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BANK FOR INTERNATIONAL SETTLEMENTS

**IFC Workshop on Financial Inclusion Indicators**

**Co-hosted by Bank Negara Malaysia**

**5 – 6 Nov 2012, Sasana Kijang, Kuala Lumpur**

# Building a financial inclusion index for Mexico[1]

José Luis Negrin, Bank of Mexico

[1] This presentation was prepared for the workshop. The views expressed are those of the author and do not necessarily reflect the views of the BIS or the central banks and other institutions represented at the workshop.

# Building a Financial Inclusion Index for Mexico

Prepared for the Workshop on Financial Inclusion Indicators.
Bank Negara, Malaysia, Kuala Lumpur, November, 2012

José L. Negrin. Manager of Financial Services Analysis

BANCO DE MÉXICO

**Disclaimer: these presentation reflects the point of view of the author and not necessarily that of Banco de México**

# Index

# 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 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.

# Index

# 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”.
- Some salient features:
  - Objective population (financially excluded): usually poor people and small firms.
  - Relevant products: service diversity and access heterogeneity.
  - Three elements: **access** (related to infrastructure), **use** y **quality** (cost).
  - 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 valuable instrument to diagnose the financial inclusion situation with respect to other countries/regions.
- Theoretically, the optimal level of access would occur when the observed usage level corresponds to a competitive environment without any frictions, given a technology (costs) and customers' preferences.
- FII allows for comparisons across countries.
- Building a FII provides a reference point: best practice within the sample.

# Index

# 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)**

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

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

**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 CP, 0<r<1.
- 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 (best practice). | 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 complementary FII for people (not firms for now):
  - Infrastructure.
  - Usage.
- We normalize dimensions by number of adults (people above 14 years old).
- 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.
- Need to determine:
  - Dimensions to be included: trade off between adding dimensions and their importance FII concavity); differential impact of low and high values.
  - Countries to be considered: adding new countries affect if it has high or low values in the dimensions included.

# FII characteristics

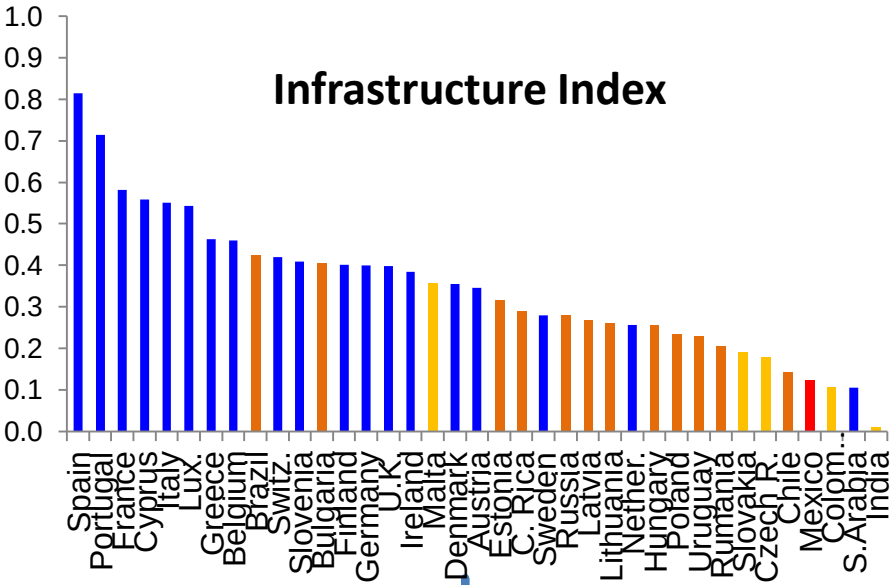
- We decided to build indices for international comparisons and indices for states comparisons (within Mexico).
- International FII: to see Mexico's relative position we choose 37 countries (data for 2010), 5 five with lower, 31 with higher GDP per person.
- The national index is more important for internal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

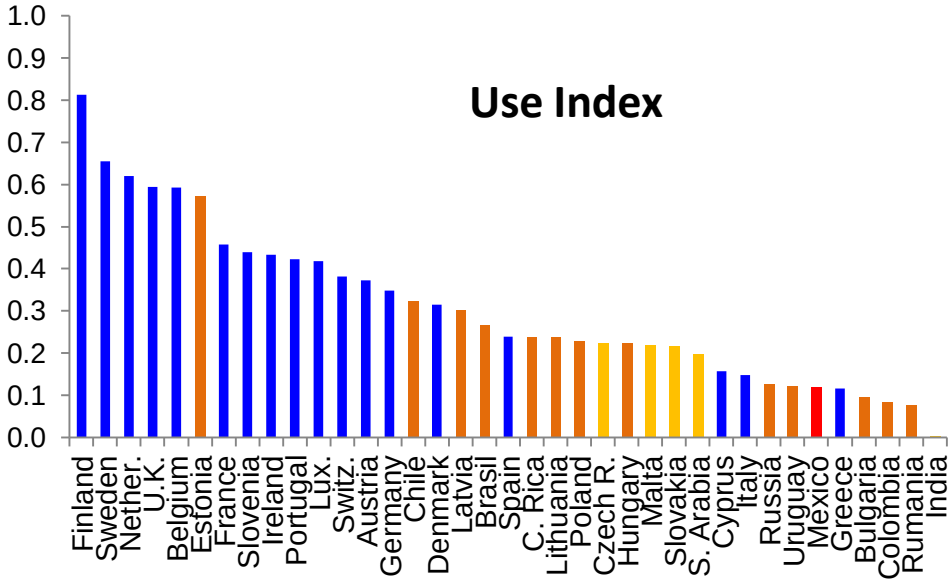
| International FII | National FII |
|---|---|
| • Allows assessment of progress relative to other countries. | • Allows for public policy decisions. |
| • Allows identification of an empirical best practice (ideal). | • Helps to focalize regulations where needed. |
| • Strong assumptions: homogenous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

# Index

# 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

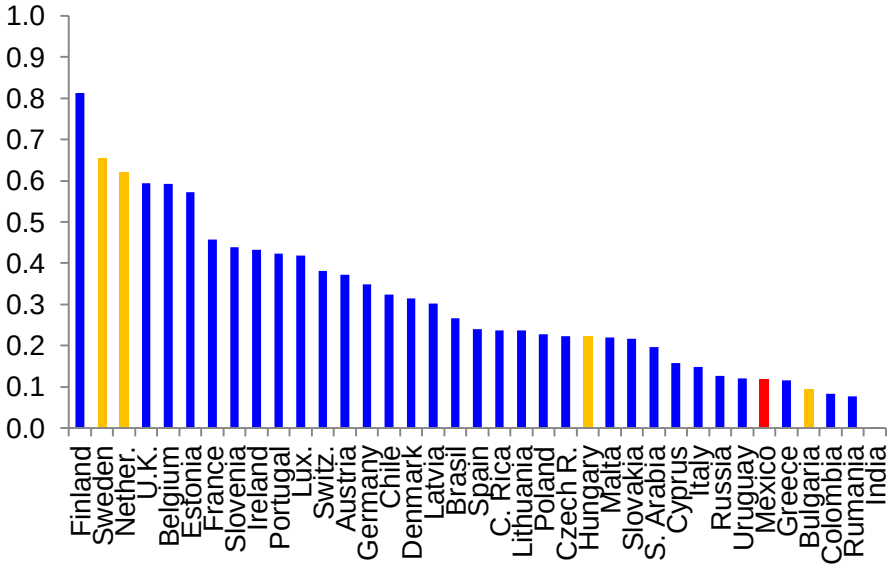
¼ Std deviation from Mexico's GDP per person

½ Std deviation from Mexico's GDP per person

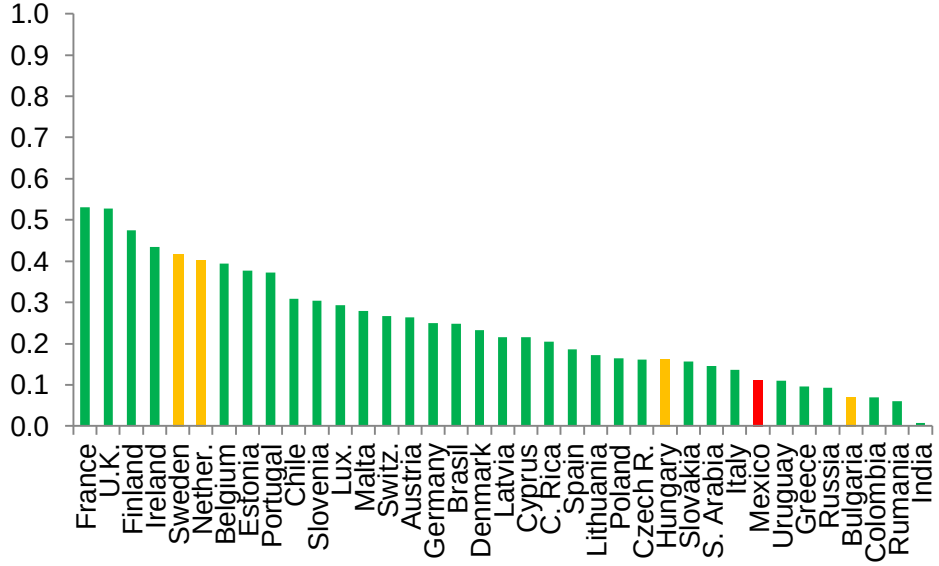
# The dimensions selection

- Changing the set of dimensions changes the index outcome.

**Index of usage – Without Checks**



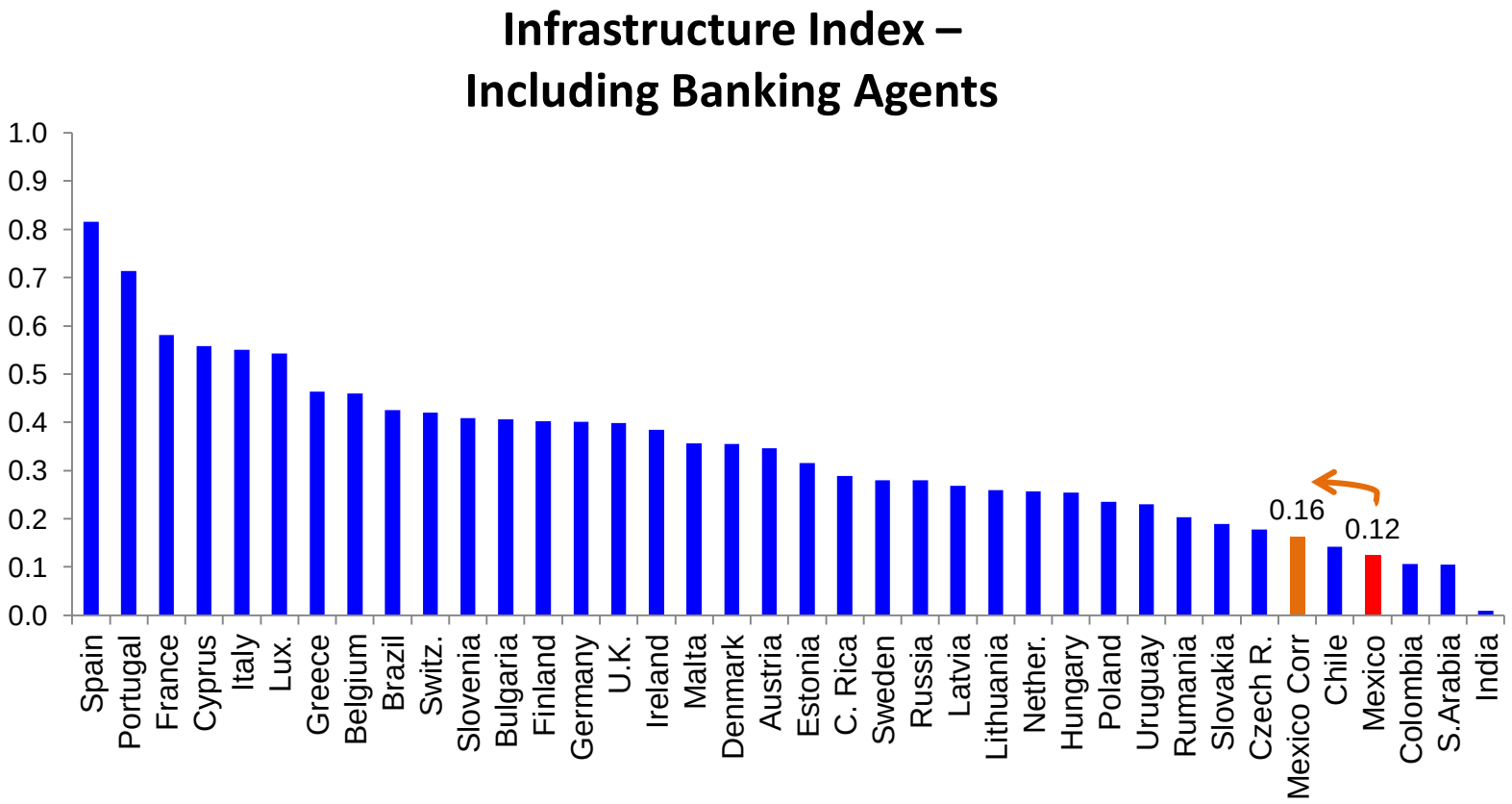

**Index of usage – Including Checks**




- 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

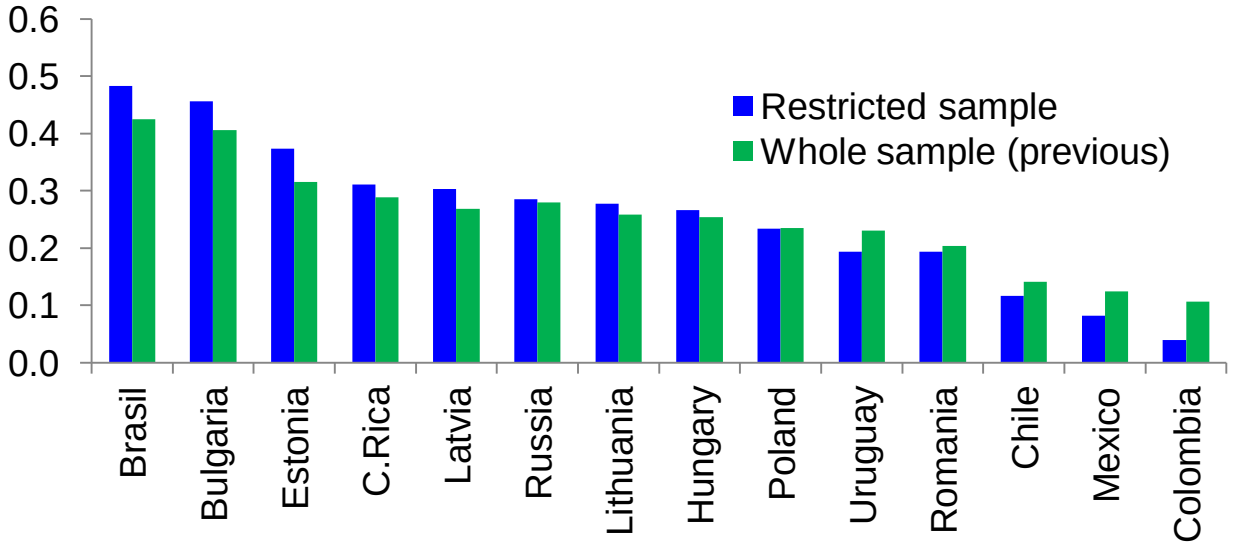
- New infrastructure dimensions: technological changes may generate discrete changes for a country: banking agents.



# The country sample selection

- Differences in development, technology, institutions and habits, makes comparisons harder.
- Restricting the sample to countries similar to México (1/4 of StDev of GDP per person): moves away from the idea of best practice.

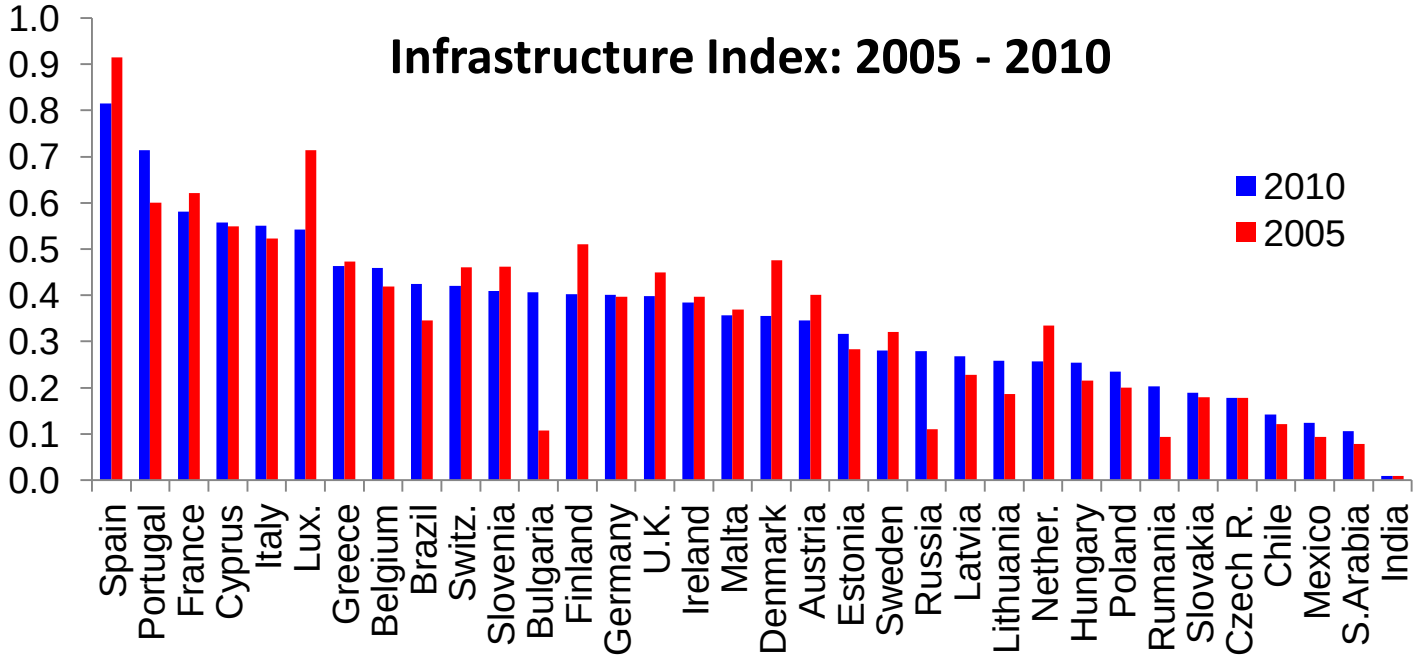
**Infrastructure IIF: Using a restricted sample**




- Restricting the sample does not necessarily improve the ranking position.
- It seems reasonable to consider a large but balanced sample (similar number of richer and poorer countries) and keep it stable through time.

# 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).

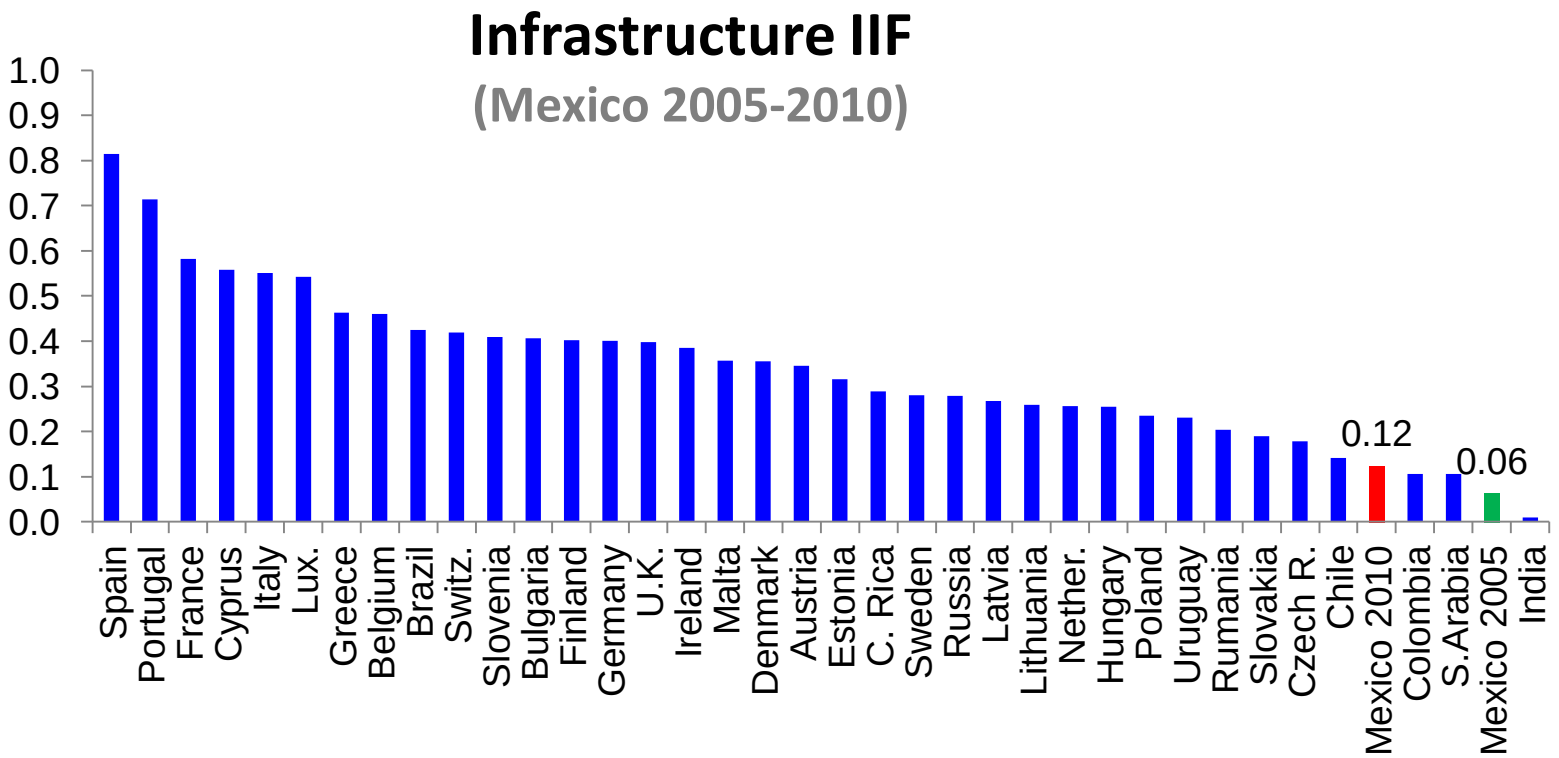
# International FII: Comparisons 2005-2010

- Selecting some countries:
  - Spain and France IIF go 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.
- Alternatively, identify countries whose index jump more.



# International FII: Comparisons 2005-2010

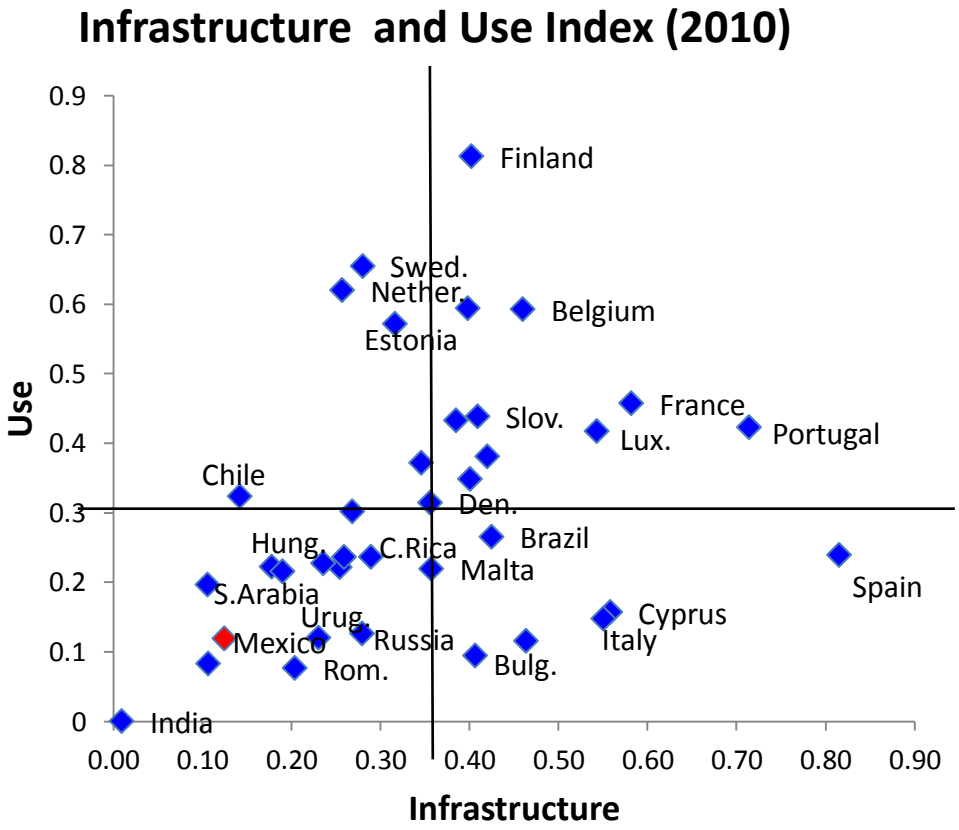
- Mexico's infrastructure FII improves in distance to the top and to the mean, but increases in distance to the mean in SD units. The opposite occurs in usage.

| | 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.

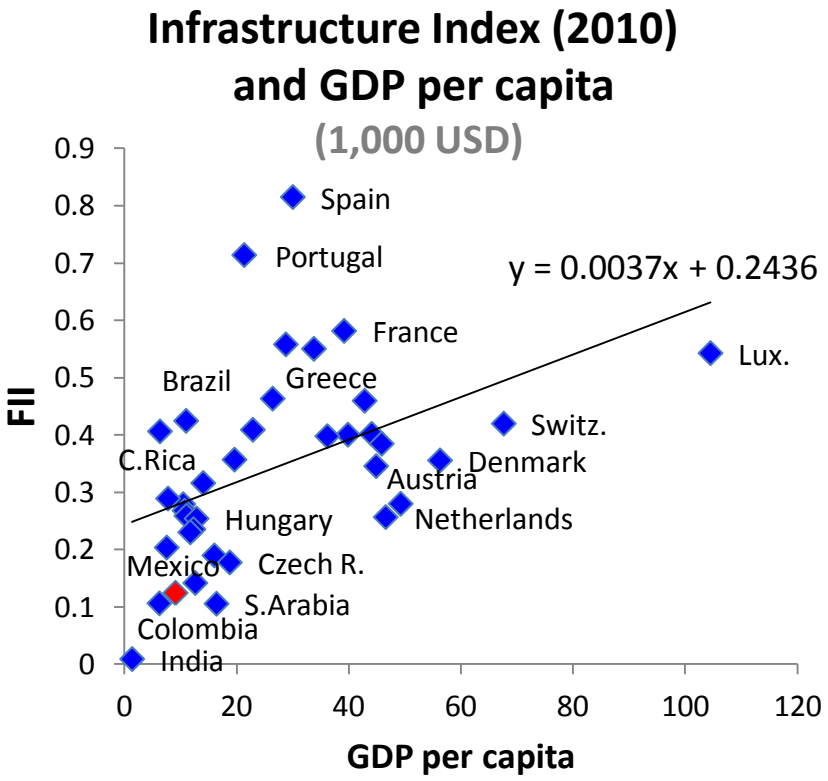
# International FII: discussion

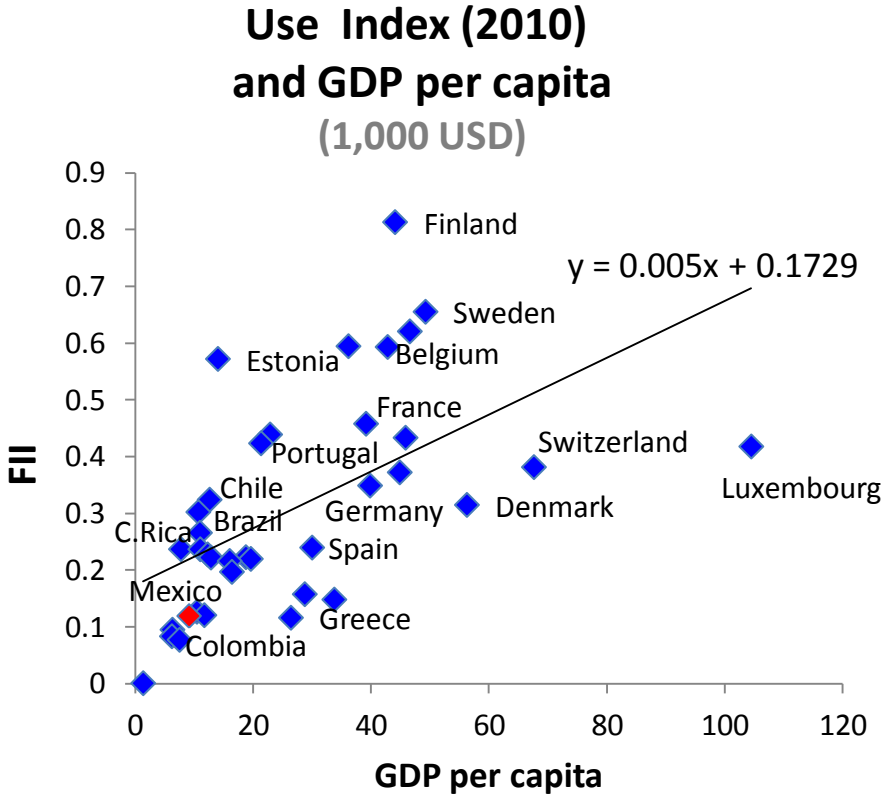
- In most cases, there is a correspondence between infrastructure and usage IIF.
- Some countries have lots of infrastructure but low usage (Spain) or low infrastructure and high usage (Netherlands).



# 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.

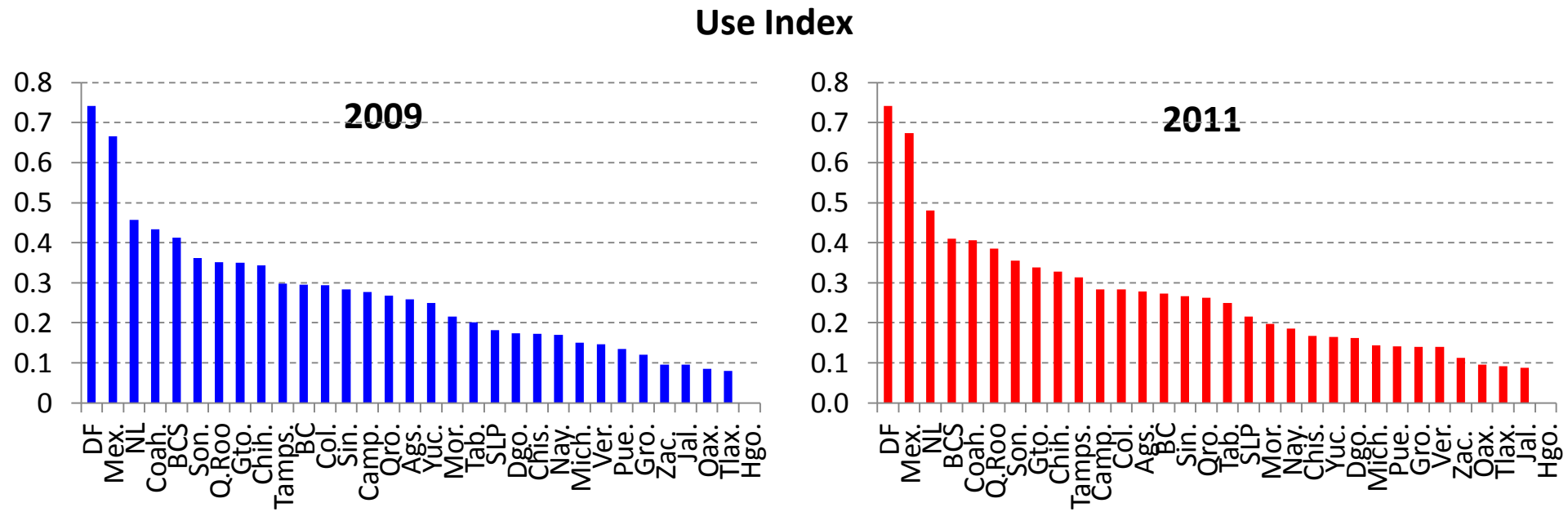


# Index

# FII for Mexican States

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

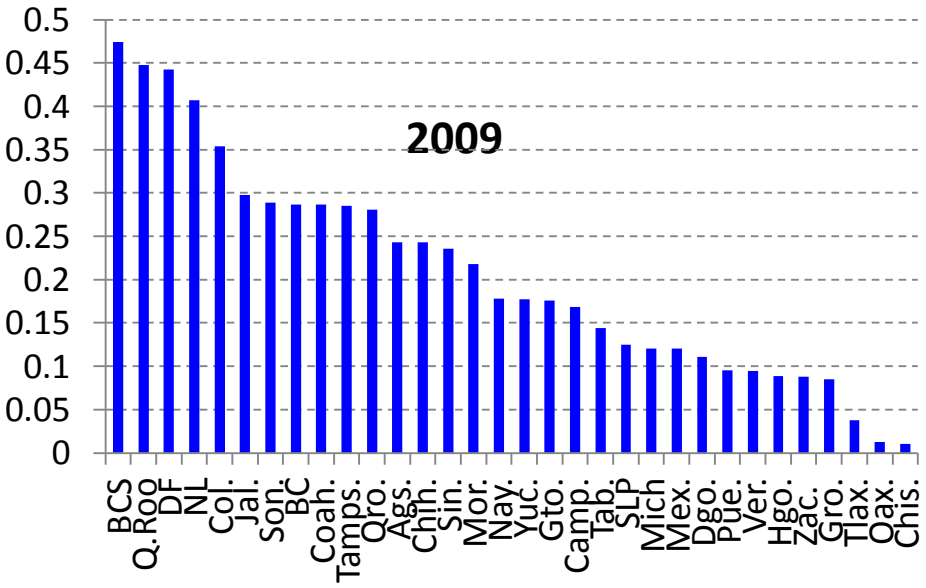


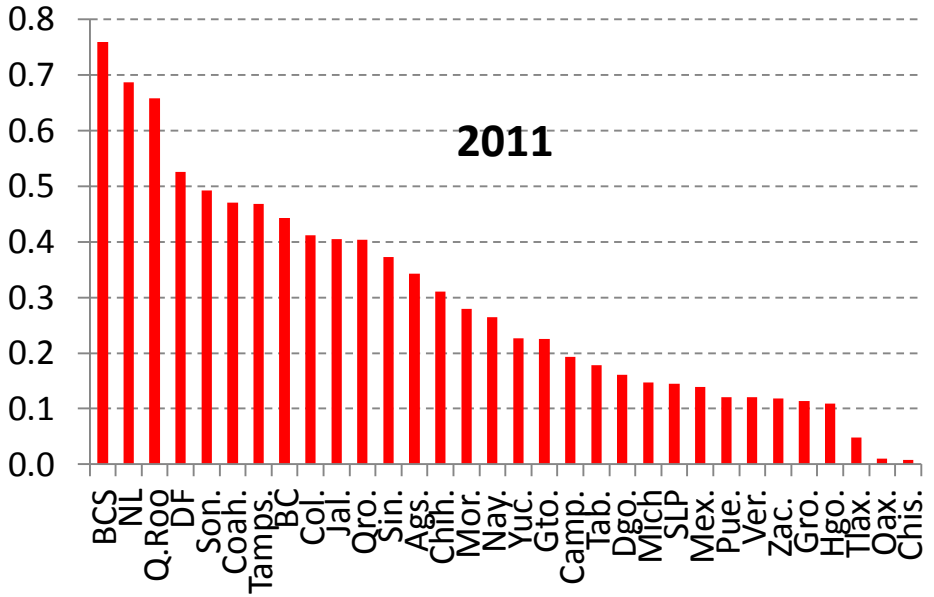

- The dimensions included (normalized by adults) are: Number of transactions in ATMs, credit transfers, checks, transactions in POS (Debit) and deposit accounts.

# FII for Mexican States

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

**Infrastructure FII**

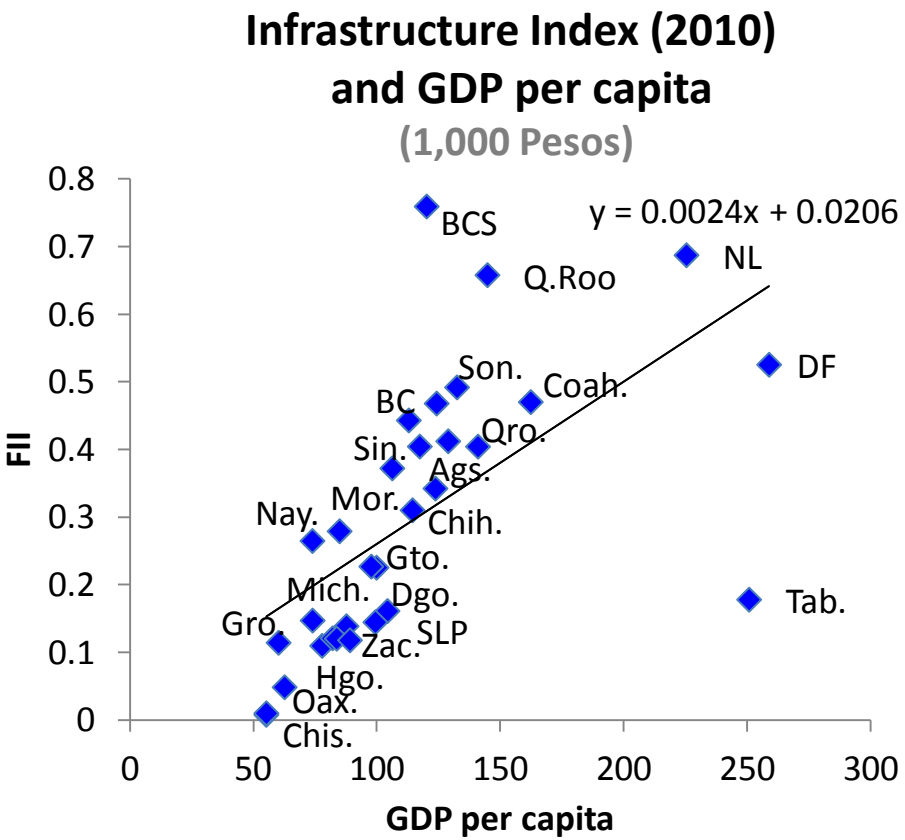


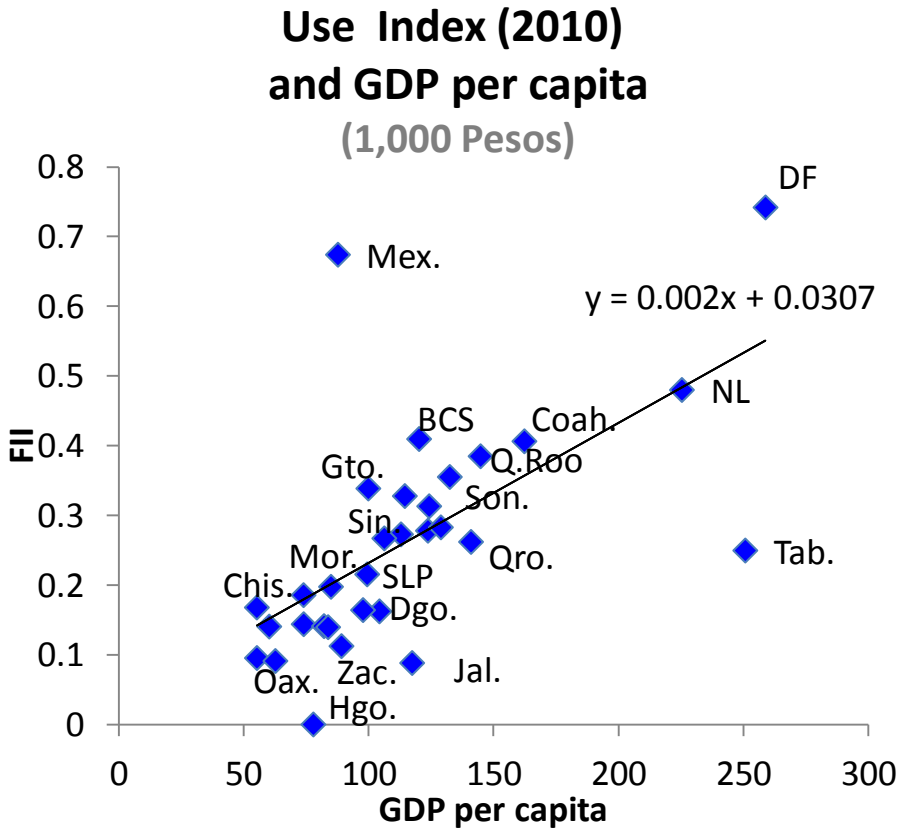




- The dimensions included (normalized by adults) are: Number of branches, Number of ATMs, Number of POS and Number of correspondents (2011).

# FII for Mexican States

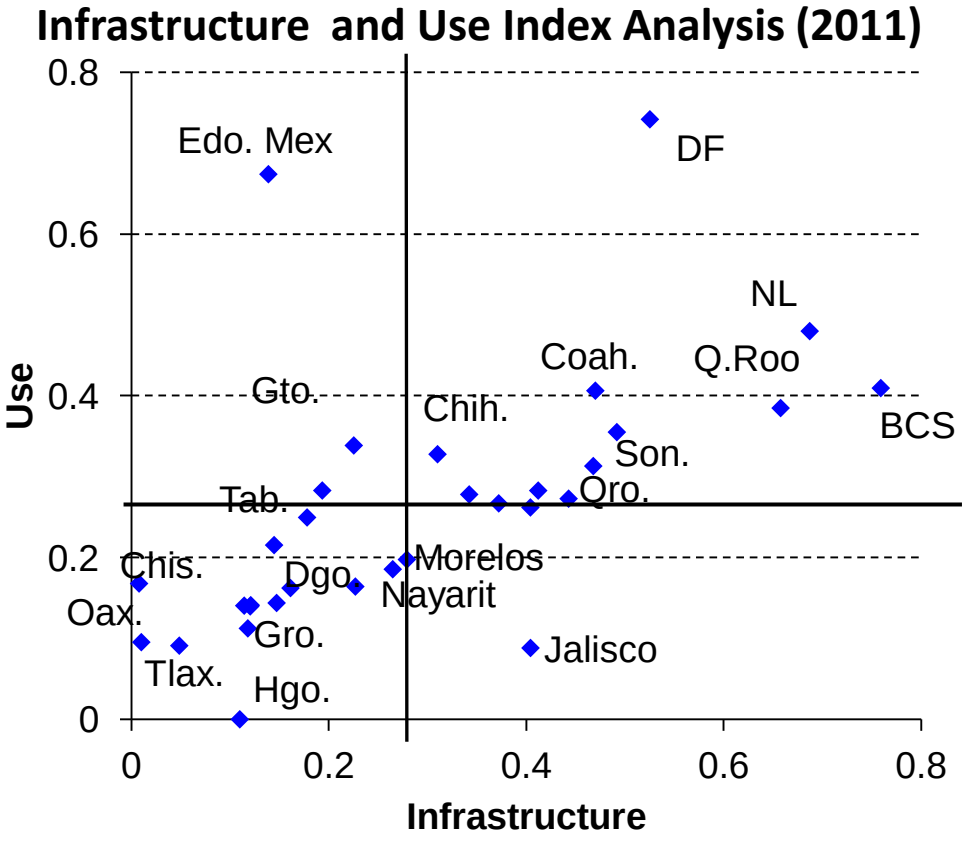
- Relating FII to GDP per person allows for the identification of states with problems. Higher GDP per person, higher FII.



# FII for Mexican States

- Many states are low on both IIF; some need to adopt policies to foster infrastructure deployment and others usage.
- Inequality approach: reduce it by moving more up backward states.



# Index

# Final Comments

- FII is a useful instrument to diagnose FI situation of a country or a region.
- Sample of countries (regions) and number of dimensions included is crucial. There are many variables; two indexes are suggested, one for infrastructure and one for usage.
- It seems better to include few dimensions.
- It seems better to include a representative sample of countries and keep it stable. 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 relates to other information, like GDP.
- For internal policy decisions, a regional IIF seems useful. It complements the international FII.

# Final Comments

- So how is Mexico doing on FII?
- At the international level:
  - In both usage and infrastructure FII 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.
  - Goals may be set: improve FII of straggler states and reduce inequality.

# Data Appendix

# 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 |

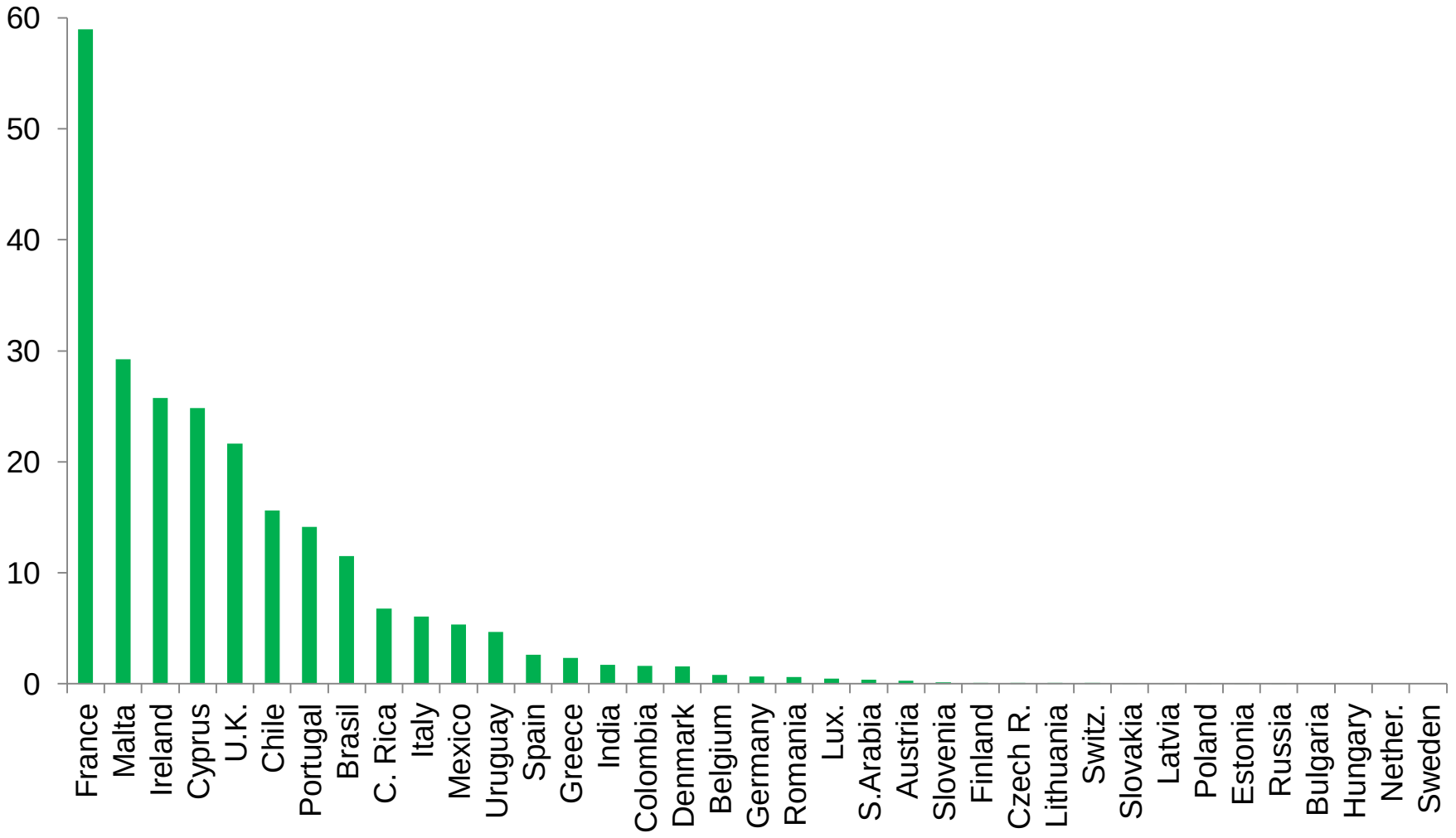
# Appendix: Comparing indexes

| **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)

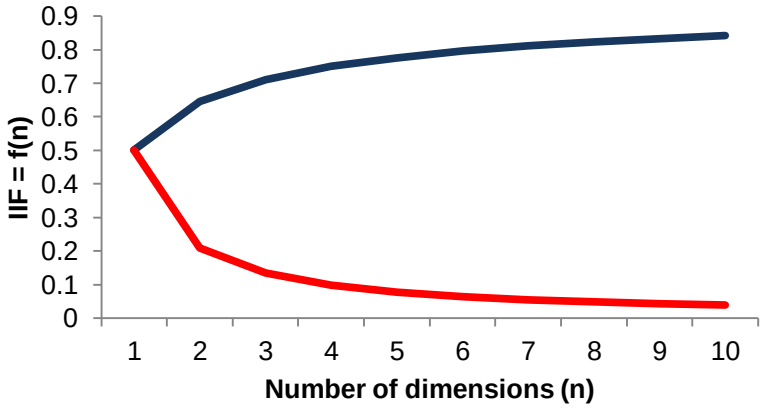


# Dimensions to be included

- Implicit in the dimensions 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, the impact is greater (smaller).

**Adding dimensions with Max and Min values**

(FII after adding new dimensions )



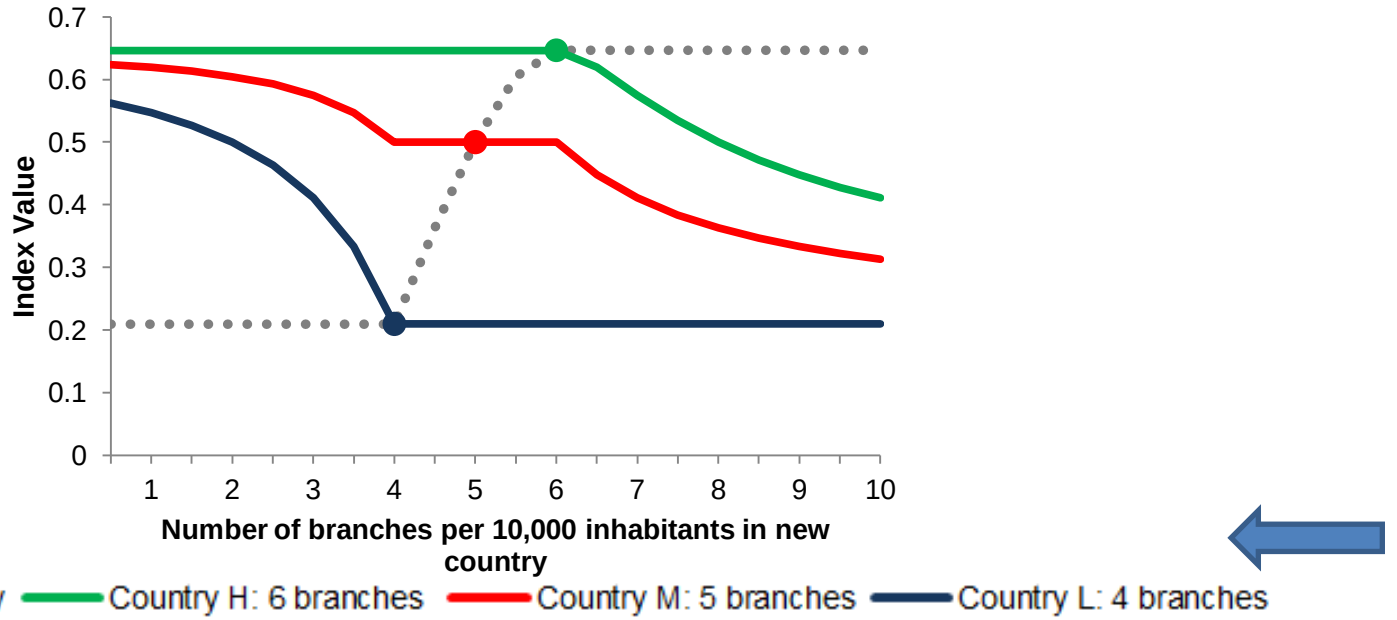

| | Inicial IIF value | New dimension value | IIF value after introducing another dimension | Change in IIF value |
|---|---|---|---|---|
| **Case 1** | 0.5 | 1 | 0.65 | 0.15 |
| **Case 2** | 0.5 | 0 | 0.21 | -0.29 |

# Choosing countries in sample

- The country selection determines the results:
  - Adding new countries may affect other countries' FII, specially if it the new country has very high or low values.
  - 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 for Mexican States: Inequality Approach

- Analysis by states allows for a different policy goal: close the gap between regions while continuing to improve the leading ones.
- Theil Index measures inequality. The index is defined as:

$$IT = \sum_{i=1}^{n} S_i \ln\left(\frac{1}{S_i}\right)$$

- Where $S_i$ stands for an observation's share and n are the number of observations (32 in this case). Thus the index takes values from (0, 3.47], where the larger the index the smaller the inequality.
- Theil Index for Mexico's IIF in 2011 was 3.23 for infrastructure and 3.29 for use. This implies relatively low inequality.
- There is more inequality in infrastructure.

# International FII: Comparisons 2005-2010

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