Research Summary

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My research provides new and innovative perspectives on central issues facing economies and markets. The common themes in my research center on credit markets as a source for economic growth but also systemic risk, the role of banks and "shadow banks" in financial stability, and the effectiveness of financial market regulation and monetary policy for the globalization of credit markets. My research can thus broadly be classified into two subareas:

1. Banking and Financial Stability,
2. Financial Intermediation and Corporate Credit Markets

I briefly summarize the main take aways of my work with a focus on my key papers (**underlined**) and other core contributions (in **bold**). Other related contributions are listed as well.

My research so far has been funded with different grants from academic as well as industry source with funding totaling €5.4 million over the last 5 years alone. I have published 11 articles in top 3 Finance journals (1 JF, 5 JFE, 5 RFS), and several other top field publications (1 JFI, 1 RCFS, 1JMCB, 1 JCF, 2 JFS, 1 JBF).

As of May 15, 2024, my research was cited 6,341 times on google scholar, and, in addition to my academic contribution mentioned above, I have written three overview articles for the Annual Review of Financial Economics related to my work on banking and financial stability, financial intermediation, and corporate credit markets.

Over the past 10 years, I have given 27 keynote speeches about my research at academic conferences, regulatory agencies, or at conferences from industry partners. My recent paper on quantitative easing and tightening was invited by the Jackson Hole Economic Symposium. I am also the founding director of the "Center for European Transformation" at Frankfurt School of Finance & Management and currently hold 8 positions as Academic Advisor.

1. Banking and Financial Stability

One key area of my research relates to the implications of **monetary policy** interventions by central banks for banks and the real economy. My papers deliver some key insights for the academic literature and policy discussion.

- In **Grosse-Rueschkamp, Steffen and Streitz (2021)**, we uncover a new channel through which unconventional monetary policy (purchases of corporate bonds), the "capital structure channel" of monetary policy. Corporate bond purchases free up capital of (particularly) capital constrained banks and allows them to increase lending to private firms.
- Monetary policy tightening and loosening might work asymmetrically through bank balance-sheets, and monetary policy might be pushing on a string when the banking sector is weak. Financial sector stability is important for the transmission of monetary policy, as shown in **Acharya et al. (2020).**
- We contrast two specific unconventional monetary policy programs by the European Central Bank (ECB), the long-term refinancing operations (LTROs) and the Outright Monetary Transaction (OMT) program (**Acharya, Pierret and Steffen, 2021**). LTROs significantly increased fire-sale risks in sovereign bonds when banks accumulated even more sovereign debt on their balance-sheets. OMT, on the other hand, introduced the ECB a buyer of last resort, which attracted new investors and reduced fire sale risks.
- Quantitative tightening is not simply a reversal of quantitative easing by central banks. Banks endogenously respond to the increase in central bank liquidity and make themselves more liquidity dependent. These incentives are elevated for weaker banks as shown in **Acharya et al. (2022, 2023)**.

A second area of research relates to the causes and consequences of **financial crises** and the implications of the responses by governments and regulators. The global financial crisis of 2007-2008 (GFC) as well as the following sovereign debt crisis in Europe (2010-2012) provide ideal settings to test related economic theories. My research provides novel contributions to this literature with a focus on European financial markets:

- The U.S. financial crises affected economically stable foreign countries as domestic banks were heavily invested in mortgage-backed securities. We show that the shock to the capital of these banks impairs their loan supply even in consumer credit markets - consumer loans and mortgages (**Puri, Rocholl and Steffen, 2011**).
- Fiscally constrained European governments did not recapitalize their banks following the GFC but provided (unconditional) guarantees (which we call "forbearance"). **Acharya et al. (2021)** show that affected banks have increased exposure to risky sovereign debt already since 2009 and engaged in zombie lending, effectively increasing their reliance on liquidity from the European Central Bank. Bailout decisions after the GFC thus saw the seeds for the European sovereign debt crisis.
- In a related paper, **Acharya and Steffen (2015)** show that sovereign bond investments by peripheral European banks can be understood as "carry trades" by undercapitalized banks. Banks shorted German bunds but loaded up on risky domestic sovereign debt. When sovereign risk materialized in 2011-2012, they were more likely to be bailed out (again) or to default. They also increased their reliance on central bank liquidity when they could no longer roll-over short-term financing.
- A further contribution of my research is to show that risks did not remain isolated in peripheral (riskier) European countries (**Korte, Kirschenmann and Steffen, 2018).** They

spilled over to saver European countries through a novel channel in the literature, the "zero risk-weight channel". Banks accumulated a significant amount of "missing capital" as regulators did not require them to fund riskier sovereign bonds with capital.

- **Schmidt et al. (2023)** emphasize the consequences of zombie lending for economic growth. Spain is an ideal laboratory as banks have not been properly recapitalized after the GFC. We show that zombie lending by undercapitalized banks (which effectively is a misallocation of capital from healthy to non-viable firms) impairs corporate innovation (fewer patents, depletion of patent stocks, and less internal R&D). Healthy firms do not enter markets and competition in these industries declines.

We discuss the literature on zombie lending and provide guidance how to measure zombie lending empirically in our survey article **Acharya et al. (2022)**.

A third theme of my research relates to **bank risk** and **financial stability**. This is a broad literature investigating bank business models and idiosyncratic risks, banks' contribution to systemic risk but also how regulators might respond to improve bank and financial stability. I make very specific contributions to this discussion.

- **Acharya, Engle, Jager and Steffen (2024)** show that bank risk during the COVID-19 pandemic was driven by banks' exposure to undrawn credit lines, which has massively increased since the GFC. Bank stocks crashed considerably more compared to stock prices of non-financial firms and did not recover after the Federal Reserve Bank has stepped in. We trace this back to two options associated credit lines, i.e., the option to draw down the credit line whenever needed but also the option to repay the credit line. Banks are short both options and therefore suffer when firms decide to exercise them.
- In a paper on bank business models and bank risk, **Hagendorff et al. (2021)** show that regulatory might have a hard time reining in bank manager risk taking by targeting obvious bank characteristics. Bank manger effects on bank risk are large but they are largely manager specific.
- We show that banks that try to mitigate idiosyncratic risks, e.g., by diversifying their loan portfolio, increase their contribution to systemic risk as bank portfolios become more interconnected. That is, the overlap of bank loan portfolios increases and banks accumulate portfolio losses at similar points in time. In other words, diversification might have externalities on the financial system (**Cai et al., 2018**).
- Since the collapse of Silicon Valley Bank in March 2023, the focus has shifted to bank liabilities and their depositors. While a large part of bank regulation after the GFC has focused on bank liquidity, depositor composition that can lead to sudden bank runs has thus far been ignored. We show that short-term unsecured investors in banks (i.e., uninsured depositors) are less likely to roll-over funding to banks with similar depositors. Banks cannot compensate for this loss in funding increasing bank and financial sector fragility (**Georg, Pierret and Steffen, 2023**).

In more recent contributions, I investigate the **role of banks in climate change** and how the financial sector can support the economy transitioning to achieve internationally agreed climate goals.

- In **Martini et al. (2023)**, we develop a bottom-up measure of U.S. banks' exposures to climate transition risks, constructed based on the carbon footprint of their syndicated loan portfolios. Banks with higher exposures disclose more on climate risks in their 10-Ks, their

exposures correlated more with bank-level climate betas and can explain bank stock returns around climate-related policy announcements.

- **Hoffner and Steffen (2023)** close an important data gap and gather information also about private firms' carbon footprint using the European Union Emissions Trading System (EU ETS). They use this to estimate German banks' exposure to climate change.

My research in these areas is accompanied by a substantial number of policy contributions (including book chapters). Several of these contributions were commissioned by European authorities such as the European Central Bank, the European Commission or the European Parliament.

2. Financial Intermediation and Corporate Credit Markets

My second area of research is on **Financial Intermediation and Corporate Credit Markets**. My first theme of research is on **credit line commitments** by banks, which have received new attention by researchers since the COVID-19 pandemic**.** I have discussed one of my contributions in this area documenting how credit line commitments adversely impacted bank stock returns already above. Here, I take a more firm-specific view and discuss different papers on this topic that I have written over the last years.

- The most recent one is **Acharya and Steffen (2020).** In this paper, we show that there was a "dash for cash" with firms collectively drawing down credit lines at the beginning of the COVID-19 pandemic to bolster cash and hedge against roll-over risk. Specifically, BBB-rated firm feared the risk of being a fallen angel. After the Federal Reserve intervention, high-quality firms issued bonds to repay credit lines.
- My earlier work relates to the pricing of these commitments. The main contribution of **Berg, Saunders and Steffen (2016**) is documenting that credit line pricing reflects the options associated with credit lines, particularly the drawdown option. **Berg et al. (2017)** expand the analysis and analyze a puzzling artifact, namely that loans are priced higher in the US compared to Europe. Important factors to understand the pricing differential are more cyclical credit line usage in the US as well as the supply of credit by institutional investors.
- In a related contribution (but using household data from German savings banks), **Rocholl, Puri and Steffen (2017)** show that default risk in loan markets can be reduced by having customers open checking or savings accounts and establish relationships with the bank. (Historical) Account behavior, e.g., through credit line usage, can be used to establish a baseline against which new client specific information can be evaluated. Banks can act on this information significantly reducing default risk.

The second theme of my research relates directly to the **corporate (syndicated)** as well as **leveraged loan market**. Particularly the leveraged loan market has increased in size over the last decade, which has inspired new research in this area.

- Research has by and large focused on public firms (mainly due to data availability). In **Saunders and Steffen (2015)**, we collected data on private firms as well were the first to quantify a significant loan spread disadvantage of private firms in the UK loan market. We document a higher costs of information production, lower bargaining power, differences in ownership structure, and differences in secondary market trading with respect to private vis-à-vis public firms as the main channels.

- The UK was widely regarded as the most important financial center in Europe and as a gateway for non-European banks into the European Union. "Brexit" could have changed this. **Berg et al. (2021)** tests this hypothesis and document a 24% decline in UK syndicated loan issuances after the Brexit vote driven by a reduction in loan demand by firms. The importance of the UK as a financial center, however, remained unchanged.
- Bank exposure to leveraged buyout loans (LBO) was the second major exposure of US banks after their exposure to mortgages before the GFC. In **Fahlenbrach, Rotermund and Steffen (2023)**, we investigate changes to LBO financing structures and show that banks change their LBO lending behavior after the GFC. Private equity sponsors need to provide 40% more equity and bank debt becomes more expensive and diversified among institutional investors.
- In our other work on bank credit line exposures, we showed that particularly firms financed by non-banks (through bonds or loans) draw down credit lines during stress periods. We explore the consequences for firms in **Acharya, Gopal and Steffen (2023)** as banks might respond ex-ante in the provision of credit. We show that reliance on non-banks by corporations leads to fragility, which banks factor in and they reduce liquidity provision ex-ante.

Berg, Saunders and Steffen (2021) further discuss trends in corporate borrowing in an overview article. **Imbierowicz, Saunders and Steffen (2017)** further investigate dynamics in corporate loan contracting.

Looking Ahead

Over the next years, I will continue working in both research topics outline above. The changing nature of financial intermediation and the role of banks and non-banks in providing capital to firms raises a set of new economically interesting questions.

Over the last 2 years, I have started to introduce artificial intelligence (AI) methods in my research across both major topics, for example to identify covenant violations and loan amendments from regulatory (SEC) filings of firms (**Krockenberger et al., 2023**), to construct an inflation expectations index from social media (Twitter) data (**Born et al., 2023**) or to explore how EGS ratings affect the cost of debt (**Fabisik, Schaefer and Steffen, 2023)**. I will continue to leverage data science techniques in my research going forward to uncover new insights in financial economics.

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