LSE INTERNATIONAL
DEVELOPMENT REVIEW

Pimentel, H. (2025). Too Interconnected to Fail? Financial Contagion and Network Structure in Financial Systems. LSE International Development Review, 4(1), pp. 71 – 74. https://doi.org/10.82191/lseidr.104

Too Interconnected to Fail? Financial Contagion and Network Structure in Financial Systems

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ABSTRACT

This paper looks into how network structure influences financial contagion in financial systems. Interconnectedness can both enhance systemic resilience by sharing risk, and also amplify negative shocks that go beyond a threshold. Looking into theory and empirical examples, I explore various contagion channels (asset side, funding side and information contagion) and describe how various network measures can capture different sides of financial contagion. Case studies on the collapse of the Silicon Valley Bank and trade shocks of Chinese imports in Italy are used to illustrate examples of financial contagion. Comprehensive and multidimensional measures of interconnectedness are important for crisis prevention.

"The international financial crisis has reminded us once again of how interconnections within the financial sector can amplify shocks. A high degree of interconnectedness essentially sets the dominoes close to one another—except that, unlike in the game, in the financial system interconnectedness is coupled with a lack of transparency. So it is hard to predict which will be the first domino to fall—and harder still to predict how problems in one part of the system will affect other parts."

— Mr. Jaime Caruana, BIS, at the 3rd Swiss National Bank–International Monetary Fund Conference, May 8, 2012

INTRODUCTION

The "too interconnected to fail" concept highlights how institutions deeply embedded in financial networks pose systemic risks because their failure can easily propagate across the system. International frameworks like Basel III provide criteria for identifying globally systemically important banks, and interconnectedness is considered as important as size (Basel Committee on Banking Supervision, 2013). However, the concept of interconnectedness remains complex. While it can enable risk-sharing through diversification, it can also facilitate the spread of shocks when they are large. This paper explores how network structure and network measures shape financial contagion. It is divided into five parts. First, I discuss how network structure influences the propagation or mitigation of negative shocks. Second, I describe the different channels through which financial contagion spreads. Third, I explain how networks are quantitatively measured. Finally, I present case studies on the collapse of Silicon Valley Bank and the trade shock associated with Chinese imports.

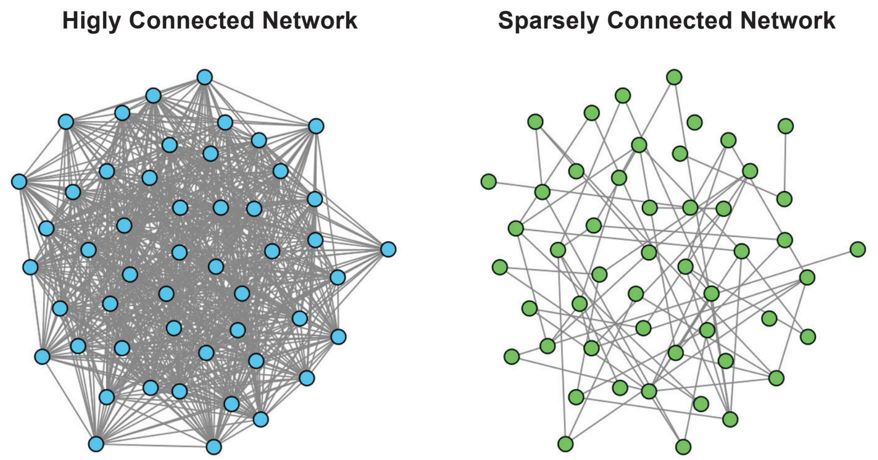

Figure 1: Network Structures

Negative Shocks and Network Structure

Negative shocks can be either propagated or contained depending on the network structure and shock magnitude. Acemoglu et al. (2015) theorize that the size of a negative shock affects a network's ability to absorb or spread risk. If the shock is below a certain threshold, a highly connected network can absorb it. However, if the shock exceeds the threshold, the same interconnected structure may facilitate contagion. In such cases, a sparsely connected network is preferred to contain the disruption within a limited number of institutions. Thus, interconnectedness can have both stabilizing and destabilizing effects. In the United States, Asgharian et al. (2022) find that banks with network centrality two standard deviations above the average face a higher probability of default, implying that more connections increase vulnerability. Conversely, Zareei (2015) finds that firms with higher centrality experience lower credit default swap spreads. In Germany, Craig et al. (2014) report that banks with greater centrality have a lower likelihood of being classified as distressed, but this effect is only observed among large and regional cooperative banks.

Channels of Financial Contagion

Glasserman and Young (2016) identify three primary channels of contagion: asset-side, funding-side, and information contagion. Asset-side contagion occurs when the value of a bank's assets declines significantly—such as a drop in real estate prices or an increase in loan defaults—leading to challenges in meeting liabilities and an increased risk of default. Funding-side contagion arises when interbank lending dries up. If Bank A stops lending to Bank B, Bank B faces a funding shortfall, which may force it to reduce its own lending and liquidate assets. Information contagion refers to spillovers caused by perceived similarity in asset holdings. If one bank sells illiquid assets to meet capital requirements, the resulting price drop can affect other banks holding the same assets. These banks may also sell the declining assets, further driving down prices and triggering a cascade.

Measuring Interconnectedness

There are various ways to measure interconnectedness among financial institutions. One is to use accounting-based variables such as transaction volumes; another is to approximate the similarity in asset holdings using market-based measures like equity return correlations (Hasse, 2021). Both are crucial because a high level of interconnectedness in one measure may not correspond to a high level in another (Brunetti et al., 2019; Giudici et al., 2017). For example, Brunetti et al. (2019) show that during the Global Financial Crisis, accounting-based networks declined, while networks constructed from equity return correlations increased. This suggests that although some banks ceased transacting, their asset portfolios remained highly correlated. Hasse (2022) proposes a method to uncover hidden, indirect connections using stock return correlations. His method identifies the shortest path between two institutions, revealing potential strong indirect links that are not immediately apparent from direct relationships. This implies that even if direct connections seem weak, systemic risk may still propagate through indirect channels.

Case Example: Silicon Valley Bank and Panic Withdrawals

On March 8, 2023, Silicon Valley Bank (SVB) announced a $1.8 billion loss from selling declining securities and a plan to raise over $2 billion to stabilize the bank. This triggered depositor panic, and the next day, SVB's stock price dropped by 60% (Zahn, 2023). SVB's collapse—marking the largest U.S. bank failure since the Global Financial Crisis—cannot be fully explained by asset-side losses due to monetary tightening. Jiang et al. (2024) argue that SVB's liability composition played a critical role: 92.5% of its deposits were uninsured, placing it among the most exposed banks in the U.S. This vulnerability made the bank particularly susceptible to a deposit run. Choi et al. (2023) note a unique aspect of the collapse: SVB responded to the liquidity crunch not by selling illiquid assets but by liquidating securities held to maturity—thereby realizing losses. The short-term contagion mostly affected medium-sized banks with assets between $50 billion and $250 billion. In the medium term, all but the largest banks were affected, likely due to the perception that large banks were better supervised and more stable.

Case Example: Trade Shocks and Systemic Implications

Trade shocks can also jeopardize financial stability. Federico et al. (2025) analyze how China's entry into the World Trade Organization impacted Italian banks and firms. Italian firms facing greater competition from Chinese imports experienced an increase in non-performing loans. Banks heavily exposed to these sectors saw a 0.3 percentage point rise in non-performing loans for every one standard deviation increase in trade exposure. This prompted banks to reduce credit to firms—not only in the affected sectors but also in unrelated ones. A one standard deviation increase in exposure to the trade shock led to a 7.4% decline in credit supply. If firms are unable to find alternative sources of financing, this credit contraction could dampen firm output, employment, and broader economic activity. This case illustrates how negative shocks can spread from vulnerable firms to their lenders, and ultimately to the wider economy.

CONCLUSION

Interconnectedness among financial institutions is a complex and double-edged phenomenon. While it can foster resilience by allowing risk-sharing, it can also accelerate contagion during periods of stress. Highly connected networks can absorb small shocks, but may amplify larger ones. Measuring interconnectedness is equally challenging, as different metrics capture different channels of risk transmission. Relying on multiple measures is therefore essential to gain a comprehensive understanding of systemic risk. As demonstrated by recent shocks—from SVB's collapse to global trade disruptions—recognizing and quantifying financial interconnectedness remains vital to safeguarding stability in an increasingly networked global economy.

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