Financial Inclusion Index an Application to Mexico

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BANCO DE MÉXICO

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Motivation and goals

- Evidence shows that Financial Inclusion (FI) may benefit society:
  - Instrument to fight poverty, increase income, savings and employment;
  - Allows families to better smooth their consumption.
- It is not clear **how to measure FI**: there are many financial services, different groups of clients and therefore many dimensions.
- An index provides an aggregation mechanism to reduce a vector of dimensions into a number (scalar).
- In this presentation we discuss the application of a FI index (FII) to the Mexican case.
- We illustrate a number of issues that arise when using a FII and derive some (hopefully) useful lessons from this application.
- We discuss the issue of information: aggregate and adult survey.

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What is FI and how to measure it

- There is no consensus definition of FI:
  - Mexican Banking Commission: “Financial Inclusion refers to the access and use of a financial products and services portfolio that reaches the vast majority of adult population with clear and concise information to satisfy the growing demand, under an appropriate legal framework.”.
  - CGAP: “FI means that all working age adults have effective access to credit, savings, payments, and insurance from formal service providers. “Effective access” involves convenient and responsible service delivery, at a cost affordable to the customer and sustainable for the provider with the result that financially excluded customers use formal financial services rather than existing informal options”.
- Salient features:
  - Targeted population (financially excluded): poor people and small firms.
  - Relevant products: service diversity and access heterogeneity.
  - Elements: **access** (more related to infrastructure) and **use**.
  - Service providers: formal (mainly banks but not only) and informal.

FI services

Financial Services:

- **Deposit and savings (accounts)**
  - **Transactions : payment services**
- Investment
- Loans
- Insurance (including pension funds)

Channels to provide services:
- Branches
- ATM's
- POS
- Banking agents (*comisionistas*)

Means to access an account:
- Cards (debit, credit)
- Checks
- Phone/Internet
- Cell phone

Type of transactions:
- Deposits
- Cash withdrawals (at branches, ATMs, etc.)
- Payments: with cards at POS, checks or electronic transfers

What is FI and how to measure it

- A FII:
  - Reduces multiple dimensions to 1.
  - Makes all dimensions comparable: no units.
  - It provides a practical reference point which allows policy makers to place the financial inclusion level regarding other countries /regions.
- The optimal financial inclusion level is unknown. Theoretically, the optimal level would occur when the observed level corresponds to a competitive environment without any frictions, given technology (costs) and customers' preferences.
- FII allows for comparisons across countries.
- Building a FII provides a reference point: best practice within the sample.

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To build an FII

- Indexes have been mainly used in Human Development context.
- There are 2 well known FII applications (at the international level):

Sarma (2008)

$$d_{ij} = \frac{A_{ij} - m_i}{M_i - m_i}$$

$$FII_j = 1 - \sqrt{\sum_{i=1}^{n} \frac{\left(1 - d_{ij}\right)^2}{n}}$$

Chakravarty and Pal (2010)

$$d_{ij} = \left(\frac{A_{ij} - m_i}{M_i - m_i}\right)^r$$

$$FII_j = \frac{1}{n}\sum_{i=1}^{n} d_{ij}$$

- Where:
  - A_{ij} = Observed value on dimension j for country i.
  - $m_i = \min_j\{A_{ij}\}$
  - $M_i = \max_j\{A_{ij}\}$
- In order to aggregate dimensions: need to normalize by population, or territory.

Characteristics of an FII

Index Characteristics		Sarma (2008)	Chakravarty (2010)
Normalization	FII has a minimum and maximum, s.t. $FII \in (0,1)$	Yes	Yes
Anonymity	Indifferent to swapping of values across dimensions. [Weighting could be appropriate in a FII – not complying with anonymity]	Yes	Yes
Monotonicity	FII should be greater(lower) if one dimension improves(worsens) and the rest stay unchanged.	Yes	Yes
Proximity	Should be such that greater (lower) value indicates that it is closer (farther from) the ideal.	Yes	No
Uniformity	A greater(lower) dispersion across dimensions should indicate a lower(greater) value.	Yes	Yes
Signaling	Unique optimal path to reach higher value.	Yes	Yes
Homogeneity	Dimension indicators should be independent to scaling.	Yes	Yes
Decreasing benefits	Lower difference in gain at higher levels of attainment difference.	Yes*	Yes
Dimension contributions id.	It should be possible to identify the contribution of each dimension to the FII.	No	Yes

FII characteristics

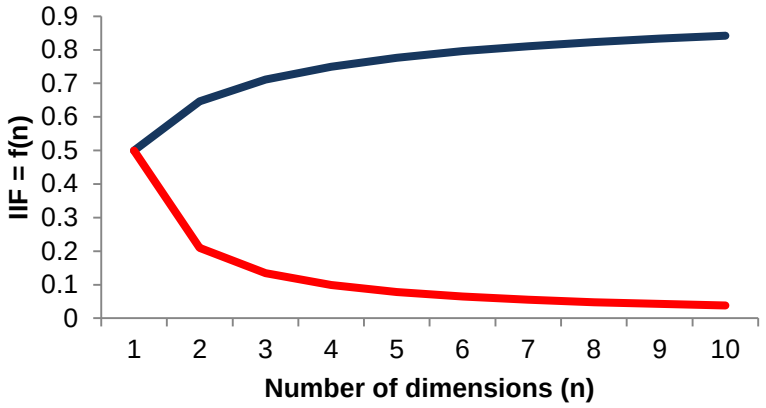
- We use Sarma (2008) Index: it is more intuitively appealing and "proximity" is a desirable characteristic.
- We decided to build two FII that complement each other:
  - Infrastructure.
  - Usage.
- We normalize dimensions by number of adults (15 years and older).
- We concentrate on retail services since it is directed to the most vulnerable group. In particular, in deposit and saving services, leaving credit and insurance out.
- We limit our index scope to banking services due to information availability.
- We need to determine:
  - Dimensions to be included.
  - Countries to be considered.

Dimensions to be included

- Implicit in the dimensions chosen are the goals authorities want to achieve.
- Complementarities must be recognized, particularly in payments.
- There is a tradeoff between adding dimensions and their importance. Due to the concavity of the FII, additional dimensions have a decreasing effect.
- Adding dimensions: if the country we are getting the FII for has a low (high) level in the new dimension, the impact over the index is greater (smaller).

Adding dimensions with Max and Min values

(FII after adding new dimensions)



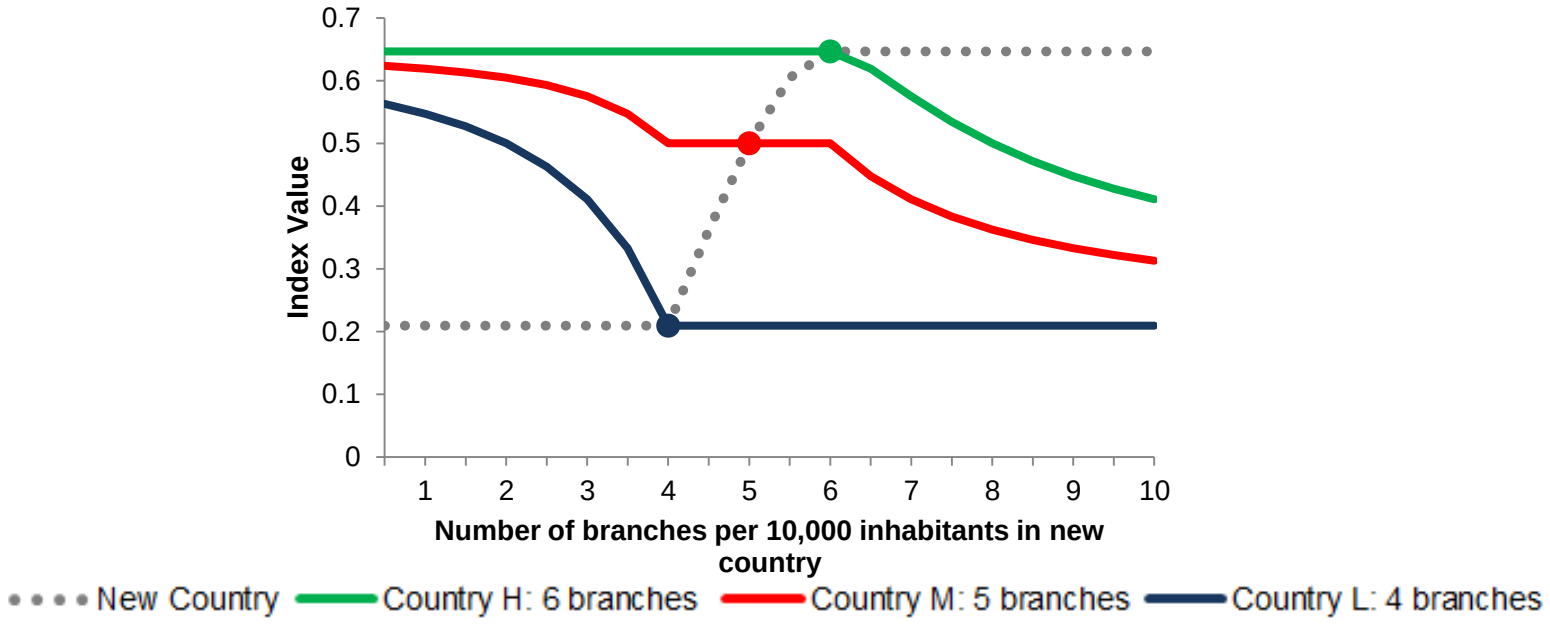
	Inicial IIF value	New dimension value	IIF value after introducing another dimension	Change in IIF value
Case 1	0.5	1	0.65	0.15
Case 2	0.5	0	0.21	-0.29

Choosing countries in sample

- The country selection determines the results:
  - Adding new countries may affect other countries' FII, specially if the new country has very high or low values in the dimensions included.
  - It seems appropriate to **keep the same country sample through time**.

Adding a Country to an original 3 Country Sample

(Variation in 1 dimension)



FII characteristics

- We decided to build indices for international comparisons and indices for states comparisons (within Mexico).
- International FII: to see Mexico's relative position we choose 37 countries (data for 2010), 5 five with lower GDP, 31 with higher per person.
- The national index is more important for policies: Improve access of the poorest states; reduce inequalities between states, etc.

International FII	National FII
• Allows assessment of progress relative to other countries.	• Allows for public policy decisions.
• Allows identification of an empirical best practice.	• Helps to focalize regulations where needed.
• Strong assumptions: homogenous technology across countries.	• Data are more comparable: same technology.
• Dimensions depend on comparable information.	• Less restrictions for dimensions selections.

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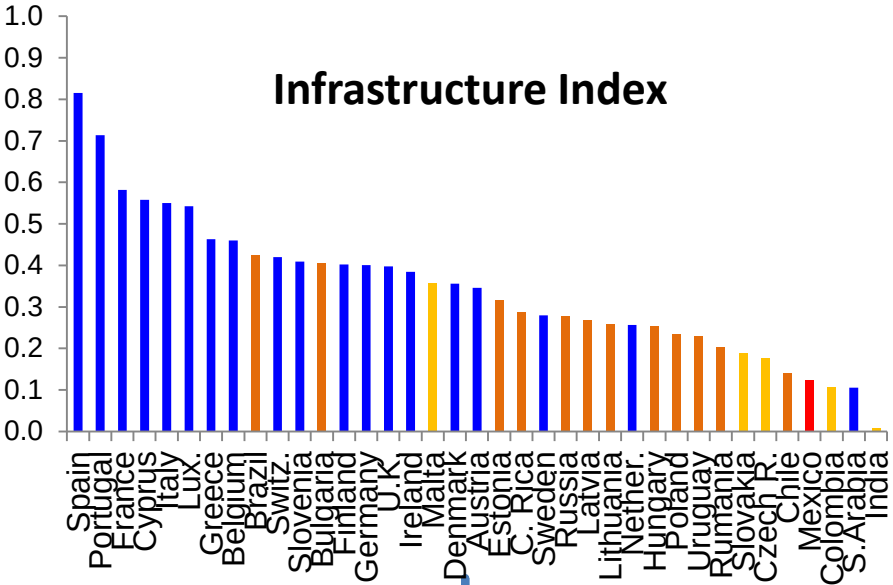
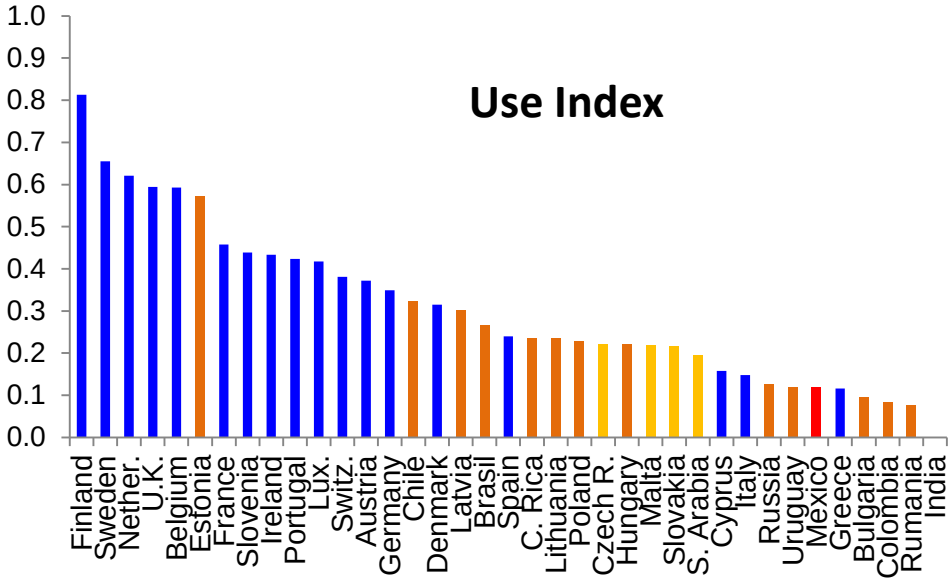
International FII- 2010

- 37 countries sample: more dimensions, less countries with available information.





The dimensions included are:

Number of branches
Number of ATMs
Number of POS

Number of transactions in ATMs
Number of transactions in POS
Number of electronic transfers

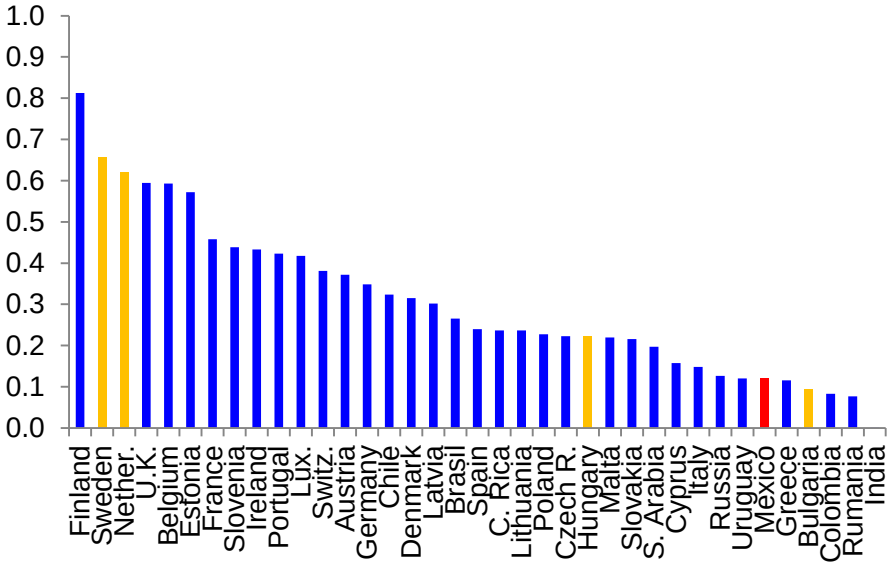
¼ Std deviation from Mexico's GDP per person

½ Std deviation from Mexico's GDP per person

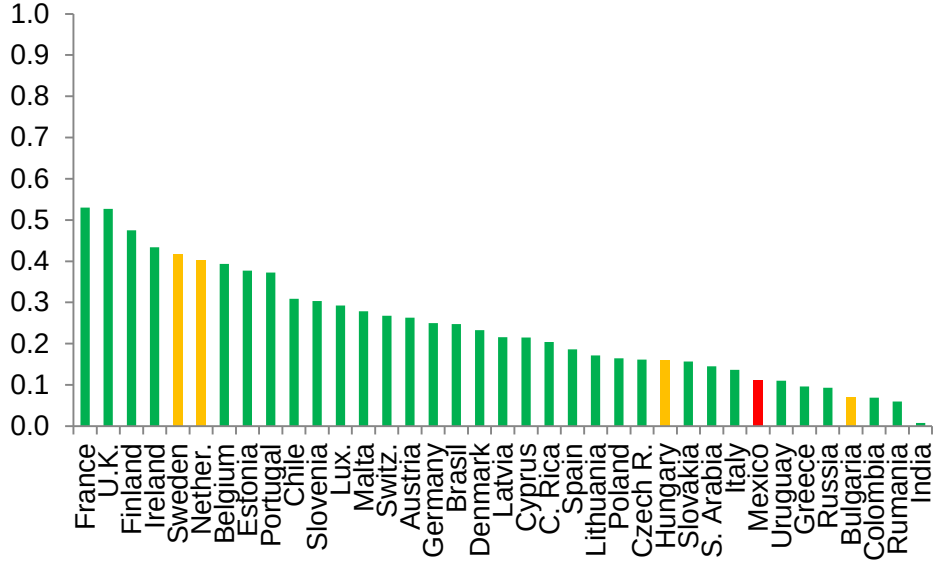
The dimensions selection

- Changing the set of dimensions changes the index outcome.

Index of usage – Without Checks



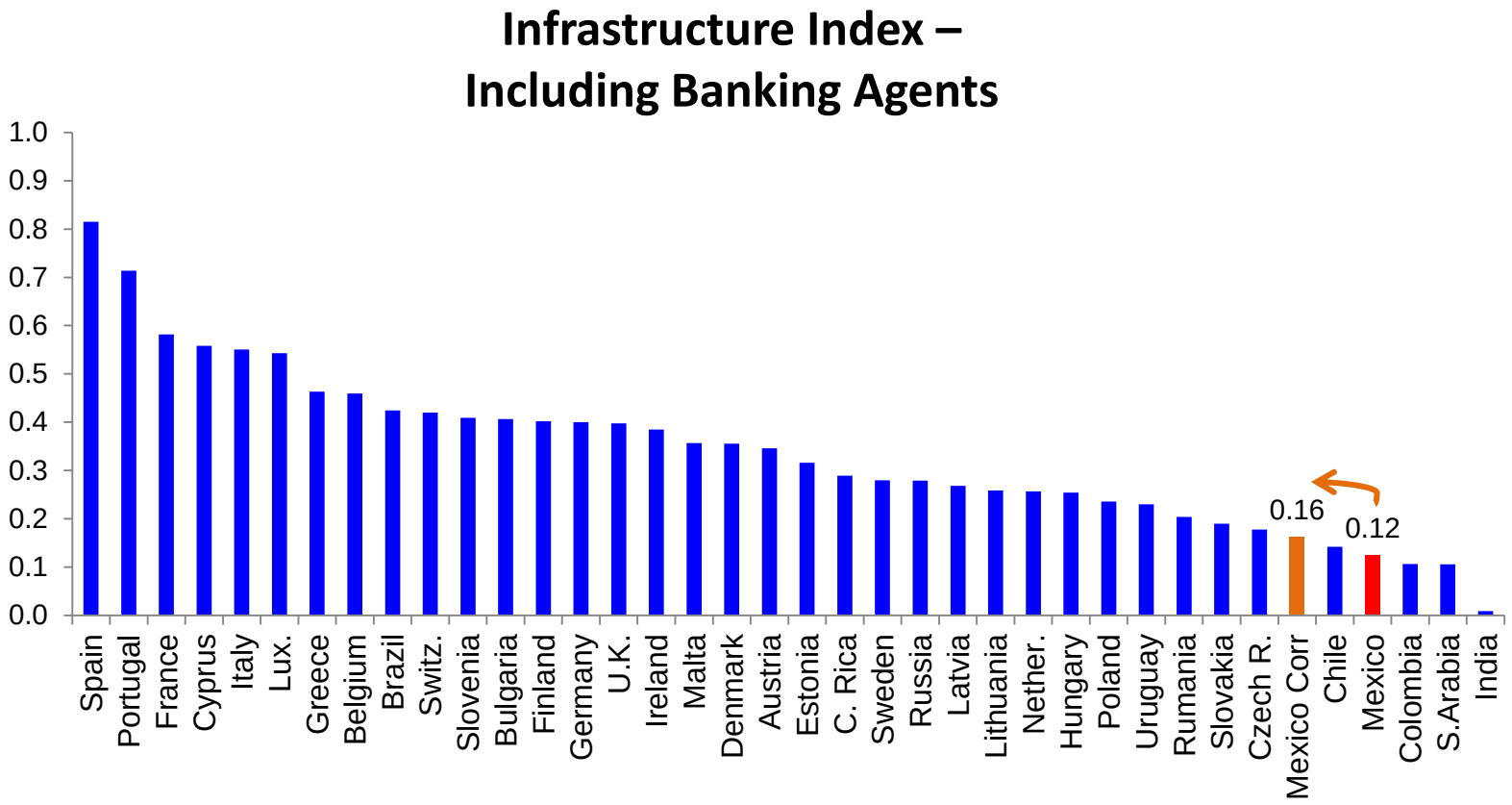
Index of usage – Including Checks



- Include the most efficient channels of service and the most payment means.
- Example: including checks in the index punishes countries that do not use them: Sweden, Netherlands and Finland.

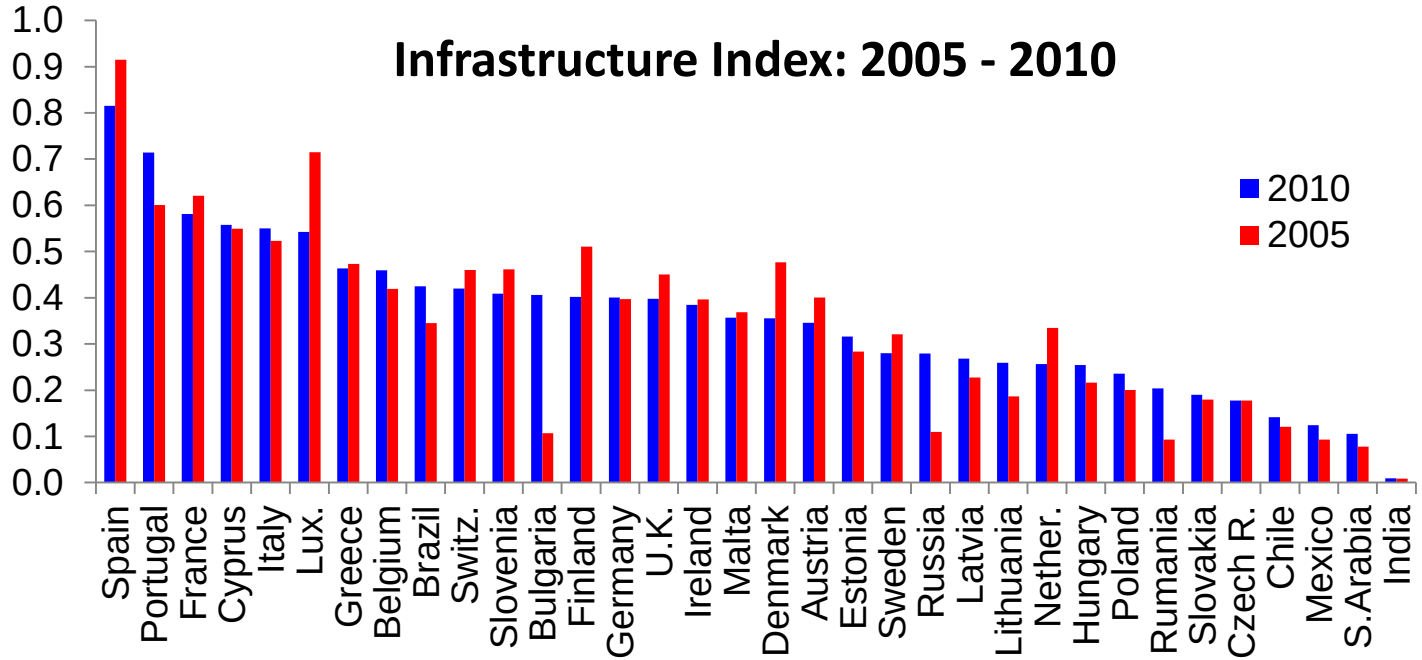
The dimensions selection

- New infrastructure dimensions: technological changes may generate discrete changes for a country: banking agents.



International FII: Comparisons 2005-2010

- All FII components change through time. How do we compare?



- Spain, the country with maximum FII, suffered because of the crisis. This affects all countries' FII (not necessarily their ranking position).
- Mexico's FII improved (from 0.09 to 0.12)but its position in the ranking went down (from 31 to 32).

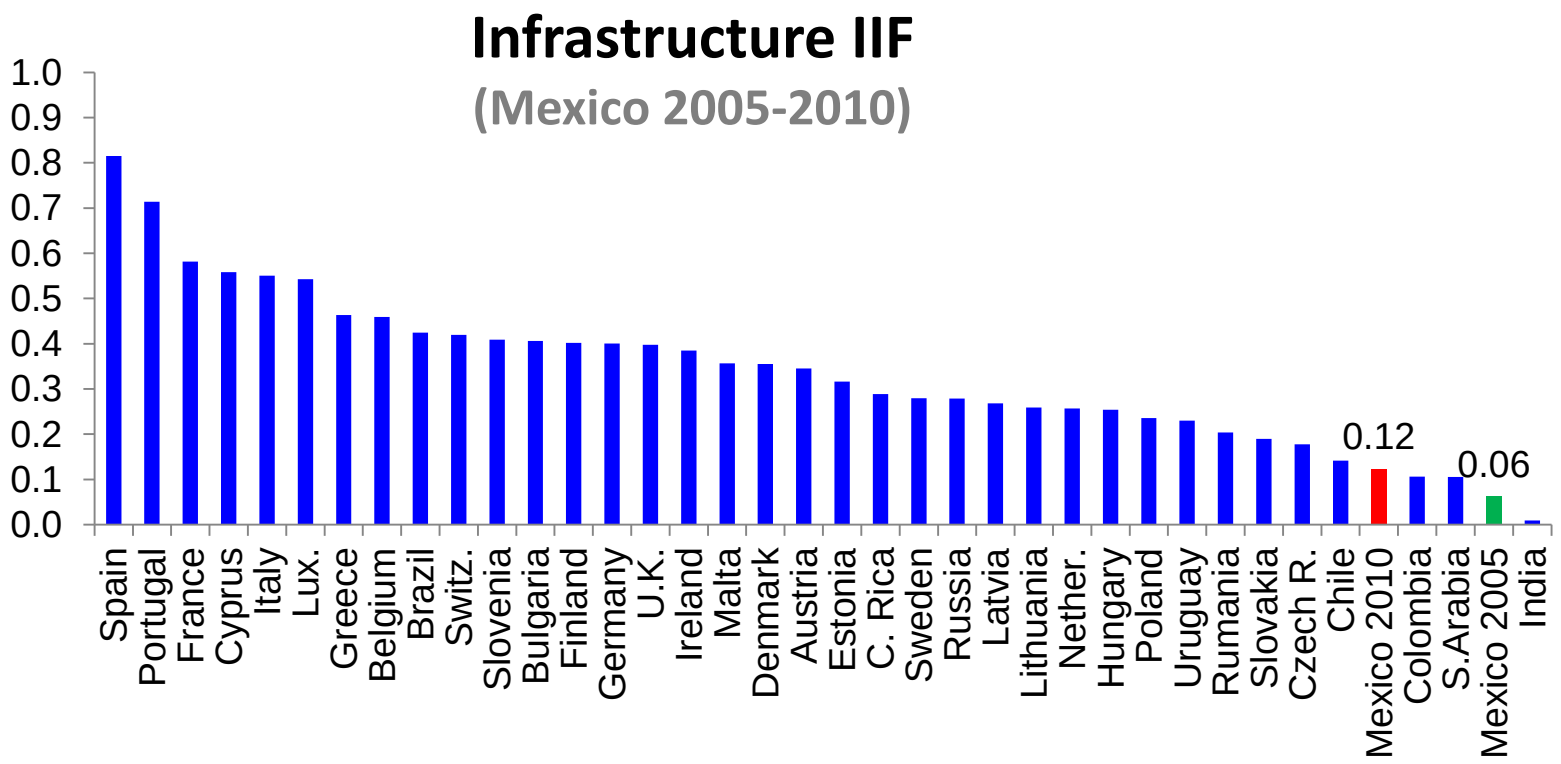
International FII: Comparisons 2005-2010

- Selecting some countries:
  - Spain and France IIF goes down but they keep their position in the ranking (1 & 3).
  - Greece's IIF goes down but it improves its position in the ranking (from 9 to 7).
  - The Czech Republic keeps its index, but it goes down in the ranking (from 27 to 30)

	Infrastructure Index (34 countries)		Ranking of 34 countries	
	2005	2010	2005	2010
Spain	0.91	0.82	1	1
Portugal	0.60	0.71	4	2
France	0.62	0.58	3	3
Greece	0.47	0.46	9	7
Belgium	0.42	0.46	13	8
Brazil	0.34	0.42	18	9
Sweden	0.32	0.28	20	21
Russia	0.11	0.28	29	22
Czech R.	0.18	0.18	27	30
Chile	0.12	0.14	28	31
Mexico	0.09	0.12	31	32

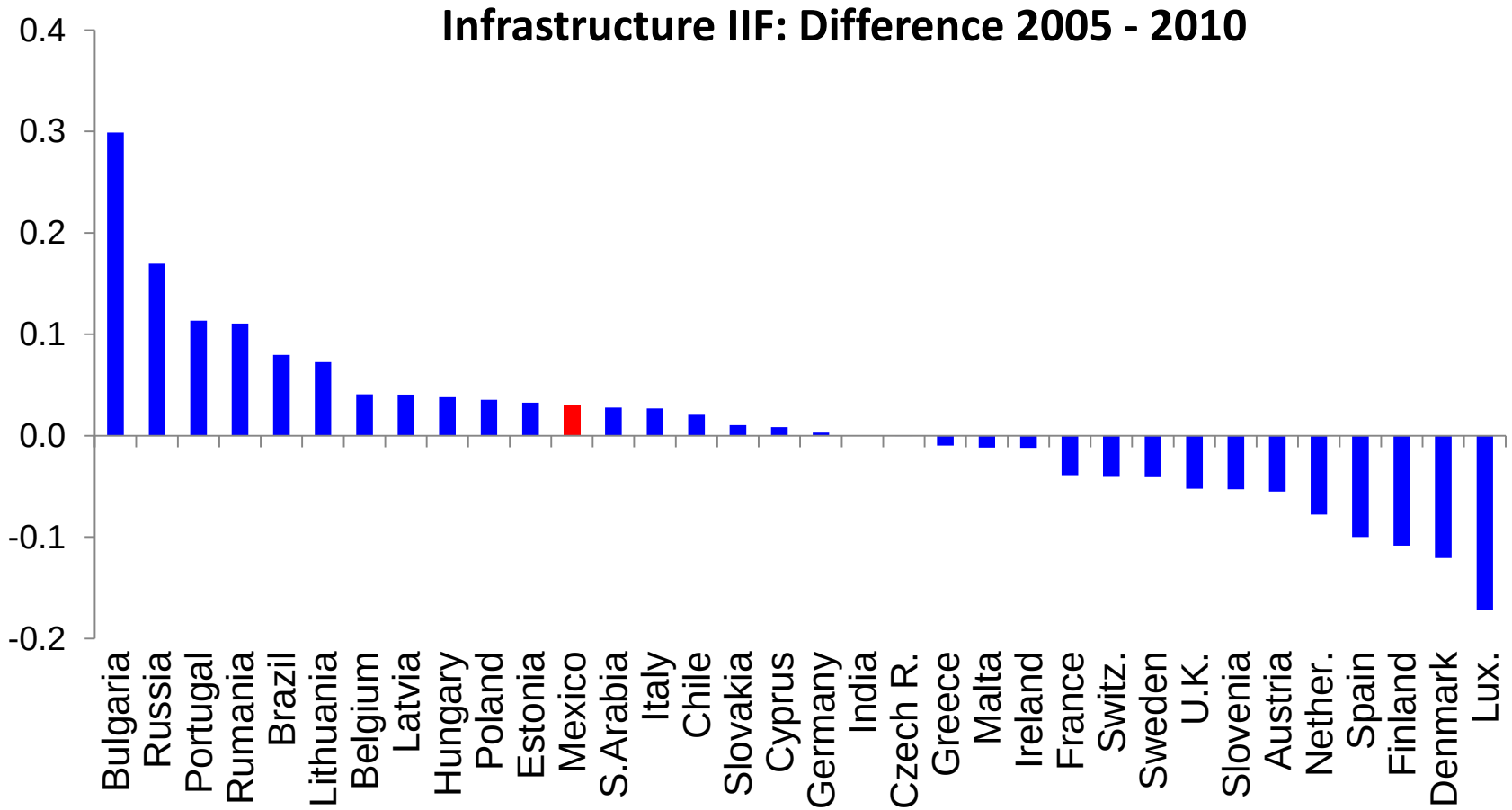
International FII: Comparisons 2005-2010

- How do we compare? Keep something fixed: compare Mexico's values for 2005 and 2010 with the rest of the countries in 2010. There is a bigger improvement.



International FII: Comparisons 2005-2010

- The difference of each countries' FII between years tells us which one *jumped* more.



International FII: Comparisons 2005-2010

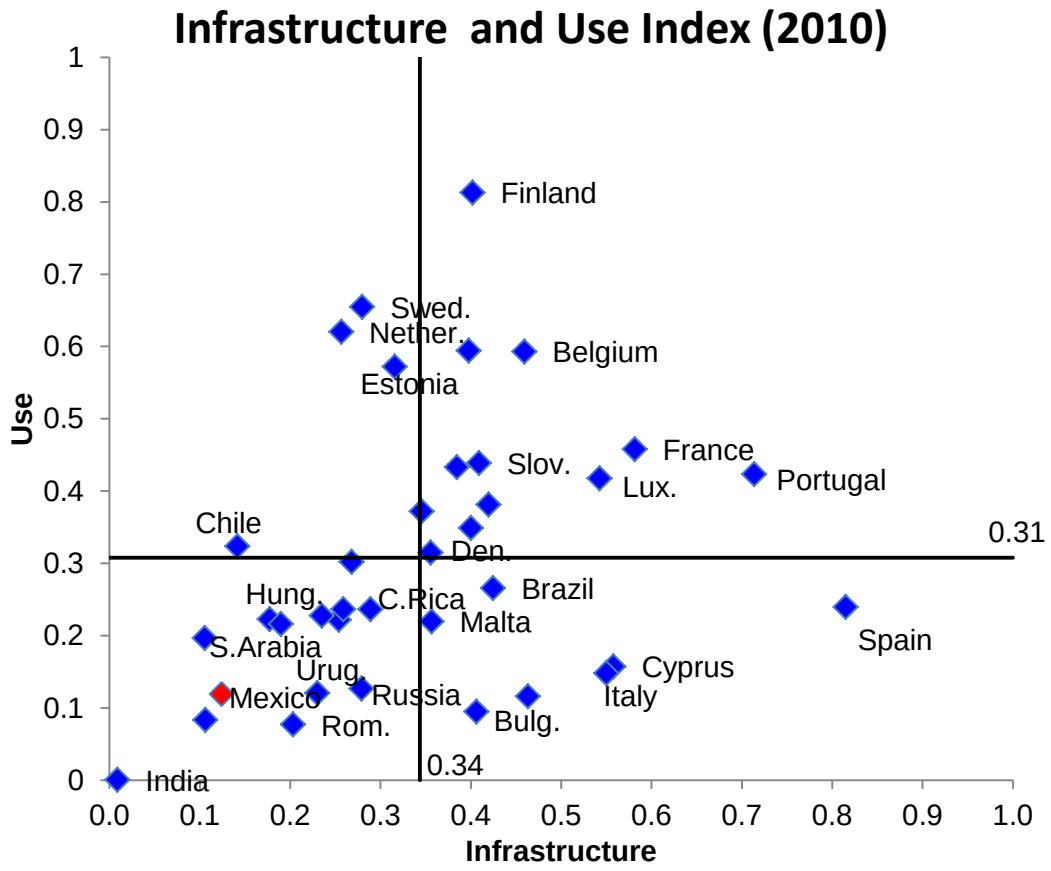
- Mexico's infrastructure FII improves in distance to the top and to the mean, but increases in distance to the mean in SD units. The opposite occurs in usage.

	Infrastructure Index		Use Index	
	2005	2010	2005*	2010
Mean	0.348	0.344	0.308	0.319
Standard Dev.	0.203	0.169	0.187	0.236
Max	0.915	0.815	0.813	0.915
Min	0.009	0.009	0.001	0.000
Mexico's IIF	0.093	0.124	0.136	0.119
Distance to the Max	0.822	0.691	0.677	0.796
Distance to the Mean	0.254	0.219	0.172	0.200
Distance to mean in SD units	1.253	1.300	0.917	0.847

*For the Use FFI in 2005, we only consider transactions at POS and ATM for lack of information on electronic transfers.

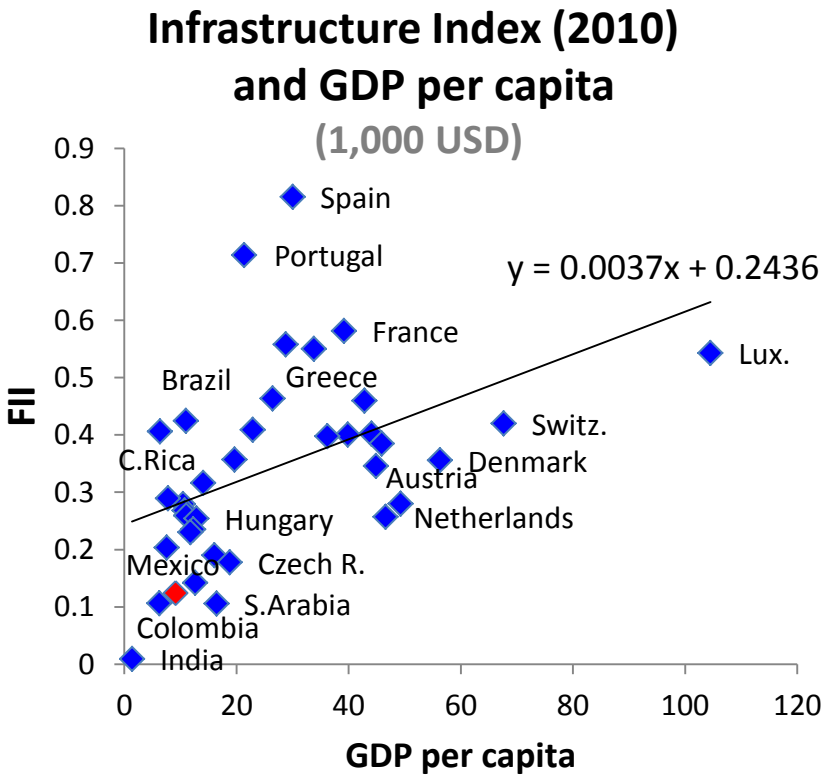
International FII: discussion

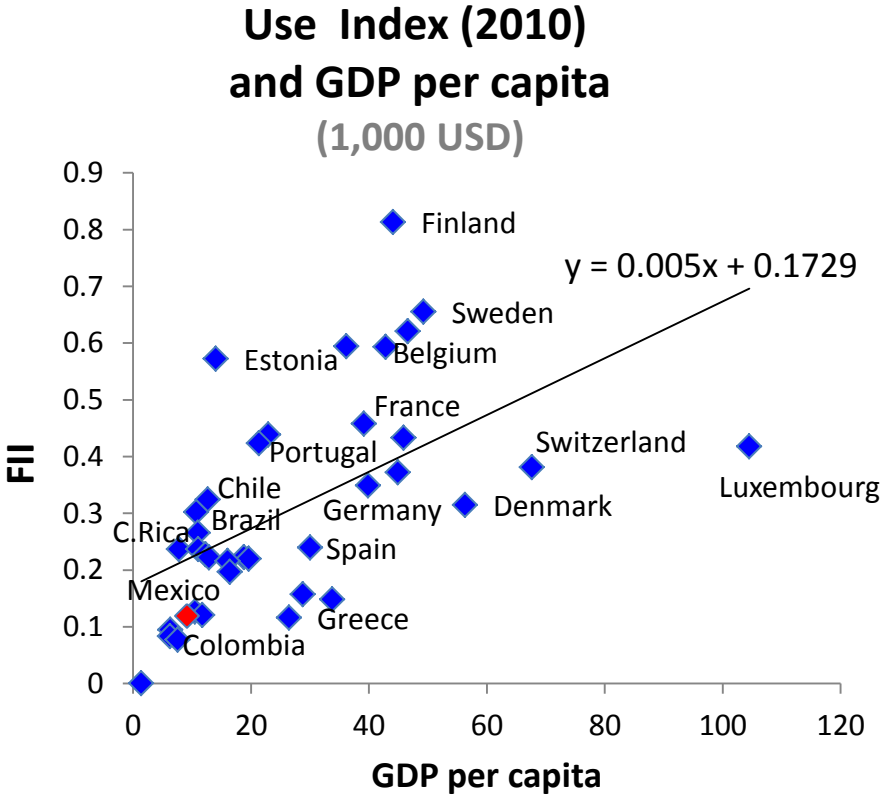
- In most cases, there is a correspondence between infrastructure and usage IIF.
- Some countries have lots of infrastructure but low usage (Spain) or low infrastructure and high usage (Netherlands).



International FII: discussion

- Is Mexico at the level of access where it could be given the size of its economy?
- Relate FII with GDP per person: Mexico is far from where it could be. This could be a policy goal: to reach the trend line.



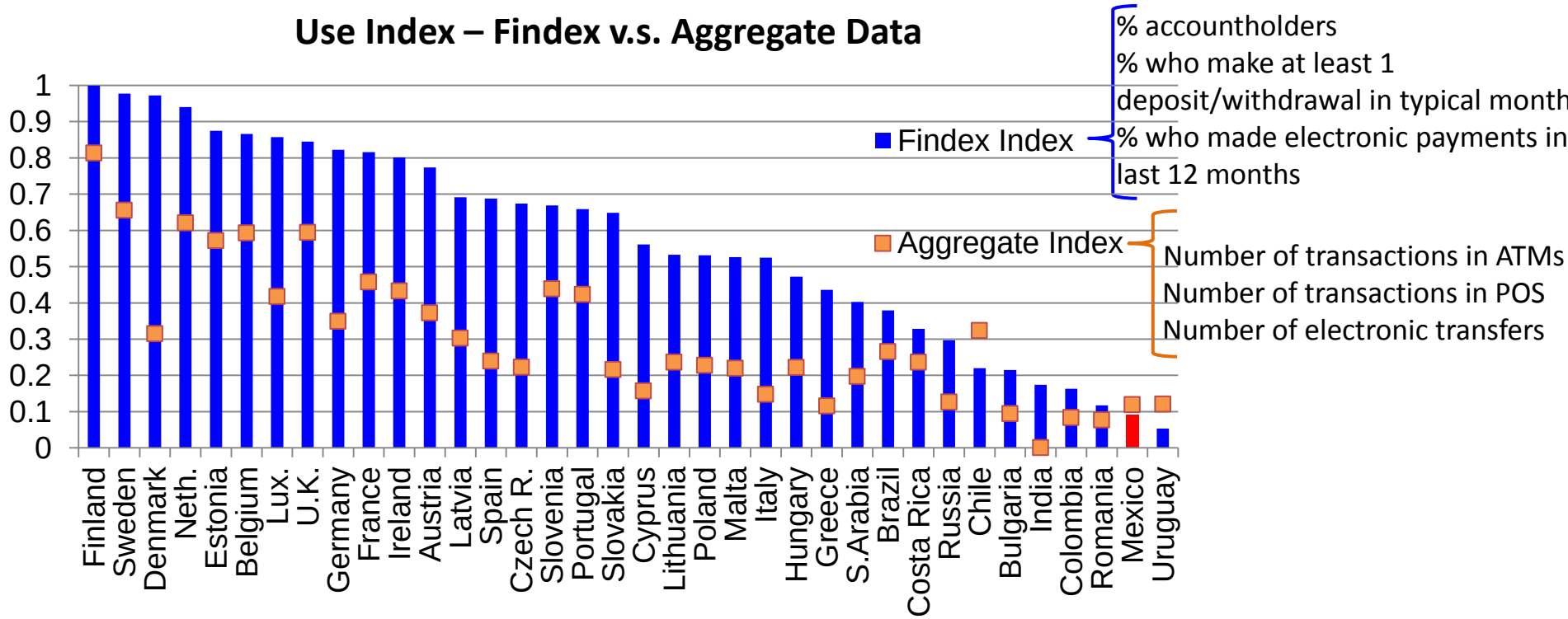


International FII: type of data

- So far we have used aggregate date to build the FII.
- Aggregate data is gathered yearly by financial authorities in many countries: data is cheap.
- Survey data is usually not available for international comparisons: data is expensive.
- Global Findex (2012) collects survey data on access and use for 148 countries. An index may be built with these data!
- What type of data is more suitable to build the FII, aggregate or survey?
- Are FII built with aggregate data and survey data consistent? They may be complementary.
- Results may not be consistent: financial services usage may be highly concentrated in a particular population group.
- Findex allows for a different type of analysis: income group FII.

International FII: Findex

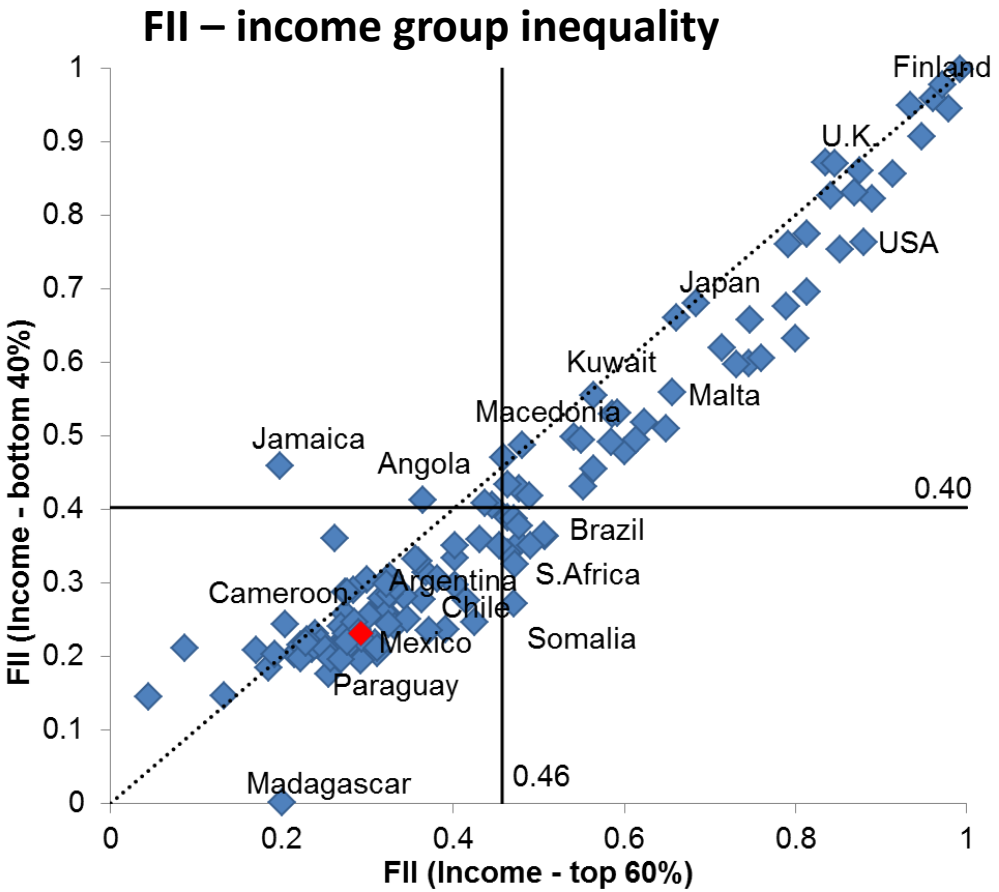
- FII varies between data sources: might be due to use intensity.
- Mexico is worse off based on Findex probably implying a financial service use concentration.



Correlation between indices: 0.82

International FII: Data

- Using Findex data we can construct an FII for different income groups: poor and rich.
  - Mexico lags behind in both income groups.
  - Developed countries have an inclusion problem among the poor only.



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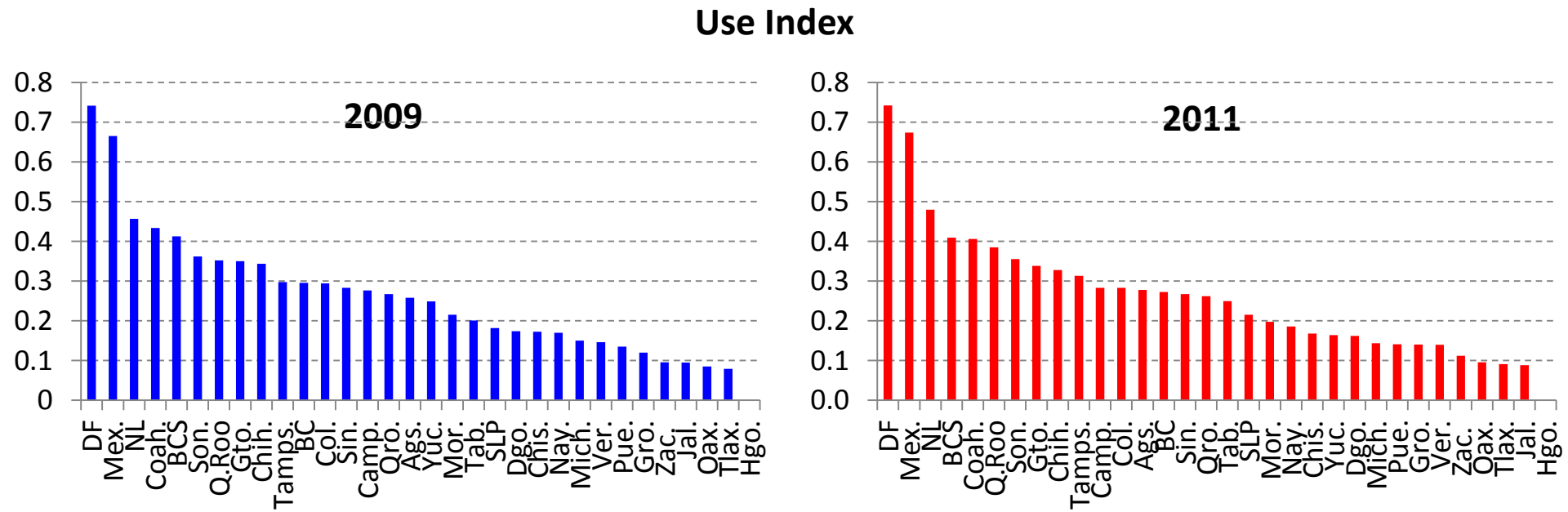
FII for Mexican States

- We include the 32 states of Mexico for 2009 and 2011.
- Less problems of comparability: same technology.

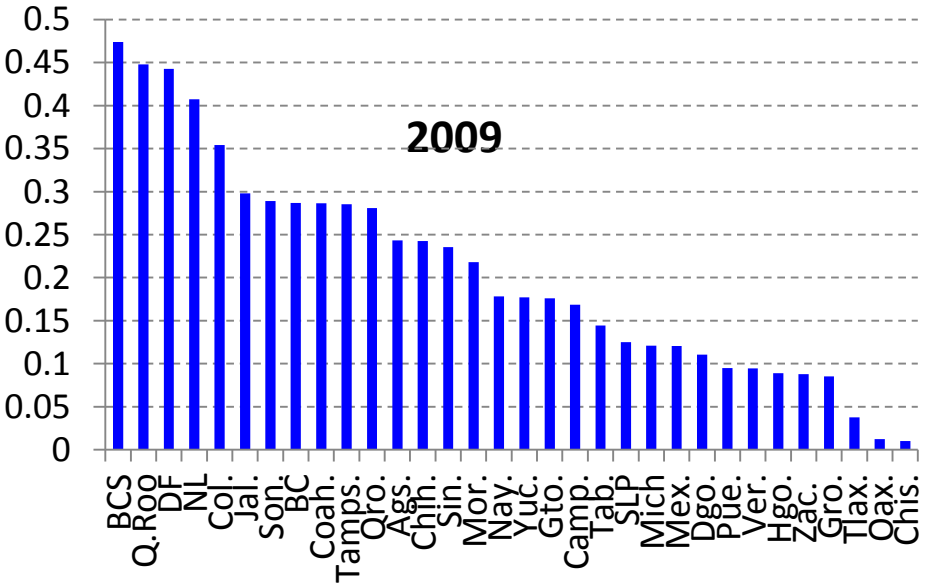


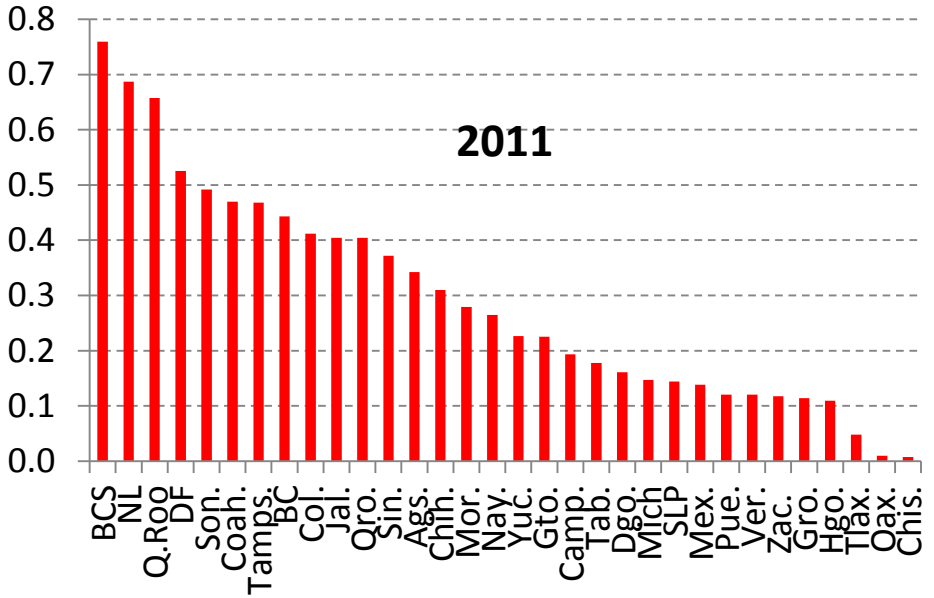
- The dimensions included (normalized by adults) are: Number of transactions in ATMs, credit transfers, checks, transactions in POS (Debit) and deposit accounts.

FII for Mexican States

- Great impact of banking correspondents in infrastructure (2009-2011).

Infrastructure FII

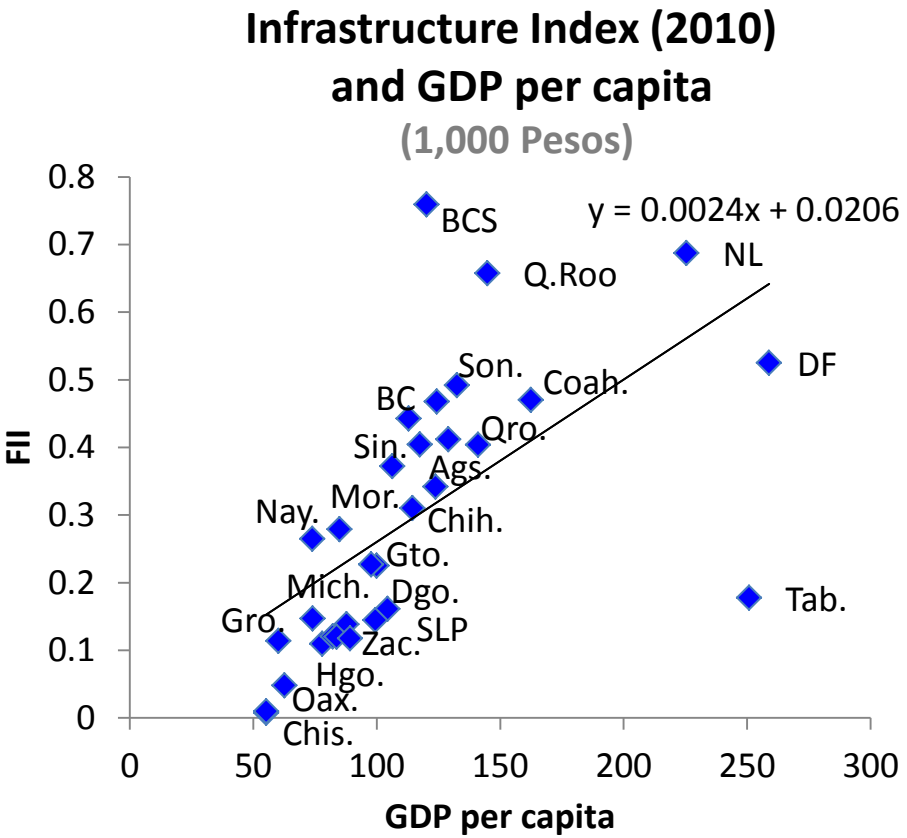


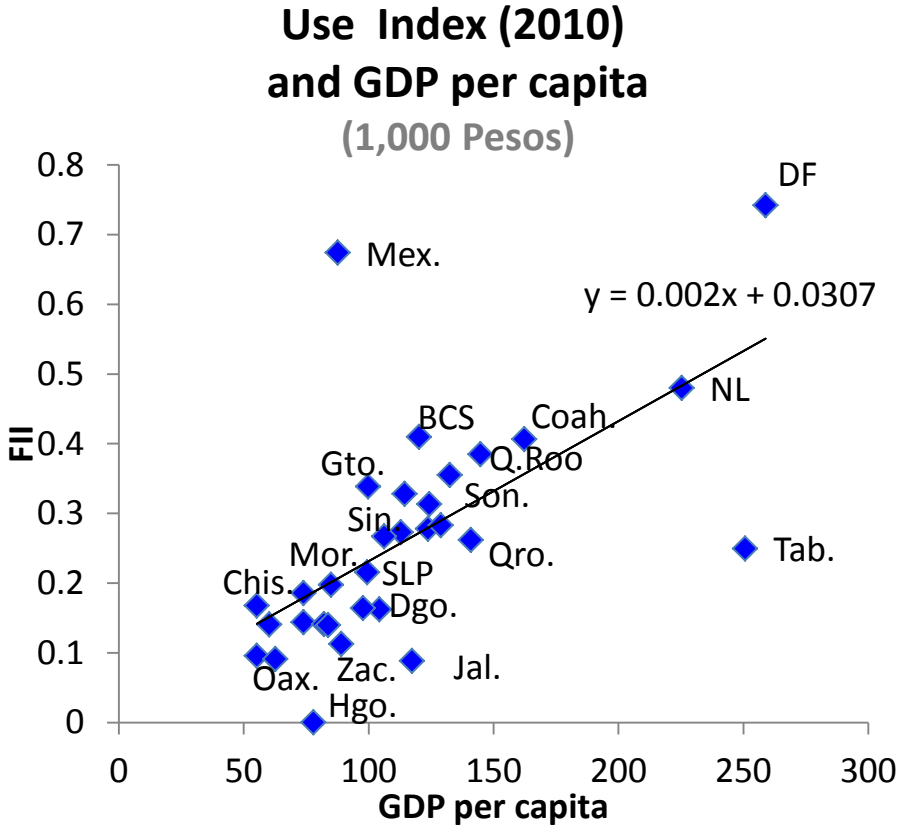


- The dimensions included (normalized by adults) are: Number of branches, Number of ATMs, Number of POS and Number of correspondents (2011).

FII for Mexican States

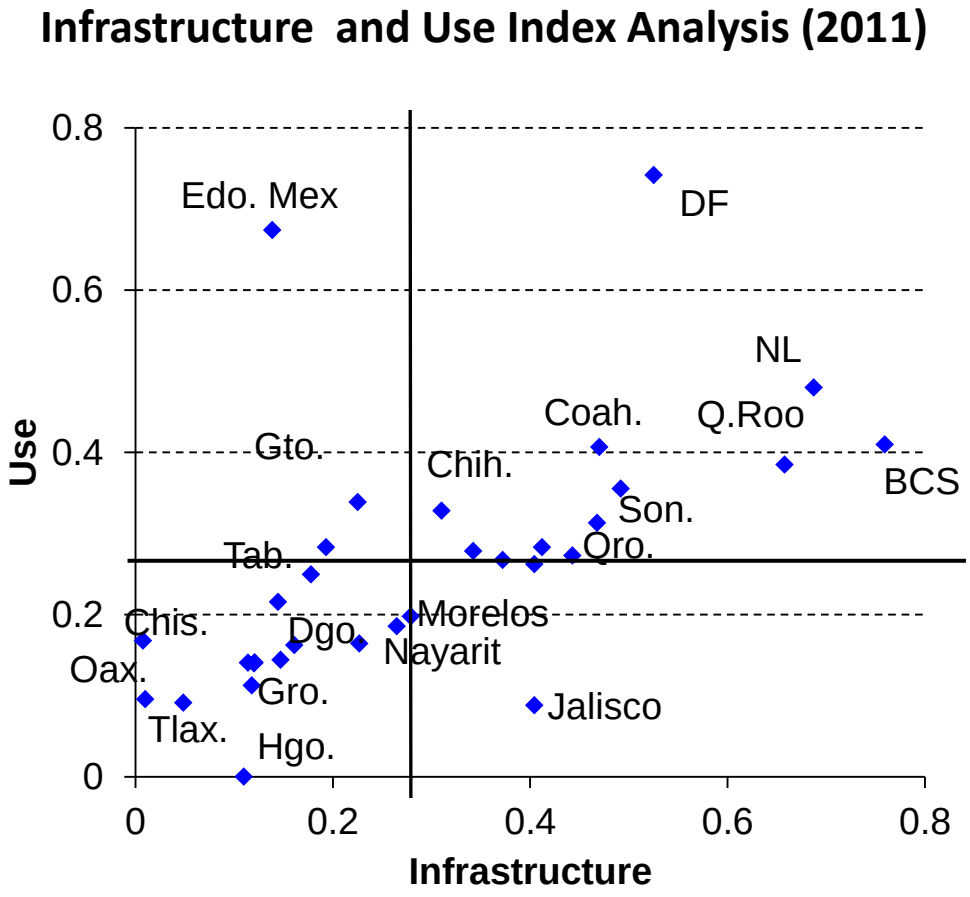
- Relating FII to GDP per person allows for the identification of states with problems. Higher GDP per person, higher FII.





FII for Mexican States

- Many states are low on both IIF; some need to adopt policies to foster infrastructure deployment and others usage.



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Final Comments

- FII is a useful instrument to compare the FI situation of a country or a region.
- The sample of countries (regions) and dimensions included are crucial. There are many variables. Two indexes are suggested: infrastructure and usage.
- It seems better to include few dimensions in each index: high correlations.
- It seems better to include a representative sample of countries and keep it for comparisons. Index is very sensitive to Max and Min values.
- Comparisons across time are tricky: everything in the index changes.
- FII is more useful when it is related to other information, like GDP.
- For internal policy decisions, a regional IIF seems useful.
- IIF is useful to set goals for policy makers, like the following:
  - At the international level, improve IIF value and reduce the distance with the top country.
  - At regional level, improve IIF of straggler states and reduce inequality.

Final Comments

- So how is Mexico doing on FII?
- At the international level:
  - In both usage and infrastructure FII the level is low, worse in the latter.
  - Despite improvement in the FII value, the position in the ranking has gone down through time.
  - When keeping sample fixed thorough time, improvement is clear.
  - Nevertheless Mexico is far from its potential level of inclusion.
  - This may be useful to set goals: improve FII and reach potential level.
- At the state level: States are identified according to their strength; some need fostering infrastructure, others usage.
- Findex: results are consistent with aggregate data regarding Mexico´s position. Not only the poor have little access, even the rich.

Appendix: Infrastructure dimensions and Index (1)

Country	ATMs per 1,000 adults		POS per 100 adults		Branches per 10,000 adults		Financial Inclusion Infrastructure Index		Ranking	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Spain	1.50	1.52	2.99	3.54	11.31	11.01	0.91	0.82	1	1
Portugal	1.54	1.96	1.65	3.08	6.74	7.15	0.60	0.71	4	2
France	0.93	1.06	2.13	2.69	7.86	7.36	0.62	0.58	3	3
Cyprus	0.57	0.74	1.96	2.76	11.51	10.04	0.55	0.56	5	4
Italy	0.75	0.98	2.08	2.88	6.26	6.47	0.52	0.55	6	5
Luxembourg	1.07	1.13	2.20	3.08	10.54	5.20	0.71	0.54	2	6
Greece	0.66	0.77	3.48	4.27	3.98	4.14	0.47	0.46	9	7
Belgium	0.83	1.70	1.16	1.53	5.24	4.52	0.42	0.46	13	8
Brasil	1.09	1.19	1.24	3.32	2.05	2.18	0.34	0.42	18	9
Suiza	0.89	0.96	1.77	2.29	4.36	3.98	0.46	0.42	11	10
Slovenia	0.87	1.03	1.96	2.02	4.08	3.93	0.46	0.41	10	11
Bulgaria	0.42	0.81	0.25	0.93	0.98	9.16	0.11	0.41	30	12
Finland	1.08	0.64	2.38	4.49	3.74	3.29	0.51	0.40	7	13
Germany	0.75	1.22	0.80	0.96	6.52	5.59	0.40	0.40	15	14
United Kingdom	1.18	1.23	1.97	2.44	2.80	2.39	0.45	0.40	12	15
Ireland	0.89	0.92	1.51	2.27	3.32	3.29	0.40	0.38	16	16
Malta	0.45	0.52	2.25	3.41	3.56	3.22	0.37	0.36	17	17

Appendix: Infrastructure dimensions and Index (2)

Country	ATMs per 1,000 adults		POS per 100 adults		Branches per 10,000 adults		Financial Inclusion Infrastructure Index		Ranking	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Denmark	0.68	0.63	2.31	2.43	4.84	3.64	0.48	0.36	8	18
Austria	0.44	0.74	1.29	1.07	7.40	5.83	0.40	0.35	14	19
Estonia	0.74	0.88	1.11	2.28	1.99	1.78	0.28	0.32	21	20
Sweden	0.38	0.43	2.37	2.59	2.59	2.47	0.32	0.28	20	21
Rusia	0.23	1.29	0.12	0.36	2.71	3.43	0.11	0.28	29	22
Latvia	0.45	0.70	0.70	1.23	3.09	3.04	0.23	0.27	22	23
Lithuania	0.37	0.56	0.57	1.30	2.67	3.36	0.19	0.26	25	24
Netherlands	0.56	0.58	1.90	1.89	2.55	2.09	0.33	0.26	19	25
Hungary	0.41	0.57	0.48	0.92	3.67	4.09	0.22	0.25	23	26
Poland	0.28	0.52	0.52	0.77	4.06	4.15	0.20	0.24	24	27
Rumania	0.24	0.56	0.15	0.59	1.94	3.39	0.09	0.20	32	28
Slovakia	0.42	0.51	0.45	0.81	2.56	2.65	0.18	0.19	26	29
Czech Republic	0.35	0.41	0.72	1.07	2.14	2.20	0.18	0.18	27	30
Chile	0.39	0.62	0.32	0.47	1.31	1.54	0.12	0.14	28	31
México	0.31	0.45	0.28	0.60	1.09	1.48	0.09	0.12	31	32
Arabia Saudita	0.29	0.57	0.28	0.42	0.77	0.83	0.08	0.11	33	33
India	0.03	0.09	0.04	0.07	1.05	1.11	0.01	0.01	34	34

Appendix: Use dimensions and Index (1)

Country	POS transactions per adult		ATM withdrawals per adult		Credit transfers		Financial Inclusion Use Index		Ranking	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Finland	155.18	232.32	48.22	38.42		181.84	0.92	0.81	1	1
Sweden	103.84	212.44	42.39	28.74		126.85	0.72	0.66	3	2
Netherlands	103.29	159.53	35.21	31.76		116.19	0.65	0.62	4	3
United Kingdom	121.57	163.87	54.61	54.19		66.06	0.85	0.59	2	4
Belgium	79.69	108.79	28.77	42.38		111.18	0.51	0.59	9	5
Estonia	69.86	137.99	43.35	38.59		85.44	0.58	0.57	6	6
France	99.51	134.96	27.86	30.24		56.45	0.56	0.46	7	7
Slovenia	42.59	62.38	38.12	33.23		94.90	0.44	0.44	10	8
Ireland	53.18	89.34	52.51	50.43		44.05	0.53	0.43	8	9
Portugal	83.13	128.24	42.79	50.30		20.62	0.64	0.42	5	10
Luxembourg	85.96	97.67	12.26	12.55		160.38	0.36	0.42	12	11
Switzerland	53.95	72.51	16.63	17.50		111.00	0.32	0.38	15	12
Austria	30.16	44.31	17.78	19.94		134.12	0.25	0.37	17	13
Germany	34.06	35.45	34.56	28.86		83.06	0.39	0.35	11	14
Chile	10.93	20.65	12.62	19.25		136.06	0.14	0.32	27	15
Denmark	138.32	195.18	3.97	3.92		63.80	0.33	0.31	14	16
Latvia	19.42	45.48	18.75	23.85		59.90	0.22	0.30	18	17

Appendix: Use dimensions and Index (2)

Country	POS transactions per adult		ATM withdrawals per adult		Credit transfers		Financial Inclusion Use Index		Ranking	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Brasil	19.60	43.00	15.92	20.21		53.10	0.20	0.27	20	18
Spain	36.59	53.57	24.79	24.18		20.62	0.33	0.24	13	19
Lithuania	17.40	32.06	17.02	22.24		40.68	0.20	0.24	19	20
Poland	8.10	25.29	15.64	21.10		45.13	0.15	0.23	23	21
Czech Republic	9.11	23.16	14.38	17.31		56.89	0.15	0.22	24	22
Hungary	10.35	23.66	13.28	13.74		70.37	0.14	0.22	26	23
Malta	13.13	26.67	26.91	30.71		17.38	0.26	0.22	16	24
Slovakia	5.84	17.09	15.71	18.53		54.72	0.15	0.22	25	25
Saudi Arabia	4.14	7.91	20.51	55.44		0.21	0.18	0.20	21	26
Cyprus	19.78	29.88	7.68	13.02		28.07	0.12	0.16	29	27
Italy	14.55	26.58	9.07	13.64		23.61	0.12	0.15	30	28
Russian Federation	0.88	4.22	5.42	16.62		21.84	0.04	0.13	33	29
México	5.62	12.55	14.60	16.86		10.40	0.14	0.12	28	30
Greece	6.93	6.42	16.50	19.59		6.56	0.16	0.12	22	31
Bulgaria	1.04	2.50	10.97	16.05		8.10	0.09	0.09	31	32
Romania	0.74	4.84	6.82	11.42		10.22	0.05	0.08	32	33
India	0.23	0.48	1.18	2.89		0.37	0.00	0.00	34	34

Appendix: Comparing indexes

Index	Infrastructure (Sarma)		Use (Sarma)		Sarma (2008)		Chakravarty (2010) (r=1)		Chakravarty (2010) (r=1)	
Year	2005		2005		2004		2003-2004		2004	
Dimensions	(3): Branches, ATMs and POS (normalized by adults).		(2): Transactions in ATMs and in POS (normalized by adult population).		(3): Deposit accounts per capita, deposit money bank branches (demographic penetration), Ratio of deposit plus credit to GDP.		(6): Bank branches (geographic and demographic penetration), ATMs (georgaphic and demographic		(3): Deposit accounts per capita, deposit money bank branches (demographic penetration), Ratio of deposit plus credit to GDP.	
Sample size	34 countries		34 countries		55 countries		42 countries (ranking out of 21 country sample)		55 countries (ranking out of 21 country sample)	
Country	**Index**	**Ranking**	**Index**	**Ranking**	**Index**	**Ranking**	**Index**	**Ranking**	**Index**	**Ranking**
Belgium	0.419	13	0.515	9	0.637	3	0.419	2	0.703	1
Brasil	0.345	18	0.197	20	0.214	22	0.092	11	0.214	11
Bulgaria	0.107	30	0.090	31	0.246	20	0.153	9	0.256	10
Chile	0.121	28	0.139	27	0.267	19	0.192	6	0.277	9
Denmark	0.476	8	0.325	14	0.614	4	0.391	3	0.671	2
Italy	0.523	6	0.120	30	0.415	9	0.335	4	0.423	7
Saudi Arabia	0.078	33	0.176	21	0.127	39	0.048	14	0.129	13

Appendix: Adding dimensions to the index

	New dimension value	Change on index value from adding the nth dimension								
		2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Case 1	1	0.15	0.06	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Case 2	0	-0.29	-0.08	-0.04	-0.02	-0.01	-0.01	-0.01	-0.01	0.00

Appendix: Checks per adult (2010)