Collateral Reuse and Financial Stability *

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Abstract

The effects of collateral reuse on financial stability are ambiguous and understudied. While greater collateral reuse can guarantee more payments with fewer assets, it can also increase the exposure to potential drops in collateral price. To analyze these tradeoffs, we develop a financial network model with endogenous asset pricing and multiple equilibria. More collateral reuse can not only improve the collateral price in the best equilibrium but also increase its likelihood, to varying effects depending on the network structure. Therefore, collateral reuse can unambiguously improve financial stability for a fixed degree of risk-taking behavior. However, with endogenous risk-taking, we show that a higher degree of collateral reuse can worsen financial stability through greater risk-taking. As a result, there may be a lower social surplus during crisis.

Keywords: collateral, collateral reuse, financial network, fire sale, multiple equilibria, systemic risk

JEL Classification Numbers: D49, D53, G01, G21, G33

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1. Introduction

Most securities financing transactions (SFTs) are collateralized, implying that one side of the trade posts assets to guarantee the payments made to the other side (counterparty) in case of a default. Collateral posted in this way can often be reused by the receiving counterparties when they themselves borrow from other counterparties. Such reuse or re-hypothecation of collateral is prevalent in the markets for SFTs, which include repurchase agreement (repo), reverse repo, security lending/borrowing, and margin lending transactions, (Fuhrer, Guggenheim and Schumacher, 2016; Singh, 2017; Infante, Press and Strauss, 2018; Infante, Press and Saravay, 2020). Policy makers have discussed potential systemic risks stemming from collateral reuse.[1] Many academic papers have explored the effect of collateral reuse on leverage, liquidity, safe asset demand, and risk of collateral runs (Gottardi, Maurin and Monnet, 2019; Park and Kahn, 2019; Infante and Vardoulakis, 2021; Chang, 2021; Maurin, 2022).

However, the effects of collateral reuse on financial stability are unclear. When holding counterparty liabilities fixed, greater collateral reuse can guarantee and protect more debt obligations with fewer assets, mitigating defaults. On the contrary, collateral reuse may harm financial stability as more debt obligations depend on the same collateral whose value can potentially drop. More collateral reuse can also incentivize agents to take on greater risk. Hence, an in-depth analysis is required to understand the financial stability implications of collateral reuse.

In this paper, we develop a model of contagion through counterparty exposures while allowing for collateral reuse.[2] The model is based on the financial networks literature where

[1] See, for example, Aitken and Singh (2010) and Financial Stability Board (2017).

[2] Typical SFTs take the form of a one-to-one relationship between a borrower and a lender. If the value of the collateral is greater than the face value of the debt (liability), then the payment is always made in full. However, if the value of the collateral is less than the face value of the debt, then the payment depends on both the price of the collateral and the cash balance of the borrowing counterparty. Therefore, a collateralized debt network has two transmission channels of shocks, the collateral price channel and the counterparty channel, and the interaction of network structure and collateral prices can dramatically alter a network's systemic risk and, thus, welfare (Chang and Chuan, 2024). For example, the collapse in prices of

links represent payment relationships, stemming from Eisenberg and Noe (2001). In particular, the model directly extends Chang and Chuan (2024), which incorporates (re)use of collateral and endogenous collateral price. Therefore, our model allows for both contagion through counterparty exposures and contagion through asset prices.

The model of Chang and Chuan (2024) is based on an economy of n agents and three periods $t = 0, 1, 2$. Agents are endowed with an asset that can be traded and used as collateral. The price of the asset p is endogenously determined in a competitive Walrasian market in each period. The payoff of the collateralizable asset s is common knowledge and realized in the final period $t = 2$. In the first period $t = 0$, agents borrow from each other using bilateral one-period secured debt contracts.[3] The collection of these bilateral debt contracts is the collateralized debt network. We take the network as exogenously given, as short-term collateralized contracts tend to be relationship based (Han, Nikolaou and Tase, 2022; Chang, Klee and Yankov, 2025). At $t = 0$, agents also invest in a long-term project that generates a non-pledgeable return at the final period $t = 2$. Liquidating the long-term project is costly and thus socially inefficient. However, agents can receive a negative liquidity shock at $t = 1$ and they may have to liquidate their long-term projects to pay their debt. If an agent's net wealth is still negative after liquidations, then the agent defaults, which can trigger additional liquidations and defaults through the network. Liquidity shock and defaults can also decrease the collateral asset price, as agents may fire sell their assets due to liquidity shortage, further exacerbating the default losses, as the collateral value declines. Under such case, the equilibrium asset price is determined by cash-in-the-market pricing, as the return on purchasing the collateral asset is greater than the cash return.

As Chang and Chuan (2024) showed, if collateral is enough, any network structure is insulated from contagion.[4] Moreover, for a fixed debt network, higher degree of collateral

subprime mortgages during the GFC was exacerbated by the bankruptcy of Lehman Brothers, which spread the initial losses to Lehman's counterparties and further decreased asset prices (Singh, 2017).

[3]The debt contract encompasses any type of SFTs and even derivatives.

[4]This result is in line with real-world markets. For example, repo collateral is exempt from the automatic stay of bankruptcy provisions and prevents further spillovers.

reuse (or high value of collateral multiplier defined by Aitken and Singh (2010) and Singh (2017)) implies the same liability amount can be covered by more collateral. Therefore, as long as the collateral price remains at its fundamental value s, more collateral reuse guarantees financial stability.

However, there are multiple equilibria in the model. In line with the literature (Rogers and Veraart, 2013; Elliott, Golub and Jackson, 2014; Bernard, Capponi and Stiglitz, 2022; Capponi, Corell and Stiglitz, 2022), the analysis of Chang and Chuan (2024) is focused on the maximum (Pareto-dominant) equilibrium. Multiplicity of equilibrium itself can generate interesting venue of research (Dybvig, 2023). As Jackson and Pernoud (2024) show, multiplicity and self-fulfilling defaults can be important to understand fragility of a financial network.[5]

Hence, we analyze the multiplicity of equilibria in the model of Chang and Chuan (2024). In particular, we show that there can be at most three equilibria in our model, depending on the network structure, when collateral (re)use is large enough. In the best (Pareto-dominant) equilibrium, the collateral asset is priced at its fundamental value $p = s$, and the high collateral price can prevent contagion, resulting in ample liquidity of the agents to buy the assets at its fundamental value. In the worst equilibrium, the collateral asset is priced at zero $p = 0$, maximizing counterparty exposures between agents, when the network is sufficiently connected. This results in full contagion, i.e., all agents default. Because all agents are defaulting, there is no one to buy the asset at a positive price. Finally, in the intermediate equilibrium, the collateral asset is priced at a market clearing price $\tilde{p}$ that equalizes the available cash in the network and the total supply of fire sales.

Our first main result is that the intermediate equilibrium price $\tilde{p}$ is decreasing in the degree of collateral reuse. The intuition is simple: more collateral reuse (c) leads to smaller counterparty exposure for a given price, resulting in an increase in net wealth of agents.

[5]For example, Fleming and Keane (2021) and Božić and Zrnc (2023) show that centrally netting out liabilities can greatly reduce the number and severity of defaults, implying that self-fulfilling defaults are real and important (Jackson and Pernoud, 2024).

Then, the collateral price p must go down to clear the market, which equalizes the remaining aggregate net wealth with the total value of assets on sale. In other words, the equilibrium price p decreases to make the total value of the collateral, which is the total collateral amount c multiplied by the market price p, constant cp. Although the intermediate equilibrium price $\tilde{p}$ may differ across different networks, the price is monotonically decreasing in the degree of collateral reuse.

We then extend our model to incorporate equilibrium selection across multiple equilibria. For equilibrium selection, we consider using both global games as in Carlsson and Van Damme (1993) and Morris and Shin (1998), and best response dynamics as in Matsui (1992) and Mäder (2024). Our main results hold regardless of the choice of the equilibrium selection rule.

Our second main result is that there is an inverse relationship between the intermediate equilibrium price ($\tilde{p}$) and the likelihood of the realization of the best equilibrium. This is because the intermediate equilibrium is unstable compared to the best ($p = s$) or worst equilibrium ($p = 0$). If the asset price is perturbed slightly above the intermediate equilibrium price $p > \tilde{p}$, then the equilibrium will quickly converge to the best equilibrium. This is because an increase in p increases agents' aggregate net wealth, which increases p further until $p = s$. Conversely, if the asset price is perturbed to be slightly lower than the intermediate equilibrium price $p < \tilde{p}$, then the equilibrium will converge to the worst equilibrium. Therefore, having lower intermediate equilibrium price $\tilde{p}$ implies that there is a greater range of $(\tilde{p}, s)$ in which any realization/perturbation of noisy asset sales would lead to the best equilibrium with $p = s$.

Therefore, by combining our first two main results, we find that more collateral reuse increases financial stability for a fixed debt network. This counterintuitive result alleviates the first-order concern of policy makers that more collateral reuse increases the financial system's exposure to self-fulfilling price declines and defaults. Even if there are multiplicity of equilibria and self-fulfilling crisis (the worst equilibrium), increase in the degree of collateral

reuse actually makes the financial system more stable, not less.

Finally, we further extend our model to incorporate agents' risk-taking decisions. In particular, we endogenize the agent's portfolio choices between cash and long-term investment project at $t = 0$. Agents can form beliefs about the expected outcome at $t = 1$ and maximize their expected payoff at the final period $t = 2$. Agents can hold cash to prevent default and purchase the asset at a cheap price, i.e., high return, if there are fire sales with $p < s$ at $t = 1$. Alternatively, agents can take on more risk by investing in the long-term project with the potential of it being inefficiently liquidated at $t = 1$.

We find that collateral reuse increases agents' risk-taking behavior and invest more in the long-term project relative to cash. This is because the likelihood of the worst equilibrium decreases as collateral reuse increases. Thus, agents have less incentives to hold cash and instead would rather invest it into the long-term investment project, which has a higher payoff if held to maturity. As a result, there will be more socially inefficient liquidations of the long-term project when crisis (the worst equilibrium) occurs. Moreover, the likelihood of crisis also increases as agents have less cash buffers to absorb liquidity shocks. Therefore, we find that greater degree of collateral reuse can harm financial stability when agents' portfolio choice is endogenously determined. In particular, it will decrease the resiliency of the financial system as social welfare in the worst equilibrium falls with respect to greater liquidations of agents' investment projects.

Our results have two important policy implications. First, the degree of collateral reuse alone is not a concern for financial stability. Indeed, collateral reuse can alter other relevant factors that may ultimately influence financial stability, such as market liquidity and the rate special due to safe asset scarcity. However, we find that the direct relationship between collateral reuse and financial stability as a result of self-fulfilling price drops and defaults is actually positive. Second, the degree of collateral reuse can still negatively impact financial stability through its indirect effects on agents' risk-taking choices, which become concerning in tail events. Therefore, monitoring the degree of collateral reuse can still be important, as

higher degrees of collateral reuse can be followed by greater leverage and other risk-taking behaviors of market participants.

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