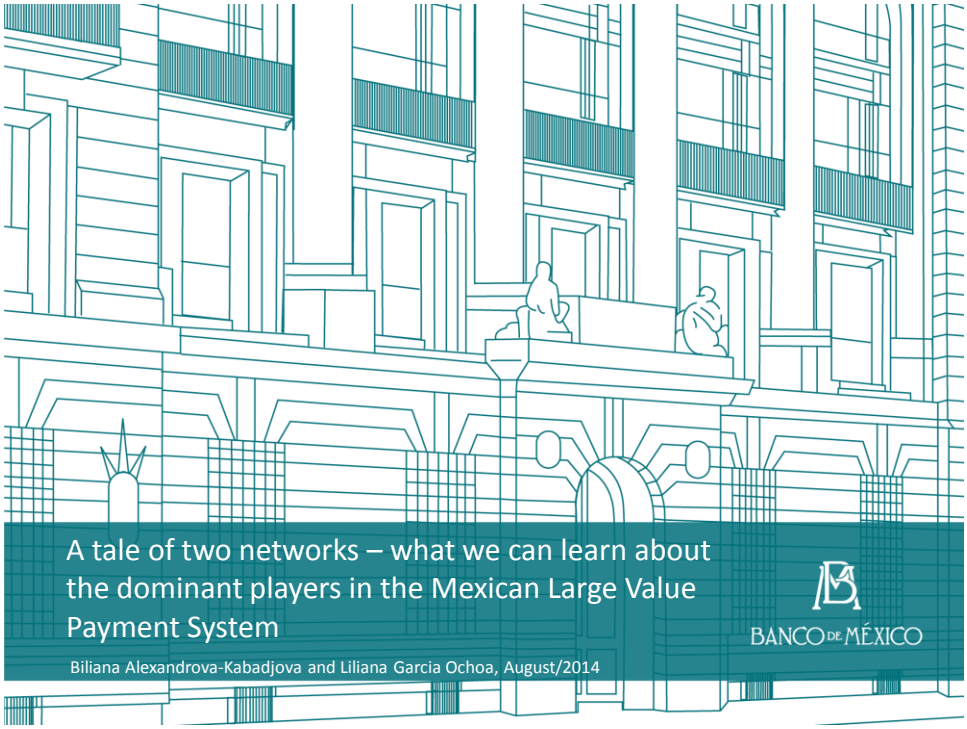


A tale of two networks – what we can learn about the dominant players in the Mexican Large Value Payment System

Biliana Alexandrova-Kabadjova and Liliana Garcia Ochoa, August/2014

BANCO DE MÉXICO

Motivation*

- Financial Market Infrastructures (FMI) are economic platforms that facilitate the clearing and settlements of financial transactions.
- Systemically important Payment Systems are FMI in charge to settle payment obligations among institutions.
- In the case of Large Value Payment Systems (LVPS), network models are widely used to represent the relationships among financial institutions.
- To analyze the network structure gives the possibility of having a systemic view of the interconnectivity among financial institutions, and
- The network paradigm allows to gain insights regarding the dominant participants and how different they are among themselves.

*The views presented in this study are exclusively of the authors and do not necessarily reflect those of Banco de México.

Agenda

1. Introduction
2. The developed stages of the project
3. Two type of payments networks
4. Future work

Introduction

- The present study is part of a project, aimed to build a model that incorporates the network structure and FMIs participants' behavior;
- The model will allow to evaluate the impact of policy decisions related to liquidity provision as well as measures taken to strengthen the soundness of the FMIs.
- The purpose of the present research is to analyze the network structure of the Mexican large value payment system (LVPS), SPEI®, by accounting for all direct participants;
- We look through two different types of payments – payments initiated by third parties and payments initiated by participants;
- We build the bilateral relationships of the financial institutions based on the aggregated amount of transactions performed on a daily basis per type of payment;

Network models and payment systems.

- Studies describing different LVPS:
  - Soramki et al. (2006)
  - Bech & Atalay (2008)
  - Becher et al. (2008)
  - Rordam & Bech (2008)
  - Propper et al. (2008)
  - Wetherilt et al. (2010)

- Other related works
  - Empirical analysis of the Italian interbank market, Iori et al. (2008)
  - Core-periphery model, Craig and von Peter (2010)
  - Analysing the impact of wide-scale disruptions, Bech & Garratt (2012)

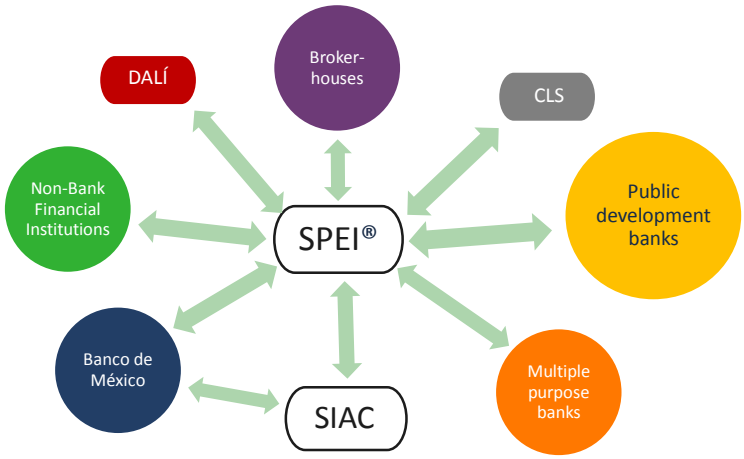
The Mexican Large Value Payment System, SPEI

- In Mexico, the LVPS named SPEI® is a Real Time Gross Settlement (RTGS) system, which allows low and large value payments between financial institutions and third parties (clients) to be processed simultaneously during the opening hours.

- This system is operated by Banco de Mexico (BdM) and on average during 2013 settled around 895,000 transactions daily.
  - More than 93% of the obligations are payments with a value lower than 10,000 USD
  - Around 0.5% of the transactions are above 1,000,000 USD

- There are ninety-eight direct participants in SPEI® identified under four categories:
  - Private multiple purpose banks (commercial banks),
  - Public development banks,
  - Broker-houses, and
  - Other nonbank financial institutions.

The Mexican Large Value Payment System, SPEI



The development of the project

- First stage - accounting only the multiple purpose banks from the perspective of large and low value payments:
  - Alexandrova-Kabadjova and Solís-Robleda, 2012 study commercial banks' behavior by evaluating the need of external funds and the degree of recycled payments per participant;
  - Martinez-Jaramillo et al., 2014 evaluate the network structure and identify the dominant players;
- Second stage – considering all direct participants in SPEI
  - Alexandrova-Kabadjova et al., 2014a look trough the liquidity provision and provide a framework to evaluate how its impact on the participants' behavior in managing funds;
  - Alexandrova-Kabadjova et al., 2014b determine the overall structure of the network in order to identify different components and measure their degree of connectivity;
- Third stage – considering all direct participants in SPEI
  - *Current work - to analyze the network structure of two different types of payments – payments initiated by third parties and payments initiated by participants;*
  - Future work – study the behavior of the participants trough accounting for the two different types of payments

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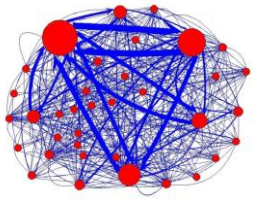
The evolution of the multiple purpose banks network

Commercial banks' networks according to the value of payment (first stage)

Large value network

Low value network



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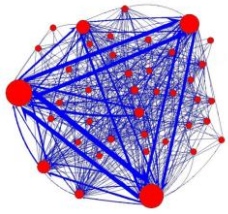

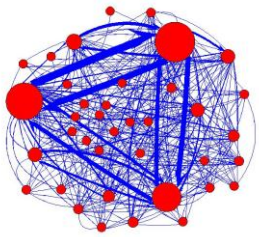

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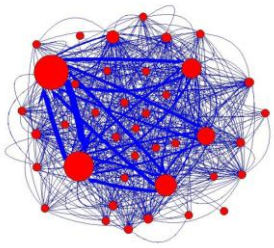
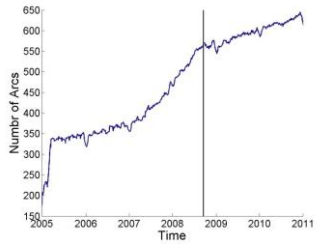
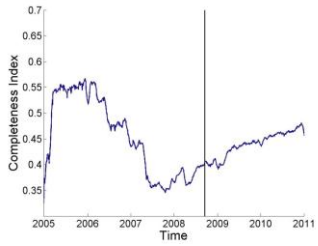
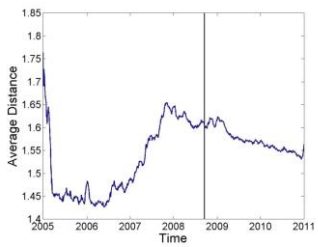
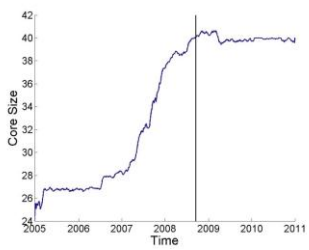


The evolution of the commercial banks' network (first stage)





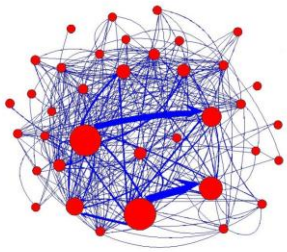




SPEI Networks according to the type of payments

Participant to participant

Third party to third party



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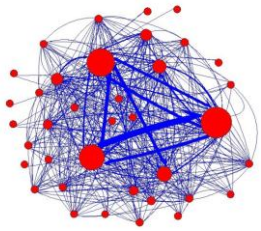

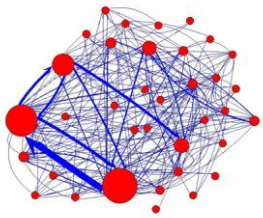

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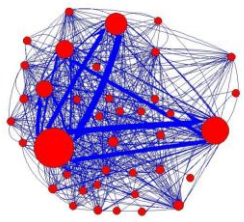
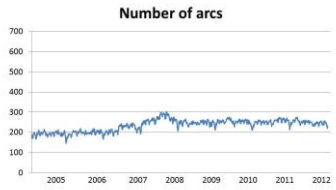
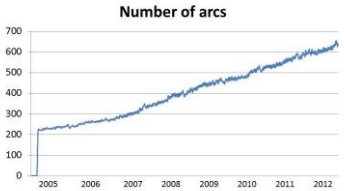
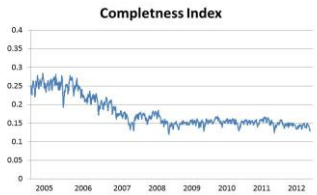


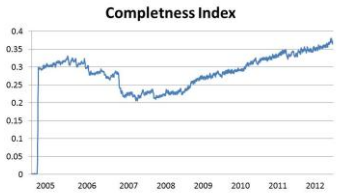
Participant to participant

Third party to third party





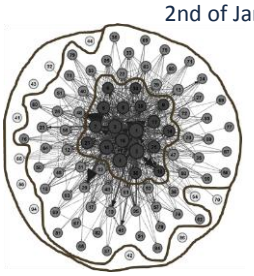




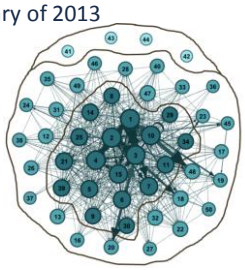
The direct participants network trough different kind of institutions

The formation of tectonic waves

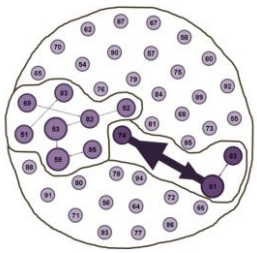
2nd of January of 2013



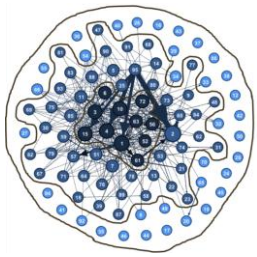
Direct participants network



Credit institutions network

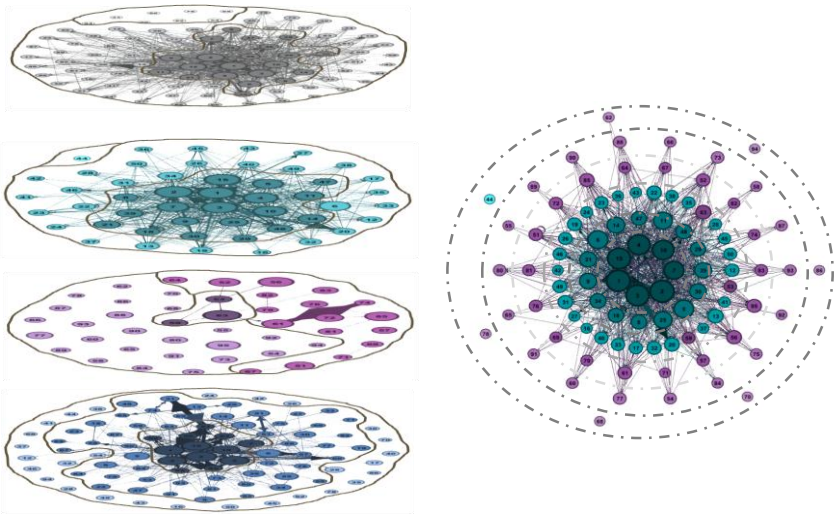


Non-bank financial insitutions network

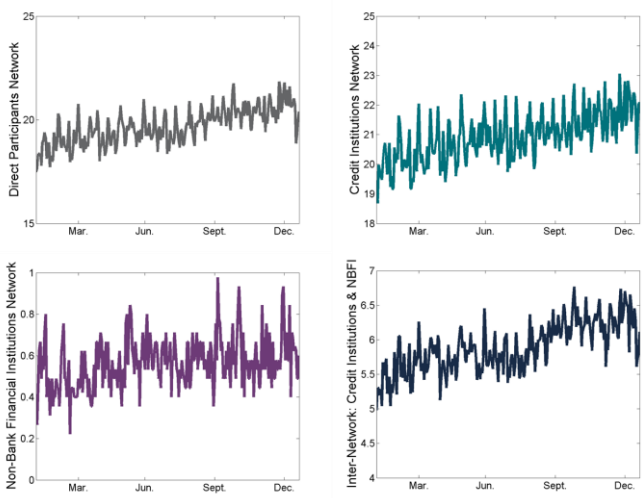


Inter-network: Credit institutions & NBFI

Wave representation

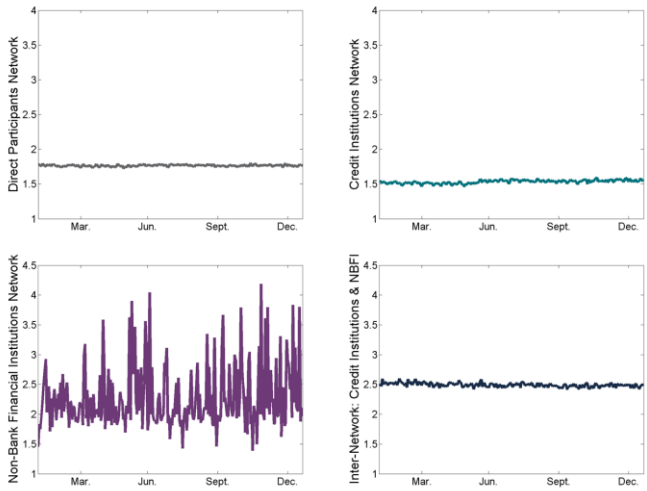


Average Degree*



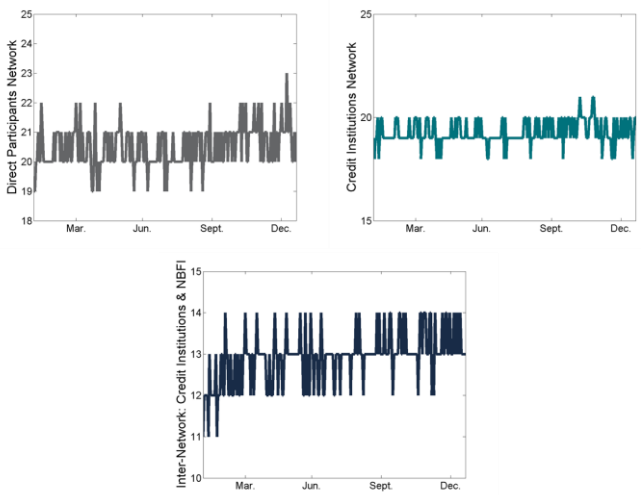
Banco de México's data from 2013.

Average shortest path



Banco de México's data from 2013.

The size of core



Banco de México's data from 2013.

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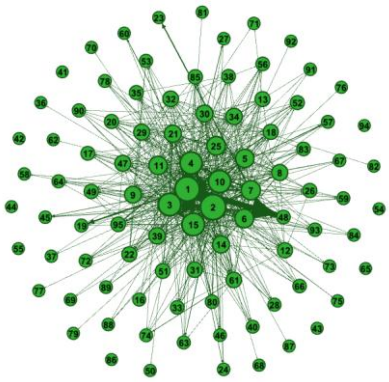
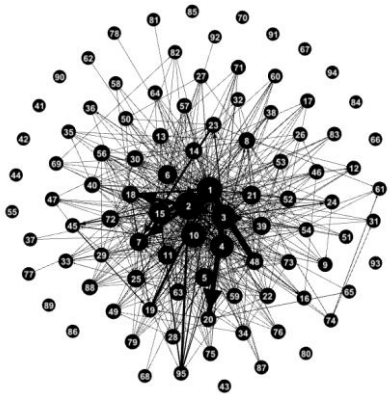
Two type of payments networks

Payments ordered by third party

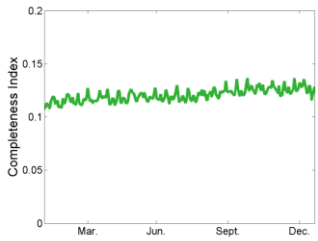


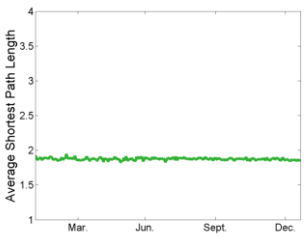
Payments ordered by participants



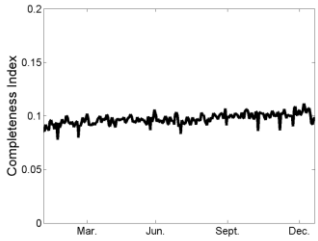
Two type of payments networks

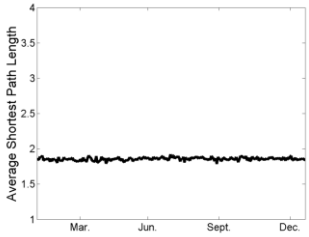
Payments ordered by third party





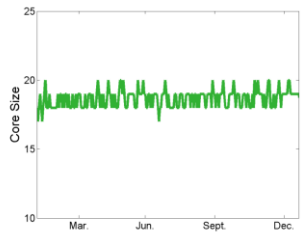
Payments ordered by participants

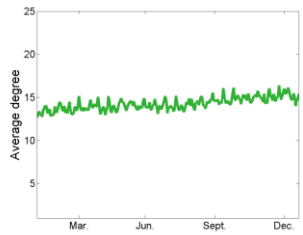




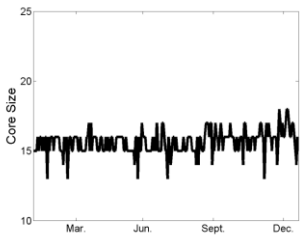
Two type of payments networks

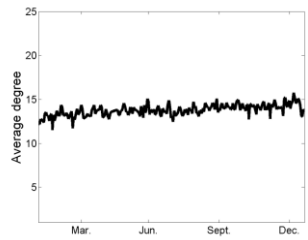
Payments ordered by third party





Payments ordered by participants





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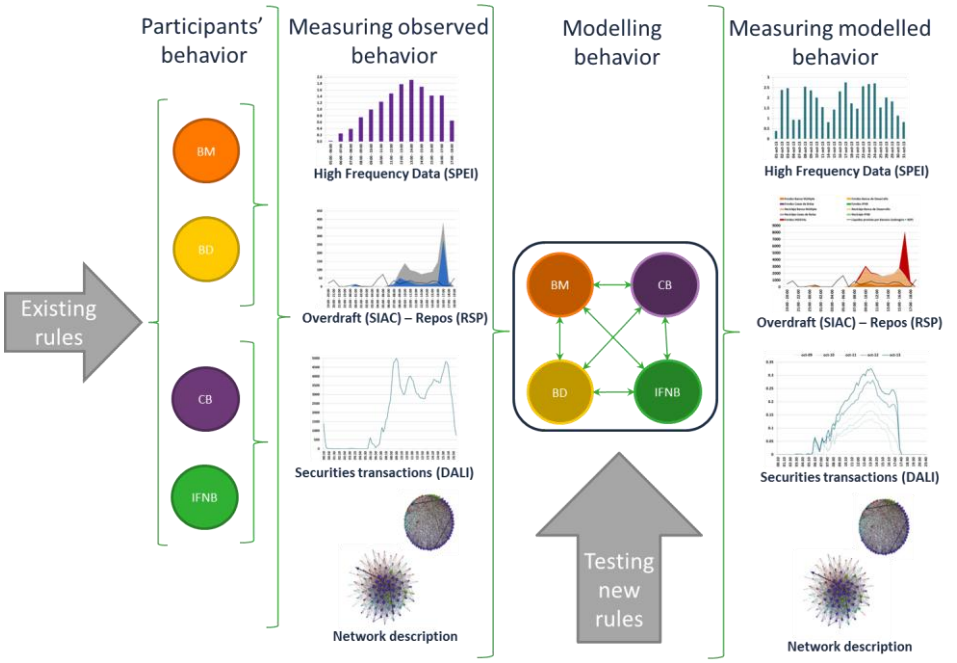
The development of the Agent Based Model



Final remarks and future work

- We have learn about the dynamics of the networks structure from different perspectives;
- We have studied the behavior of the participants in SPEI® by calculating the need of external funds and the degree of recycled payments;
- We need to evaluate to what extent a payment initiated by a third party increased the demand on liquidity or allow to reduce the pressure on it through recycling.
- We need to gain more insights on the mechanism of redistribution of funds among participants through unsecured/secured lending;
- Build an agent-based model to test new rules on policy decisions related to liquidity provision and measures taken to strengthen the soundness of the FMIs

References

- Bech, M., and R. Garratt, "Illiquidity in the Interbank Payment System Following Wide-Scale Disruptions," *Journal of Money, Credit and Banking*, 5, 903-929, August 2012.
- M. L. Bech and E. Atalay, "The Topology of the Federal Funds Market," Federal Reserve Bank of New York Staff Reports, 354, November 2008.
- C. Becher, M. Galbiati, and M. Tudela, "The timing and funding of chaps sterling payments," *Economic Policy Review*, pp. 113–133, September 2008.
- B. Craig and G. von Peter, "Interbank tiering and money center banks." BIS Working Papers 322, Bank for International Settlements, October 2010.
- G. Iori, G. D. Masi, O. V. Precup, G. Gabbi, and G. Caldarelli. A network analysis of the Italian overnight money market. *Journal of Economic Dynamics and Control*, 32(1):259 - 278, 2008.
- M. Pröpper, I. van Lelyveld, and R. Heijmans, "Towards a network description of interbank payment flows," De Netherlandsche Bank, DNB Working Paper 177, May 2008.
- K. B. Rordam and M. L. Bech, "The topology of danish interbank money flows," Danmarks Nationalbank, Working Paper 59, December 2008.
- K. Soramäki, M. L. Bech, J. Arnold, R. J. Glass, and W. E. Beyeler, "The topology of interbank payment flows," Federal Reserve Bank of New York Staff Reports, 243, March 2006.
- A. Wetherilt, P. Zimmerman, and K. Soramäki, "The sterling unsecured loan market during 2006-08: insights from network theory," Working Paper 398, Bank of England, 2010.