	0.085*	0.171***
	[0.048]	[0.051]	[0.026]
Observations	1,948	1,948	1,948
# of countries	20	20	20
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes
Panel C: Advanced economies			
Financial inclusion	-0.115***	0.023	-0.053***
	[0.029]	[0.029]	[0.013]
Observations	7,501	7,501	7,501
# of countries	9	9	9
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes
Panel D: Countries those have a ratio of private credit to GDP that is more than the sample average			
Financial inclusion	-0.265***	-0.187***	-0.241***
	[0.037]	[0.040]	[0.036]
Observations	5,000	5,000	5,000
# of countries	11	11	11
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes
Panel E: Countries those have a ratio of private credit to GDP that is less than or equal to sample average			
Financial inclusion	0.255***	0.132***	0.225***
	[0.015]	[0.011]	[0.015]
Observations	6,576	6,576	6,576
# of countries	81	81	81
All bank and macro controls	Yes	Yes	Yes
Year	Yes	Yes	Yes

Using alternative indicator of financial inclusion (Global Findex)

Dependent variable: **EFF**	Adults with an account at a formal financial institution to total adults (%)	Adults saving at a financial institution in the past year to total adults (%)
Variables	1	2
Global Findex	0.001***	0.001***
	[0.000]	[0.000]
LogTA	0.061***	0.063***
	[0.002]	[0.002]
LIQ	0.023***	0.028***
	[0.007]	[0.007]
EQA	0.523***	0.539***
	[0.045]	[0.036]
LLP	0.064	0.072
	[0.151]	[0.139]
GDP	0.004***	-0.001
	[0.001]	[0.001]
Pop_gr	0.015***	0.011***
	[0.002]	[0.002]
Constant	-0.277***	-0.229***
	[0.020]	[0.015]
Observations	3,678	3,678
# of countries	105	105
Year	Yes	Yes

The role of banking regulation

	Bank performance	
Financial inclusion	0.086***	0.098***
	[0.009]	[0.010]
Activities restrictions	0.019***	
	[0.003]	
Financial inclusion x Activities restrictions	-0.042***	
	[0.006]	
Overall capital stringency		-0.016***
		[0.003]
Financial inclusion x Overall capital stringency		0.057***
		[0.007]
LogTA	0.073***	0.073***
	[0.001]	[0.001]
LIQ	0.012***	0.008*
	[0.005]	[0.005]
EQA	0.697***	0.694***
	[0.031]	[0.026]
LLP	-0.363***	-0.440***
	[0.089]	[0.093]
GDP	0.165**	0.276***
	[0.073]	[0.072]
Pop_gr	0.007***	0.005**
	[0.002]	[0.002]
Constant	-0.330***	-0.327***
	[0.015]	[0.014]
Observations	11,501	11,476
All bank- and country-level controls	Yes	Yes
Year	Yes	Yes
Number of countries	77	76

The timing of the countries that signed Maya Declaration

Country	Year	Country	Year	Country	Year	Country	Year
Armenia	2012	Ghana	2012	Mongolia	2012	Philippines	2011
Bangladesh	2012	Guatemala	2012	Morocco	2013	Rwanda	2011
Brazil	2011	Guinea	2011	Mozambique	2012	Samoa	2013
Burundi	2011	Indonesia	2012	Namibia	2012	Trinidad And Tobago	2013
Chile	2012	Kenya	2011	Nepal	2013	Uganda	2011
Colombia	2012	Liberia	2013	Pakistan	2011	United Republic Of Tanzania	2011
Congo	2012	Madagascar	2013	Panama	2013	Zambia	2011
Ecuador	2012	Malawi	2011	Papua New Guinea	2013		
El Salvador	2013	Malaysia	2012	Paraguay	2011		
Fiji	2011	Mexico	2011	Peru	2011		

The impact of pro-financial-inclusion policy on bank performance

Variables	Bank efficiency			
Panel A: Difference-in-differences	1	2	3	4
Pro-access policy	0.057***	0.030**	0.066***	0.027**
	[0.012]	[0.012]	[0.013]	[0.011]
LogTA		0.068***		0.069***
		[0.021]		[0.011]
LIQ		0.044*		0.023
		[0.025]		[0.019]
EQA		0.677***		0.377***
		[0.105]		[0.096]
LLP		-0.024		-0.164
		[0.279]		[0.177]
GDP		-0.319**		-0.350***
		[0.157]		[0.112]
Pop_gr		0.001		-0.001
		[0.004]		[0.005]
Constant	0.340***	-0.221	0.338***	-0.165**
	[0.002]	[0.149]	[0.003]	[0.080]
Observations	6,065	6,065	6,065	6,065
Adjusted R^2	0.363	0.466	0.804	0.821
Country Fixed Effects	Yes	Yes	No	No
Bank Fixed Effects	No	No	Yes	Yes

Panel B: Matching estimators	**Nearest Neighbor**	**Kernel**
Variables	1	2
Average treatment effect	0.055***	0.023***
S.E.	[0.012]	[0.008]
t-stat	[4.961]	[2.682]
No. of treated & control obs.	1,211 & 871	1,211 & 4,463
Common support condition	Yes	Yes

Summary

- We contribute to this ongoing policy debate by analyzing whether greater financial inclusion can help improve bank efficiency using an international sample of banks.
- We, first, document a strong positive association between financial inclusion and bank efficiency.
- And then show that this association is stronger in countries with limited restrictions on banking activities and more capital regulation stringency.
- Exploring plausible channels, we find that greater financial inclusion helps banks reduce return volatility and volatility of customer deposit-funding share.
- We also show that banks operating in less developed financial markets benefit more from inclusive financial development.
- Exploiting cross-country and temporal variation in the timing of inclusive financial agenda in a difference-in-differences set up, we show that an enabling inclusive financial environment has positive impact on bank performance.
- These results have significant implications for ongoing regulatory reform debate.

Thank You

Thank you

Variables, definition and source

Variables	Definition	Source
Bank-specific variables		
EFF	Data Envelopment Analysis (DEA) efficiency scores	Own
LogTA	Logarithm of total assets	BankScopre
LIQ	Total loans/total deposits	BankScopre
EQA	Shareholder's equity/total assets	BankScopre
LLP	Total loan loss provision divided by total loans	BankScopre
σ_{CDEP}	Standard deviation of Share of customer deposits of total deposits and short-term funding (calculated using a rolling window)	BankScopre
σ_{roa}	Sum of return-on-assets (ROA), defined as net profit over assets, and equity ratio (EQA), defined as equity over assets, divided by standard deviation of (ROA) of each bank over past three years (calculated using a rolling window)	BankScopre
Country-specific variables		
Financial inclusion index	Financial inclusion index is constructed using PCA from the financial outreach and usage dimensions.	IMF FAS
Financial outreach	The outreach dimension constructed using principal component analysis (PCA) from the variables related to geographic and demographic availability of branches and ATMs	IMF FAS
Usage	The number of deposit and loan accounts per 1000 adults	IMF FAS
GDP	The growth rate of GDP	WDI
Pop_gr	Population growth (Annual %)	WDI
Activities restrictions	The score for this variable is determined on the basis of the level of regulatory restrictiveness for bank participation in: (1) securities activities, (2) insurance activities, (3) real estate activities, and (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted or prohibited and are assigned the values of 1, 2, 3 or 4, respectively. This index takes a value from 0 to 16, with larger values denoting more stringent activity restrictions.	Barth et al. (2004; 2008; 2013a)
Overall capital stringency	Whether the capital requirement reflects certain risk elements and deducts certain market value losses from capital adequacy is determined. Specifically, it is an indicator developed based on the following questions (Yes = 1, No = 0): 1. Is the minimum capital-asset ratio requirement risk weighted in line with the Basle guidelines? 2. Does the minimum ratio vary as a function of an individual bank's credit risk? 3. Does the minimum ratio vary as a function of market risk? 4. Before minimum capital adequacy is determined, which of the following are deducted from the book value of capital: (a) market value of loan losses not realized in accounting books; (b) unrealized losses in securities portfolios? (c) Unrealized foreign exchange losses? Higher values indicating greater stringency	Barth et al. (2004; 2008; 2013a)
Instrumental variables		
Share of informal economy	Share of informal economy as percentage of GDP	Medina and Schneider (2018)
Average-deposit-balance-mfi	The average deposit balance per depositor of MFIs/ GNI per capita (%)	mixmarket.org

Note: IMF FAS = IMF Financial Access Survey; WDI = World Development Indicators.

Summary statistics

Variables	Mean	Median	Std.dev.	Min.	Max.	# of countries	# of obs
Bank-specific variables							
EFF	0.35	0.31	0.20	0.01	1.00	86	11576
LogTA	6.87	6.85	1.55	3.07	10.76	86	11576
LIQ	0.72	0.63	0.37	0.11	2.50	86	11576
EQA	0.10	0.08	0.07	0.02	0.49	86	11576
LLP	0.01	0.01	0.02	-0.01	0.12	86	11576
σ_{CDEP}	0.03	0.01	0.06	0.00	0.55	86	11101
σ_{roa}	0.00	0.00	0.01	0.00	0.04	86	11169
Country-specific variables							
Financial Inclusion Index	0.29	0.23	0.24	0.01	0.99	86	86
Financial outreach	0.24	0.18	0.24	0.00	0.95	86	86
Usage	0.34	0.28	0.27	0.01	1.00	86	86
GDP	0.04	0.04	0.02	-0.04	0.09	86	86
Pop_gr	1.42	1.35	1.21	-1.31	4.33	86	86
Activities restrictions	7.87	8.07	1.74	3.00	11.83	77	77
Overall capital stringency	4.14	4.00	1.53	1.00	7.00	76	76
Instrumental variables							
Share of informal economy	31.11	30.74	11.13	8.70	65.08	75	75
Average-deposit-balance-mfi	0.54	0.12	6.71	0.01	298.79	45	45

Outline of the theory

- **Before financial inclusion**
  - only customers with endowments above $\underline{\omega}$ are allowed to get a loan and have an account
  - customers choose banks according to bank's survival probability, & transportation distance

- **Regulation** could reduce bank efficiency
  1. Restricting activities could reduce the investment risk-taking and the expected return.
  2. CAR creates upper bound on the risky investment.

Outline of the theory

- **After financial inclusion (**typically defined as broad access to and use of financial services)
  - customers with endowments below $\underline{a}$ are allowed to have an account (but cannot get a loan)
  - choose banks according to bank's survival probability, & transportation distance
  - We show that: the increase in each bank's deposit
    1. will be higher only with efficient banks
    2. During the financial crisis, inclusive banking will benefit the efficient banks more.
- **Regulations**
  - little favourable interaction effects of financial inclusion with prohibition of activities.
  - Investment upper bound by CAR will increase, producing opposite effects.

The Model

- **Two banks: A and B,**
  - located at points a and b with $0 < a < b < 1$.
  - P_i: bank i's survival probability
  - r_i : bank i's interest rate
- ∞ **customers**$\tilde{}$ $U[0,1]$
  - $x \in [0,1]$: a customer who is located at x.
  - observable endowment $\varpi \tilde{} U[0,1]$; private income $\varepsilon^{\varpi} \tilde{} U[-1,1]$
  - θ and $(1-\theta)$: customer's locational preference and expected return
- **Customer's decisions**
- Payoff for depositing in bank i :

$$V_i(\varpi + \varepsilon^{\varpi}) \equiv \max\{P_i(1+r_i)(\varpi + \varepsilon^{\varpi}), [E(R) - (1+\phi)]L + \varpi + \varepsilon^{\varpi}\}.$$

Two possibilities: keep in bank and earn interest, or borrow L and invest.

- $P_i(1+r_i)(\varpi + \varepsilon^{\varpi})$: if keep all her money $(\varpi + \varepsilon^{\varpi})$ in the bank
- $[E(R) - (1+\phi)]L + \varpi + \varepsilon^{\varpi}$: borrow L and make an investment and gain a return $[E(R) - (1+\phi)]L$

The Model

$E(R)$ is the expected rate of return from investment
ϕ is the interest charged on the loan L.

- Hence customer's expected return for opening an account in bank $i = a, b$ is:

$$(1-\theta)V_i(\varpi+\varepsilon^{\varpi})-\theta(\delta|x-i|),$$

  - transportation cost or dissatisfaction for depositing in bank i: $\delta|x-i|$

- **Before Financial Inclusion**
  - wealth restriction: only $(1-\underline{\varpi})$ can open an account.
  - For every $\varpi > \underline{\varpi}$, we can find a customer $\widehat{x}$ who is indifferent between depositing in bank A and B,

$$(1-\theta)V_a(\varpi+\varepsilon^{\varpi})-\theta(\delta(\widehat{x}-a))=(1-\theta)V_b(\varpi+\varepsilon^{\varpi})-\theta(\delta(b-\widehat{x}))$$

  - $\widehat{x}=\frac{(1-\theta)}{2\theta\delta}[V_a(\varpi+\varepsilon^{\varpi})-V_b(\varpi+\varepsilon^{\varpi})]+(b-a)$.
  - **Bank Deposits:** $D_a^0=(1-\underline{\varpi})\widehat{x}$, and $D_b^0=(1-\underline{\varpi})(1-\widehat{x})$.

Bank's Payoff and Efficiency

- **Bank's Payoff**
  - Bank i's expected return will be
- $\pi_i = \int\{(1+R)I_i\}dF(R) + \overline{P}(1+\phi)L_i + (D_i^0 - I_i - L_i) - c(D_i^0)$.
  - D_i^0 deposits
  - I_i denote bank i's investment in risky assets.
  - L_i be the total sum of loans made to their customers.
  - $\{(1+R)I_i\}dF(R)$: expected return from investment I_i, and R is the rate of return and we assume that the distribution of R is $F(R)$.
  - $\overline{P}(1+\phi)L$: the expected return from making loans to customers, where $\overline{P}$ is the probability that $E(R) > (1+\phi)]L - \varpi - \varepsilon^{\varpi}$.
  - $(D_i^0 - I_i - L_i)$: safe asset
  - $c(D_i^0)$: convex cost function for managing the deposit
- **Bank Efficiency:**

$$c_i(D_i^0)/\{\int\{(1+R)I_i\}dF(R) + \overline{P}(1+\phi)L_i + (D_i^0 - I_i - L_i)\}.$$

1. As π_i increases, the ratio decreases and the bank efficiency increases.
2. As D_i^0 increases, if the marginal cost $c'(D_i^0)$ is relatively small, then the bank efficiency will increase.

Two Regulations

- **Prohibiting risky activities**
  - Will reduce the investment risk-taking and the expected return

$$\int \{(1+R)I_i'\} dF'(R)$$

  - $F(R) \leftrightarrow F'(R)$ with a smaller mean
  - the investment in risky asset is smaller under regulations.

- **CAR**
  - CAR creates upper bound on the risky investment I_i^0

$$\overline{\{P}(1+\phi)L_i + (D_i^0 - I_i - L_i)\} / \int \{(1+R)I_i\} dF(R) \geq 8\%$$

  - I_i^0 increases with deposit
  - reduces efficiency.

After Financial Inclusion

- **Deposit Increases:**
  - those with $\varpi < \underline{\varpi}$, can only deposit but cannot borrow
  - Hence, $V_i(\varpi + \varepsilon^{\varpi}) = P_i(1 + r_i)(\varpi + \varepsilon^{\varpi})$.
  - indifferent consumer $\overline{x}$:

$$\overline{x} = \frac{(1-\theta)}{2\theta\delta}[P_a(1+r_a)(\varpi+\varepsilon^{\varpi}) - P_b(1+r_b)(\varpi+\varepsilon^{\varpi})] + (b-a).$$

Hence, increases in demand: $\triangle D_a = \underline{\varpi}\overline{x}$, and $\triangle D_b = \underline{\varpi}(1-\overline{x})$.

- **Impacts:**
  - $c_i(D_i^0)/\{\int_1\{(1+R)I_i\}dF(R) + \overline{P}(1+\phi)L_i + (D_i^0 - I_i - L_i)\}$.
  - Deposit increases: $D_i^0 + \triangle D_a$
  - I_i^0 increases
  - No effect on $F'(.)$

After Financial Inclusion: Impacts

- **Proposition 1: (1) Financial inclusion will benefit efficient banks more, and those banks' efficiency will increase even during the financial crisis. (2) If the increase in operating cost is sufficiently high, then inclusive banking may reduce the efficiency of inefficient banks.**

  - Financial inclusion will increase bank's deposit, but the total loans made to the customers remain the same (low income customers are not eligible for borrowing), and hence the denominator of the efficiency ratio will increase. Since the deposit increase in efficient bank is higher, the increase in bank A's efficiency is higher.

  - More customers may also increase the agency costs and the operation costs. If the more efficient banks also own better skills, then the increase in bank A's operation cost will be lower after banking inclusiveness.

- **Proposition 2: (1) There is little interactive effect between inclusive banking and regulations on bank activities. (2) Inclusive banking will lower the negative effect of CAR regulation.**

  - We have shown that "while the regulations on bank activities do not reduce bank efficiency, CAR can reduce bank efficiency". This result suggests that the interaction effect between inclusive banking and regulations on bank activities is no longer positive.

  - When deposit increases with greater inclusion, the upper bound for risky investment also increases, mitigating the negative effect of CAR on bank efficiency. This is consistent with the empirical analysis undertaken in this paper.