

## **Research Statement**

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I am an applied finance theorist working on topics related to financial intermediation. Financial intermediaries are key players in the financial system. At best, financial intermediaries facilitate trade, provide insurance, and improve the allocation of resources. At worst, they can precipitate or exacerbate crises with devastating real effects. My research focuses on the role of financial intermediaries in shaping the stability and efficiency of the financial system. I combine tools commonly used in macroeconomics and information theory to study liquidity provision, regulation, and information frictions in two broad areas: intermediation in banking and intermediation in financial markets. While my work is primarily theoretical, I also incorporate empirical analyses to understand intermediary behavior and its broader implications for the financial sector. The combination of theory and data allows me to connect theoretical insights with practically relevant aspects of financial intermediation, which are useful for policy. My research is regularly presented at leading academic and policy institutions, and my contributions have been integrated into Ph.D. curricula and featured in regulatory and practitioner discussions.

### **INTERMEDIATION IN BANKING**

Banks are canonical financial intermediaries and have captivated the interest of academics and regulators alike. Many complementary theories seek to justify why banks exist. On the one hand, banks create liquidity, enabling depositors to insure against idiosyncratic shocks. On the other hand, banks serve as information producers, by signaling the quality of loans to investors, producing new information about potential investments, and screening borrowers. My research looks at banks from both perspectives.

### **Banking Specialization**

Banks play a critical role selecting high-quality borrowers and monitoring their adherence to loan covenants. These tasks require the acquisition of costly information, which can lead to economies of scale achieved through portfolio specialization. In the most recent branch of my research agenda, I look at how banks' role as information producers affects their loan portfolios and the overall supply of credit. The combination of empirical and theoretical work in this area is essential for uncovering aspects of the informational landscape among lenders that significantly impact credit market outcomes.

Banks can specialize their lending across many dimensions, including geography, collateral, and industry. Most existing evidence on bank specialization has focused on foreign banks or relatively small domestic

banks. Using supervisory data for all stress-tested banks in the U.S., **“Specialization in Banking” (Journal of Finance, forthcoming)** documents that even large banks specialize by disproportionately concentrating their lending in one industry. By leveraging the richness of the Y14 data, the paper reveals patterns of bank specialization that are consistent with banks having informational advantages in their preferred industry. Loans in the preferred industry perform better, have longer maturities, lower rates, and are more likely to be collateralized by monitoring-intensive capital. Additionally, banks disproportionately increased their lending within their specialized industry after receiving unexpected deposit inflows in 2020, and they reduce their lending less in their specialized industry in periods of tight tier-1 capital. This preference has real effects on firm growth, with firms borrowing from specialized lenders benefiting. Consequently, deposit reshuffling within the banking system—such as the one observed in 2023 following the Silicon Valley Bank crisis—can have profound real consequences.

The evidence on bank specialization suggests that information asymmetries in the credit market extend beyond just borrowers and lenders. Competing banks are also asymmetrically informed, with specialized banks having systematic informational advantages over others. These specialized banks tend to get more precise and broader information than their competitors, allowing them to screen loans better and price them more precisely. **“Information-Based Pricing in Bank Specialized Lending” (R&R Journal of Financial Economics)** studies a credit-market competition model with a specialized and a non-specialized bank. The specialized bank observes characteristics of the borrower that are unobservable by the non-specialist. This specialized information structure gives the specialized bank an informational advantage and allows it to price loans based on it. This private-information-based pricing, which stems from the novel information structure in the paper, helps explain why loans made by specialized lenders have lower interest rates (lower winning bids) and better ex-post performance (fewer non-performing loans), which are supported with robust empirical evidence for stress-tested U.S. banks using Y14 data.

The nature of the information structure among banks is central in determining the competitiveness of the loan market and, ultimately, access to credit. Hence, the rapid rise of FinTech and non-bank lenders is bound to change the lending market landscape dramatically. The increase in data availability and the technological advancements in information processing resulting from Big Data and machine learning can potentially upend how the banking sector operates, changing how banks compete, the risks they take and the overall stability of the banking sector. **“Information Span in Credit Market Competition”** distinguishes between two characteristics of information that are affected by technological change: span (breadth) and precision (quality). Distinguishing between these two dimensions is crucial to analyze the effects of changes in information technologies, especially for specialized lenders. The paper shows that policies like open banking which increase the precision and correlation of “hard” information available to

specialists and non-specialists alike increases the informational advantage of the specialized bank and decreases the competitiveness of the lending market. However, the hardening of soft information, resulting from improved processing capacity and increased data, levels the playing field for the non-specialized bank. While the paper explores the contrast between information span and precision in the context of the lending market, there is scope to study this distinction in other contexts involving strategic interactions.

### **Bank Stability**

The stability of banks and bank-like intermediaries is essential to avoid recurring financial crises. To manage the risks in the banking sector, regulators around the world rely on stress tests. These tests elicit information about the potential losses banks may face under hypothetical stress scenarios, enabling regulators to assess the health of the financial system and guide financial regulation. Central to the efficacy of stress tests as a policy tool are the stress scenarios. Despite the ubiquitous use of stress tests in financial supervision (and risk management more generally), there is little theoretical guidance on exactly how one should design these scenarios. **“Designing Stress Scenarios” (Journal of Finance, forthcoming)** fills this void. The paper develops a tractable and implementable framework to characterize the optimal stress scenario by reformulating the scenario choice problem as a signal design problem. The basis of this reformulation is linking the optimal scenario choice to the optimal signal precision choice through the regulator’s Bayesian updating. The framework’s tractability together with the optimal design approach makes it possible to quantify the social value of stress testing. A calibration of the model to U.S. banking sector finds that adding an optimally designed scenario improves welfare modestly when the regulator only has access to capital requirements. However, optimally designed stress tests can be considerably valuable when the regulator can also use targeted interventions to reduce banks’ exposures to risk factors.

A central challenge surrounding the implementation of supervisory stress tests is the disclosure of the results to the market. As thoroughly discussed in Goldstein and Sapra (2014) and Goldstein and Leitner (2022), there are tradeoffs associated with the disclosure of stress test results. While disclosing this information can discipline banks and regulators, it is not without costs. Disclosing information about banks’ assets, and more generally a more transparent banking system, can crowd out private information production (Goldstein and Yang (2017)), destroy risk-sharing opportunities (Goldstein and Leitner (2018)), and lead to coordination failures and runs. **“Transparency and Bank Runs” (Journal of Financial Intermediation, conditionally accepted)**, theoretically shows that more precise information about the quality of bank assets increases the economy’s vulnerability to bank runs by facilitating the coordination of depositors, and thereby it can decrease risk-sharing and welfare.

## **Liquidity and Financial Stability**

Beyond loan selection, one of most distinctive roles played by banks is to create liquidity through maturity transformation. Though this has been almost an exclusive characteristic of banks, the past 20 years have seen a rise in shadow banks, such as Money Market Funds (MMF), that also engage in this activity without facing the same tight regulatory environment imposed on banks.

One of the main differences between MMFs and banks is the former's lack of capital or precautionary liquid reserves to deter outflows. Instead, MMF may receive discretionary support from their sponsors, who can transfer outside funds to the MMF's balance sheet. While voluntary sponsor support helped prevent system-wide outflows in the past, it proved insufficient to avert runs in 2008. **“Fragility in Money Market Funds: Sponsor Support and Regulation” (Journal of Financial Economics 2016)** shows how sponsor support, which can be stabilizing in normal time, can become distinct source of fragility for the MMF industry during liquidity crises. Specifically, strategic complementarities in the sponsors' support decisions can trigger runs of the MMF on the money market, amplifying systemic shocks. When liquidity in asset markets is limited, increased liquidations decrease asset prices are lower if more funds liquidate, which renders sponsor support costlier and leading to further asset liquidations. Considering this sponsor support as a source of fragility has important implications when evaluating regulatory policies on the MMF industry.

The liquidity crisis that triggered the MMF reform in 2016 was partly fueled by a freeze in the collateralized debt markets, where many liquid securities are posted as collateral. **“Collateralizing Liquidity” (Journal of Financial Economics 2019)** explores why firms use financial assets as collateral rather than selling them when they are in need of funds. I show that borrower firms choose to collateralize financial assets when they expect them not to be perfectly liquid in the future. Borrowers want to start each period with as many assets as possible to be able to borrow to invest. If the financial asset is perfectly liquid, collateralizing or selling them is the same as borrowers can always purchase what they sold in the market. However, under the threat of future illiquidity, borrowers maximize their expected next-period asset holdings by financing their investment with collateralized debt, which implies losing the assets only if their projects are not successful and they default, rather than with certainty as is the case with asset sales.

## INTERMEDIARIES IN FINANCIAL MARKETS

The second part of my research agenda centers on intermediaries in financial markets. A common thread throughout this work is the emphasis on efficiency in intermediated markets, whether through the lenses of liquidity and welfare or by addressing information frictions. In many instances, I emphasize the use of theory to guide measurement.

Financial intermediation is not reserved for banks and shadow banks; it permeates most financial markets. For example, arbitrageurs are intermediaries among segmented asset markets, exploiting price differences between assets to make a risk-free profit. In doing so, they contribute to eliminating market inefficiencies. Conventional arbitrage logic relies on the ability to trade frictionlessly. However, in practice, various frictions generate arbitrage gaps, with a growing body of evidence showing that deviations from the law of one price are widespread. While there is a large theoretical literature that studies why these gaps arise, the welfare costs of these deviations have been largely unexplored.

**“The Value of Arbitrage” (Journal of Political Economy 2024)** studies the social value created by arbitrageurs by closing price differentials in financial markets. Based on a model of trading in segmented markets, the paper derives measures for the marginal and aggregate values of arbitrage as a function of only price differentials and price impacts. These measures show that, for a given arbitrage gap, the value of closing the price differential is higher in more liquid markets (with a lower price impact). The sufficient statistic derived in the first part of the paper is then used to compute the welfare gains associated with closing the arbitrage gaps in the context of covered interest parity (CIP) violations. The paper uses high-frequency data to compute price impact estimates for the FX futures market. Combining these estimates with cross-currency bases, the paper finds that the maximum welfare gains from closing CIP arbitrage gaps among the five studied currency pairs are of the order of \$1.2B, but do not exceed \$300M outside of the Yen-Dollar basis.

A common source of limits to arbitrage is transaction taxes, which impose a wedge between the arbitrageurs’ optimal strategy and the socially optimal one. Transaction taxes (Tobin taxes) are usually proposed to curb speculative trades and keep volatility in check. A usual counterargument to this type of tax is that increasing transaction taxes will also discourage trade by informed investors and information acquisition (e.g., Vives (2017) among others) and therefore, reduce market efficiency. This insight is based on models in which the noise in asset markets is taken as exogenous (coming from noise traders), which is not an innocuous assumption, especially for policy analysis.

**“Trading Costs and Informational Efficiency” (Journal of Finance 2020)** studies the effect of (exogenous) transaction costs on the informational content of prices. The paper develops a model of trading with disagreement and dispersed information in which the amount of aggregate noise in the price is an equilibrium outcome. Whether trading costs affect price informativeness depends on the heterogeneity among the investors. If investors are ex-ante homogeneous, changes in trading costs do not affect price informativeness. When investors are ex-ante heterogeneous, trading costs reduce price informativeness if and only if investors who trade relatively more aggressively on their information have an overall demand that is more sensitive to trading costs than that of investors who trade relatively more aggressively on their beliefs. These results hold independent of whether trading costs are quadratic, linear, or fixed. The paper highlights the role of how economic noise is modeled when studying information aggregation in several examples of applied interest.

An essential role of financial markets is to aggregate dispersed information within the economy. As with trading costs, the effect of regulation on the market’s ability to aggregate information is hard to assess. On the one hand, the effect is often ambiguous and depends on unobservable variables, such as investors’ risk aversion, their beliefs, and the precision of their information. On the other hand, price informativeness is not directly observable, and therefore it is hard to use case studies to assess the effect empirically. However, understanding how the market’s ability to aggregate dispersed information reacts to policy changes is paramount to assessing a policy’s effect on the efficiency of the economy and welfare.

Starting with Grossman and Stiglitz (1980), a large theoretical literature in economics and finance, reviewed by Vives (2008) and Veldkamp (2011), focuses on the informativeness of prices. On the empirical front, several variables arguably correlated with the informational content of prices have been proposed to proxy for price informativeness. Two of my papers aim to tighten the connection between theory and data by using insights from theory to learn about price informativeness empirically.

**“Volatility and Informativeness” (Journal of Financial Economics 2023)** explores the relation between price volatility and price informativeness in financial markets. The goal of the paper is to make inferences about changes in price informativeness, which is not directly observable, from changes in conditional price volatility, which is easily computable. The paper theoretically identifies two channels through which volatility and informativeness are related: a noise reduction channel and an equilibrium learning channel. Using this characterization of the volatility-informativeness relation, the paper identifies parameter regions such that the two variables of interest positively or negatively comove for changes in any parameter of the model. Based on these regions, a stock-specific comovement score is derived and implemented empirically. The comovement score captures the likelihood of positive or negative comovement between price volatility

and price informativeness for each stock in the sample. There is a large dispersion in the computed comovement scores. Around 14% of the estimated comovement scores are in or near the negative comovement region and roughly 40% of them are in or near the positive comovement region.

**“Identifying Price Informativeness” (R&R Review of Financial Studies)** shows how to identify and recover relative price informativeness, which formally corresponds to the precision of the signal about future payoffs contained in asset prices relative to the precision of the innovation in the payoff. Starting from an asset pricing equation and a stochastic process for asset payoffs, the paper shows how to recover relative price informativeness from linear regressions of changes in asset prices on changes in asset payoffs. The main result shows that a specific combination of R-squareds from these regressions exactly identifies relative price informativeness. The results are valid within a large class of models that may feature rich heterogeneity across investors’ preferences, endowments, private signals, and private trading needs; competitive or strategic market structures; symmetric or asymmetric information; and that require minimal distributional assumptions. The paper then uses the identification results to recover a panel of stock-specific measures of relative price informativeness. In the cross-section, stocks have higher price informativeness if they: i) are larger, ii) turn over more quickly, iii) have higher idiosyncratic volatility, and iv) have a higher institutional ownership share. In the time series, the median, mean, and standard deviation of price informativeness have steadily increased since the mid1980s.

There are many other intermediaries in financial markets. Market makers help clear transactions, brokers facilitate trades, and dealers intermediate between clients. There is a wide variety in the configuration of intermediated markets, ranging from a unique trading venue in which trade is concentrated to decentralized markets featuring mostly bilateral trades. The degree of market fragmentation has important implications for intermediary liquidity and the efficiency of the market as discussed most recently by Chen and Duffie (2021) and Manzano and Vives (2021). Moreover, the degree of market fragmentation is an equilibrium outcome that depends on the type of friction in the market.

Most of the literature on endogenous market fragmentation focuses on venue characteristics or dealers’ choices and tends to downplay the role of investors’ choices and characteristics, which can be key in determining the market structure of asset markets in practice. **“Strategic Fragmented Markets” (Journal of Financial Economics 2022)** focuses on investors’ choices to theoretically study the determinants of market fragmentation and the associated implications for market liquidity and welfare. The paper shows that when investors’ disagreement about the value of the asset is low, market fragmentation is an equilibrium outcome. In this case, investors take the same side of the market. This increases the competition among investors, which allows a dealer to exploit her position in the market better. If disagreement among

investors is low enough, investors are willing to trade in smaller markets with higher price impact to face less competition when trading against the dealer. This is true whether there is learning from prices or not. The maximum degree of market fragmentation increases as disagreement decreases. In terms of welfare, dealers can benefit from fragmentation, but investors are always better off in centralized markets.

Finally, sometimes the government acts as an intermediary in financial markets, especially when the provision of public goods is involved. A clear example of this is the financing of infrastructure, in which many projects would not be privately funded without government intervention. In infrastructure projects, private capital may find it difficult to ensure adequate returns due to the government's expropriation risk. The government's expropriation of private rents can come from limits to user fees that operators who build and manage infrastructure can charge to the public, from changes in ownership such as privatizations or early termination of concessions, or through regulatory changes such as the unexpected phasing out of technology. **“Financing Infrastructure in the Shadow of Expropriation” (Review of Financial Studies, forthcoming)** theoretically analyzes the optimal financing of infrastructure when governments have limited commitment and can expropriate rents from private sector firms that manage the infrastructure project. In the model, project operators need incentives to implement the projects well (a standard moral hazard problem in corporate finance) and the government needs incentives to limit expropriation. This double moral hazard limits the willingness of outside investors to fund infrastructure projects. Optimal financing involves government guarantees to investors against project failure to incentivize the government to commit not to expropriate which improves private sector incentives and project quality. The model captures several other features prevalent in infrastructure financing in practice such as government co-investment, tax subsidies to the private parties and bundling of development rights.



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