The Repo Market in Mexico: Empirics and stylized facts

Regional Course on Financial Markets

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Content*

- The Repo market in Mexico

- Interest Rate Spread in the Mexican Secured and Unsecured Interbank Markets

- On Relations in the Unsecured and Secured Overnight Interbank Lending Markets

- US Repo market and the Euro interbank Repo market

- Regulation of Shadow Banking*

The views expressed in this presentation are exclusively the responsibility of the author and do not necessarily reflect those of CEMLA or Banco de México.

The importance of interbank markets

Motivation

The secured lending (repo) market is very important for the well functioning of the financial system:

o A funding market of significant importance for Mexican commercial banks, brokerage houses, and development banks.

o Its relationship with monetary policy implementation.

o Represents an important vehicle for liquidity transmission.

o Unlike the repo markets in Europe and the U.S., is an OTC market with no central counterparty or tri-partite repos.

The Repo market in Mexico

The Repo market

o The Repo (repurchase agreement) market is a financing method for short-term liquidity needs. The Repo market is a collateralized transaction with securities. A repurchase agreement is a two-part transaction:

1. The transfer of specified securities by one party, the bank or the borrower, to another party, the depositor or the lender in exchange of cash: the depositor holds the security, and the bank holds the cash.

2. The borrower repurchases the securities at the original price plus an agreed additional amount on a specified future date. Repurchase agreements are not under the US Bankruptcy Code so if one-part defaults do not end up in a bankruptcy court.

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The Repo market

o A repo transaction involves a lender, a borrower, cash, collateral and a rate.

o The demand for repo has increased in the last 30 years because of the flexibility to use the cash in short term and because of the increase of interest rates.

o The size of repo haircuts depends on the identity of the counterparty and on the type of collateral. A haircut is needed to protect the lender against price volatility and provides an incentive for a counterparty to repurchase the security.

o Gorton and Metrick (2010)* argue that the repo market in the US experienced a run-like phenomenon during the Great Financial Crisis.

*Gorton and Metrick, Securitized Banking and the Run on Repo, NBER, 2010.

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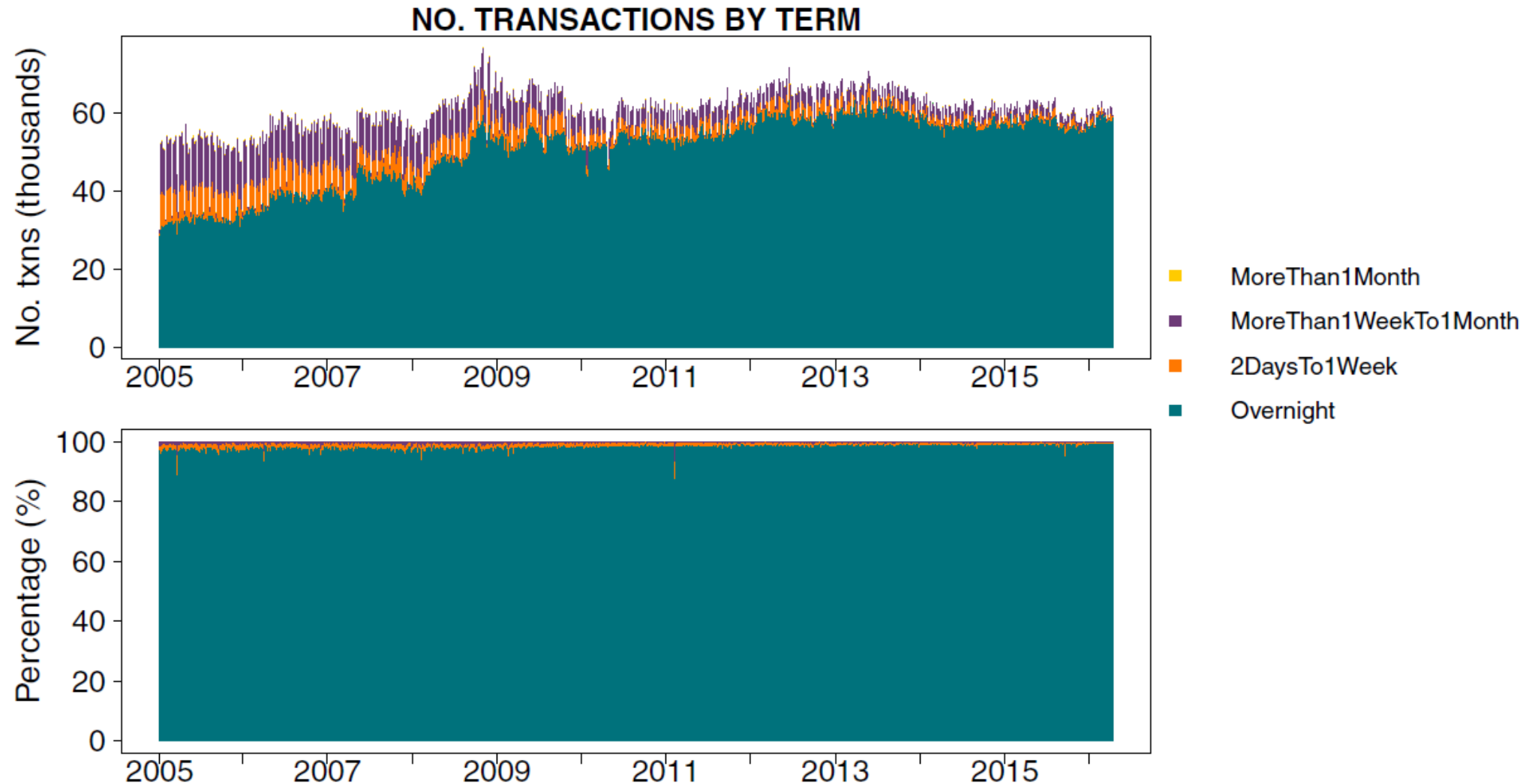CENTER FOR LATIN AMERICAN MONETARY STUDIES

The Repo market in Mexico

o A relevant aspect of the institutional framework for the repo market in Mexico is that banks cannot perform repo or reverse repo transactions with securities issued or guaranteed by themselves.

o Using a comprehensive dataset from the Mexican central bank, Usi-López et al. (2017) described this market for a long period, including the financial crisis that started in 2007.

o The secured market in Mexico is very active, with around sixty thousand transactions processed every day in 2016, and a daily average volume of 35 million Mexican pesos.

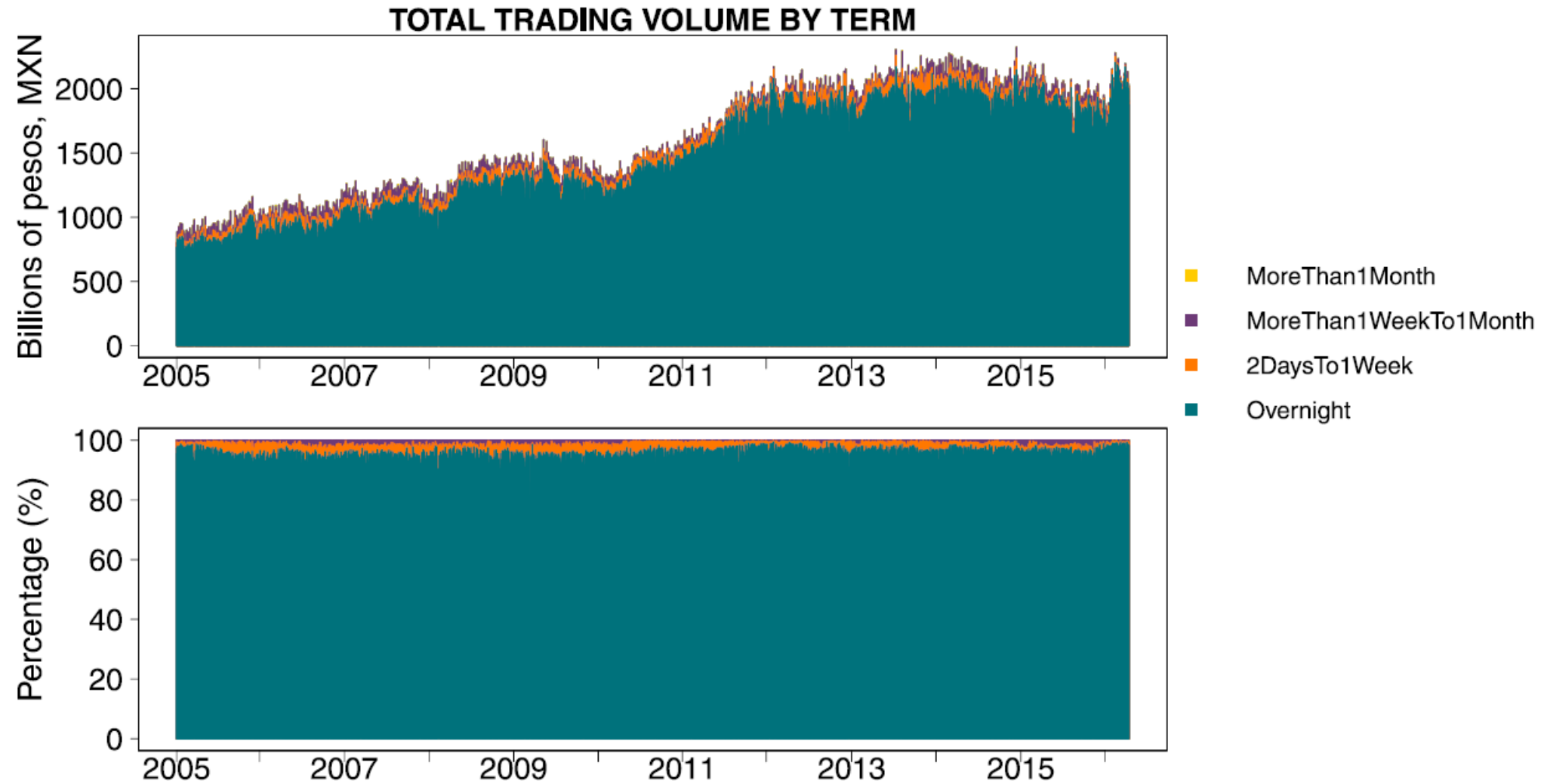*Usi-López et al., The Repo market in Mexico: Empirics and stylized facts, Neurocomputing 264, 2-19, Elsevier, 2017.*

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The Repo market in Mexico

o Most of the activity comes from overnight transactions, which constitutes more than 95% of the total transactions.

o The most important types of counterparties are local individuals and local companies, whose contribution amounts to more than 90% of the total number of transactions.

o However, regarding volume, other counterparties contribute the most – these are investment funds, commercial banks, and brokerage houses, whose contributions, alongside that of the local firms, adds up to more than 60%.

o Another relevant feature of the interbank secured market in Mexico is a strong disassortative mixing in the network, meaning that banks with a small degree tend to connect with banks with a high degree.*
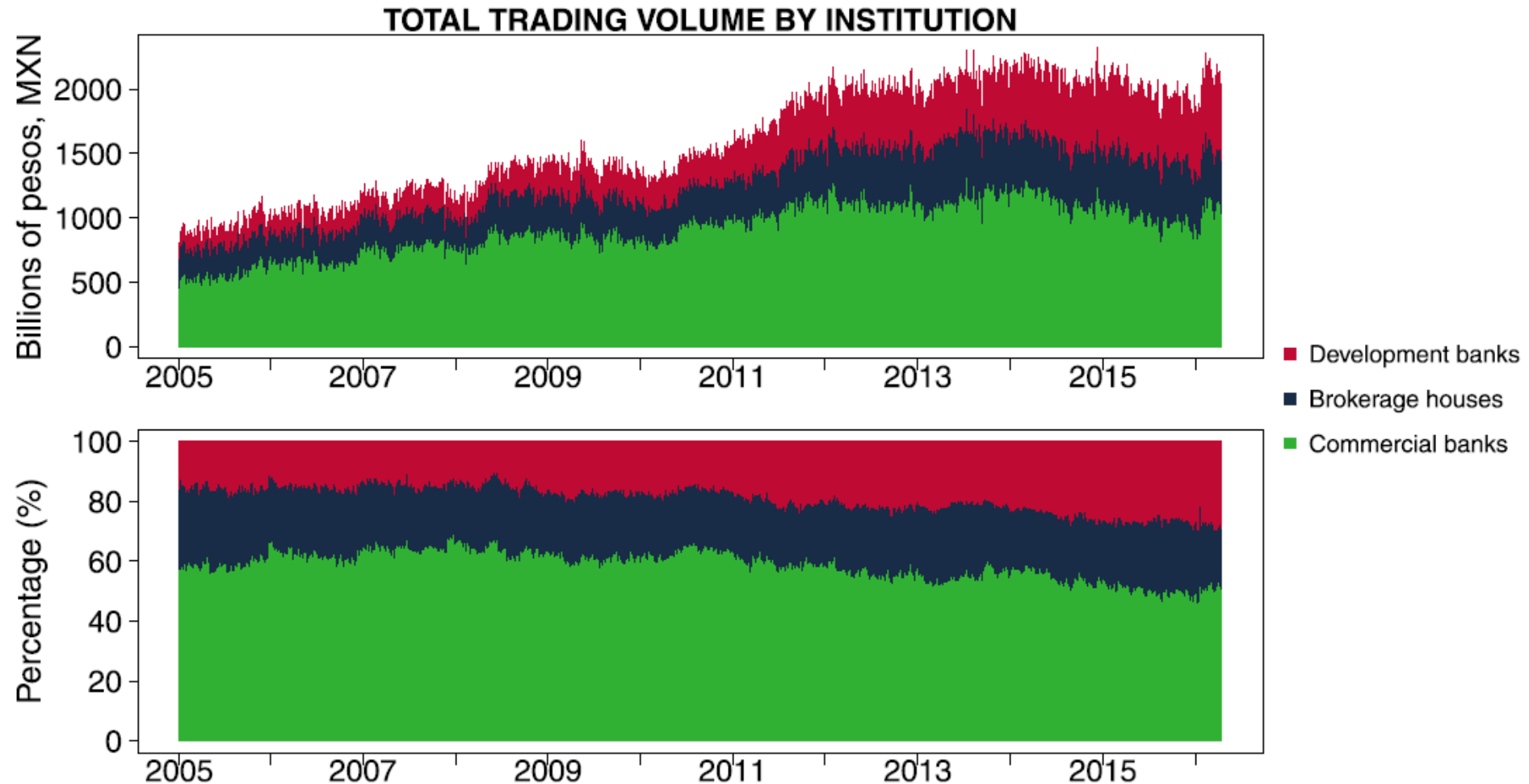
Repo transactions by maturity

NO. TRANSACTIONS BY TERM

Legend:
- MoreThan1Month
- MoreThan1WeekTo1Month
- 2DaysTo1Week
- Overnight

Repo volume by maturity

TOTAL TRADING VOLUME BY TERM

Legend:
- MoreThan1Month
- MoreThan1WeekTo1Month
- 2DaysTo1Week
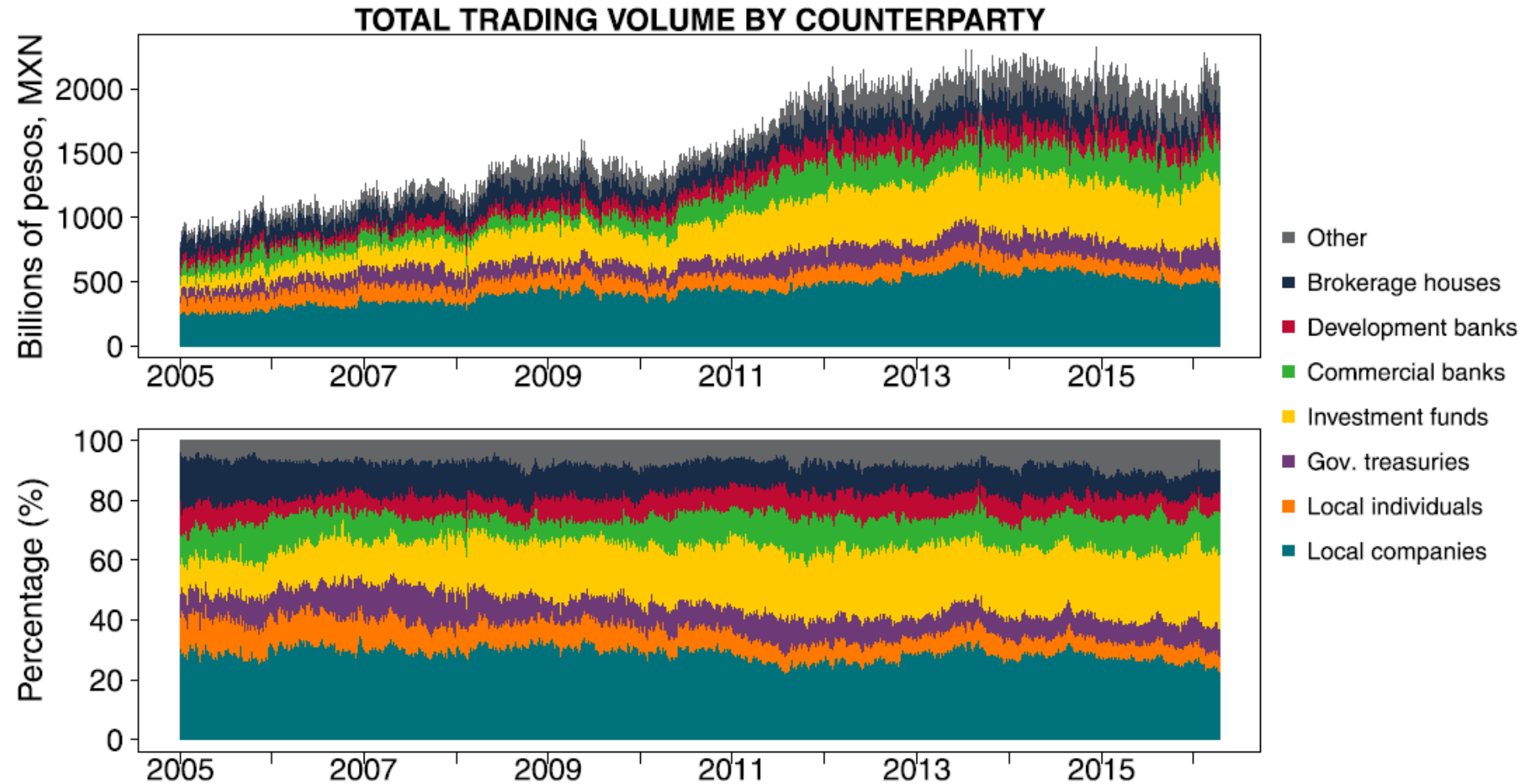- Overnight

Repo transactions by institution type

Repo transactions by counterparty type

TOTAL TRADING VOLUME BY COUNTERPARTY

Legend:
- Other
- Brokerage houses
- Development banks
- Commercial banks
- Investment funds
- Gov. treasuries
- Local individuals
- Local companies

Aggregated volume by collateral type

TOTAL TRADING VOLUME BY COLLATERAL

Legend:
- Other
- Udibonos
- Bank bonds & PRLVs
- Cetes
- IPAB bonds
- BREMs
- M bonds
- Bondes D

Repo rates and volume

REPO RATE & TOTAL TRADING VOLUME

Legend:
- Lagged total trading volume (grey)
- Avg. repo rate (red)
- Median repo rate (green)
- Maximum repo rate (dark blue)
- Minimum repo rate (orange)

Y-axis (left): Billions of pesos, MXN
Y-axis (right): Percentage (%)

Repo rates standard deviation

REPO RATE'S STANDARD DEVIATION & AVG. TRADING VOLUME
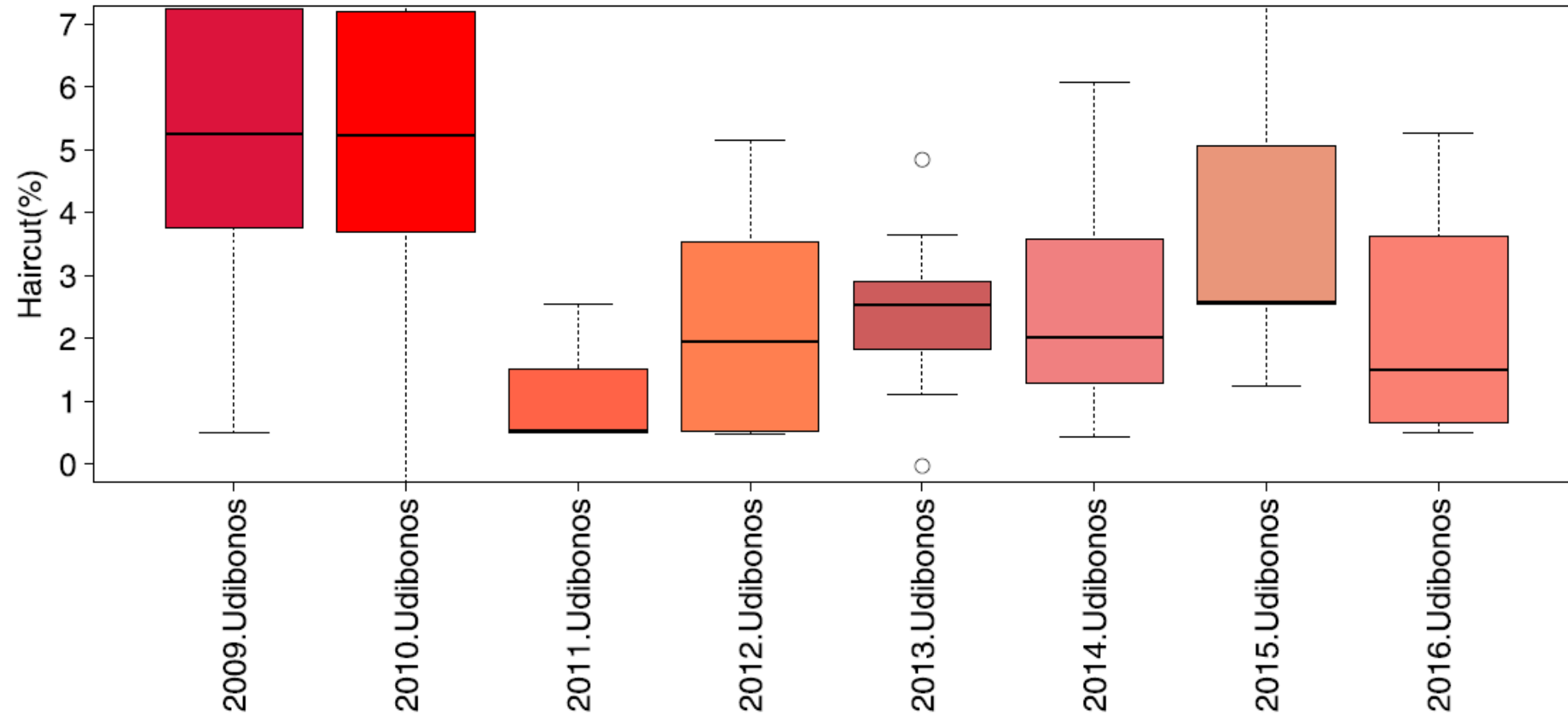
- Lagged avg. trading volume
- Repo rate's sd
- Repo rate's weighted sd
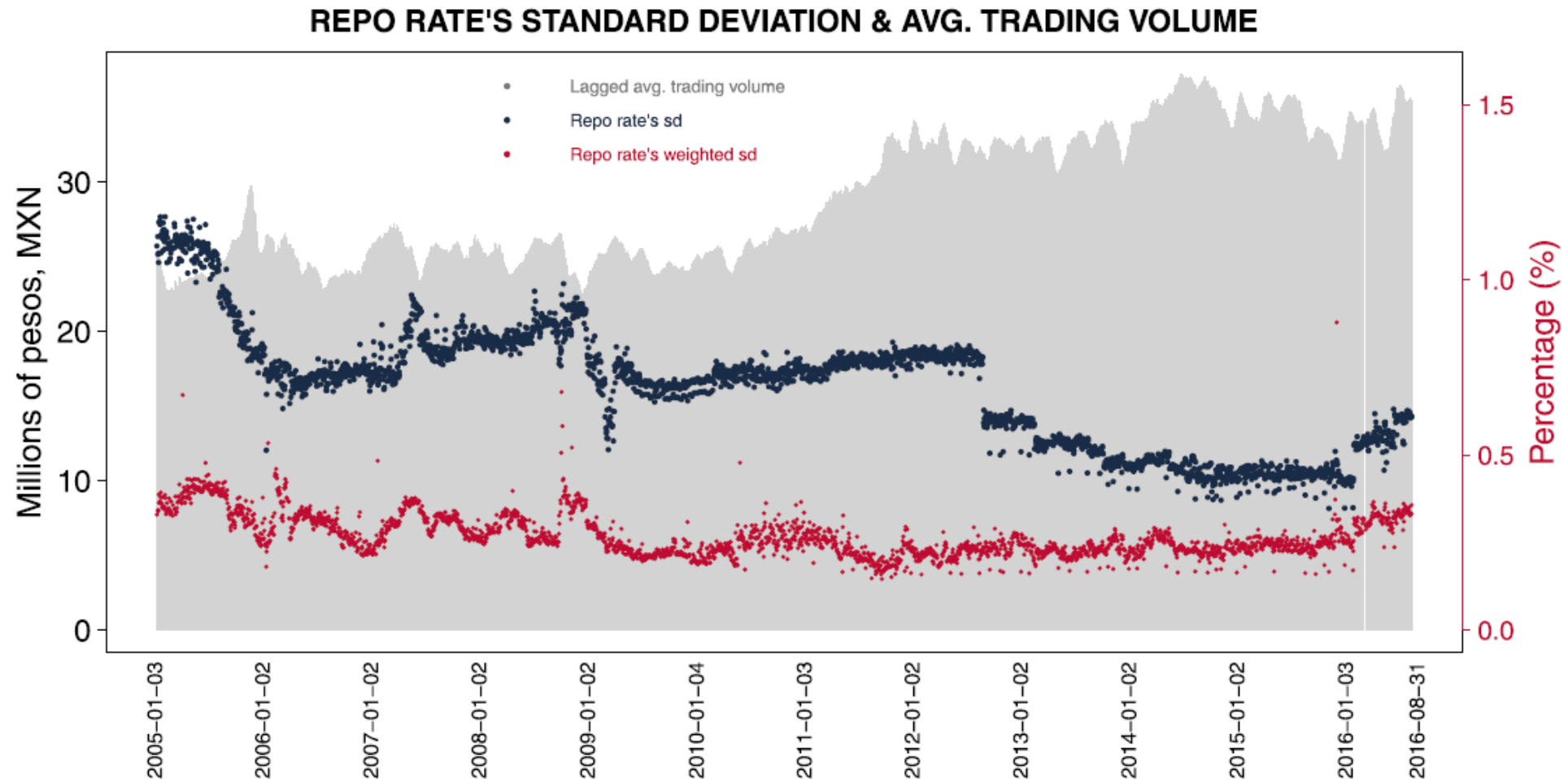
Haircuts distributions

Haircuts by year: Udibonos,
Banco de México acting as cash lender, 2005–2016

The repo network

Other
Local individuals
Commercial banks
Local companies
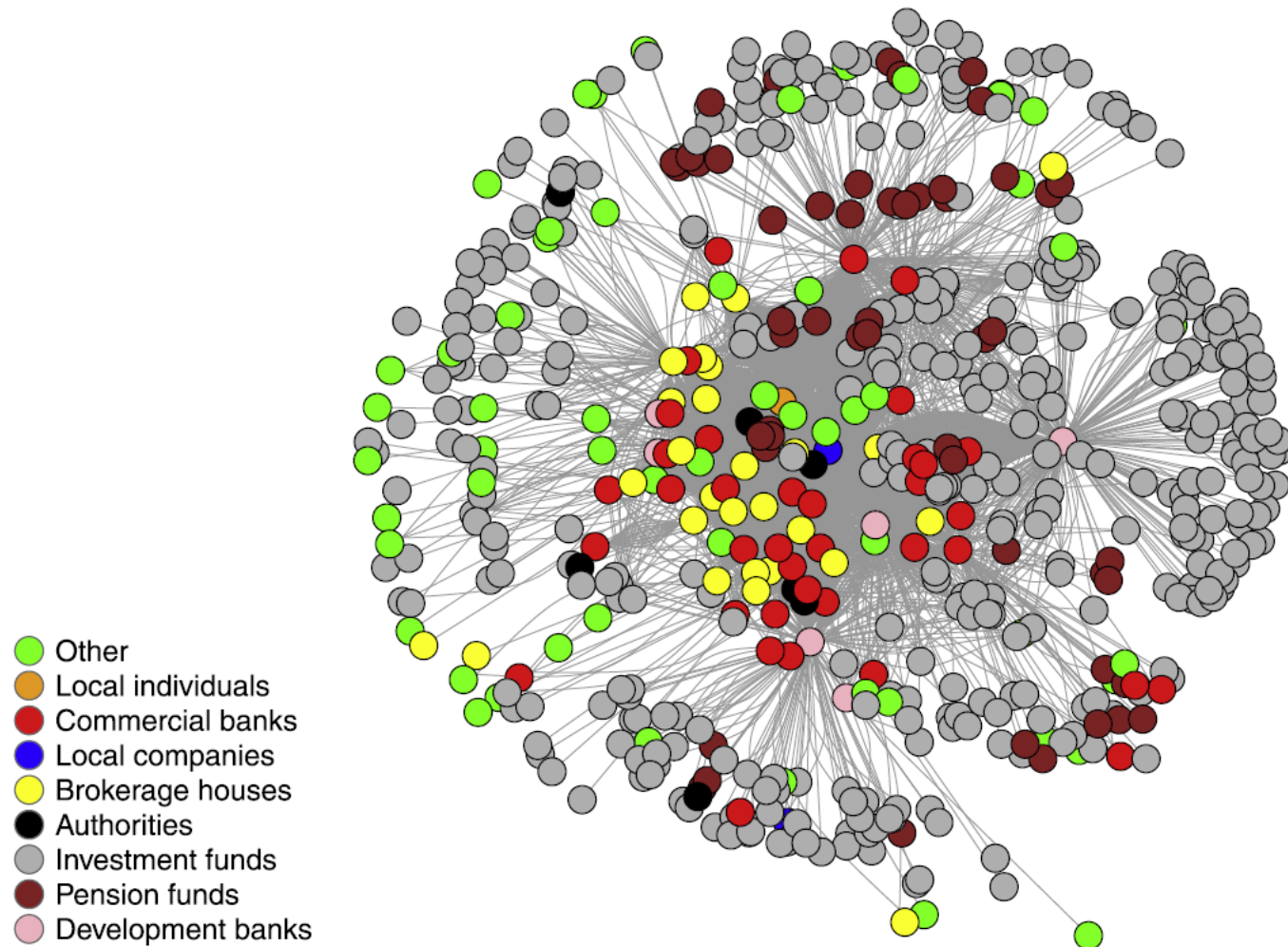Brokerage houses
Authorities
Investment funds
Pension funds
Development banks

Fig. 20. The complete repo network on December 31, 2015.

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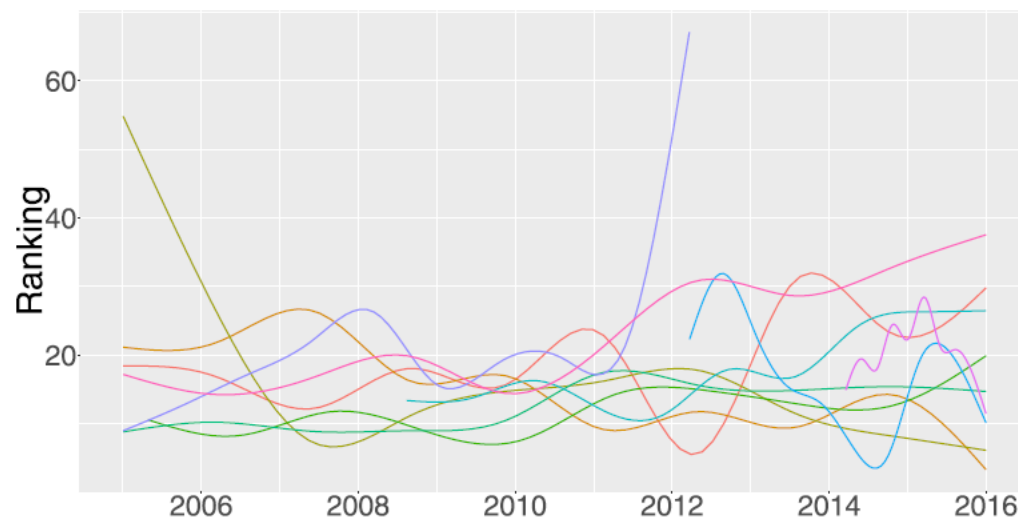
Interbank repo network
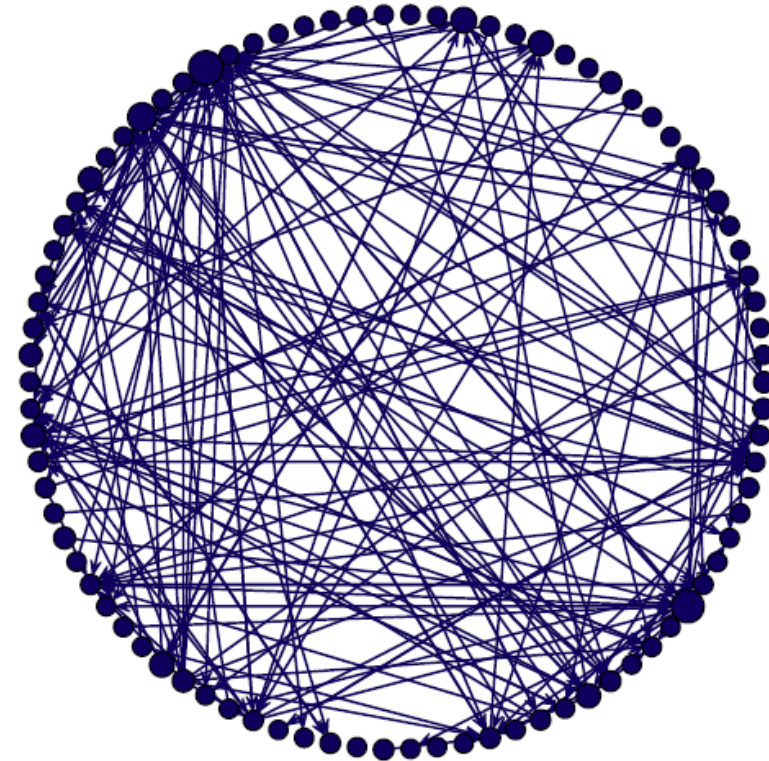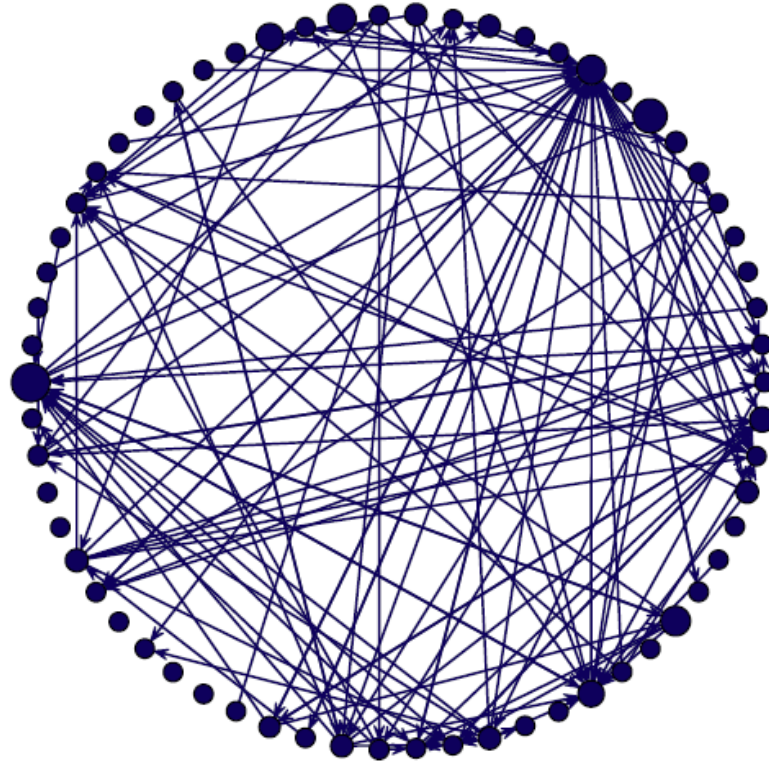
(a) Extended repo network January 2, 2005. (b) Extended repo network December 31, 2015.

Centrality in the repo market network
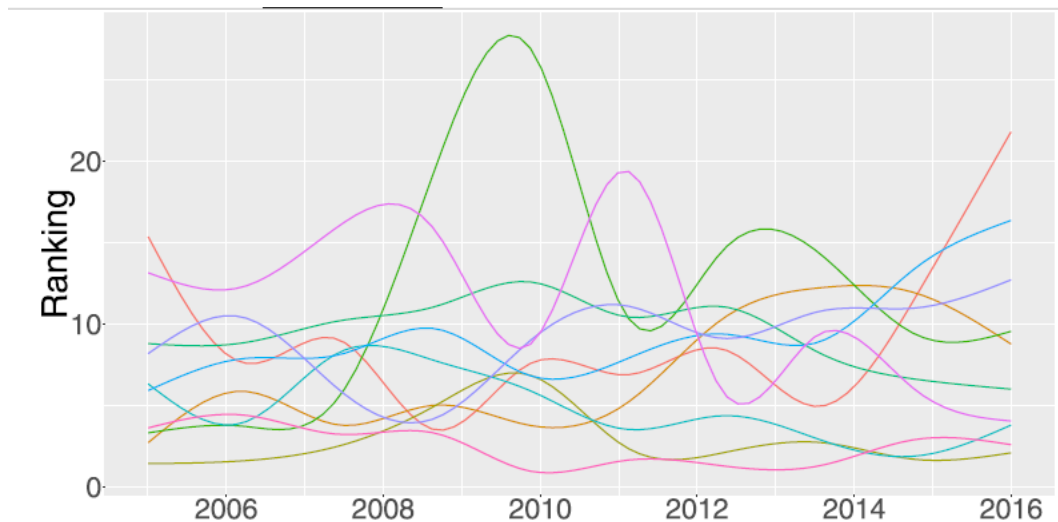
(a) First group of nodes.

Interconnectedness and systemic risk

Multilayer networks
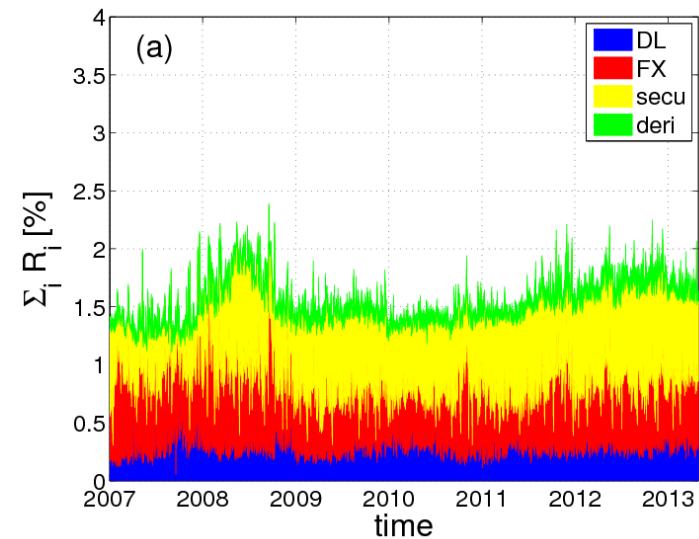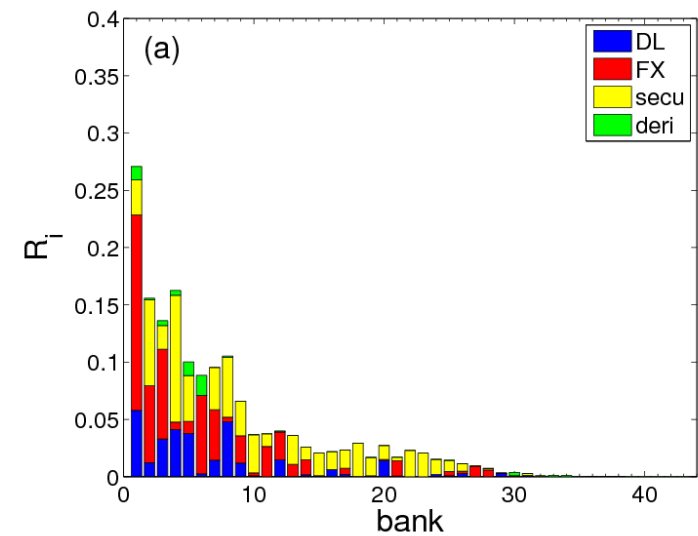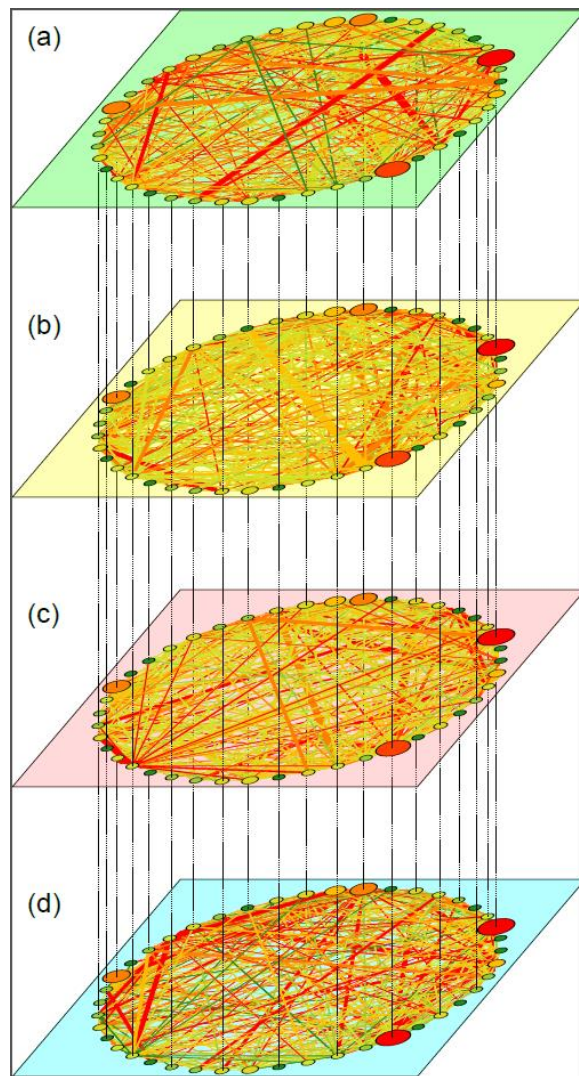
Sovereign and financial risk

o Banks are exposed to systemic risk directly and indirectly

- o Propagates through different channels and mechanisms

o *Overlapping portfolios*

- o Indirect interconnections: Financial institutions investing in common assets. This is an important source of systemic risk and contagion

o *Poledna et al (2019)[1]* propose a network model to quantify systemic risk from direct and indirect exposures

Red: assets
Blue: banks.
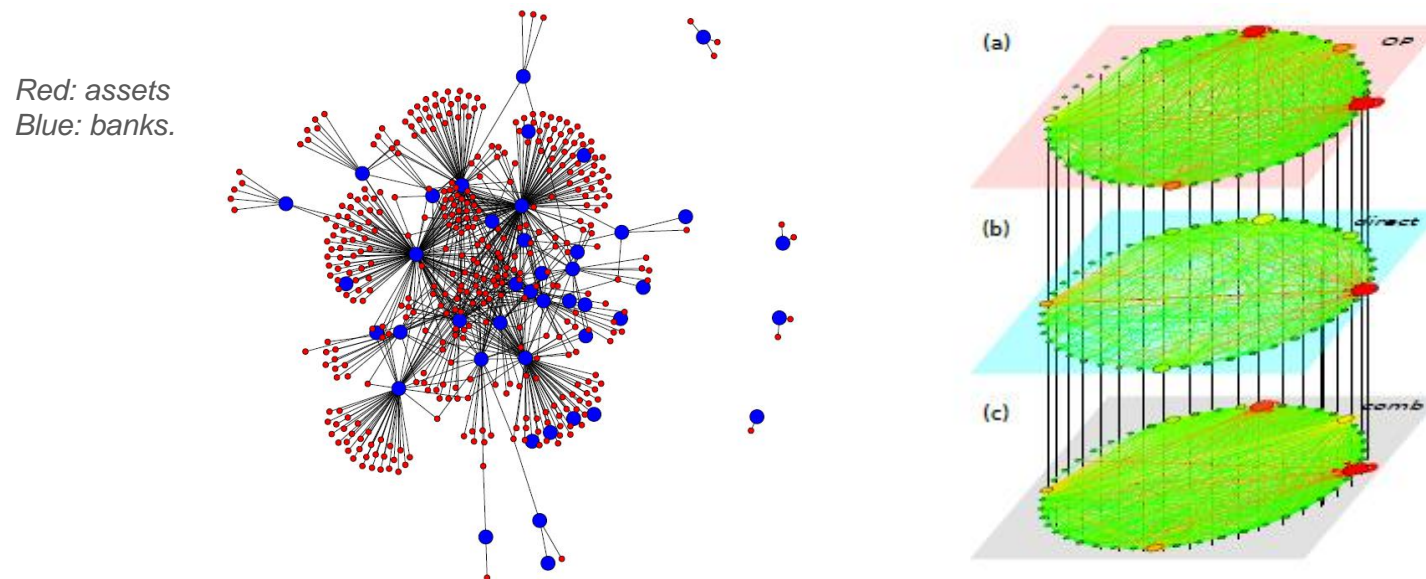
Poledna, S., Martinez-Jaramillo, S., Caccioli, F., Thurner, S., 2019. "Quantification of systemic risk from overlapping portfolios in the financial system", Journal of Financial Stability

Sovereign and financial risk

- The systemic risk metric from direct exposures is considerably lower tan the one from overlapping portfolios.
- When both exposures are considered together the metric is higher that the sum of the individual metrics.
- This metric could be even higher if sovereign exposures are considered.

Blue: direct
Red: OP
Black: combined
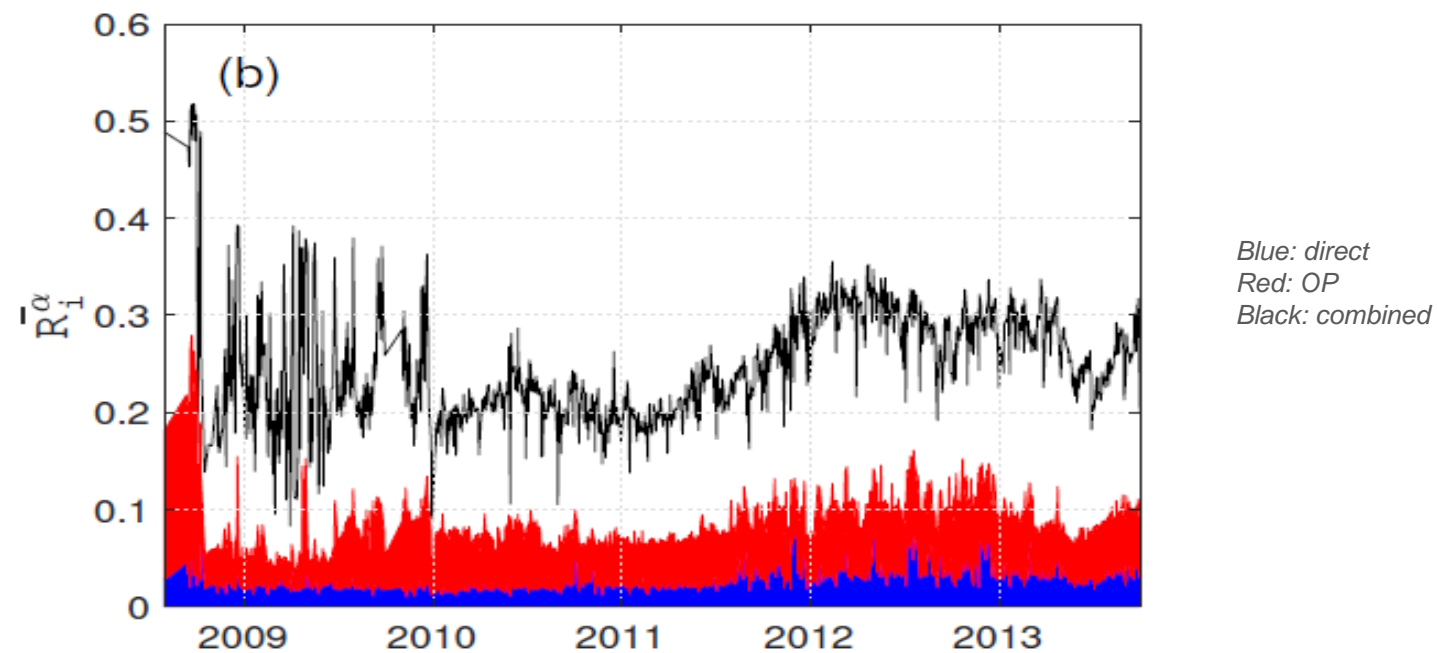
The doom loop

o Existing capital regulation assigns zero risk weight to domestic sovereign securities.

o Government debt holdings are exempted from concentration limits and are even encouraged by the recent liquidity regulation.

o Some jurisdictions have acknowledged the importance of this problem. For example, in Alogoskoufis and Langfield (2018)

o The author concludes that by changing the sovereign exposures treatment in the capital requirements could lessen the impact of this negative feedback loop.

o A non-exhaustive list of related works includes: Farhi & Tirole (2018), Acharya & Rajan R. (2013), Acharya et. al. (2014), Brunnermeier (2015).

Climate change and financial stability
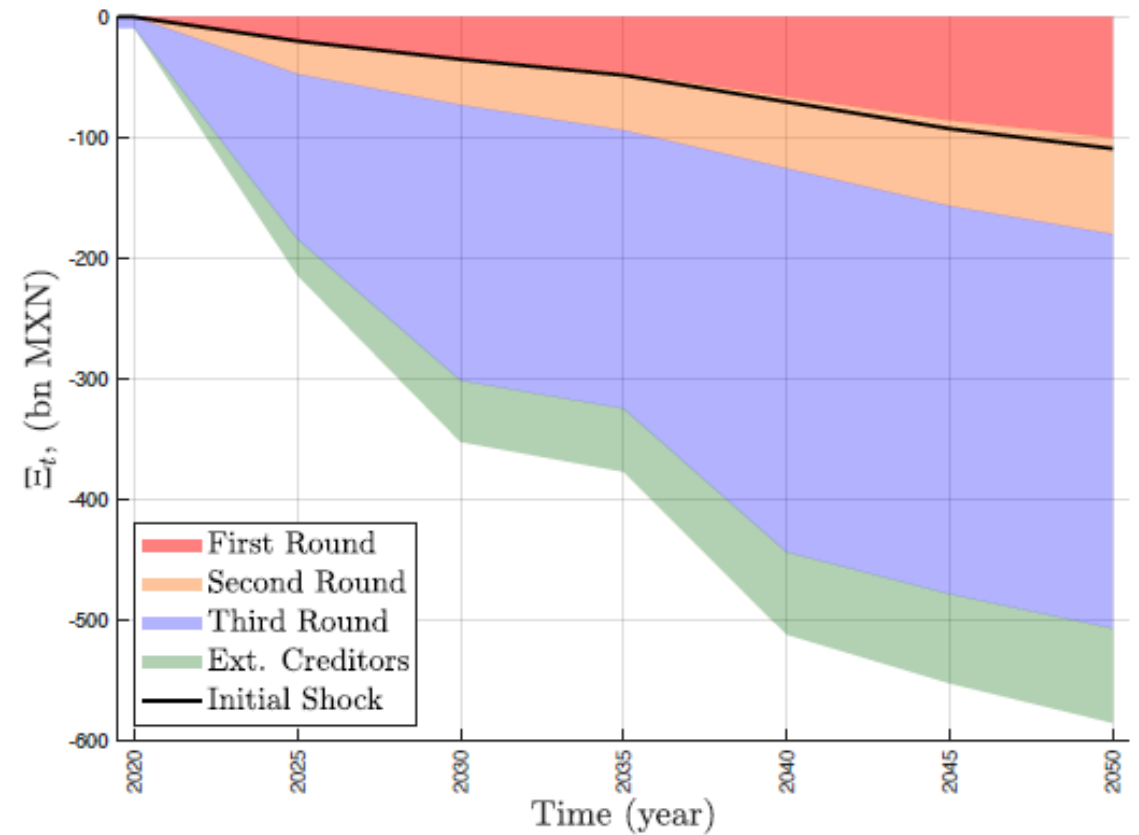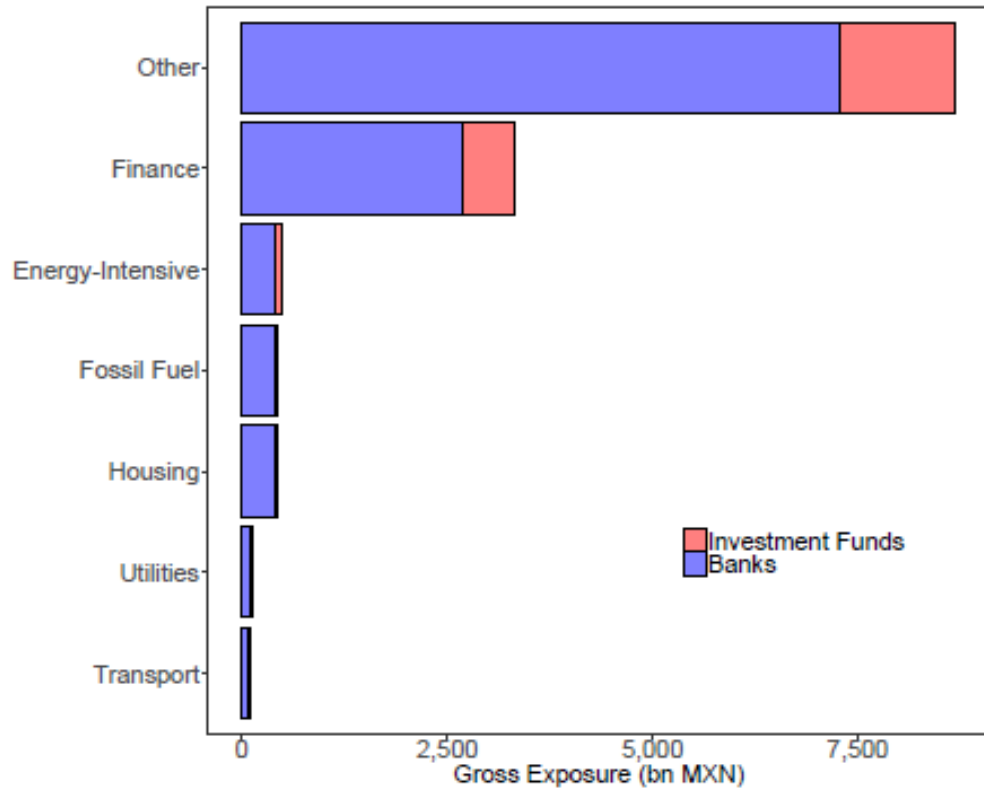
Interest Rate Spread in the Mexican Secured and Unsecured Interbank Markets explained by Network Measures*

*Téllez-León et al., Which Network Measures explain the Interest Rate Spread in the Mexican Secured and Unsecured Interbank Markets by regularized GLMs with Machine Learning, 2019.

Trading relationships- Review of Literature

o Using data from the Fedwire Funds Service, Afonso at al. (2013) found that the liquidity of banks rely less on non-frequent transactions and more on funds from institutions with which they have a stable funding relationship.

o In Han and Nikolaou (2016), the authors investigate the influence that trading relationships have on the terms of trade in the US tri-party repo market, they find evidence that although trading parties perform transactions with a large number of counterparties, they tend to have a small set of counterparties with whom they prefer to trade.

o In Temizsoy et al. (2015), using data from the e-MID interbank market, they find that long term relationships between banks exist and have a positive impact on the rates and volume for both lending and borrowing. Similar results are presented in Bräunig and Fecht (2017) for the German interbank market during the financial crisis.

o Van der Leij and Martinez-Jaramillo (2019) found a trading relationship in the secured (OTC repo) and unsecured markets and these relationships have impact on the terms of trading.

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Interest Rates and Network Structure – Review of Literature

o   In Iori et al. (2014), the authors conduct an analysis of the determinants of spreads on the e-MID by taking into account the behavior of banks and market microstructure.

o   Gabrieli (2012), previously, investigated the role of network centrality on the determinants of interest rates.

o   In Temizsoy et al. (2017), the authors investigate the role of centrality on the rates in the interbank markets. They (using data from e-MID) find that centrality plays an essential role on the rates banks get on the unsecured money market, and even more, that this effect became more significant during the crisis of 2008.

o   Most of the previously mentioned works involve interbank unsecured lending markets.

Unsecured market

o The data used for this study comprises daily deposits and loans transactions in domestic currency between commercial banks.

o From the whole interbank unsecured market, the overnight segment accounts for about 90% in terms of volume for a typical day.

o In terms of number of transactions (loans) the share is slightly higher, for about 92%.

o Unlike the experience in other jurisdictions, neither the unsecured nor the repo market in Mexico suffered a sharp decline on activity.

Funding structure

o The figures below show the structure of the main deposits of commercial banks in Mexico.

o We used regulatory balance sheet data obtained from an institutional repository at Banco de México.

o Sight deposits and term deposits add up to more than 50% of the total system funding. Secured transactions are in the third place, which constitute more than 85% of the deposits, while unsecured market represents only around 1%.

Funding structure of the banking system
(Percentage)

■ Current Account   ■ Term   ■ Secured Market
■ Bank bonds   ■ Unsecure market   ■ Subordinated Obligations

Trading volume Secured vs Unsecured

■ Secured Market   ■ Unsecured Market
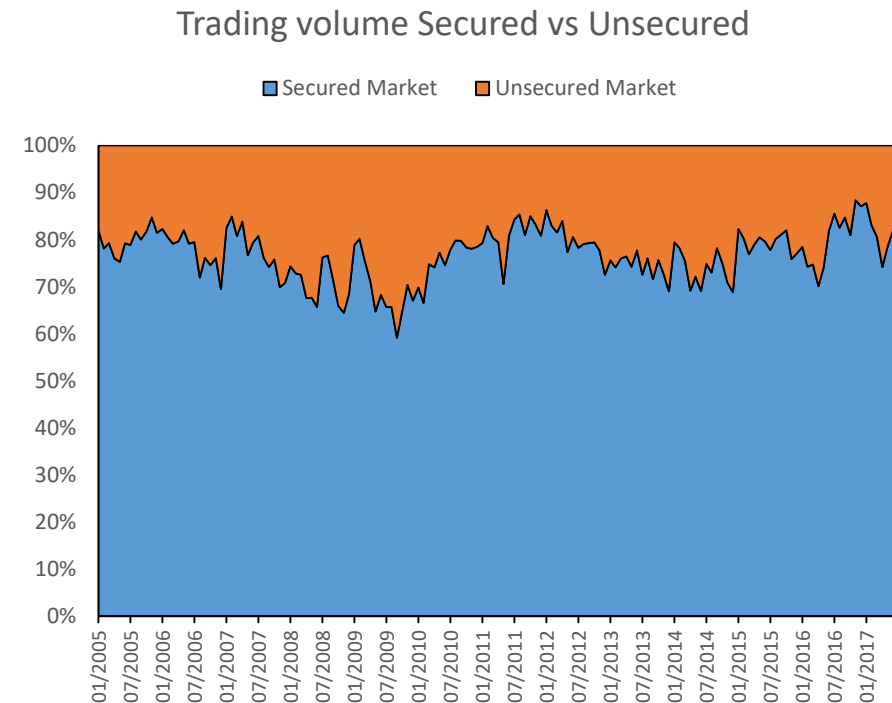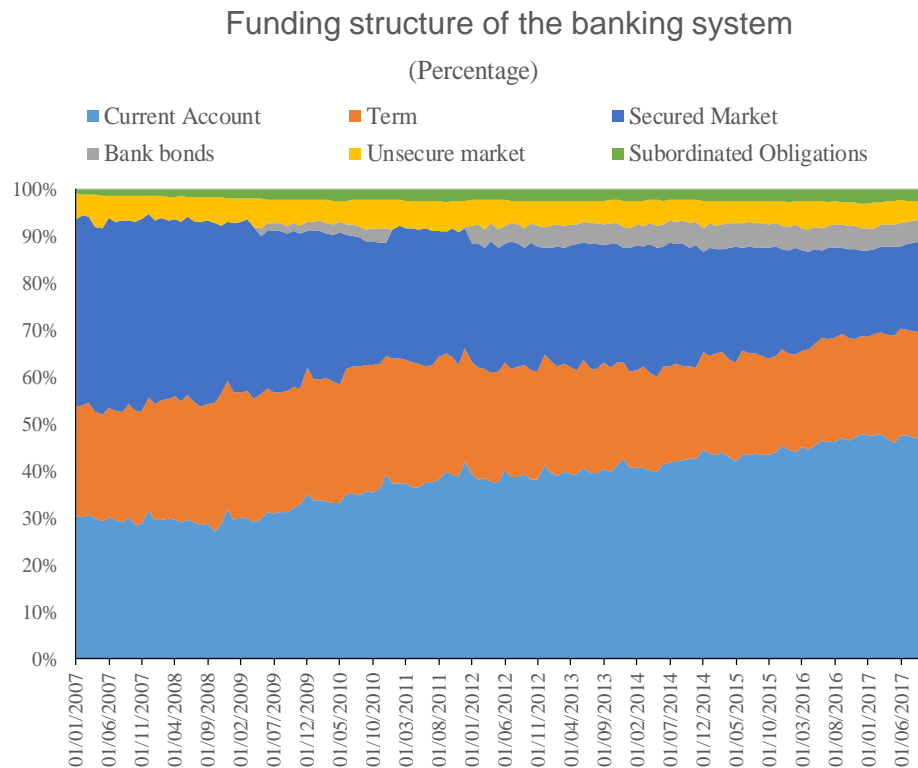
Source: Elaborated by the authors with data from the National Banking and Securities Commission and Banco de México.

Model and Econometric analysis

Centrality

- The main idea of centrality is to identify important nodes in a network.

- Freeman (1978) introduces the concept of centrality in social networks, which can be extended to financial networks.

- In Bonacich (1987), we can find further discussion on the centrality and the relation of it, with the power that a participant has in a network.

- Nowadays, the plethora of centrality metrics makes it hard to decide which metric is more useful to identify relevant nodes in a network.

- There are many classes of centrality and among the most important ones we can find: degree, closeness, betweenness, eigenvector, cross-clique, Katz, PageRank, DebtRank, SinkRank, etc.

- The DebtRank centrality metric measures the potential contagion that an institution poses to the system.

- A higher DebtRank implies a more systemic institution due to the higher potential losses such an institution can impose on the system.

- In Martinez-Jaramillo et al. 2014, the authors perform an empirical study on centrality for interbank exposures and payment systems networks.

Financial network measures: Explanatory variables

○ The market network is represented in matrix form. We denote this matrix by W, with its entries $w_{ij} \geq 0$ represents the amount of money that institution i lends to j takes from institution i, $w_{ii} = 0$ for all $i \in \{1, \dots, N\}$, where N is the number of institutions represented in W.

○ We can define two additional matrices: the outflow matrix W^+ and the inflows matrix W^-. Accordingly, the entry w_{ij}^+ defines a money flow from institution i to institution j and the entry w_{ij}^- defines a money flow from institution j to institution i, this implies that $W = W^+ + W^-$ and $W^+ = (W^-)^T$.

○ Some of the network measures are calculated from the adjacency matrix A, defined by

$$a_{ij} = \begin{cases} 0 & \text{if } w_{ij} = 0, \\ 1 & \text{otherwise.} \end{cases}$$

Model specification

As in Temisoy et al. 2017, the dependent variable in the model is the monthly volume-weighted average interest rate spread for each pair of institutions i, j, which is defined as:

$$S_{ij,t} = \frac{1}{\sum_{n=1}^{N_{ij,t}} V_{ij,n}} \sum_{n=1}^{N_{ij,t}} \left(r_{ij,n} - r_m^{-d}\right) * V_{ij,n}$$

where

$$r_m^{-d} = \frac{\sum_{n=1}^{N_{ij,d}} \sum_{j=1} \sum_{i=1} r_{ij,n} * V_{ij,n}}{\sum_{n=1}^{N_{ij,d}} \sum_{j=1} \sum_{i=1} V_{ij,n}}$$

$r_{ij,n}$ and $V_{ij,n}$ are the transaction level interest rate and volume, respectively, for each pair of banks i, j for $i \neq j$.

$N_{ij,t}$ is the number of transactions for the bank pair i, j at period t for $i \neq j$.

r_m^{-d} is the daily volume-weighted average rate over all transactions carried out by the bank pairs.

We consider the following centrality measures:

ACCESSIBILITY_B	CLOSENESS_L	DEBTRANK_B	DEGREE_L	EXPECTEDFORCE_B	KATZ_CENT_L	PERCOLATION_B
ACCESSIBILITY_L	CLUSTERING_B	DEBTRANK_HAT_B	DEGREE_OUT_B	EXPECTEDFORCE_L	KATZ_CENT_W_B	PERCOLATION_L
AFFINITY_B	CLUSTERING_L	DEBTRANK_HAT_L	DEGREE_OUT_L	HHI_IN_B	KATZ_CENT_W_L	SINKRANK_B
AFFINITY_L	CORE_PERIPHERY_B	DEBTRANK_L	EEC_B	HHI_IN_L	PAGERANK_B	SINKRANK_L
BETWEENESS_B	CORE_PERIPHERY_L	DEGREE_B	EEC_L	HHI_OUT_B	PAGERANK_L	STRENGHT_L
BETWEENESS_L	CROSS_CLIQUE_B	DEGREE_IN_B	EIGENVECTOR_B	HHI_OUT_L	PART_B	STRENGHT_B
CLOSENESS_B	CROSS_CLIQUE_L	DEGREE_IN_L	EIGENVECTOR_L	KATZ_CENT_B	PART_L	

Where B means the institution is the borrower in the spread and L for lender.

Model specification

- Control variables:
  - AM_PM_Ratio: Percentage of operations that occur in two different partitions of a day of activity, it is defined as:

  $$\frac{Morning\ Operations\ -\ Evening\ Operations}{Total\ Operations\ in\ the\ Day}$$

  - Transaction Ratio: It is used to identify significant relationships in the market, is defined as the ratio between the number of transactions of a given pair of institutions and the total number of transactions in the market.

  - Capital ratio.

  - Delinquency ratio.

- A multicollinearity test was performed to eliminate redundancy in the data.

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Model specification

o Least-Squares models with fixed effects were estimated, alongside a GMM model with instrumental and control variables. Finally, we estimated a GLM resorting to the following regularization techniques: Ridge, Lasso (least absolute shrinkage and selection operator) and Elastic Net.

o The final fitted model is specified as:

$$\Delta S_{it} = \beta_1 \Delta S_{it-j} + \beta_2 \Delta X_{it} + \beta_3 \Delta C_{it} + \Delta u_{it}$$

$i,$ denotes banks, t indexes time.

S_{it} is the spread of the interest rate at time t.

X_{it} contains the financial network metrics.

C_{it} represents the controls variables: AM/PM, capital, delinquency and transaction ratio.

u_{it} are the unobserved residuals.

o The estimation of the GMM model used variables of control and lagging values as instruments. The standard errors were estimated with Robust- White period weights from final interaction.

o We estimated the Sargan's *J* test for each model GMM weighting matrix, white period, innovations have time series correlation structure that varies by cross-section.

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Results

Results of the econometric model

Many different specifications were estimated for both markets:

- o Full sample period.
- o Pre-Lehman default period.
- o Crisis period.
- o European crisis (relatively calmed period for Mexico).
- o Uncertainty about the rescue program for Greece.
- o Minutes about the reduction in the assets purchase program (relatively calmed period for Mexico).
- o End of the asset purchasing program (more stressful period for Mexico).

These periods where validated by resorting to a stress index, used at the Mexican Central Bank, and performing Chow break point tests to validate such periods.

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Sample periods

○ The selected periods based on the statistical test to detect breakpoints, it was performed on the Stress Index, which is a variable that allows us to know the periods of marked stress.
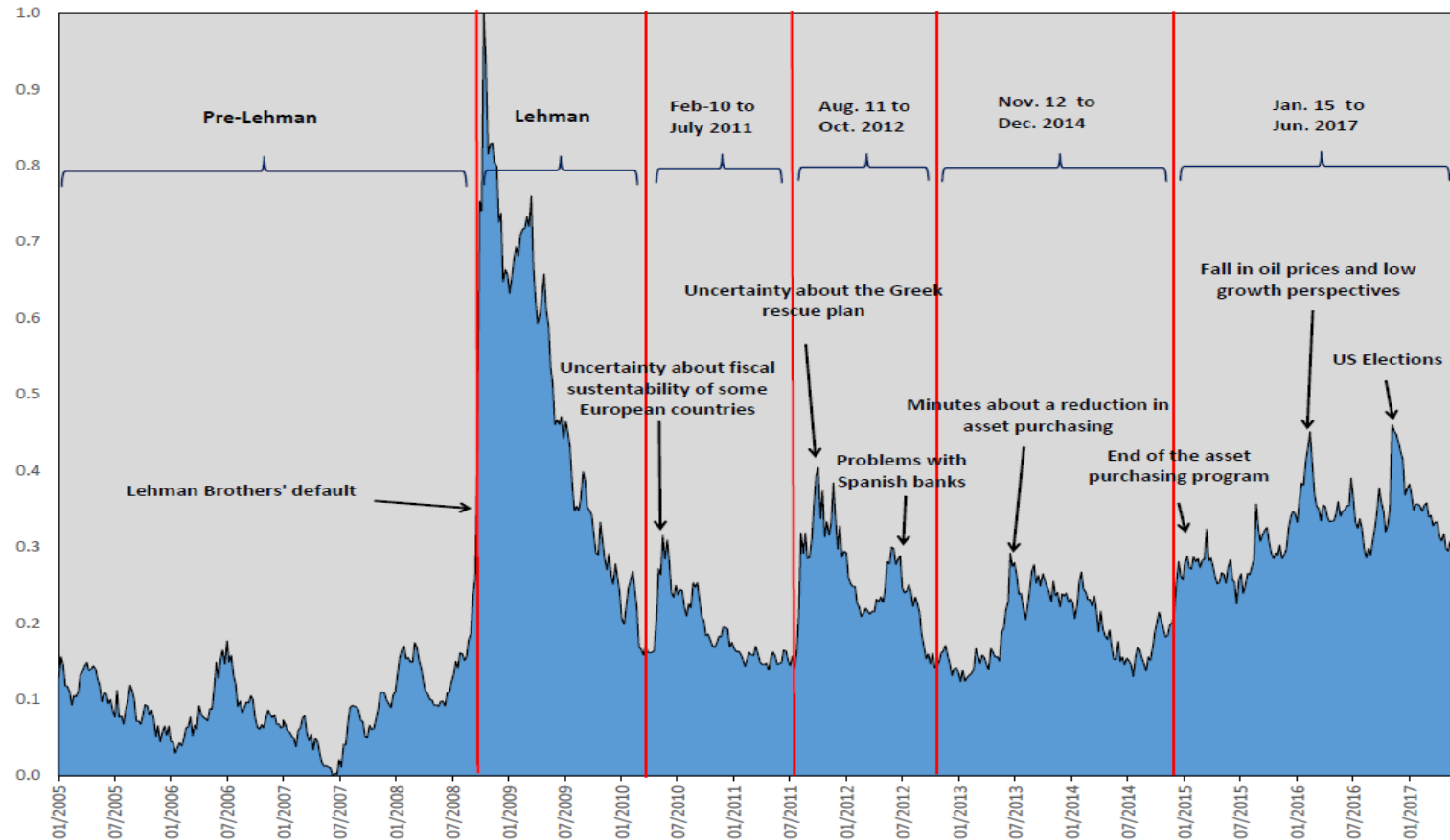
Source: Elaborated by the authors with data from Banco de México.

Secured
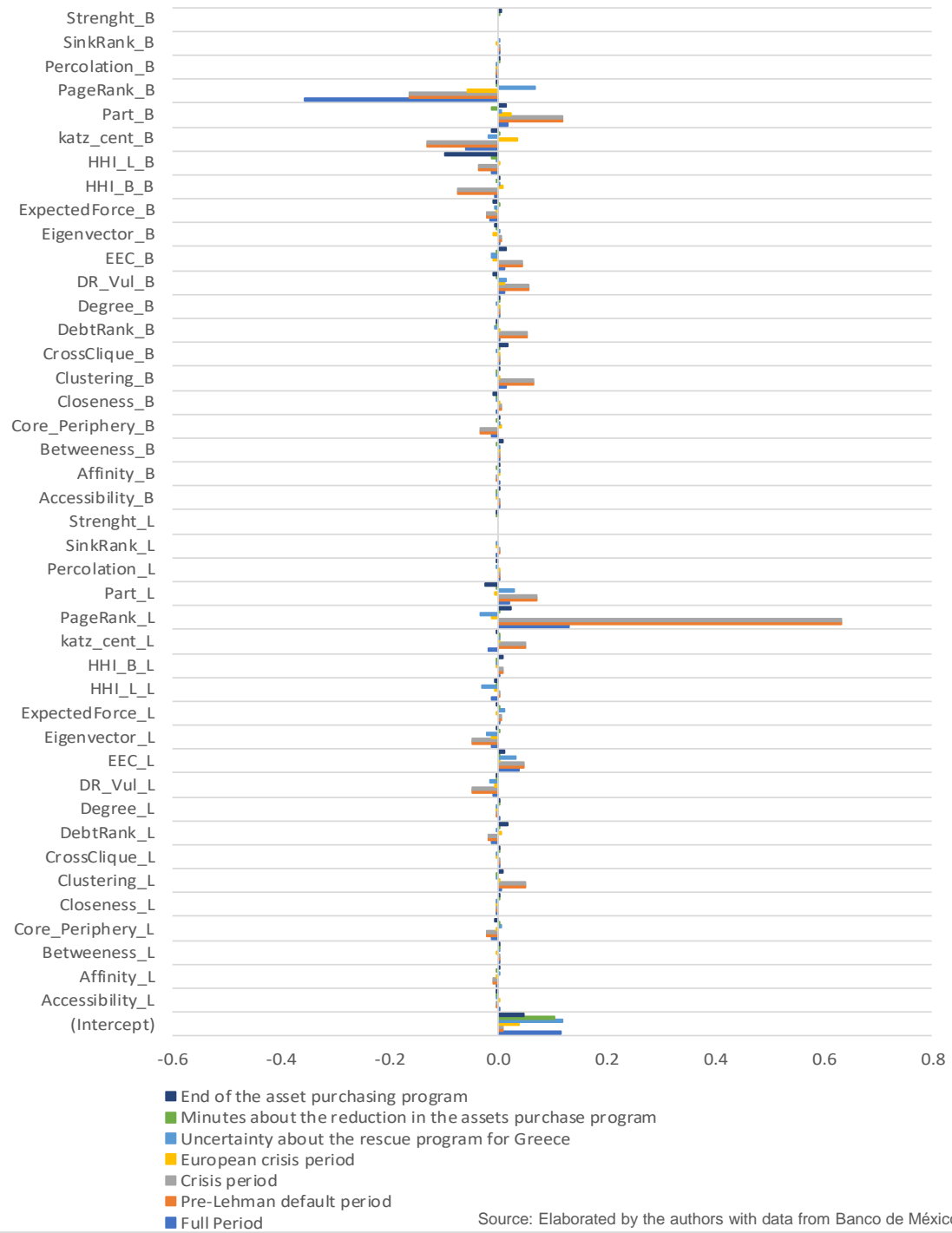
Source: Elaborated by the authors with data from Banco de México.

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Secured

- During the first three periods, most of those 8 metrics of centrality are highly significant.

- Borrowing and lending network metrics compatible with the Too Interconnected to Fail (TITF) hypothesis, in general in all the periods in this market, being central was linked to cheaper access to liquidity and better lending conditions.

- This being a collateralized market, systemic risk centrality metrics (DebtRank) are less important.

Unsecured

Source: Elaborated by the authors with data from Banco de México.

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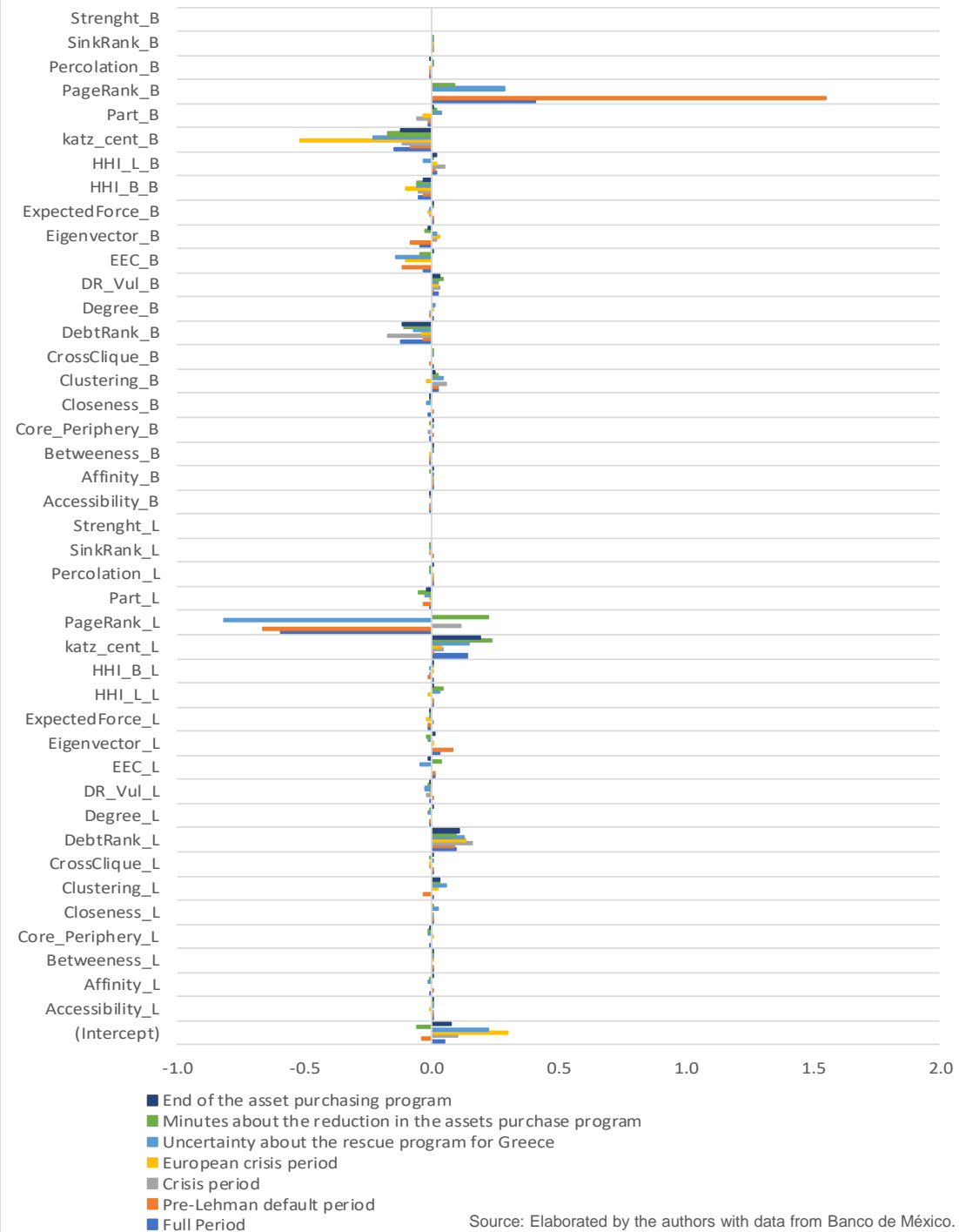
Unsecured

- During the first three periods, most of those 8 metrics of centrality are highly significant.

- Borrowing and lending network metrics compatible with the Too Interconnected to Fail (TITF) hypothesis, in general in all the periods in this market, being central was linked to cheaper access to liquidity and better lending conditions.

- Only PageRank (topological metric) signals in a very different direction to DebtRank (systemic risk metric).

- These stresses the importance of consider several centrality metrics and, in particular, with economic interpretation.

Evolution spread distribution for the secured and unsecured interbank market

Source: Elaborated by the authors with data from Banco de México.
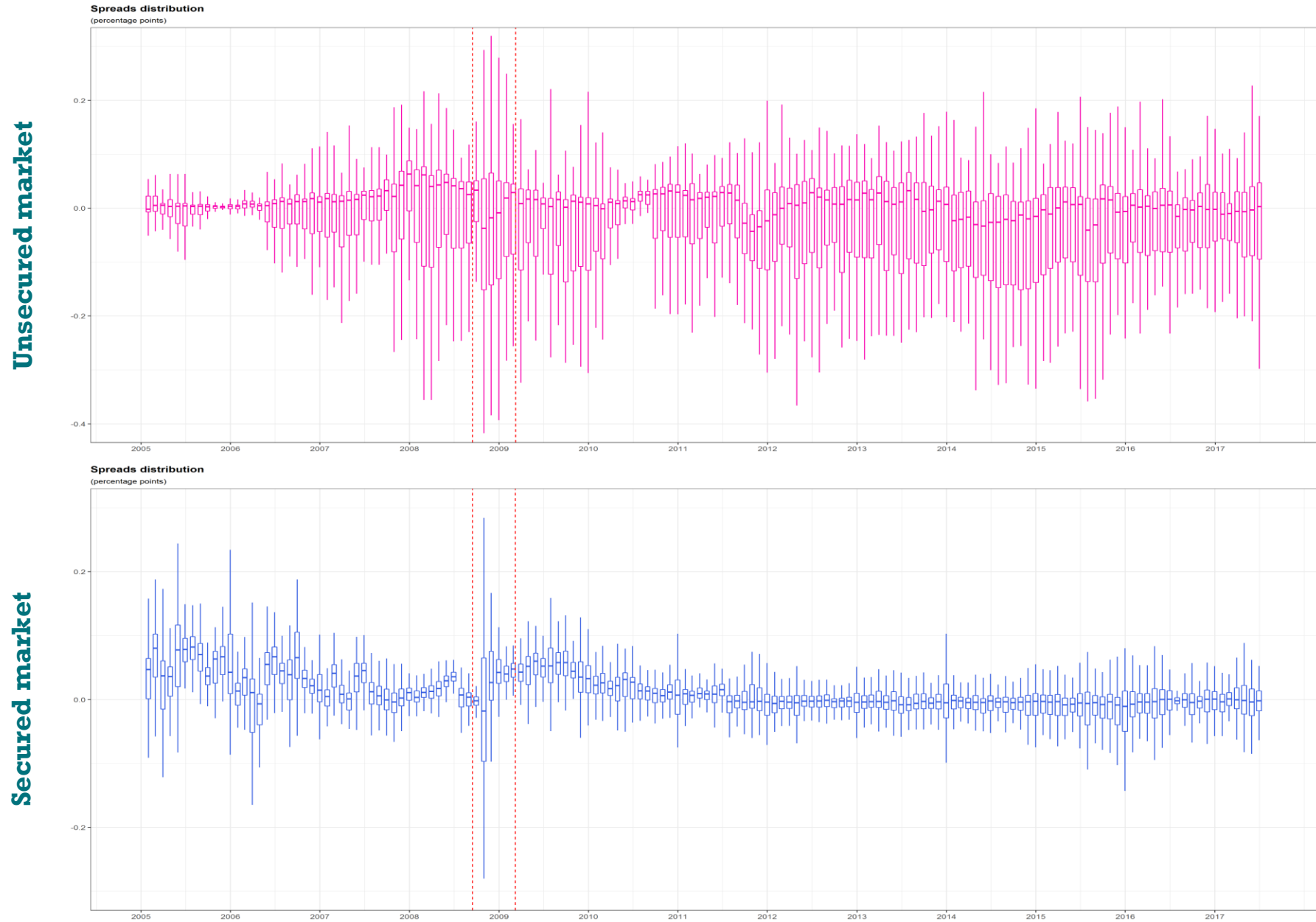
Key findings

Is centrality important?

o It seems that there is a strong relationship between centrality and the term conditions in the unsecured and secured lending markets.

o On the full sample estimations the evidence was inconclusive regarding the Too Interconnected to Fail (TITF) hypothesis for both markets.

o Splitting the sample for different periods lead to similar results.

o There is evidence of a relationship between centrality and spreads on both markets.

Key findings

o The network structure in the unsecured and secured markets appears to be informative on the spreads.

o It seems that higher centrality is related to benefits in terms of rates for borrowers and lenders, in particular, for the unsecured interbank market and in certain periods of time.

o There are many more aspects of the modeling of financial stability and systemic risk which can be tackled by using network theory and models.

o There are many other relevant markets and institutions for which similar studies can be done.

o The research agenda is still open with many opportunities for developing new (multilayer) network models and use their structural metrics on econometric studies.

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Contributions

o It allows us to observe if the centrality, or the notion of influence in the interbank system, is related to the interest rate differentials on each of the analyzed markets.

o We perform our study for two important interbank markets: the unsecured and the repo market.

o We selected a set of variables that cover the most important structural aspects of the financial networks that arise on each market.

o We introduce new variables which measure important features of financial networks from the financial stability point of view: the core-periphery variable and DebtRank.

o The time period is longer than for previous studies to include relevant events for the Mexican financial system.

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On Relations in the Unsecured and Secured Overnight Interbank Lending Markets*

Van der Leij et al., On Relations in the Unsecured and Secured Overnight Interbank Lending Markets, 2019.

Trading relationships

- In Van der Leij et al. (2019), we studied the existence of trading relationships and the transmission of liquidity shocks in the Mexican interbank lending market:

  o Unsecured and secured (repo) overnight loans market.

  o From the 2nd of January 2005 to the 31st of December 2013.

  o Between 27 Mexican commercial banks (of which 7 are big banks).

- We consider:

  o Persistence of repeated trading in repo and unsecured market.

  o Construction of binary trading relationship variable.

  o Effect of trading relationships on volume and interest rates.

  o Reaction of banks to negative liquidity shock in external repo funding.

Review of literature

- Boot (2000), defined relationship banking as the provision of financial services by a financial intermediary that:

  1. invests in obtaining customer specific information, often proprietary in nature; and

  2. evaluates the profitability of these investments through multiple interactions with the same customer over time and / or across products.

- From the above, we highlighted two important elements, when building a measure of interbank relationship trading: the investment of the bank, in order to obtain specific information, and the repeated nature of such activity.

- Boot (2000) and Elyasiani & Goldberger (2004), described relationship banking literature as the main purpose of solving information asymmetries.

- Afonso et al. (2013) found heterogeneity on trading relationships on the US overnight market. Additionally, they found that trading relationships are formed and they have an impact, in terms of volume and rates, in the presence of external liquidity shocks.

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Mexican Interbank Market Data

- The Mexican Interbank Lending Market

  o Daily data from the 2nd of January 2005 to the 31st of December 2013.

  o Between 27 Mexican commercial banks (of which 7 are big banks).

  o Only overnight.

- Type of loans:

  o Unsecured, involve credit risk of borrowing bank default.

  o Repo, secured by collateral:

    • Government bonds and high-quality bank securities.

    • Mortgage backed securities not allowed.

    • Only banks can act as borrower, any legal person/enterprise can act as lender.

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Trends in the unsecured and repo interbank market:
The Repo funding network by sectors

o The repo market in Mexico represents an important source of funding for financial intermediaries. Only commercial banks, brokerage houses and developments banks can fund themselves through repo transactions.

o The nodes represent the different types of market participants: Commercial Banks, Brokerage Houses, Development Banks, Private Companies, Institutional Investors, Public sector, Authorities (the Mexican Central Bank), Mexican residents and foreign residents (companies and persons).

o The size of the node is scaled to the amount of funding received and the thickness of the arc represents the volume of funding which goes in the direction of the arc.

o Nodes are colored in terms of their role on the repo market, in orange are the providers of funds and in green the funds recipients.

o Commercial banks are the most important fund receivers whereas the companies are the most important providers of funding in terms of volume.
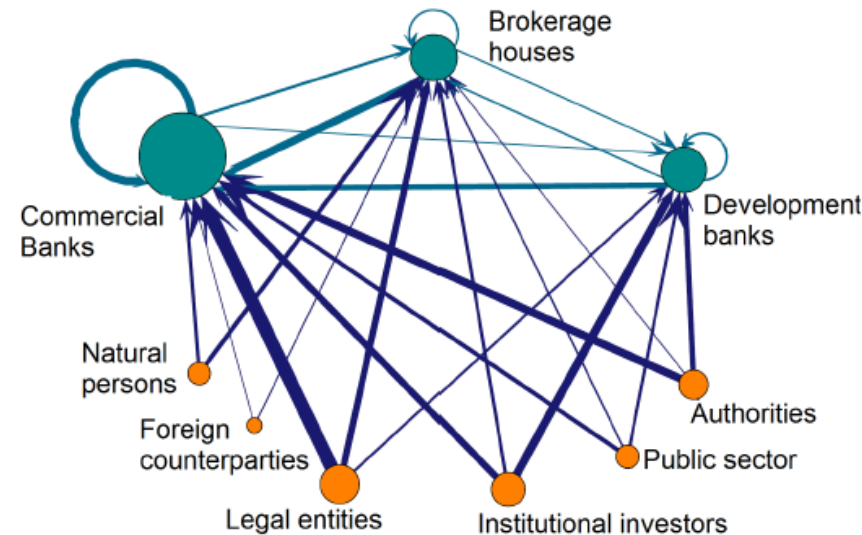
Source: Elaborated by the authors with data from Banco de México.

Aggregated volumes of unsecured loan and secured repo transactions, interbank only (billions of MXN)

o After the beginning of 2008, there was a brief period of decrease in transacted volume followed by a new period of growth, which lasted until the beginning of 2010.

o After a period of almost no growth, with high volume of trading though, a new period of rapid growth started up to recent dates in which the volume has doubled since the beginning of the period of study.
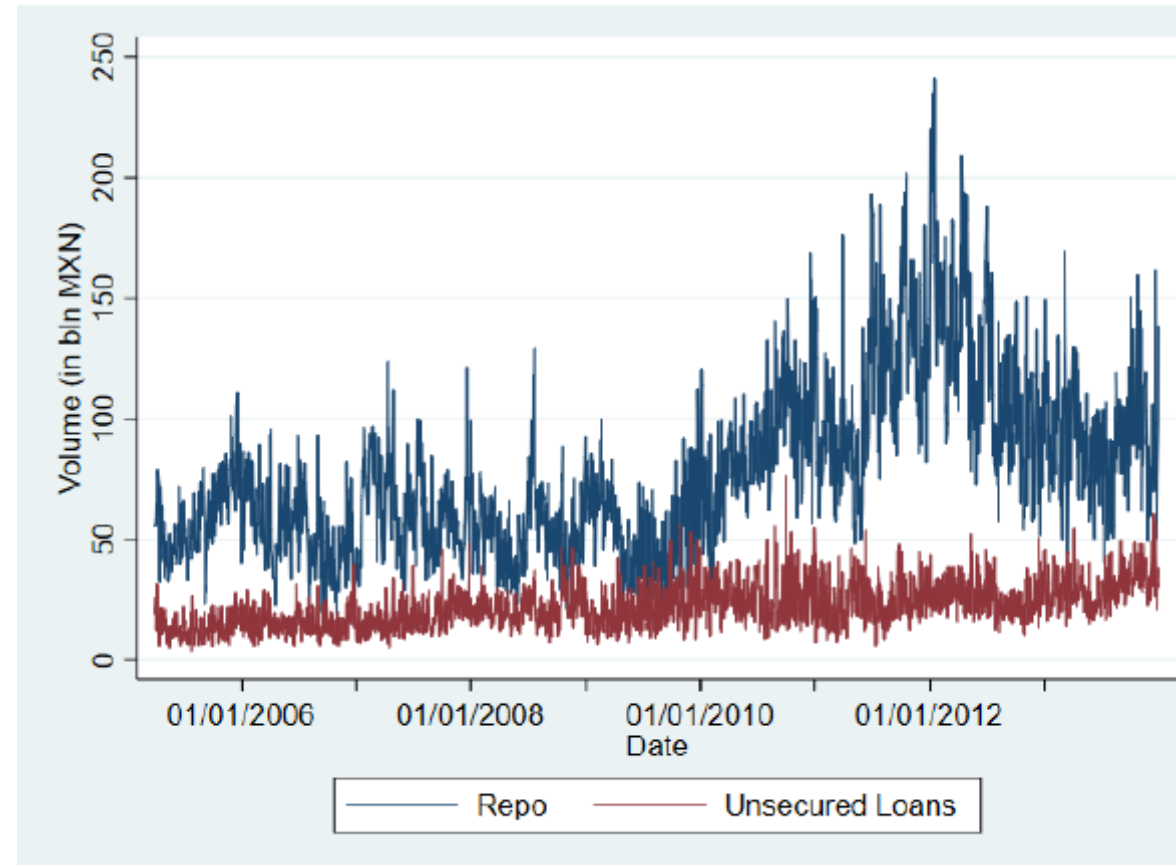
Source: Elaborated by the authors with data from Banco de México.

Repo and unsecured lending rates (weighted averages)

o Secured and unsecured rates tracked closely the reference rate, with an interesting exception: starting around the 20th October 2008, there was a sudden drop in the interbank repo rate. The spread between unsecured and secured (repo) overnight lending reached a peak of 165 basis points on October 24th, 2008.

o This sudden fall in the repo rate related to shocks to the Mexican exchange rate and yield curve in the same period. We believe that the Mexican financial market experienced a flight to quality, with investors selling long-term bonds and putting the money into short term bonds and repos, and willing to accept lower rates in an extremely volatile environment.

Source: Elaborated by the authors with data from Banco de México.

Scattered plot for the amount borrowed (x-axis) and amount lent (y-axis) for one single day for each bank on the interbank unsecured market (a) and the repo market (b)

o Figure (a) shows a scattered plot in which each point is the amount lent and amount borrowed for each day for each bank on the unsecured interbank market. Banks take both positions at the same time. There is some concentration close to both axes, but there is an important mass of points outside them.

(a)

o Figure (b) illustrates in the same way as Figure (a), the amount borrowed (on the x axis) vs the amount lent (on the y axis) for each bank for each day on the repo market. There is a slightly different picture than for the unsecured interbank market: banks borrow and lend at the same time on the interbank repo market more than on the unsecured interbank market. However, there are values close to both axis, meaning that in some occasions some banks take only one side lending or borrowing.
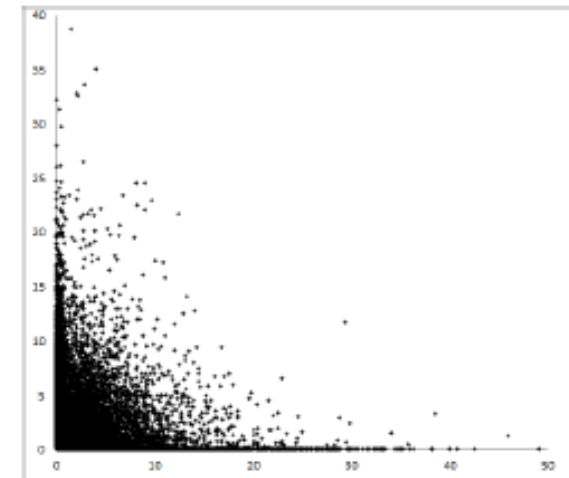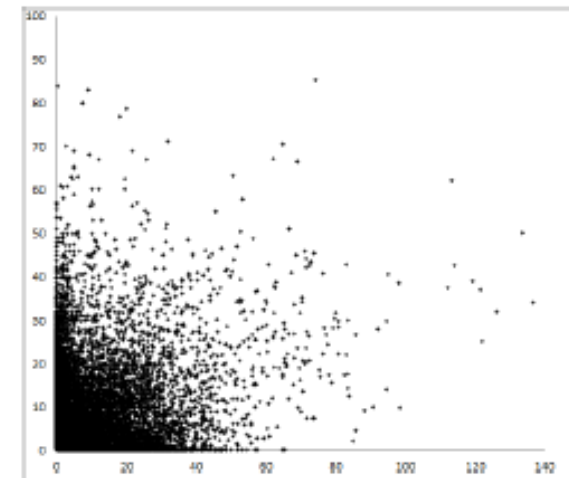
(b)

Source: Elaborated by the authors with data from Banco de México.

Existence of trading relationships

- Reasons for Trading Relationships:

  o Monitoring & Credit Risk (Rochet & Tirole, 1996).

  o Search frictions (Brauning & Fecht, 2016;Wang, 2017).

- Given that repo transactions are collateralized, credit risk should be less of a concern in the repo market:

  o Hypothesis: Trading relationships more prominent in unsecured loan market.

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Model and Econometric analysis

Measuring trading relationships: Link persistence

- Fixed effect probability framework for each market-borrower-month triple (k; i; t).

$$\Pr\left[y_{ijt} = 1 \mid Y_{ij,t-1}, X_{j,t-1}\right] = F\left(Z_{ijt} = \alpha_{it} + X_{j,t-1}\beta + \gamma_1 y_{ij,t-1} + \ldots + \gamma_p y_{ij,t-p}\right)$$

$y_{ijt} = 1$: bank i has borrowed from bank j in month t.

$X_{j,t-1}$: lender specific characteristics in month t-1.

α_{it}: FE controlling for number of borrowing partners of i in month t.

- Given number of partners of i in t: which partners does i choose?

$\gamma_1, \ldots, \gamma_p$ measures the time persistence of a borrowing relationship.

- Regressions:

1. Linear FE regression.

2. FE Logit (Chamberlain, 1980) conditioning on number of borrowing partners of i in month t.

Linear FE Regression

- The persistence of a link (trading relationships) are large, last for several months and the significance is high, 99% for the first two periods and 95% for the remaining 17. The case for the unsecured loans (not reported here) is similar: trading relationships are persistent, large and statistically significant.

	Repo
Log Total Lent by j in month $t-1$	0.022***
	(0.007)
Log Total Assets of j in month $t-1$	0.029**
	(0.014)
# of Trading Days of j in month $t-1$	0.0059***
	(0.0009)
Log # of Lending Partners of j in $t-1$	0.088**
	(0.044)
$y_{ij,t-1}$	1.469***
	(0.046)
$\vdots$	$\vdots$
$y_{ij,t-19}$	0.118**
	(0.053)
Observations	47954

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Link persistence of Repo borrowing

- The persistence of links is really high for the first periods with slow decay and lasts for several months.

- The gray areas around the line represent the statistical significance of such trading relationship.
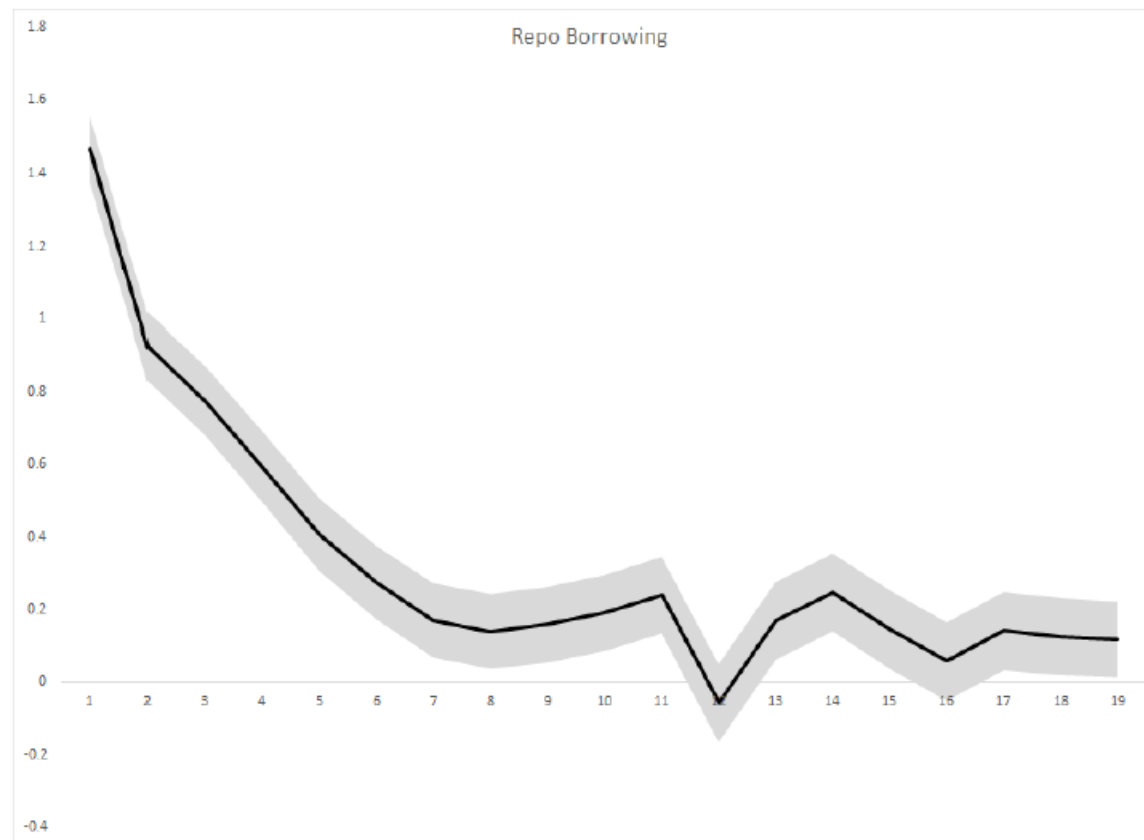
Link persistence of unsecured and repo borrowing

- The repo and reverse repo links present higher persistence than the unsecured loans. Nevertheless, all of them are persistence and this lasts for several months.

Link dependence (borrower side)
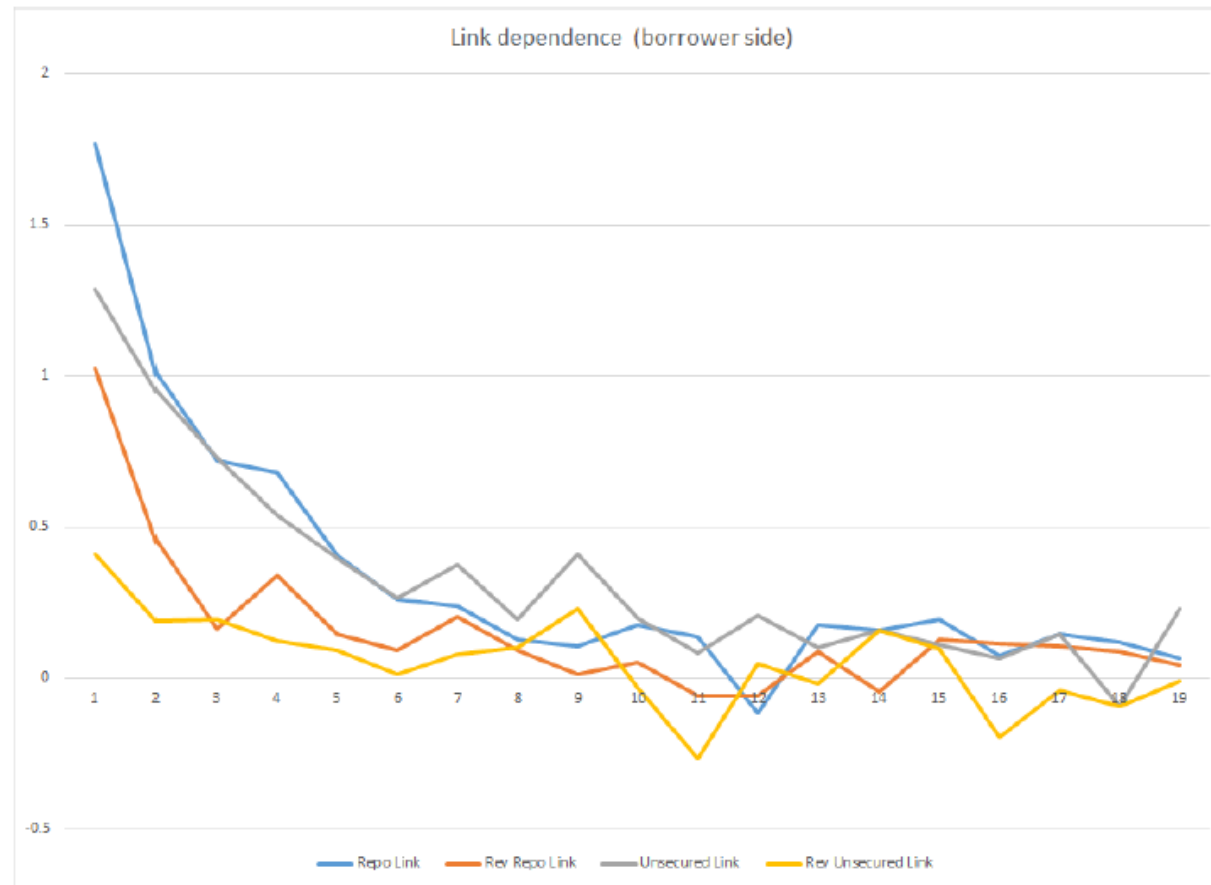
Negative repo funding shocks

- We analyze the impact of a negative liquidity supply shock on the Mexican interbank market, both the repo market and the unsecured lending market.

- The shock that we consider is external, that is, has its source outside of the interbank market, and therefore affect all banks simultaneously.

- However, banks that rely more on external funding are affected more by this shock than other banks. This heterogeneity in shock impact allows us to identify the effect of the shock on trade volumes and prices at the bank level.

- Identification of supply shocks is difficult, as we could not identify any events that could serve as a natural experiment in the market and period under study. Instead, we proxy the shocks by taking 1 if day t is one of the 10% lowest funding days and 25% highest repo rate days. This last, by using a Hodrick-Prescott filter with 21 days of bandwidth to estimate the trend and the weighted average repo rate spread relative to central bank target rate.

Log volume and trend of repo funding coming from physical persons and legal entities, deviations from the trend, as calculated by the Hodrick-Prescott filter

■ For each day t, let z_t be the logarithm of the total volume of overnight repo funding in Mexican currency, in which a legal or natural person is on the long side, that is, provides funding. Legal and natural persons are only able to provide repo funding to banking institutions; they are institutionally not allowed to obtain liquidity (borrow) on the repo market or to provide funding (lend) to non-banking institutions

■ Let $\tilde{z}_t$ be the detrended time series of z_t, where we use a Hodrick-Prescott filter with 21 days of bandwidth to estimate the trend. We considered the weighted average repo rate spread relative to central bank target rate. We take the 25% days with highest repo rate relative to a Hodrick-Prescott filter with a 21-day window.
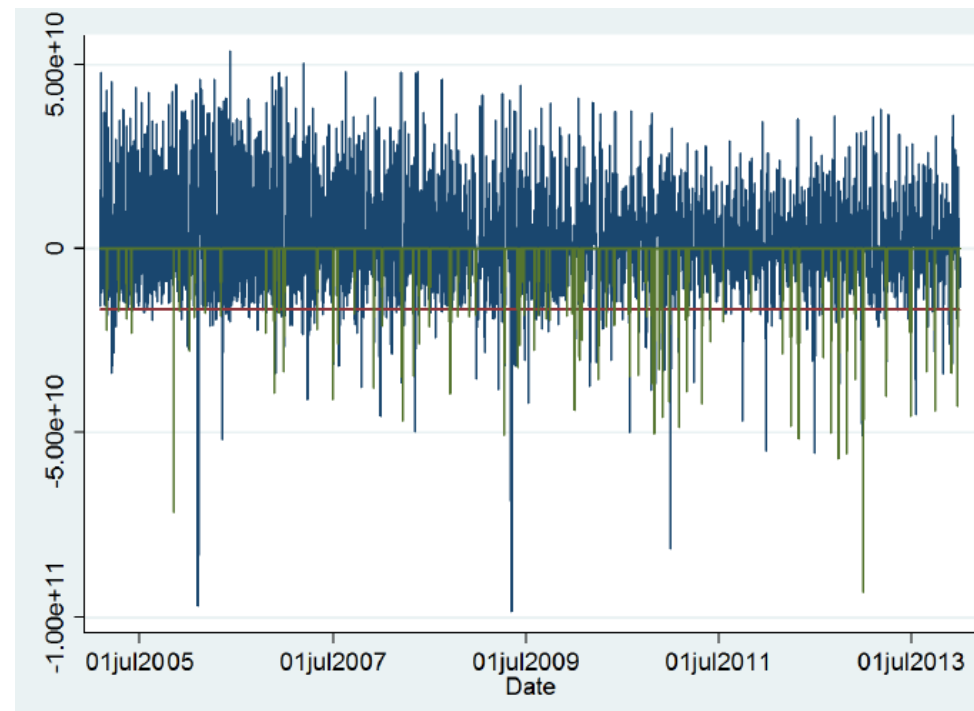
Fixed effects OLS and Type-2 Tobit model

$$v_{it}^{SM} = \alpha_i^{vSM} + \gamma_t^{vSM} + \beta_1^{vSM} s_{it} + \beta_2^{vSM} X_{it} + \beta_3^{vSM} w_t s_{it} + \beta_4^{vSM} w_t X_{it} + \varepsilon_{it}^{vSM}$$

$$r_{it}^{SM} = \alpha_i^{rSM} + \gamma_t^{rSM} + \beta_1^{rSM} s_{it} + \beta_2^{rSM} X_{it} + \beta_3^{rSM} w_t s_{it} + \beta_4^{rSM} w_t X_{it} + \varepsilon_{it}^{rSM}$$

for $S \in \{L, B\}$, $M \in \{D, R\}$. X_{it} are control variables

- These regressions are estimated both by fixed effects OLS for those observations for which:

$$v_{it}^{SM} > 0.$$

- We also consider a Type-2 Tobit model. We estimate this model by the standard Heckman-procedure, in which we first estimate the probability that $v_{it}^{SM} > 0$ with a Probit model including fixed effects dummies, and next perform a fixed effects OLS regression on the volume or the interest rate with the inverse Mills-ratio from the first stage as extra regressors to correct for sample selection.

- As control variable, we include the relative total asset size of a bank, relative to the total asset size of the banking sector, and the average value of the dependent variable over the last 21 days.

- The above regressions, consider the total amount (and interest rate) of a bank's interbank borrowing and lending on a particular day.

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Hypothesis

- **Hypothesis 1**: $\beta_3^{vBR} > 0.$ When there is a negative external repo supply shock, banks that heavily depend on external repo funding increase their level of repo borrowing from other banks.

- **Hypothesis 2**: $\beta_3^{vBD} > 0.$ When there is a negative external repo supply shock, banks that heavily depend on external repo funding increase their level of unsecured deposits and loans borrowing from other banks.

- **Hypothesis 3** (Liquidity Hoarding): $\beta_3^{vLR} < 0.$ When there is a negative external repo supply shock, banks that heavily depend on external repo funding decrease their level of repo lending to other banks.

- **Hypothesis 4** (Liquidity Hoarding Spillover): $\beta_3^{vLD} < 0.$ When there is a negative external repo supply shock, banks that heavily depend on external repo funding decrease their level of unsecured deposits and loans lending to other banks.

- **Hypothesis 5**: $\beta_3^{rBR} > 0, \beta_3^{rBD} > 0.$ When there is a negative external repo supply shock, banks that heavily depend on external repo funding pay a higher interest rate for their liquidity borrowing on the interbank market than other banks.

- **Hypothesis 6**: $\beta_3^{rLR} > 0, \beta_3^{vLD} > 0$ When there is a negative external repo supply shock, banks that heavily depend on external repo funding ask a higher interest rate for their liquidity lending on the interbank market than other banks.

Hypothesis

- We would like to know if a bank increases or decreases its borrowing or lending equally over all partners, or whether it treats different banks differently.

- For that purpose, we consider regressions with observations of total amount and the weighted average interest rate of each bank i lending to bank j at day t.

- We are, in particular interested, in how much it matters to have a trading relationship. To measure the strength of relationship, we consider the borrowing preference index h_{ijt}^{BM} and lending preference index h_{ijt}^{LM}, introduced by Cocco et al. (2009).

- These are defined by:

$$h_{ijt}^{LM} = \frac{v_{ijt}^M}{v_{it}^{LM}} \text{ and } h_{ijt}^{BM} = \frac{v_{ijt}^M}{v_{jt}^{BM}}$$

- Where v_{ijt}^M is the amount i lends to j at day t in the market M. Thus, the lender preference index of i with respect to j is the volume that i lends to j as share of the total volume that i lends.

Results

Regression on the amount of (secured) repo borrowing of individual banks at the overnight interbank market for big banks

	Full period	Pre-crisis	Crisis	Post-crisis
Share External Repo	-0.324**	-0.751***	-0.013	0.728***
	(0.150)	(0.268)	(0.381)	(0.210)
Assets (Normalized)	4.855***	7.369***	-.639	8.782***
	(0.859)	(1.442)	(3.334)	(1.419)
Shock indicator	0.047	0.053	0.145	0.015
	(0.126)	(0.194)	(0.352)	(0.175)
Shock X	**0.655****	**0.755***	**1.067***	**0.072**
Share External Repo	**(0.273)**	**(0.413)**	**(0.638)**	**(0.361)**
Shock X Assets	-1.727**	-1.644	-2.609	-0.613
	(0.816)	(1.207)	(1.700)	(1.225)
Log Borrowed Amount	0.704***	0.668***	0.464***	0.686***
$(d - 21$ to $d - 1)$	(0.015)	(0.024)	(0.051)	(0.020)
Borrower dummies	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes
Observations	15494	6378	1780	7336

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- This table shows that banks which depend more on external repo funding, in the presence of a shock, would have to increase borrowing. Also, it shows an increase on lending, it makes sense, since the scattered plots showed that banks lend and borrow at the same time even in the same day.

Regression on the rate of (secured) repo borrowing of individual banks at the overnight interbank market

	Full period	Pre-crisis	Crisis	Post-crisis
Share External Repo	-0.099***	-0.120***	-0.219**	0.0568***
	(0.017)	(0.031)	(0.097)	(0.015)
Assets (Normalized)	0.385***	0 .876***	-1.470*	0.693***
	(0.097)	(1.167)	(0 .764)	(0.132)
Shock indicator	0.003*	-.021	-0.168	.049***
	(0.0248)	(0 .047)	(0.158)	(0 .011)
Shock X	**0.085****	**0.101***	**0 .413***	**0.016**
Share External Repo	**(0.035)**	**(0.058)**	**(0.230)**	**(0 .031)**
Shock X Assets	-0.057	0.130	0.029	-0.215*
	(0.113)	(1.221)	(2.358)	(0.110)
Log Borrowed Amount	0.754***	0 .666***	.672***	0.604***
$(d-21$ to $d-1)$	(0.017)	(0.025)	(0 .074)	(0.035)
Borrower dummies	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes
Observations	15494	6378	1780	7336

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

■ This table shows an increase on the rates. In principle, this result is also very intuitive and it is interesting that the results are significant only before and during the crisis and the effect disappears after the crisis.

Regression on the amount of unsecured borrowing of individual banks at the overnight interbank market

	Full period	Pre-crisis	Crisis	Post-crisis
Share External Repo	-.033	0.186	-0.366	-0.061
	(0.179)	(0.395)	(0.552)	(0.241)
Assets (Normalized)	-5.639***	-5.361***	5.386	-5.462**
	(1.215)	(1.9896)	(4.705)	(2.325)
Shock indicator	-0.340*	-0.224	-0.133	-0.322
	(0.185)	(0.373)	(0.670)	(0 .220)
Shock X	**0.464**	**1.057****	**0.397**	**.100**
Share External Repo	**(0.286)**	**(0.461)**	**(0.817)**	**(0 .357)**
Shock X Assets	0.8274266	-0.309	-1.010	1.368
	(0.926)	(1.667)	(2.422)	(1.322)
Log Borrowed Amount	0 .747***	0.551***	0.192***	0.752***
$(d-21$ to $d-1)$	(.0197)	(0.045)	(0.075)	(0.026)
Borrower dummies	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes
Observations	15650	6369	1854	7427

$*\ p < 0.10$, $**\ p < 0.05$, $***\ p < 0.01$

- This table shows a significant result of a change on borrowing on the unsecured market only before the crisis. The table shows that a bank in the presence of an external repo funding shock, it would have to borrow more from the unsecured market but results are only significant before the beginning of the crisis. In the case of the lending side (not reported here), the results are not significant.

Effect on the Probability of Unsecured Borrowing (Big Banks)

	Full period	Pre-crisis	Crisis	Post-crisis
Share External Repo	1.012***	-0.305	-1.277*	0.334
	(0.185)	(0.342)	(0.730)	(0.312)
Assets (Normalized)	12.9253***	4.542	3.905**	-3.940
	(1.484)	(2.853)	(9.380)	(2.86296)
Shock indicator	-0.212	-.290	-0.587	-0.138
	(0.148)	(0.310)	(0.380)	(0 .204)
Shock X	**.962***	**1.0009**	**1.299**	**1.032***
Share External Repo	**(0.250)**	**(0.399)**	**(0.807)**	**(0.380)**
Shock X Assets	-2.053*	-1.189	-1.684	-2.562
	(1.150)	(2.075)	(2.517)	(1.632)
Log Borrowed Amount	0.488***	0.171***	.184***	0.509***
$(d-21$ to $d-1)$	(0.017)	(0.032)	(0.056)	(0.025)
Borrower dummies	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes
Observations	15650	6369	1588	7427

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- In the face of a supply shock on the repo market, banks would be more active borrowing on the unsecured market. This result is significant for the whole sample period, as well as, for the pre-crisis and post-crisis periods.

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Effect on the Probability of Unsecured Lending (Big Banks)

	Full period	Pre-crisis	Crisis	Post-crisis
Share External Repo	1.554***	0.189	-1.002*	0.814***
	(0.156)	(0.272)	(0.545)	(0.246)
Assets (Normalized)	17.697***	1.796	-1.821**	5.644**
	(1.143)	(1.952)	(4.357)	(2.306)
Shock indicator	-0.143	-0.404	-.8484461	-0.054
	(0.137)	(0.359)	(0.521)	(0.164)
Shock X	**0.873***	**0.971**	**2.272***	**0.775**
Share External Repo	**(0.237)**	**(0.487)**	**(0.803)**	**(0.336)**
Shock X Assets	-1.530*	-0.102	-2.253	-1.264
	(0.915)	(1.815)	(2.213)	(1.117)
Log Borrowed Amount	0.187***	0.260***	0.132*	0.240***
$(d-21$ to $d-1)$	(0.015)	(0.032)	(0.069)	(0.023)
Borrower dummies	Yes	Yes	Yes	Yes
Month dummies	Yes	Yes	Yes	Yes
Observations	15671	6398	1862	7411

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

- This table shows the results for the probability of lending on the unsecured market. Results here are similar to the borrowing case, but they are significant for all the time periods.

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Results

■ Persistent repeated trading with same partner in both markets.

■ Trading relations capture more trading volume in unsecured market (95%) compared to repo market (90%). Relationships in the repo market are stronger and persists over time.

■ During the crisis, trading relations offered a discount in repo market.

■ Banks hit by a repo supply shock borrow more on interbank market.

■ There is no clear effect of repo supply shock on interest rates or unsecured loan market.

■ Evidence on the transmission from the repo to the unsecured market, it is also important to verify if the opposite is true, i.e. if a shock on the unsecured market is transmitted to the repo market, how far on the network is transmitted and how long does it take to the system to absorb such an impact.

■ In the face of an external repo funding shock, banks react by borrowing more from the repo and become more active (by lending and borrowing) on the unsecured market.

■ There are important differences on the significance of the results if we split the sample in three different periods: pre-crisis, crisis and post-crisis.

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Key findings

Key findings

- Banks are affected by negative external supply shocks. These shocks obligate banks to increase their interbank repo funding, which is natural given that they have suffered a decrease of external repo funding.

- Banks that are highly dependent on external repo funding increase their repo borrowing and decrease their repo lending to other banks.

- We found evidence of an impact of these shocks on the rates.

- Repo funding shocks leads banks to enter the unsecured market.

- Links in repo markets as strong as in unsecured market. Relationships are weaker in the unsecured market.

- Preliminary results show that the reduction on unsecured interbank lending affected more banks which do not have strong trading relationships but we are still verifying the robustness of such results.

Contributions

- This is the first work in which trading relationships in the unsecured and secured markets are jointly studied.

- This study sheds some light on the behavior of banks in two different and important funding markets.

- Finally, the understanding of bank behavior is extremely useful for stress testing purposes as under difficult situations, the endogenous reactions of banks could lead the financial system to undesirable situations with negative implications for the whole economy.

- The implications of our findings are useful, among many other possible applications, on the design of supervisory liquidity stress tests and to understand the banks interactions in both markets.

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US Repo market and the Euro interbank Repo market*

*Baklanova et al., Reference Guide to U.S. Repo and Securities Lending Markets, FRBNY Staff Reports, 2015.
*Mancini et al., The Euro Interbank Repo Market, Oxford University Press, 2015.

US Repo market infrastructure*

- Since the crisis, the US daily volumes in the repo market have declined and, the triparty repo contracts have been resettled.

- The Federal Reserve Bank of New York's Triparty Repo Infrastructure Task Force helped to reduce the use of discretionary intraday credit extended by the triparty clearing banks and improve their liquidity and credit risk management practices.

- Clearing banks had ended with daily unwind cash and collateral for non maturing trades by redesigned their settling maturing trades.

- Daily settlement had reduced its dependency on the clearing banks' provision of intraday credit because the market participants reduced their demand for intraday credit.

Baklanova et al., Reference Guide to U.S. Repo and Securities Lending Markets, FRBNY Staff Reports, 2015.

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US Repo market infrastructure*

- The US repo market consist of two segments: triparty repo and bilateral repo, with the main differences in settlement.

- A triparty repo involves a third party= a clearing bank. The clearing bank provides back-office support to both parties of trade. Clearing and settlement services to securities dealers in the US are offered by Bank of New York Mellon Corp and JPMorgan Chase & Co.

- The main differences between bilateral and triparty repos are:

  1. Timing of settlement.

  2. Settlement risk protections.

  3. Cost of clearing and settlement.

  4. The ability to specify that any security within a general asset class can serve as collateral.

Baklanova et al., Reference Guide to U.S. Repo and Securities Lending Markets, FRBNY Staff Reports, 2015.

US Repo market infrastructure*

- Copeland, Martin, and Walker (2010) found that during stressful periods cash investors in the triparty repo market prefer to withdraw funding if they considered that the dealer is not creditworthy.

- Morrison, Roe, and Sontchi (2014) stated that the risk of fire sales increase, since there is a special treatment of repo contracts during bankruptcy, because the counterparties avoid the normal process of bankruptcy and seize assets.

- They proposed that these contracts have to follow the normal process of bankruptcy by eliminating safe harbor provisions for repo contracts backed by non-government securities.

- There is a lack of transparency related to cross-border securities financing activity, thus there are risks of cross-border regulatory arbitrage when the participants transferred their repo funding overseas.

*Baklanova et al., Reference Guide to U.S. Repo and Securities Lending Markets, FRBNY Staff Reports, 2015.

Euro interbank Repo market*

- The central counterparty (CCP)-based euro interbank repo market functions well relative to other funding markets. It can even act as a shock absorber, since repo lending increases with risk; while spreads, maturities, and haircuts (or margins) remain stable.

- After cross borders analysis, the authors found that *"…the key market features ensuring resilience are anonymous CCP-based trading, safe collateral, and the absence of an "unwind" mechanism."*/***

- The euro interbank repo market has a unique structure as the majority of repos are traded anonymously via CCPs. Haircuts are set by the CCP, and thus, are exogenous to repo traders.

- Moreover, euro interbank repos are collateralized by relatively safe securities (e.g., government bonds) and are not subject to the daily unwind.

- The euro interbank repo market helps explain how these unique features impact repo market activity and which market features are key for repo market stability.

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Euro interbank Repo market*

- Mancini empirical results show that the CCP-based euro interbank repo market is resilient, in contrast to, the repo markets in the United States.

- The aggregate volume of CCP-based repos did not decline during crisis periods, but it actually increased from January 2006 to February 2013.

- For instance, from 2008 to 2010, CCP-based euro repo volume increased by 14%, whereas the total volume of U.S. triparty repos and repos from money market mutual funds, as well as security lenders declined by 40% (Copeland, Martin, and Walker 2014) and 34% (Krishnamurthy, Nagel, and Orlov 2014), respectively.

- The results showed that there is no empirical positive relationship between risk and repo spreads. Also, they found that, during high-risk episodes, as the Global Financial Crisis, the average repo term did not shorten.

- There is a negative relationship between repo volume and the volume in the unsecured money market.

- The authors conclude that anonymous trading via a CCP, safe collateral, and the absence of an unwind mechanism are **jointly** sufficient to ensure repo market resilience.

Mancini et al., The Euro Interbank Repo Market, Oxford University Press, 2015.

Regulation of Shadow Banking*

Policy Framework Addressing Shadow Banking Risks in Repo Markets*

- Financial stability risks in the securities lending and repo markets can be divide off (i) "pure" shadow banking risks (maturity/liquidity transformation and leverage outside the banking sector) and (ii) risks that span both banking and shadow banking:

  - Pure shadow banking risks:

    a) Using repo to create short-term, money-like liabilities, facilitating credit growth and maturity/liquidity transformation outside the banking system.

    b) Securities lending cash collateral reinvestment.

  - Risks that span both banking and shadow banking:

    a) Tendency of securities financing to increase procyclicality of system leverage.

    b) Risk of a fire sale of collateral securities.

    c) Re-hypothecation of unencumbered assets.

    d) Interconnectedness arising from chains of transactions involving the re-use of collateral.

    e) Inadequate collateral valuation practices

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Strengthening Oversight and Regulation of Shadow Banking, FSB, 2013.

Policy Framework Addressing Shadow Banking Risks in Repo Markets*

■ The FSB has focused in 5 areas in which policies are needed to mitigate the potential systemic risks associated with shadow banking:

1. *"Mitigate the spillover effect between the regular banking system and the shadow banking system."**

2. *"Reduce the susceptibility of money market funds (MMFs) to runs."**

3. *"Assess and align the incentives associated with securitization."**

4. ***"Discourage risks and pro-cyclical incentives associated with securities financing transactions, such as, repos and securities lending that may exacerbate funding strains in times of market stress."***

5. *"Assess and mitigate systemic risks posed by other shadow banking entities and activities."**

* Strengthening Oversight and Regulation of Shadow Banking, FSB, 2013.

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Policy Framework Addressing Shadow Banking Risks in Repo Markets*

■ **Policy recommendations** on securities lending and repos:

1. *"Authorities should **collect more granular data** on securities lending and repo exposures amongst large international financial institutions."**

2. ***"Trade-level (flow) data and regular snapshots** of outstanding balances (position/stock data) for repo markets should be collected."**

3. *"FSB will **provide global trends of securities financing markets** (market size, collateral composition, haircuts, tenors) and FSB will **aggregate total national and regional data for both repos and securities** lending on a monthly basis."**

4. *"The Enhanced Disclosure Task Force (EDTF) should work **to improve public disclosure for financial institutions' securities lending**, repo and wider collateral management activities."**

* Strengthening Oversight and Regulation of Shadow Banking, FSB, 2013.

Policy Framework Addressing Shadow Banking Risks in Repo Markets*

■ **Policy recommendations** on securities lending and repos:

5. *"Authorities should **review reporting requirements for fund managers to end-investors against the FSB's proposal,** and consider whether any gaps need to be addressed."**

6. *"Regulatory authorities for non-bank entities that engage in securities lending (including securities lenders and their agents) should **implement regulatory regimes meeting the minimum standards for cash collateral reinvestment in their jurisdictions** to limit liquidity risks arising from such activities."**

7. *"Authorities should ensure that regulations address the following: (i) financial intermediaries should **provide sufficient disclosure to clients in relation to re-hypothecation of assets;** (ii) client assets **should not be re-hypothecated for the purpose of financing the own-account activities** of the intermediary and (iii) only entities subject to adequate regulation of liquidity risk should be allowed to engage in the re-hypothecation of client assets**.**

* Strengthening Oversight and Regulation of Shadow Banking, FSB, 2013.

Policy Framework Addressing Shadow Banking Risks in Repo Markets*

■ **Policy recommendations** on securities lending and repos:

8. *"An expert group should examine **possible harmonization of client asset rules with respect to re-hypothecation**, taking account of the systemic risk implications of the legal, operational, and economic character of re-hypothecation."**

9. *"Authorities should **adopt minimum regulatory standards for collateral valuation and management for all securities lending and repo market participants**."**

10. *"Authorities should **evaluate, with a view to mitigating systemic risks, the costs and benefits of proposals to introduce CCPs in their inter-dealer repo markets** where CCPs do not exist."**

11. ***"Changes to bankruptcy law treatment and development of Repo Resolution Authorities (RRAs) may be viable theoretical options** but should not be prioritized for further work due to significant difficulties in implementation."**

* Strengthening Oversight and Regulation of Shadow Banking, FSB, 2013.

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Data on repo transactions that would help to inform authorities' financial stability monitoring and policy responses*

Financial stability monitoring focus (repo)	Value date	Maturity date[41]	Collateral type	Collateral quality	Principal amount	Counter-party type[42]	Haircut	Market segment[43]	Repo rate	Currency[44]	
										cash	collateral
1. Degree of rollover risk / vulnerability to run/fire sales on the market or a specific • market segment • asset type • counterparty • collateral quality	X	X	X	X	X	X		X		X	X
2. Interconnectedness of repo market participants		X			X	X					
3. Concentration of total repo exposure	X				X	X					
4. Concentrations of exposure to a specific asset class	X		X	X	X	X					
5. Size of the repo market (total and by segment) – snapshot and trend over time	X	X			X			X			
6. Collateral composition of market (total and by segment) – snapshot and trend over time – and degree of potential for fire sales	X	X	X		X			X			
7. Easing/tightening of funding terms for a specific asset class over time (i.e. global increases in rates, spreads or haircuts)	X	X			X		X		X		
8. Maturity profile of the overall market (original as well as remaining maturity perspective)	X	X									
9. Degree of leverage in the repo market					X		X				
10. Degree of currency mismatch										X	X

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Summary of Market surveys on repos, 2013*

	Size of book (value of cash legs)	Currency	Tenor composition	Collateral asset class	Haircut ranges	Counterparty breakdown and concentration	Ability to re-hypothecate
Australia	Y	N	N	Limited[46]	N	Limited	N
Canada	Y	Limited[47]	Y	Y	N	N	N
EU[48]	Y	Y	Y	Y	N	Limited[49]	N
Germany	Y	Y	Y	Y	N	Limited	N
Italy	Y	Y	Y	Y	N	Limited	N
Japan	Y	N	Y	Y	Y	Y	N
Netherlands	Y	Y	Y	Y	N	Limited	N
Spain	Y	Y	Y	Y	N	Limited	N
Switzerland	Y	Y	Y	Y	Y	Y	N
UK	Y	Y	Y	Y	Limited[50]	Y	N
US	Y	N	N	Y	Y	N	N

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Disclosure template on encumbered assets
(include more granular information on sources and uses of securities collateral)*

US$bn	Encumbered assets*						Total encumbered assets (A)	Unencumbered assets*		Total unencumbered assets (B)	A / (A+B) in percentage
Use of collateral	Repo/reverse repo and securities lending/borrowing	Of which: collateral swaps	Derivatives	Securitisation	Covered bonds	Alternative uses (other than those specified in the previous columns)		Available as collateral	Other**		
Cash and other liquid assets											
Other investment securities											
Loans											
Other financial assets											
Non-financial assets											
Total assets											

*:   Includes both on- and off-balance sheet assets.

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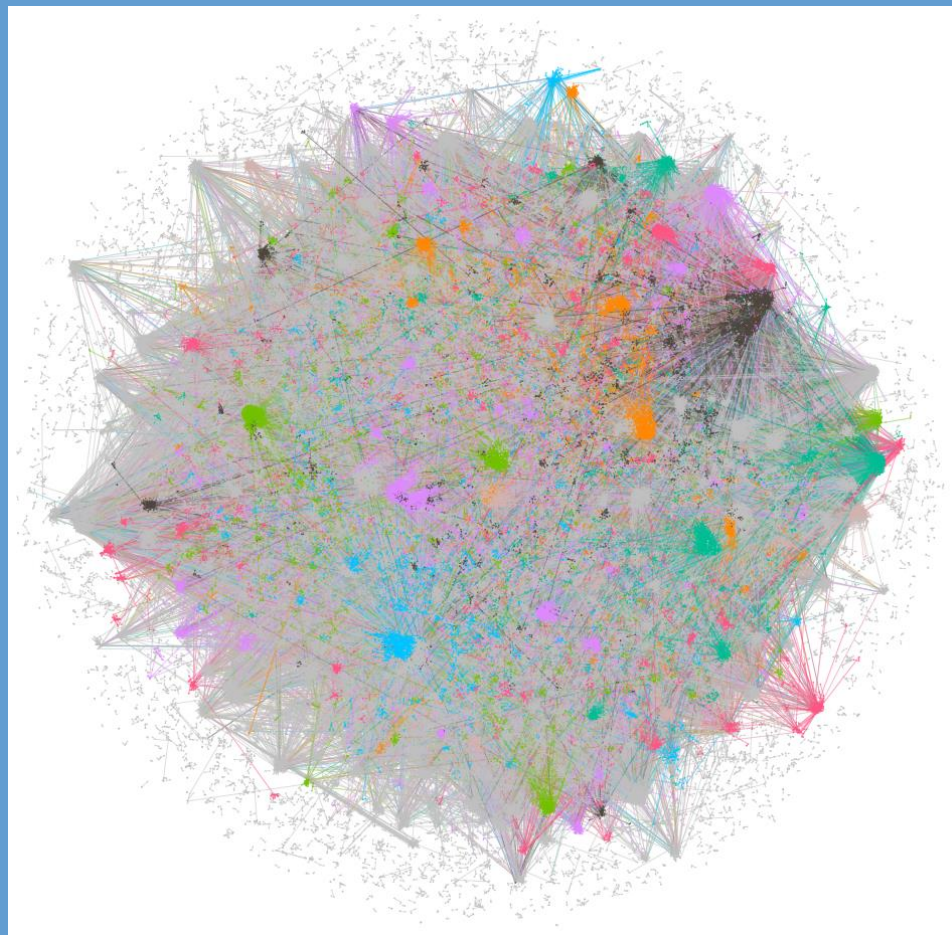CENTER FOR LATIN AMERICAN MONETARY STUDIES

Disclosure template on encumbered assets
(include more granular information on sources and uses of securities collateral)*

US$bn	On-balance sheet assets	Collateral received				Other off-balance sheet assets**	Client assets with right to re-use	Total assets
		Repo/reverse repo and securities lending/borrowing	Of which: collateral swaps	Derivatives	Alternative uses (other than those specified in the previous columns)			
Cash and other liquid assets								
Other investment securities								
Loans								
Other financial assets								
Non-financial assets								
Total assets								

*:   Includes both on- and off-balance sheet assets.

**: Please specify main types of assets included in "Other".

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* *Strengthening Oversight and Regulation of Shadow Banking, FSB, 2013.*

Thanks a lot for your attention.