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Competition, Stability, and Efficiency in Financial Markets[1]

Discussion on a paper by Dean Corbae and Ross Levine
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1 Overview

The competitive environment in which banks operate has changed profoundly over the past decades, with implications for the stability and efficiency of financial markets. The post-war period was characterized by tightly regulated banks and limited competition. A second period, roughly between the 1980s and the global financial crisis, featured deregulation and increasing competition across activities and borders. In the third, post-crisis period, a comprehensive reform agenda has been initiated with the aim of enhancing the resilience of the financial system. Raising capital requirements, reducing too-big-to-fail subsidies and reforms of the shadow banking system are its core elements. Such reforms are designed to enhance the resilience of the financial system, and they affect also the competitive structure of markets. Looking ahead, competition through new technologies and new market entrants will pose a challenge to incumbent financial institutions.

The banking industry is thus going through a phase of significant structural change, which raises a number of questions: Has the concentration of banking markets increased, and has competition declined, and what are the implications for stability? To what extent are these trends driven by post-crisis regulatory reforms? Have non-viable banks exited the market? How effective is macroprudential policy? How can policy support banks' adjustment to structural change without having adverse effects on the efficiency and stability of the system? What do new technologies imply for the efficiency-stability trade-off? There is a large body of empirical and theoretical literature on the efficiency-stability (or risk-return) trade-off, but the findings are rather inconclusive (Carletti 2008).

Assessing trends in competition and their interaction with policy measures requires a framework that allows an analysis of the link between competition and stability. Corbae and Levine (2018) explicitly model the dynamic response of banking systems to various policy measures through market entry and exit of banks. They thus provide a theoretical framework for studying market dynamics and, in

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particular, the entry and exit of banks. They test the model using a novel identification strategy which exploits the exogeneity of deregulation of entry across US states and the predetermined structure of banks' affiliates across states. And they analyze policy implications, stressing interactions of policies (capital requirements, regulation of compensation, monetary policy).

The paper has an important message: More competition can yield a "double dividend" in terms of efficiency and stability – but only if accompanied by good policy design. Policy interventions are needed: More intense competition alone enhances efficiency – but also increases fragility. Also, monetary policy is more effective in more competitive markets with compressed margins.

My comments focus on three questions: Does the model match key stylized facts? What are the implications for policy? And how can macroeconomic dynamics and general equilibrium effects be modeled empirically? I shall begin with a discussion of broad trends in banking and how the paper contributes to the literature on the competition-stability nexus, and I shall conclude by making some remarks on how to improve the transfer of knowledge between research and policy.

2 Assessing Structural Changes in the Banking Industry

Financial markets can facilitate structural changes in the real economy – and financial markets are themselves undergoing structural changes. The post-war evolution of banking shows how the entry and exit of banks, regulation and deregulation, and technological change have interacted.

a. Structural Changes in the Banking Industry

Phase 1: Regulation and Limited Competition

In the post-war period, banking markets were largely protected by capital controls and restrictions on the activities of domestic financial institutions, including regional branching restrictions. Banking crises were rare (Kaminsky and Reinhart 1999). Banking was “boring” (Krugman 2009), as reflected in the structure of skills and compensation systems (Philippon and Reshef 2012).

Decomposing the valuation of bank equity prices shows that, between 1970 and 1985, franchise values of US banks were not high, market-to-book values of bank equity were closely aligned, and estimates of implicit government guarantees were small (Atkeson, d’Avernas, Eisfeldt, and Weill 2018).

Phase 2: Deregulation and Increasing Competition

Deregulation of banking markets started in the 1980s. In the US, the Riegle-Neal Act of 1994 and the Gramm-Leach-Bliley Act of 1999 allowed banks to expand across state lines and into new types of business. “Regulation Q”, imposing restrictions on deposit rates and incentivizing households to resort to Money Market Funds, was relaxed beginning in the mid-1980s. [2] In Europe, the First Banking Directive of 1977 allowed banks to establish branches in other member states. The Second Banking Directive of 1989 opened up capital markets across European countries.

Deregulation, market entry, and technological change ramped up competitive pressure. Deregulation may have been in the interest of banks in terms of opening up new markets. Eventually, however, deregulation may have been self-defeating as it eroded margins and increased incentives to take risks. The impact of deregulation on financial stability may have been underestimated – policy

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discussions of systemic risk and the need for macroprudential regulation have gained momentum only since the crisis.[3] Evidence for the US shows that, between 1996 and 2007, market values of bank equity rose, banks took on more risk, and the value of government guarantees increased (Atkeson, d'Avernas, Eisfeldt, and Weill 2018).

Phase 3: The Global Financial Crisis and its Aftermath

The post-crisis evolution of banking is shaped by the interaction of initial structural conditions, shocks, policy responses, and long-term trends on financial markets. Initially, the global financial crisis was seen as a major liquidity shock to global wholesale funding. Yet, it soon became evident that some business models were being affected more in structural terms and that many banks were, in fact, facing solvency problems. At the macroeconomic level, several shocks interacted, causing a macroeconomic crisis with the ensuing decline in credit demand, and, in some regions, a sovereign debt crisis.[4]

Initial structural conditions – including the degree of competition – had an impact on banks' adjustment to the new environment. Some banking systems had already manifested weaknesses in capitalization or profitability prior to the crisis. The margins of German banks, for example, had been under pressure well before the crisis (Hellwig 2018a). Reactions to the crisis were thus heterogeneous across banks and countries. Many banks consolidated their international operations. Other banks were not heavily exposed to the most turbulent markets and were thus not affected much by the initial shock. Some banks had strong capital buffers and seized the opportunity to expand into new markets.[5] Overall, the crisis appears to have precipitated a reallocation of market shares away from weaker banks to stronger banks.

Policy responses differed as well, reflecting the need for intervention and the available institutional frameworks for dealing with bank distress. Some

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policymakers intervened early on in order to restore financial institutions' capital; others intervened more cautiously, perhaps in the hope that the situation in which the banks found themselves would improve over time (Borio 2016). Many of those choices are shaping the competitive structure of banking markets today.

At the international level, the G20 leaders agreed, in 2009, on a set of reforms that reduce frictions and risk-taking incentives. [6] These reforms affect and, to some extent, operate through the competitive structure of banking markets: (i) *Enhancing resilience:* More stringent capital requirements, as a core reform element, shift activities towards well-capitalized banks. (ii) *Ending too big-to-fail*: Policies aimed at reducing implicit subsidies for systemically important financial institutions affect the market power of banks strongly reliant on such subsidies. For the reforms to be effective, they need to be accompanied by reforms of resolution frameworks which enable weak financial institutions to exit the market without adverse effects on financial stability.[7] (iii) *Reforming derivatives markets:* The promotion of central clearing creates centralized players on derivatives markets. (iv*) Shadow banking:* The transformation of shadow banking into resilient, market-based finance changes the nature of competition through non-banks.

Superimposed on these policy responses have been global trends: Technological changes and competition through "FinTechs" and "BigTechs" influence banks' business models;[8] globalization of non-financial firms affects the demand for banking services; the normalization of monetary policy has implications for financial institutions.

It is thus important to analyze the stability of financial systems through the lens of industrial organization and competition theory (Vives 2016) as well as the interaction between competition and financial stability (Carletti 2008, Carletti and Smolenska 2017).

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b. The Contribution by Corbae and Levine (2018)

Corbae and Levine (2018) build on Corbae and d'Erasmo (2018) and provide a theoretical framework for studying the dynamics of banking market structure and, in particular, the entry and exit of banks. They test the model using a novel identification mechanism that exploits the exogeneity of deregulation of entry across US states and the predetermined structure of banks' affiliates across states. They analyze policy implications, stressing in particular how different policies (capital requirements, regulation of compensation, monetary policy) interact.

The theoretical part of the paper has a number of relevant features:

- Risk-return trade-offs: Banks fund projects that use a technology which incorporates a risk-return trade-off – riskier projects have higher returns.[9] This feeds into the riskiness of banks: bank managers choose the scale of their operations (by competing for deposits) and the riskiness of their assets (projects). Future profits (rents) constitute franchise value. This should lead bank managers to be cautious. But more intense competition also erodes future rents, lowers franchise value, and increases incentives to take risks. Managers receive a variable compensation as a fixed fraction of profits.
- Frictions: Compared to the central planner's solution, the competitive market outcome leads to excessive risk-taking because of two sources of moral hazard. The first concerns the interaction between managers and shareholders. Managers have an objective function in which future dividends are discounted with the discount factor β. Managers are myopic and more impatient than shareholders who discount future dividends with a discount factor δ,: $\delta \geq \beta$. This inequality describes the conflict between managers and shareholders. The second agency problem occurs between managers and shareholders versus taxpayers. Limited liability and deposit insurance, which represent an explicit government guarantee, give rise to risk-taking.

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- Policy instruments: Policymakers have four instruments at their disposal to mitigate the above frictions and agency conflicts. κ is fixed entry costs, β is the rate with which managers discount cash flows, α is the premium paid by the bank for deposit insurance or, more generally, a proxy for banks' funding costs, and λ is a leverage constraint ($D_i/E_i \leq \lambda$). The bank's owners pay the entry cost κ but there is no equity capital on the balance sheet: loans equal deposits.
- Competitive structure: The theoretical model assumes Cournot competition on the market for deposits. Banks are symmetric, and the total volume of lending is divided across *N* banks in the market.
- Dynamics: The model is solved for the short term (keeping the number of banks *N* fixed) and the long term (where free entry occurs). Entry of banks occurs until the expected value of future profits is equal to the fixed costs of entry κ. Banks exit the market when the bad state of the world is realized. This happens – in the benchmark model – with a probability of 1 - *p* = 0.59. Because projects return nothing in this state, the bank cannot repay its depositors. Depositors are compensated by the deposit insurance fund. Limited liability implies that shareholders do not cover losses. The exit of banks opens up new profit opportunities, and new banks enter the market.
- Macroeconomic implications: Even though the model is not a full-fledged macro model,[10] production is endogenous, which allows potential output effects from regulation to be analyzed.

The model has a number of policy implications. First, there is a competition-stability trade-off: An intensification of competition can increase efficiency but also the fragility of banks. The intuition is that competition erodes margins and franchise value, which banks try to restore by taking greater risks. Second, there is a role for policy: enhanced bank governance and tighter leverage requirements increase efficiency benefits without the fragility costs of competition. Third, competition matters for the effectiveness of monetary policy. Tighter competition lowers interest margins, and banks respond more to changes in monetary policy rates.

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a. Modeling Market Dynamics

One key contribution of the paper is the discussion of the competition-stability nexus in banking in a dynamic model. Previous literature tends to focus on adjustment along the intensive margin, and macroeconomic feedback mechanisms are often not modeled. This literature has no clear-cut implications. A low degree of competition may reduce risk:[11] weak competition generates monopoly rents which the bank manager wants to protect by investing in safe assets (Keeley 1990). However, weaker competition increases interest rate costs, borrowers choose riskier projects, and banks become riskier (Boyd and De Nicolo 2005). Martinez-Miera and Repullo (2010) nest these models, introduce funding risks, and show that the effect of bank competition on bank risk taking is nonlinear.

Freixas and Ma (2014) similarly address the (inconclusive) evidence on the competition-stability trade-off. They distinguish between different types of risk – portfolio risk, insolvency risk, liquidity risk, and systemic risk – and different types of banks – retail banks financed through deposits and originate-to-distribute banks relying on short-term, market-based funding. They show that the link between risk and competition depends upon the type of bank and the type of risk considered. In contrast to Corbae and Levine (2018), these papers do not model an endogenous adjustment of market structures through entry and exit.

Similar to Corbae and Levine (2018), Faia and Ottaviano (2017) model the effects of market entry on risk. They show that multinational banking, thanks to lower barriers to entry, can reduce risk-taking by promoting local competition. Key to their results is a trade-off between an increase in banks' profits through larger scale and a compression of the spread between the loan and the deposit rate.

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b. Causal Identification

Just as the theoretical predictions on the competition-stability nexus are not clear-cut, the vast body of empirical work on the competition-stability trade-off for banks does not reach a definite conclusion (Carletti 2008, Freixas and Ma 2014). Simply *observing* that the riskiness of banks increased following deregulation does not tell us whether deregulation has *caused* greater risks. Similarly, causal identification is needed when assessing the effects of other policy measures discussed in the paper.

The empirical work in Corbae and Levine (2018) builds on Jiang, Levine, and Lin (2018) who argue that earlier literature studying the competition-stability trade-off for banks does not properly account for exogenous changes in bank competition.[12] They use an identification approach which combines information on the deregulation of bank entry across US states with information on pre-existing structures of bank holding companies. They construct a bank-specific, exogenous, proxy for the degree of competition: the competitive pressure faced by each bank holding company is calculated by using the distance between its subsidiaries and states which deregulate entry. This measure differs across banks and time, which allows both state-year and bank fixed effects to be included in the empirical model. This identification can be used to test the implications of the model concerning changes in competition but not – as stated by the authors – implications concerning other policy measures.

Risk is measured using the standard deviation of daily stock returns and market-based measures of systemic risk. The proxy used in this paper, the “importance of institutional investors,” follows a small previous literature (O'Brien and Bhushan 1990; Freudenberg, Imbierowicz, Saunders, and Steffen 2017).

Using these measures, Corbae and Levine (2018) find that competition reduces banks’ profit margins and charter values. Bank risk increases. Mitigating agency

problems reduces risk. In this sense, the results are in line with recent work for the National Banking Era in the US in the 19th century (Carlson, Correia, and Luck 2018).[13] Yet, other research studying the effects of intrastate branching in the 1920s and 1930s finds that branch banking increased the stability of banking systems (Carlson and Mitchener 2009).

Overall the empirical results are in line with the predictions of the theoretical model. In future work, it would be interesting to explore the exact channels through which these effects run, the effects of different policy measures, and the robustness of results with regard to alternative proxies of competition and risk. This includes an extension to indicators of bank risk which do not require market data because, in some countries, relevant parts of the banking system are not traded on the stock market.

c. Framework for Assessing the Effects of Reforms

The link between competition and stability is of key concern for policymakers. Post-crisis, G20 leaders agreed upon financial sector reforms which aim at making the financial system more resilient and stable. In 2017, the FSB developed a framework for the ex post assessment of financial regulatory reforms (FSB 2017). The framework has three main objectives: (i) causal impact assessment (attribution), (ii) identification of relevant heterogeneities across countries, financial institutions, and reform areas, and (iii) identification of general equilibrium effects. The FSB framework focuses on empirical methodologies.

Changes in the competitive structure of banking markets are a key channel through which the reforms affect resilience. Assessing the effects of reforms thus requires a conceptual framework which links competition and stability in a dynamic setting. Corbae and Levine (2018) provide elements of such a complementary framework: short-term versus long-term effects, effects of policy packages, intended and unintended effects of reforms. The paper can provide useful

guidance for the modeling of policy evaluations. Assessing the robustness of its qualitative and quantitative implications is thus important.

Take the example of a change in capital requirements. The model by Corbae and Levine (2018) shows how different policy measures interact and how their individual effects are magnified. Generally, tighter leverage requirements reduce risk-taking, and these effects are more pronounced in more competitive markets and when banks are better governed. These interactions and potential non-linearities need to be taken into account when assessing the effects of leverage requirements.

3 Comment 1: Does the Model Match Key Stylized Facts?

The empirical analysis of the paper is confined to the US. Results are based on Call Report data, which are used to match empirical and theoretical moments. The focus on US data raises the question of the extent to which the stylized facts and the empirical results generalize beyond the US. The following figures show trends in banking systems across G7 countries since the early 2000s.[14]

While banking systems are better capitalized than they used to be, time trends in terms of market structure and competition differ across countries. This is not surprising, given differences in initial conditions, different policy responses, and different shocks. Applying the insights of the model to different countries would thus be an interesting avenue for future work.

a. Activities of Banks

In terms of the share of banking system assets relative to total assets of the financial system, the US financial system is not very representative of the G7. Banking system assets are less important in the US (about 20% of total assets) compared to European countries (about 60-70% of assets) (Figure 1).

Zooming in on the banking system alone, the US looks more similar to other G7 countries, with about 50% of assets being loans (Figure 1). Out of total loans, about 38% in the US and 27% in the euro area are loans to business – about one quarter are housing loans.[15] Focusing on corporate loans in the theoretical model thus captures a relevant part of banks' activities, and it would be interesting to discuss whether analyzing mortgages that often grow dynamically and trigger financial stability risks would change the overall message of the paper.

In future work, it would be interesting to see which of the implications of the model are driven by the specific assumptions on the modelling of competition and frictions. For example, Corbae and Levine (2018) assume imperfect competition on the liability side (competition for deposits) but asset demand (the projects) is infinite for any quality level. Corbae and D'Erasmo (2018), in contrast, assume that there is imperfect competition for loans. Also, maturity transformation and modeling the wholesale funding market may matter, in particular, for other G7 countries, where the share of deposit funding for banks is lower than in the US (Figure 1). These features might be important for the analysis of capital requirements. For example, Mankart, Michaelides and Pagratis (*forthcoming*) show that a tightening of capital requirements has stronger effects on bank failures for small banks than for large banks because small banks have less access to wholesale funding markets. Generally, modelling liquidity risk could be an interesting extension of the model (Carletti 2008, Carletti and Leonello 2018).

b. Competition

The model is calibrated assuming a rather high degree of concentration of $1/N = 0.33$ or $N = 3$ at the state level as a benchmark. The assumption is that all banks have the same size and that the number of banks is relatively small. Yet even the largest 5 banks in the US account for only about 40% of the market (Figure 2). Generally, banking markets have a very skewed size structure in which a few, large banks dominate (Bremus, Buch, Russ, and Schnitzer *forthcoming*). It would

thus be interesting to discuss whether alternative modeling strategies (Stackelberg competition, for instance, as in Corbae and D'Erasmo 2018) would yield similar results.

In addition, trends in competition are not homogeneous across countries and indicators. Banking systems in most G7 countries have become more concentrated over the past 20 years (Figure 2) – except where concentration was high to begin with. Moreover, focusing on domestic competition is a reasonable assumption for the US, but perhaps not for other markets. In terms of market shares of foreign banks, there is great variation across G7 countries – from less than 5% in Germany and Japan to around 50% in the UK (Figure 2).

c. Stability

The capitalization of banking systems has increased in all countries. This increase is more pronounced when looking at Tier 1 capital in percent of risk-weighted assets than regulatory capital relative to total assets (Figure 3a). This reflects the decline in average risk weights in most countries except the US (Figure 3a). It would thus be interesting to analyze to what extent results for a risk-insensitive leverage ratio carry over to regulations based on a risk-weighted capital ratio.

Turning to risks, non-performing loans increased due to the crisis and declined afterwards – with the notable exception of Italy, reflecting structural weaknesses and low growth (Figure 3b). Z-scores, and thus a more forward-looking measure of bank risk, indicate a decline in risk (Figure 3c). Indicators of systemic risk – measured, for example, by the propensity of a financial institution to be undercapitalized when the whole system is undercapitalized – have peaked in the crisis (Figure 3d). Notwithstanding general trends, these measures are of course highly sensitive to the modelling of (tail) risks and the propagation channels within the financial system, which limits the forecasting potential of systemic risk measures.

d. Efficiency and Profitability

In the model, the efficiency of banks does not change over time, which is in line with the existing empirical evidence. Philippon (2015) measures the efficiency of financial intermediation by looking at the ratio of financial income to assets. He finds that, for the US, the annual costs of financial intermediation of 1.5-2% of intermediated assets have been rather stable over time. European data for the period 1950-2007 likewise supports the claim that the unit cost of financial intermediation did not decrease over the period, except in France (Bazot 2017).

Figure 4 shows that both return on assets and net interest margins have been higher in the US than in the other G7 countries since the financial crisis. Net interest margins have tended to come down, a trend that was already visible before the crisis. The decline in interest margins would be consistent with increased competition. But tighter capital requirements work into the opposite direction: they drive the economy closer to the planner's optimum and raise short-term profitability and equity valuations because of a decline in risks.

This shows that interpreting changes in bank profitability requires a conceptual framework integrating the competitive structure of markets, distortions due to government guarantees, and risk-taking incentives.[16] An interpretation of increasing profitability of banks as increased franchise value (in an accounting sense) can be misleading if (implicit) government guarantees have not been taken into account (Atkeson, d'Avernas, Eisfeldt, and Weill 2018). Similarly, measures of the costs of capital of banks can have misleading interpretations in periods where tail risk is growing (Kovner and van Tassel 2018). Moreover, high bank profitability can be a leading indicator of systemic risk building up in the system (Meiselman, Nagel, and Purnanandam 2018).

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e. Compensation

Managerial incentives are a key element of the theoretical model, yet it is difficult to obtain cross-country data on compensation practices. The Financial Stability Board (FSB) regularly reports on its Principles for Sound Compensation Practices, but the reports contain no comparative quantitative information across countries (FSB 2017). For European banks, information on "high earners" is provided by the European Banking Authority (EBA 2017a, 2017b). The EBA data provide detailed information on compensation practices across countries. They also show the multi-dimensional aspects of managerial incentives which are difficult to capture in a single indicator.

4 Comment 2: What Are Implications for Policy?

Market dynamics in the banking industry can have implications for financial stability. If not enough financial institutions exit the market, this can lead to overcapacity and excessive risk-taking, weaken profitability and limit banks' ability to rebuild buffers following negative shocks. In this sense, competition and financial stability are two sides of the same coin. This raises the questions as to how macroprudential policy should take the competition-stability nexus into account and whether there is need for coordination across policy areas.

a. Macroprudential Policy

In terms of implications for macroeconomic policies, the paper discusses monetary policy: an expansionary monetary policy lowers the costs of funds[17] while profitability increases. In the long run, this induces entry, thereby increasing competitive pressure and encouraging risk-taking.

This link between monetary policy and stability highlights the potential role of macroprudential policy. Risks to financial stability can arise if the distress of

financial institutions threatens the proper functioning of the financial system in terms of the allocation of resources and risks (Hellwig 2018b). Such externalities are insufficiently accounted for by individual market participants. Macroprudential supervision thus complements microprudential supervision (and monetary policy).

Generally, the link between competition and financial stability depends on the nature of the shock and risk-taking incentives at the level of the individual firm.[18] In a highly concentrated banking system, in which a few banks dominate, an idiosyncratic shock hitting a large financial institution can have repercussions for the entire system (granularity effects or "too big to fail").[19] But a decentralized and weakly competitive banking system populated by many small banks may have destabilizing features as well. If many smaller banks are exposed to the same (macroeconomic) risks, this may create systemic instability as well ("too many to fail").

A priori, regulation of *individual* banks – the focus of microprudential regulators – does not explicitly take the competitive structure of *markets* into account. Microprudential banking regulation aims at individual banks' and their behavior given exogenous risks. It is conceptionally not designed to provide information about industry-wide feedback mechanisms. Macroprudential regulation can take a system-wide perspective, which raises a number of questions. Is a microprudentially optimal capital requirement in the model also optimal from a macroprudential perspective? Do the two coincide or do they differ, i.e. can there be a conflict between the two? Are there policy measures that unambiguously improve the competition-stability trade-off, irrespective of the structure of banking systems? A recent Bundesbank study shows that a tightening of capital requirements reduces (systemic) risk, measured by CoVaR and bank stock market volatility (Eickmeier, Kolb, and Prieto 2018).

b. Regulating Management Compensation

In addition to capital regulation, Corbae and Levine (2018) study the effects of executive incentives which encourage bank executives to focus on the long-term franchise values of banks. Policy measures which reduce myopic behavior can reduce excessive risk-taking. Moreover, policy measures interact: lowering barriers to competition *and* improving private governance mechanisms can be welfare improving.

Managerial incentives certainly matter for individual institutions' risk-taking, and, ultimately, financial stability.[20] Yet, whether and, if so, which restrictions on management compensation enhance financial stability is difficult to assess for three reasons.

First, it would be interesting to analyze in more detail why private contracts would fail to address the model's agency problems and why policy interventions are warranted. In principle, the incentives of owners and managers could be aligned through private contracts.[21] Yet, such contracts may fail to internalize systemic risk externalities.

Second, guidelines for compensation models may be interpreted as a regulatory "approval" of certain contractual features or governance mechanisms. Given that regulation of executive pay is complex and can hardly rely on a single indicator, regulatory arbitrage, indemnification, and evasion strategies may become an issue. If many banks rely on the same governance models, commonality of responses to shocks might be the result. A financial system might actually be more stable if different governance models coexist and if incentive systems are not fully aligned across institutions.

Third, as reforms of compensation schemes have been the focus of national and international policy initiatives, more data is accumulating that can help to assess

the effects of different regulatory approaches. Recent work on caps on bonus payments in the EU shows that banks complied with these regulations by increasing fixed compensation and lowering maximum variable compensation (Colonnello, Koetter, and Wagner 2018). The caps tended to increase idiosyncratic risks with no adverse effects on banks' ability to attract high-quality managers.

c. Policy Interaction

One motivation for the paper is the tension between financial stability and competition policy. Assessments of the welfare implications of competition in banking may indeed differ according to policymakers' viewpoints. Competition authorities care about implications for market concentration and market power; monetary authorities are interested in the implications of competitive structures in banking for the transmission channels of monetary policy; fiscal authorities may consider the implications for taxation and public safety nets; microprudential supervisors assess the stability of individual banks.

The paper thus stresses the importance of dealing with policy trade-offs (p. 4) which requires coordination of policies across different authorities with different objective functions. The new rules for the recovery and resolution of banks in Europe can serve as an example, as they explicitly address such trade-offs. The Bank Recovery and Resolution Directive (BRRD) is, in principle, distinct from competition law.[22] At the same time, its objective is to allow banks to be liquidated and eventually to be resolved without recourse to taxpayers' money. This should reduce competitive distortions resulting from implicit subsidies. Use of the bail-in instrument under the BRRD is explicitly linked to competition policy: public support for financial institutions is, according to EU competition legislation, permitted only if a bail-in of creditors would not be proportionate or if it would threaten financial stability.[23]

Different authorities – resolution and competition authorities – thus interact, each operating within clearly defined mandates. Balancing the different objectives may, at times, seem cumbersome and bureaucratic. But the work by Corbae and Levine (2018) shows the importance of taking aspects of competition into account when designing regulation which addressing frictions on financial markets. Rather than restricting competition in order to enhance stability, well-designed regulatory measures can ensure that increased competition need not come at the expense of financial stability. In a similar vein, Carletti and Smolenska (2017) argue that viewing financial regulations through the lens of competition theory and enhancing cooperation between different authorities can be beneficial.

5 Comment 3: How to Model Macroeconomic Dynamics and General Equilibrium Effects Empirically?

Market dynamics – entry and exit of banks – are at the heart of this paper. Yet, like most of the earlier literature, the empirical part takes deregulation as a one-off event: deregulation is proxied through the lifting of branching restrictions in a particular year, there are no anticipation effects, and dynamics are not studied explicitly. The focus is on the implications of competition on charter value and risk, not lending. Yet there is good reason to believe that lead and lagged effects of entry (de)regulation do matter. Similarly, changes in capital regulation have dynamic effects on financial stability and macroeconomic aggregates, including the provision of credit (Eickmeier, Kolb, and Prieto 2018).

Anticipation effects are likely because deregulation of entry does not happen overnight. Policy changes are discussed extensively in parliaments, with actual outcomes being affected by lobbying (Rajan and Ramcharan 2016). Banks can adjust behavior prior to the actual liberalization date. One strategic response could be that banks try to deter entry by increasing credit provision in local markets preemptively.[24] Similarly, deregulation of entry changes the structure of regional banking markets, and banks will gradually adjust to the new environments.

Using similar data on deregulation to Corbae and Levine (2018), Buch, Eickmeier, and Prieto (2018) assess the effects of banking competition on macroeconomic dynamics in the US. Using state-level data and panel local projections, we investigate the dynamic effects of deregulation events on the macro-economy. We find that these events were anticipated, leading to a temporary boom in economic activity and lending. We then analyze to what extent the monetary transmission has changed with greater competition in the banking industry. In line with the predictions of the model, a monetary policy tightening is found to have sizeable adverse effects on economic activity, house prices and loans in more competitive environments. Effects on prices are unchanged.

Finally, it would be interesting to explore the implications of the model in periods of unconventional monetary policies and with regard to the cross-border transmission of policies. Recent work by the International Banking Research Network (IBRN) shows that the effects of monetary policy in lending crucially depend on the type of monetary policy instruments, the openness of economies, and the structure of domestic banking markets.[25]

6 Concluding Remarks: Improving the Transfer of Knowledge between Research and Policy

Corbae and Levine have an important message: More competition can yield a "double dividend" in terms of efficiency and stability – but only if accompanied by good policy design. Policy interventions are needed: More intense competition alone increases efficiency – but also fragility. They also show that bringing insights from competition theory into the analysis of financial stability and into an assessment of financial sector reforms is crucial.

Understanding the competition-stability trade-off is important from an academic point of view. It is – arguably – even more important for policymakers and regulators. Insights from the vast body of literature on the issue, from policy

evaluations, from replication studies, and from good meta-analyses provide useful inputs into policy decisions. Much is at stake: Flawed policy decisions which lead to excessive risk taking and distort market structures can have high costs to the taxpayer.

The work by Corbae and Levine (2018) is an important step towards an improved analysis of the competition-stability nexus. Testing the robustness of their implications across countries and markets empirically, and analyzing the robustness of the theoretical mechanisms, will be an important project going forward. In order to make this – and related – work more accessible, the infrastructures for information need to be improved.

Given the significant technological changes that have occurred over the past few decades in terms of accessing, filtering, and providing information, it is surprisingly difficult to access reliable information on analytical work in the field. The vast body of theoretical and empirical literature that is available on regulation, bank risk, bank competition, or management compensation is has been the subject of standard literature reviews. Library systems provide information on JEL codes[26] and keywords, but much relevant information for policymakers is not coded systematically.

Unlike in other disciplines, repositories of evaluation studies that provide a systematic overview of relevant literature are largely lacking in economics. A centralized collection of (evaluation) studies can reduce the costs of obtaining relevant information for all stakeholders. A repository can ease access to evaluation studies. Other fields, such as development economics or medicine, have established repositories in order to collect and structure the available evidence.[27] New technologies can reduce the costs of setting up and maintaining such repositories.

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An additional gap in the information infrastructure concerns consistent cross-country data that allows trends in competition and stability of banking markets to be assessed. The indicators of market structure that (macroprudential) authorities may want to monitor include the degree of competition and market power across business lines and regions, market dynamics in terms of entry and exit, the degree of concentration of a system, the degree of connectedness, and information on new players such as FinTechs and BigTechs. Enhanced information sharing between supervisors and competition authorities can be particularly fruitful, given the link between competition and financial stability (Carletti and Smolenska 2017).

There are a number of useful initiatives. The World Bank provides information in its database on financial structures and global financial development, while the BIS has recently compiled new data on the structure of banking systems.[28] Often, the indicators used in these datasets are based on private sources of information. These databases could benefit from being based on supervisory information and by being more tightly linked to indicators that are relevant for financial stability surveillance. Moreover, some information which is relevant from the point of view of the present paper – such as information on compensation schemes and governance models – is not included at all.

In addition to information on activities of financial institutions, information on relevant regulations is needed, including macroprudential regulation and capital account measures across countries. Recent work by the IMF on a macroprudential database is an important step forward,[29] but more needs to be done to improve the data and to learn from analytical work based on this data.

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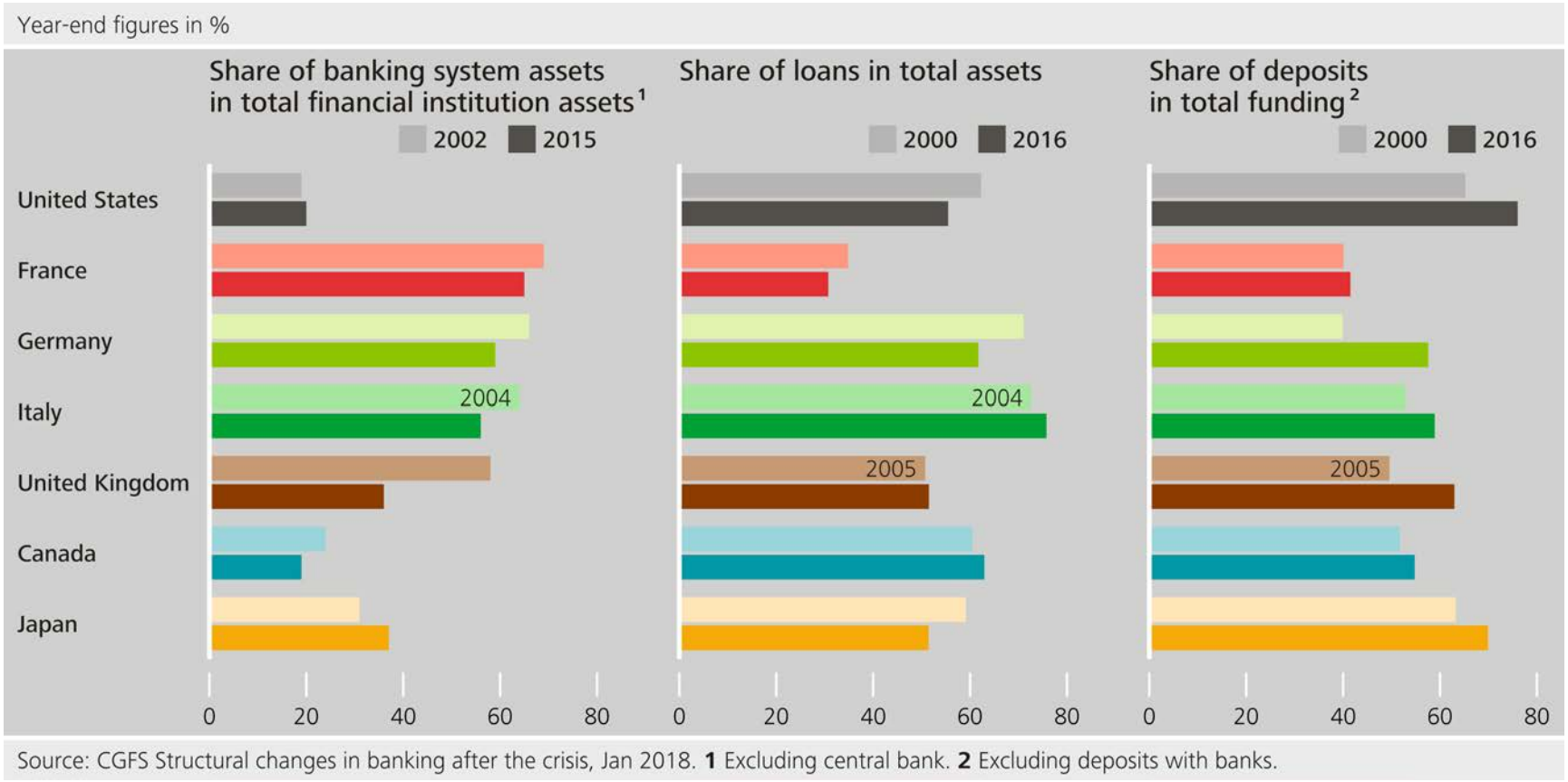
Figure 1: Banking Activities



Source: CGFS Structural changes in banking after the crisis, Jan 2018. **1** Excluding central bank. **2** Excluding deposits with banks.

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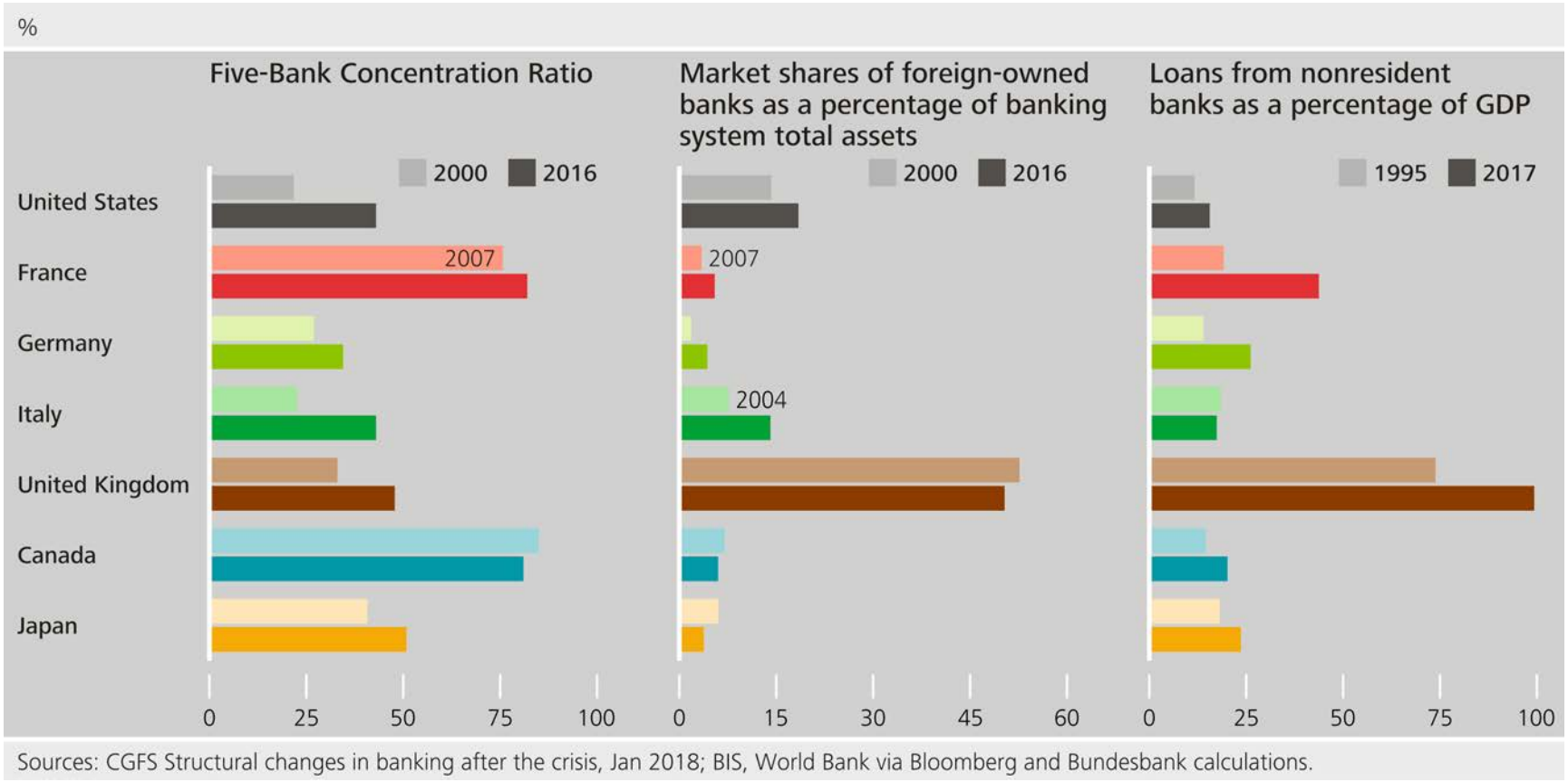
Figure 2: Banking Competition



Sources: CGFS Structural changes in banking after the crisis, Jan 2018; BIS, World Bank via Bloomberg and Bundesbank calculations.

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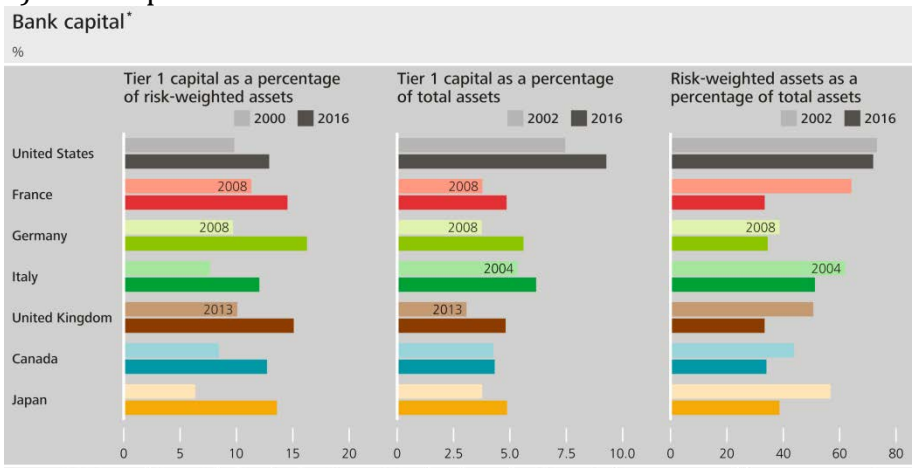
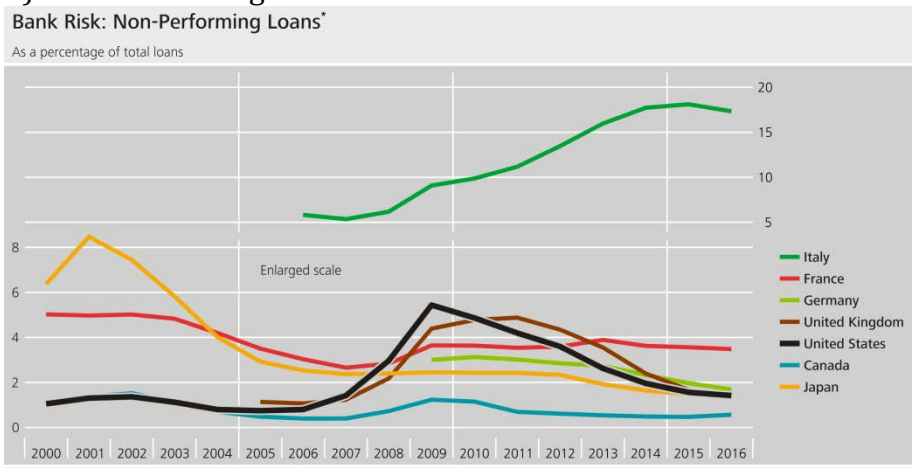
Figure 3: Stability

a) Bank capital



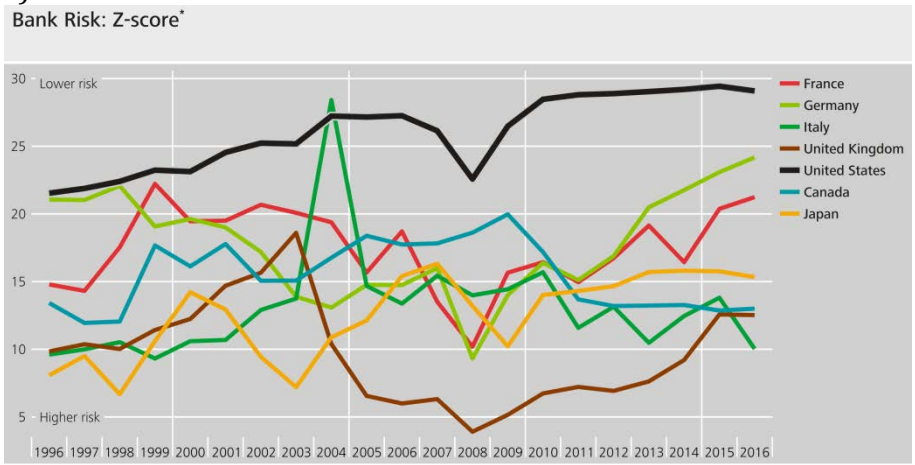
Source: CGFS Structural changes in banking after the crisis, Jan 2018. * These data can be subject to significant measurement differences across countries.

b) Non-Performing Loans



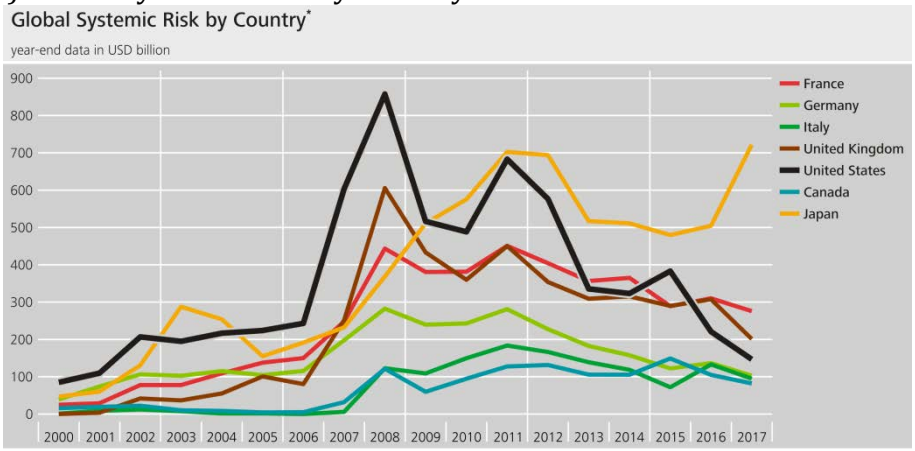
Source: CGFS Structural changes in banking after the crisis, Jan 2018. * These data can be subject to significant measurement differences across countries.

c) Z-score



Source: The World Bank, Financial Structure Database, July 2018. * Estimated as (return on assets + equity / assets) / standard deviation of return on assets.

d) Global Systemic Risk by Country



Source: The Volatility Laboratory of the NYU Stern Volatility Institute (https://vlab.stern.myu.edu). * Expected capital shortfall faced by the country's financial corporations in a potential future financial crisis.

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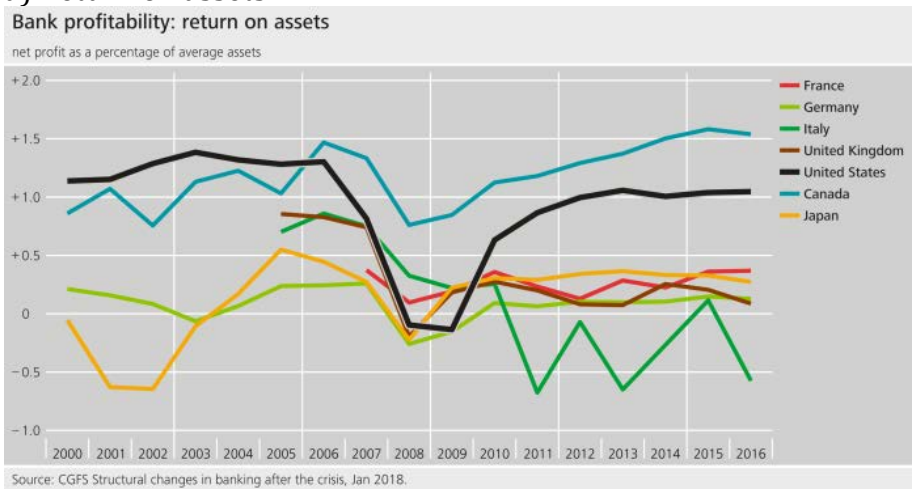
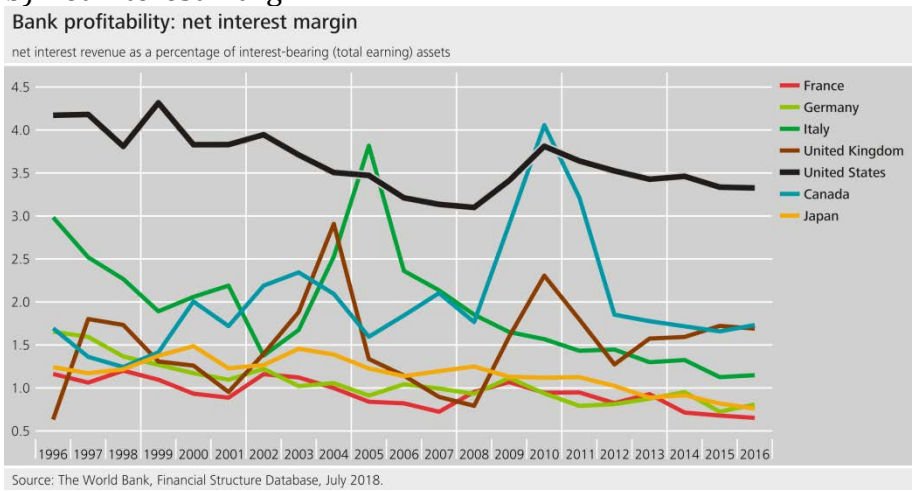
Figure 4: Bank Profitability

a) Return on assets



b) Net interest margin



1 I would like to thank Kartik Anand, Elena Carletti, André Ebner, Sandra Eickmeier, Cornelia Kluge, Phillipp J. König, Jochen Mankart, Felix Noth, Esteban Prieto, Katheryn Russ, and Benjamin Weigert for most helpful discussions on and contributions to an earlier draft. All errors and inconsistencies are my own.

2 In the US, the number of new banks entering the market declined from more than 100 annually between 1990 and 2008 to fewer than two in the period 2009 through 2013 (Adams and Gramlich 2014). The authors attribute most of this decline to weak macroeconomic conditions and low interest rates.

3 For early discussions of systemic risk, see Borio (2003), Crocket (1997), or Hellwig (1998).

4 See Shambough (2012) for an analysis of the European case.

5 Buch and Goldberg (2017) summarize evidence from the International Banking Research Network (IBRN) on the cross-border spillovers of prudential policies. These results show a significant degree of heterogeneity, including the reallocation of market shares across banks and countries.

6 See the declaration of the Pittsburgh Summit in 2009: http://www.fsb.org/wp-content/uploads/g20_leaders_declaration_pittsburgh_2009.pdf

7 See Bolton and Oehmke (2018) for a theoretical analysis of resolution strategies (multiple versus single point of entry) for global banks.

8 See the 2017 FSB Report “Financial Stability Implications from FinTech” (http://www.fsb.org/2017/06/financial-stability-implications-from-fintech/).

9 Entrepreneurs are not explicitly modeled. In that sense, banks do not intermediate funds between savers and investors, and there is no risk diversification across entrepreneurs.

10 The income of households, for example, is exogenous.

11 For theoretical models supporting this mechanism, see Allen and Gale (2004), Hellmann, Murdock, and Stiglitz (2000), Keeley (1990), Matutes and Vives (2000), or Wagner (2010)

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12 A related paper by Goetz, Laeven, and Levine (2016) finds that banks which are more geographically diversified have lower risk.

13 Identification in this paper is based on the fact that entry restrictions (capital requirements) changed in response to exogenous, decennial census results.

14 The following data has been compiled in the context of the BIS Report titled “Structural changes in banking after the crisis”. For details, see https://www.bis.org/publ/cgfs60.htm. Due to differences in data definition across countries, the evolution of indicators across time is more informative than the interpretation of levels of indicators across countries.

15 These data are for 2016 and are taken from the CGFS database.

16 On the interpretation of bank capital and profitability, see also Admati and Hellwig (2014).

17 This is reminiscent of a decline in payments into deposit insurance. One interesting question is whether the central bank would be able to control the real costs of funds permanently.

18 Likewise, the link between financial contagion and the connectedness of financial institutions is non-linear (Allen and Gale 2000; Gai, Haldane, and Kapadia 2011).

19 These granularity effects have been shown by Gabaix (2011) for the manufacturing industry. Applications to banking markets include Amiti and Weinstein (forthcoming) and Bremus, Buch, Russ, and Schnitzer (forthcoming).

20 For the US, there is evidence that risk-taking and variable pay increased after deregulation in the 1990s (DeYoung, Peng, Yan 2013).

21 See, for instance, the discussion in Bebchuk and Fried (2003) or the literature reviewed in Colonnello, Koetter, and Wagner (2018).

22 See the European Commission’s Banking Communication 2013, position 7: “Financial stability remains of central importance in the Commission's assessment of state aid to the financial sector under this Communication.” Art. 107(3)b.

23 BRRD, Art. 32(4)d: [an institution shall be deemed failing or likely to fail if] “extraordinary public financial support is required except when, in order to remedy a serious disturbance in the economy of a Member State and preserve financial stability […].”

24 Carlson, Correia, and Luck (2018) find evidence in favor of this hypothesis when studying the response of incumbent banks in the US to deregulation as the result of an exogenous event.

25 See Buch, Bussière, Goldberg, and Hills (forthcoming) for a summary of a large set of country-level studies using bank-level data to identify the transmission of monetary policy into lending.

26 This classification system for academic literature in economics is based on the Journal of Economic Literature. See https://www.aeaweb.org/jel/guide/jel.php

27 Examples include the Health Systems Evidence from the McMaster Health Forum (https://www.healthsystemsevidence.org), the Cochrane Library (http://www.cochranelibrary.com), or, for development economics, J-PAL (https://www.povertyactionlab.org/) or the International Initiative for Impact Evaluation (www.3ieimpact.org).

28 See the World Bank’s financial structure database http://www.worldbank.org/en/publication/gfdr/data/financial-structure-database, the Global Financial Development Database (GFDD) https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database, the database prepared by the Working Group on Structural Changes in Banking after the Financial Crisis of the Committee for Global Financial Structures of the Bank for International Settlements https://www.bis.org/publ/cgfs60.htm. See also Čihák, Demirgüç-Kunt, Feyen, and Levine (2012) on classifications of financial systems and Claessens and van Horen (2014) on international banks.

29 See https://www.elibrary-areaer.imf.org/Macroprudential/Pages/Information.aspx

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