ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Hirtle, Beverly J.

Working Paper

Banking supervision: The perspective from economics

Staff Report, No. 952

Provided in Cooperation with:
Federal Reserve Bank of New York

Suggested Citation: Hirtle, Beverly J. (2020) : Banking supervision: The perspective from economics, Staff Report, No. 952, Federal Reserve Bank of New York, New York, NY

This Version is available at:
https://hdl.handle.net/10419/241145

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

Federal Reserve Bank of New York
Staff Reports

Banking Supervision: The Perspective from Economics

Beverly Hirtle

Staff Report No. 952
December 2020

This paper presents preliminary findings and is being distributed to economists and other interested readers solely to stimulate discussion and elicit comments. The views expressed in this paper are those of the authors and do not necessarily reflect the position of the Federal Reserve Bank of New York or the Federal Reserve System. Any errors or omissions are the responsibility of the authors.

Banking Supervision: The Perspective from Economics
Beverly Hirtle
Federal Reserve Bank of New York Staff Reports, no. 952
December 2020
JEL classification: G20, G21, G28

Abstract

Economists have extensively analyzed the regulation of banks and the banking industry, but have devoted considerably less attention to bank supervision as a distinct activity. Indeed, much of the banking literature has used the terms "supervision" and "regulation" interchangeably. This paper provides a heuristic review of the economics literature on microprudential bank supervision, highlighting broad findings and existing gaps, especially those related to work on supervision's theoretical underpinnings. The theoretical literature examining the motivation for supervision (monitoring and oversight) as an activity distinct from regulation (rulemaking) is just now emerging and has considerable room to grow. Meanwhile, the empirical literature assessing the impact of supervision is more substantial. Initial results suggest that supervision reduces risk at banks without meaningfully reducing profitability. The evidence is more mixed about whether more intensive supervision reduces credit supply. The channels through which supervision achieves these results have yet to be fully explored, however. Finally, there is a body of work exploring how supervisory incentives—at both the individual and institutional levels—affect outcomes. Supervisory incentives are fundamentally entwined with the theoretical rationale for supervision as a distinct activity and with empirical assessments of its impact. Drawing these links more clearly is an additional area for fruitful future work.

Key words: banking, supervision, regulation

Hirtle: Federal Reserve Bank of New York (email: beverly.hirtle@ny.frb.org). The author would like to thank Peter Conti-Brown, Thomas Eisenbach, Howell Jackson, Anna Kovner, David Lucca, Don Morgan, Matthew Plosser, João Santos, and Kevin Stiroh for helpful comments and suggestions. The views expressed in this paper are those of the authors and do not necessarily represent the position of the Federal Reserve Bank of New York or the Federal Reserve System.

To view the authors' disclosure statements, visit
https://www.newyorkfed.org/research/staff_reports/sr952.html.

Banking Supervision:
The Perspective from Economics

Beverly Hirtle[1]
Federal Reserve Bank of New York

Economists have extensively analyzed the regulation of banks and the banking industry, but have devoted considerably less attention to bank supervision as a distinct activity. Indeed, much of the economics literature on this topic has used the terms "supervision" and "regulation" interchangeably, distinguishing the two mainly by noting that supervision is important for regulatory compliance. But in practice, supervisors do much more than ensuring regulatory compliance, including making qualitative assessments of banks' internal risk management and control processes and enforcing remedial actions tailored to the circumstances they uncover. To some extent, the confusion may owe to a lack of information about what bank supervision is and what bank supervisors do, perhaps reflecting that most supervisory activities and outcomes are confidential (Eisenbach et al. 2017, Hirtle, Kovner and Plosser 2020). But it also reflects some significant gaps in the existing economics literature about the goals and rationale for supervision as a complement to (or substitute for) regulation.

This paper provides a heuristic review of the economics literature on bank supervision, highlighting broad findings and existing gaps, especially related to work on supervision's theoretical underpinnings. The review focuses principally on *microprudential* supervision, that is, the supervision of individual banking institutions aimed at assessing the financial and operational health ("safety and soundness") of those firms. The discussion does not directly address other forms of supervision of individual banking firms and their activities, such as compliance with consumer protection or market integrity regulations, or supervision aimed at addressing macroeconomic or financial stability concerns (macroprudential supervision), though obviously there are overlaps among these areas. Finally, the discussion focuses on supervision of commercial banks and commercial bank holding companies, which for convenience will both be referred to as "banks."

---

[1] The views expressed in this paper are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of New York or of the Federal Reserve System. The author would like to thank Peter Conti-Brown, Thomas Eisenbach, Howell Jackson, Anna Kovner, David Lucca, Don Morgan, Matthew Plosser, João Santos and Kevin Stiroh for helpful comments and suggestions.

To set the stage, the next section provides a review of the theoretical literature on the core functions of banks and what makes banks unique as financial intermediaries, then describes the (closely related) theoretical rationale for regulation of these institutions. The section ends by describing bank supervision as it is currently practiced, emphasizing the distinctions from regulation.

The main part of the paper reviews the economics literature about supervision, organized around three key themes:

1. Why do we have supervision? What role does it play distinct from other mechanisms such as regulation and corporate governance?
2. What do we know about the impact of supervision on supervised banks?
3. How do supervisory incentives affect outcomes?

The existing economics literature addresses these questions with varying degrees of scope and depth. Where there are gaps, the paper suggests directions for future work that could provide a better understanding of whether bank supervision as it is currently implemented is meeting its objectives and, more fundamentally, how those objectives might be better articulated and designed.

Economic Theories of Banking and Bank Regulation[2]

As noted, there is a long history of economic analysis of the rationale for the existence of banks and for the regulation of these firms. Theories of banking generally revolve around three key themes: asymmetric information and monitoring, liquidity and payments provision and the synergies of combining deposit-taking with contingent credit provision (loan commitments). Theories about banking regulation focus on closely related issues through the lens of externalities or other market failures, consistent with the broader economics literature on the rationale for regulation. A particularly important idea in this literature is that because bank owners and managers do not internalize the full set of costs of bank failure or severe distress, they will engage in riskier behavior or be willing to bear a higher risk of failure than is optimal from a social perspective.

Economic Theories of Banking

Perhaps the most significant ideas advanced in the economics literature about the rationale for the existence of banks have to do with asymmetric information. As described in Mishkin (2001), asymmetric information is a key feature of lending, since borrowers know more about the quality and

[2] The intent in this section is to provide an overview of the primary ideas that have been advanced in the economics literature to explain the existence of banks and the motivation for regulating them, rather than to give a comprehensive list of all the papers that have addressed these topics. The papers cited in this section contain relatively comprehensive reviews of the literature.

prospects of their projects than lenders. This asymmetry results in both adverse selection – for any given borrowing rate, riskier borrowers are more likely to be willing to take the loan – and moral hazard – once the loan is made, borrowers have incentives to "slack" to reap private benefits. Both adverse selection and moral hazard decrease incentives to lend, meaning that good borrowers are less likely to be funded and thus that productive investment will be lower than is optimal from a social perspective. [3]

The solution to this asymmetric information problem is the idea that banks can efficiently generate information about borrowers and monitor them after loans have been made (Diamond 1984, Dewatripont and Tirole 1994, Mishkin 2001). Because information production and monitoring are costly, these activities are best done inside the same organization that realizes the benefits of these activities. But other firms, such as finance companies, also lend, so this is just a partial explanation for the existence of banks. Aside from lending, the other key feature of banks is that they provide deposits that can be withdrawn at face value on demand and used as a means of payment. Asymmetric information also plays a role in understanding why these two activities – deposit-taking and lending – might naturally go together in a single institution.

An important idea in this literature is that runnable deposits exert discipline on banks.[4] In a kind of chain effect, the asymmetric information problem between the bank and its borrowers also exists between the bank and its depositors. Banks are opaque (Flannery 1994, Morgan 2002) and depositors cannot easily gauge the risk that the bank will fail. Because deposits are paid on demand and in full, many depositors may seek to withdraw their deposits at the same time if they believe that there is a large enough probability that the bank's assets are not sufficient to pay back all its deposits *or* if they believe that other depositors believe this (Diamond and Dybvig 1993).[5] Banks know that such runs are a possibility and this threat provides discipline on them in their choice of borrowers and in their monitoring (Calomiris and Kahn 1991).

Kashyap, Rajan and Stein (2002) further note that, in contrast to many other kinds of lenders, banks offer loan commitments – agreements that allow borrowers to request funding on demand, generally with pre-arranged terms. Thus, both sides of banks' balance sheets involve providing liquidity

---

[3] Ackerlof (1970) develops key theoretical concepts related to information and adverse selection in a general setting, which the literature in banking draws on. An early example is Stiglitz and Weiss (1981), who show how adverse selection can result in credit rationing (inefficiently low levels of lending).

[4] Fama (1985) argues that deposit-taking provides an information advantage to lenders in monitoring their borrowers. Banks can get information about their borrowers by observing transaction flows in and out of the borrowers' deposit accounts at the bank. This information can make banks more efficient monitors as compared to other lenders who do not offer deposits.

[5] Gorton and Metrick (2020) demonstrate that runs on wholesale funding, particularly repurchase agreements, played an important role in the global financial crisis.

on demand. To provide this liquidity, banks must hold a provisionary stock of highly liquid, safe (but low yielding) assets such as Treasury securities or deposits at the central bank. If loan commitment drawdowns and deposit withdrawals are less than perfectly correlated[6], an institution that provides both services can hold a smaller "overhead" of liquid assets than if the two activities were provided in separate organizations. This provides the rationale for conducting deposit-taking and (contingent) lending in the same organization – a bank.

Economic Theories of Bank Regulation

In general, the economics literature suggests that regulation is warranted to address the negative impacts of externalities – situations in which the parties making decisions do not take into account the impact of their choices on others and thus make choices that differ from what might be optimal from a social or economy-wide perspective – or when there are market failures that cause the actions of individual parties to differ from the actions that would achieve the best outcomes for all. As the theories of banking suggest, information asymmetries in lending lead to such externalities and market failures, as does the interconnectedness of the banking system.

As noted, it is difficult for depositors to assess bank risk and thus bank runs can take place even if a bank is not in true danger of insolvency (Diamond and Dybvig 1993). Bank runs can be inefficient because when a bank fails, its investment in specialized information and monitoring technology may be lost, reducing credit supply to both current and future borrowers.[7] Depositors can also bear significant losses, both from receiving less than full value for the deposits and from loss of access to deposits (liquidity) in the event of a prolonged period of resolution. Dewatripont and Tirole (1994) argue that these factors mean that bank regulation should be focused on bank solvency, as a way of representing the concerns of small depositors (the "representation hypothesis").

One solution to the asymmetric information chain from borrowers to banks to depositors is deposit insurance and the associated government safety net. Deposit insurance can reduce or eliminate incentives for depositors to run because the value and the on-demand feature of deposits are retained under a credible deposit insurance system. But deposit insurance can create its own set of market failures in that fully protected depositors have no incentive to monitor or discipline banks. Further, to the extent that uninsured depositors and other creditors believe they will be made whole in the event

[6] Gatev, Schuermann and Strahan (2007) provide evidence that deposit flows and loan commitment drawdowns are negatively correlated, especially during period of stress, so that the two activities in fact hedge one another.
[7] Slovin, Sushka and Polonchek (1993) and Ashcraft (2005) document the costs of lost information and reduced credit supply following the failures of Continental Illinois and a series of banks in Texas in late 1980s and early 1990s.

the bank fails, market discipline will be further curtailed, resulting in greater incentives for risk-taking by bank managers.

These moral hazard concerns are often cited as the motivation for bank regulation aimed at curbing risk-taking and limiting leverage – so-called (micro)prudential regulation. At its heart, prudential regulation aims to undo the impact of moral hazard on bank risk-taking and resiliency, so that a bank is less likely to require taxpayer support via the deposit insurance fund or a broader government safety net (Mishkin 2001).

While the need for prudential regulation is often linked directly to the moral hazard arising from deposit insurance and the government safety net, there are other externalities and market failures that also suggest banks' private incentives could result in higher risk and lower solvency probability than would be desirable from a social perspective. And in fact, prudential regulation and supervision at the Federal level existed prior to the establishment of the FDIC in 1933 (White 2011). Banks are connected in an intricate network system and the failure of one bank can cause direct losses at other banks. Perhaps more significantly, a failing bank's attempt to liquidate its asset holdings as it become increasingly stressed can result in fire sales that drive asset prices lower and cause mark-to-market losses at other banks holding similar positions (Brunnermeier et al. 2009; Tirole 2013).

The critical point is that no individual bank will take account of the knock-on effects of its failure or distress to other banks and to the broader economy through contraction of credit supply and intermediation services, because the bank does not bear these costs. This is true with or without deposit insurance and a government safety net. Thus, while deposit insurance provides one motivation for prudential regulation, the rationale for regulating banks is actually much broader, resting on the role that banks play in originating credit and monitoring borrowers and supplying liquidity and payment services to depositors and borrowers.

What Do Bank Supervisors Do?

The discussion thus far has focused exclusively on the motivation for bank *regulation*, with no specific reference to bank *supervision*. Some of the literature on bank regulation does describe a role for bank supervision, namely, to ensure compliance with regulation (Masciandaro and Quintyn 2016, Mishkin 2001). But, in practice, supervisors do much more than ensure regulatory compliance. There is little in the current theoretical economics literature that addresses the role or motivation for these broader supervisory activities.

Before describing the existing economics literature on supervision, it is helpful to describe what bank supervisors actually do, as a way of highlighting how supervision differs from regulation. At a high

level, regulation is the set of rules under which banking organizations must operate, involving issues such as who can own and manage commercial banks, what corporate form banking companies must adhere to, what activities commercial banks and parent banking companies can and cannot pursue, how much capital and liquidity banks must have to operate without additional sanctions or restraints and what financial transactions are permitted between subsidiaries within a banking organization. Supervision, in contrast, involves monitoring and oversight of banks, including evaluating banks' risk management processes, assessing corporate governance and internal controls, and identifying risks to a bank's continued financial health and viability – and critically, taking action to ensure that banks remediate deficiencies identified through these reviews (Eisenbach et al. 2017).

An important part of supervision is monitoring and testing to ensure compliance with regulation. But supervisory monitoring touches on areas well beyond narrow regulatory compliance. Specifically, supervisors engage in a broad series of monitoring activities intended to identify any weaknesses in banks' risk management and controls, internal processes and procedures, governance, and financial and operational soundness. These monitoring activities include review of banks' internal documents and reports; discussions with internal auditors, risk managers, business leaders, senior management and directors; and independent analysis of compliance with internal policies and procedures ("transactions checking"). This monitoring is sometimes targeted at an individual bank, but is often coordinated across institutions, to provide peer perspective and to develop insights into industry best practices. Importantly, the assessment and judgments made by supervisors are often qualitative in nature, aimed at determining whether banks are operating in manner that supports (or threatens) the continued health and viability of the organization (Eisenbach et al. 2017).

Beyond monitoring, bank supervisors also take actions intended to ensure that banks address shortcomings identified through monitoring and examinations. These actions include public enforcement actions; downgrades to supervisor ratings, which, under regulation, can affect a bank's ability to expand into new activities or to acquire other institutions through mergers; and confidential supervisory actions such as Matter Requiring Attention (MRAs) and Matter Requiring Immediate Attention (MRIAs), which stipulate steps that banks must take to improve their internal processes, financial condition or operating procedures. Failure to comply with these actions can result in more serious supervisory steps, such as escalation from a confidential MRA to a public enforcement action, limits on asset growth or expansion, or fines (Eisenbach et al. 2017).

The key message from this overview is that while bank supervision and bank regulation are entwined and have areas of overlap, in practice, the two are distinct. In their day-to-day activities,

supervisors indeed seek to enforce compliance with regulation. But they also make qualitative assessments concerning the safe and sound operation of banks that go beyond the enforcement of regulation. These assessment and the resulting remediation actions are important, due to the continual and often rapid evolution of financial markets, innovation in financial products, and changes in technology, climate and non-financial regulation that impact borrowers and depositors, as well as the banks themselves. The economics literature is just now beginning to address the impact and motivation for these activities.

Why Do We Have Bank Supervision? What Distinct Role Does it Play?

As noted, there is little in the current economics literature that directly addresses the role that bank supervision plays relative to regulation.[8] What purpose does or should supervision have, if any, beyond addressing regulatory compliance? Is it a substitute or complement for regulation – or does it serve a wholly separate purpose? Does supervision address the same set of externalities as regulation or does it address a different set of market failures? How would we know if the resources devoted to supervision are well-spent or allocated optimally from a social perspective?

Supervision and Information

There are a few papers that provide some insight into these questions, nearly all related to information asymmetries, information gathering and monitoring. Berger and Davies (1998), for instance, argue that "the main purpose of bank examinations is information acquisition" about a bank's risk exposures and financial condition. They find evidence that bank examinations have both an auditing effect on the reported value of loans on a bank's balance sheet and generate new information about the bank's underlying financial condition. This latter effect is particularly pronounced for weaker banks. These findings are consistent with the idea that bank balance sheets are difficult for outsiders to assess, as theories related to banks' roles in information gathering and monitoring opaque borrowers suggest. Implicitly, the role of supervision – via examinations – is to generate more precise information about a bank's condition to enable supervisors to take appropriate action to reduce failure risk.

[8] Interestingly, a small set of papers written in the late 1940s and early 1950s addresses the question of what bank supervision should be attempting to achieve and the ways in which supervision should (or should not) be integrated with monetary policy to create countercyclical impacts (Bach 1949, 1950; Warburton 1950). The discussion in those papers focuses predominantly on supervision's role in evaluating banks' lending, but also presages contemporary discussions about macroprudential supervisory policies such as countercyclical capital buffers. I thank Peter Conti-Brown for pointing out these papers to me.

Eisenbach, Lucca and Townsend (2016) develop a model that expands on the idea of information acquisition as a primary role for supervision. In particular, their model begins with the idea that the shared objective of supervision and regulation is to "align banks' risk-taking with the objectives of society as a whole, for the good of the financial system and the economy." Their model assumes two types of information about banks' condition and risk exposures: "hard" information that can easily be verified (e.g., whether capital ratios exceed minimum required levels) and "soft" information that requires effort to obtain and judgment to assess, such as the quality of risk management. In the model, verifiable hard information forms the basis of regulation while acquiring and assessing soft information is the role of supervision.[9]

The distinction between hard and soft information and its role in supervision is closely related to ideas raised in papers that discuss the role of hard and soft information in lending. As summarized in Liberti and Petersen (2019), hard information is "quantitative, is easy to store and…is independent of its collection" while soft information is "difficult to completely summarize in numeric score, … requires a knowledge of its context to fully understand, and … becomes less useful when separated from the environment in which is was collected." This literature argues that smaller banks who are closer to their customers are better equipped to deal with soft information (e.g., from local small businesses) while larger banks with more hierarchy and greater geographic scope use hard information more successfully (e.g., credit card scoring).

Supervisory Flexibility

In the Eisenbach, Lucca and Townsend (2016) model, supervisors intervene to alter banks' risk-taking behavior after acquiring and assessing the soft information, basing their intervention on the signal they receive about the bank. These interventions are intended to reduce the probability of bad outcomes (e.g., loan losses) at the bank. Interventions are flexible, tailored to the particular circumstances supervisors discover about the bank.

The paper argues that this flexibility has both benefits and costs. On the benefit side, supervisors' ability to tailor remediation actions allows them to respond optimally based on what they learn from the information they discover. If the full range of potential future conditions is difficult to specify in advance, this flexibility can be an effective supplement to hard-wired regulation in curbing

[9] In a different setting, Repullo (2017) develops a related model in which supervisors' role is to collect non-verifiable information on bank solvency and to make decisions using that information about whether the bank should be liquidated. The Basel Committee on Banking Supervision also recognized supervisors' role in assessing qualitative information in the supervisory review pillar ("Pillar 2") of the Basel II capital standards adopted prior to the global financial crisis (Basel Committee on Banking Supervision 2004).

banks' risk-taking. However, pre-committing via regulation to certain actions could successfully curb risk-taking even if these actions turn out to be harsher than necessary given information eventually discovered by supervisors. Which of these two approaches is optimal from a social perspective depends on a variety of factors, including the degree of uncertainty surrounding a bank's health and performance (the extent of the information asymmetries) and how difficult (costly) it is for supervisors to uncover accurate information about the firm.

The costs and benefits of supervisory flexibility mirror themes widely addressed in the economics literature in other settings, including the literature on rules versus discretion in monetary policy (see, for instance, Fischer 1990 and Kocherlakota 2016) and the incomplete contracting literature (Grossman and Hart 1986, Hart and Moore 1990, Hart 1995). This work addresses a series of issues that are relevant to banking regulation and supervision, such as dynamic inconsistency (the optimal action in the future could differ from the optimal action today since future conditions are uncertain), credibility in committing to future actions (because future conditions are uncertain, it can be difficult to convincingly pledge what steps will be taken in the future) and the "hold up" problem (because parties can renegotiate in the future, they can have incentives not to cooperate fully today, resulting in under-investment).

These themes all address uncertainty about future outcomes, which is relevant for banks, who are exposed to a variety of micro-economic (individual borrower) and macro-economic (business cycle) risks that resolve only over time. That said, the insights from these literatures could also be helpful in understanding the role of supervision in the face of uncertainties arising from the asymmetric information problems inherent in banking. If the role of supervision is to discover and assess "soft" information about a bank's underlying financial and operation health, as the nascent literature on the rationale for supervision suggests, what insights do these other literatures have for the actions supervisors should take as the uncertainty is resolved? How do we think about principles-based versus rules-based approaches to supervisory actions? From a theoretical perspective, what are the costs and benefits of supervisory judgment and supervisory discretion? The economics literature is only just beginning to address these questions.

What Do We Know about the Impact of Supervision on Supervised Banks?

In contrast to the very small body of theoretical work exploring the rationale for supervision, there is a growing empirical literature assessing the impact of supervision on banks. Interest in this topic has grown in the years following the global financial crisis and subsequent changes to bank

supervision and regulation, especially for large, globally systemically important banks. Through a variety of lenses, these papers examine how supervision affects the risk-taking, lending and profitability of supervised banks. The papers generally find that more intensive supervision results in reduced risk-taking. A key question is whether the risk-reducing impact of supervision comes at the cost of reduced lending or lower profits and whether this trade-off, if it exists, is socially optimal. Some papers find that more intense supervision results in reduced credit supply, while others find that supervision reduces risk without significantly reducing lending. Most papers that examine the question find that supervision has a neutral to positive impact on profitability. Overall, however, the literature is just beginning to address these fundamental questions in a systematic way.[10]

Bank Lending

The longest-standing economics literature on supervision examines how the stringency of the bank examination process – in particular, the standards examiners apply when reviewing a bank's loan portfolio or assessing bank safety and soundness – affects bank lending supply (Peek and Rosengren 1995, Swindle 1995, Berger, Kyle and Scalise 2001, Curry, Fissel and Ramirez 2008, Krainer and Lopez 2009, Kiser, Prager and Scott 2012, Bassett, Lee and Spiller 2015). In general, these papers find that increased supervisory stringency is associated with reduced loan origination or slower loan growth, though the estimated economic effects of the impact vary, with some finding statistically significant but economically small effects and others finding more meaningfully sized impacts.

More recently, Basset and Marsh (2017) and Kim, Santos and Plosser (2018) find that supervisory guidance related to commercial real estate and leveraged lending, respectively, reduced these forms of lending at targeted banks, though banks may take on additional risk via other types of lending or the targeted lending may shift to other institutions. Finally, several papers have examined the impact of the introduction of the Single Supervisory Mechanism for large banks in Europe and found that while the resulting more intense supervision of these banks results in lower risk, it is also associated with a reduction in credit supply, at least in the period immediately following the introduction of the new regime (Eber and Minoiu 2016, Ben-David et al. 2018, Haselmann, Singla and Vig 2019, and Abbassi et al. 2020).

[10] A related body of work assesses the effects of the stress testing conducted by the Federal Reserve and European supervisory authorities during and after the global financial crisis. As described in Hirtle and Lehnert (2015), the Federal Reserve's Comprehensive Capital Analysis and Review (CCAR) program, which embeds stress testing, involves both regulation (compliance with minimum post-stress capital requirements) and supervision (assessment of banks' internal stress testing and capital management programs).

Bank Risk-Taking and Performance

A growing series of papers have looked at the impact of formal supervisory enforcement actions, such as cease and desist orders, written agreements or fines, on risk-taking and performance. In general, this work finds that that public enforcement actions are associated with subsequent reductions in bank risk (for instance, Delis and Staikouras 2011, Delis, Staikouras and Tsoumas 2017). Pereira et al. (2019) find that equity prices decline and deposit growth falls in response to public enforcement actions, especially those that are more severe, but that these effects reverse and are sometimes positive when the enforcement action is seen as correcting a management deficiency. Other work finds that the costs (borrowing rates and fees) faced by a bank's syndicated loan borrowers decline following enforcement actions, largely reflecting decreased market power of the "penalized" bank (Deli et al. 2018).

While these papers have focused on particular supervisory activities, others have taken a broader approach to assessing differences in supervisory attention and intensity. This work focuses on discrete events that result in more or less intense supervisory focus for some banks, such as changes in asset size cutoffs for particular types of supervisory reviews or closures of regional supervisory offices. For instance, Rezende and Wu (2014) examine banks before and after a regulatory change in the asset size cut-off determining the frequency of examinations and find that, after the regulatory change, banks receiving more frequent exams experience higher profitability and lower loan losses than banks just below the new asset size cut-off. Bisetti (2020) finds that market-to-book ratios fall for banks with reduced reporting requirements following an increase in asset size cutoff for certain regulatory reports, as these banks increase spending on internal controls and external audit.

Papers examining the impact of supervisory office closures – that is, when a supervisory agency closes a regional office and re-assigns oversight responsibilities to staff located further away – generally find that the office closures result in greater risk and lower profitability for banks with now more distant supervisors (Gopalan, Kalda and Manela 2017, Hagendorff, Lim and Armitage 2017, Kandrac and Schlusche 2017, Leuz and Granja 2020). These papers interpret greater physical distance as a proxy for reduced supervisory attention and familiarity. Using a different identification approach based on asset size rank within a Federal Reserve district, Hirtle, Kovner and Plosser (2020) find that banks receiving more supervisory attention have less risky loan portfolios, less volatile income and are less negatively

impacted by economic downturns, but are no less profitable and do not have slower asset or loan growth than similar banks receiving less intensive supervisory scrutiny.[11]

Taken as a whole, the findings in these papers suggest supervision decreases the risk of bank failure, with little cost to bank profitability. The evidence on credit supply is more mixed, though some papers find that banks intermediation activities are not reduced in an economically meaningful way. Finding that the additional safety that supervision provides comes at little cost to lending or to bank profitability would be an important conclusion because it would suggest that supervision is welfare-enhancing. Still, none of the papers directly address whether the current structure and resources devoted to supervisory activities are fully socially optimal. Few address the direct costs of supervision (salaries and other expenses associated with maintaining supervisory agencies). Eisenbach, Lucca and Townsend (2020) is an exception. Using an extension of their 2016 model discussed in the previous section, they assess whether supervisory resources within the Federal Reserve System are allocated optimally and finding that resources could be more efficiently allocated among districts and toward riskier banks. They also do a back-of-the-envelope exercise to assess the impact of increasing the overall pool of resources spent on supervision and find positive net benefits. This is a simple assessment, however, and whether the "amount" of supervision being conducted is socially optimal in terms of the degree of risk-reduction or the impact on economic activity remains an open question that the economics literature has yet to address fully.

Disclosing Supervisory Information

Another strand of the literature considers disclosure of supervisory information, specifically, the costs and benefits of supervisors disclosing to the public the outcomes of their monitoring and assessments of bank risk. Traditionally, supervisory information such as ratings (bank "CAMELS" ratings) and many remediation actions (MRAs and MRIAs) have not been disclosed to the public, even on an ex post basis. The rationales for keeping this information confidential typically involve concerns about the potential to destabilize individual banks or the banking system or that potential disclosure could make banks more reluctant to disclose information to their supervisors.

The Federal Reserve's 2009 Supervisory Capital Assessment Program (SCAP) stress tests broke with the tradition of confidentiality by disclosing firm-specific stress test results, and the subsequent Dodd Frank Act (DFAST) and Comprehensive Capital Analysis and Review (CCAR) stress tests have

[11]In a different setting, Jackson and Roe (2009) reach similar conclusions about the positive impact of supervisory intensity, finding that countries allocating more resources to public enforcement by securities regulators tend also to have more robust capital markets.

continued to make results available to the public. The Federal Reserve argued that disclosing the SCAP results would reduce uncertainty and enhance confidence in the banking system at a time of considerable stress (Board of Governors of the Federal Reserve System 2009; Hirtle, Stiroh and Schuermann 2009). A number of papers have examined the impact and content of the SCAP and subsequent DFAST/CCAR stress test disclosures, finding that they conveyed new information to the market (Morgan, Peristiani and Savino 2014; Flannery, Hirtle and Kovner 2017; Fernandes, Igan and Pinheiro 2020). A parallel set of work has examined disclosure of European stress test results, finding somewhat more mixed evidence of market impacts (see, for example, Petrella and Resti 2013 or Candelon and Sy 2015).

These papers address whether the stress test disclosures affect the market's perception of a bank's risk and performance, but few papers directly address whether the disclosures themselves affect bank-risk taking. In part, this is because it is very difficult to identify the impact of disclosure as distinct from the overall impact of the stress test program and the counterfactual – the existence of the stress test program without disclosure of results – cannot be tested. Goldstein and Sapra (2014) discuss some theoretical costs to disclosure of supervisory information and stress test results, including disruptions to risk-sharing in interbank markets and distortions to banks' risk-taking behavior. Sahin, de Haan and Neretira (2020) find that systematic risk, as measured by the beta of a bank's stock, is reduced following stress test disclosures. Based on interviews with current and former bankers and supervisors, Kohn and Liang (2019) conclude that banks have improved their risk management and capital planning as a result of the U.S. stress test regime, largely due to the public disclosure of the Federal Reserve's qualitative review of internal processes. These conclusions echo findings about the impact of public disclosure by OSHA of workplace safety violations and fines, which resulted in reduced risk not only at the firms in question, but at other unrelated facilities (Johnson 2020).

Open Questions

While the literature generally finds that supervision promotes lower risk and a better risk-performance tradeoff at supervised banks, it does not fully identify the channels through which this risk-reduction occurs. As noted, some papers look at the impact of specific types of supervisory actions, addressing those tools directly. But supervisory ratings and enforcement actions are the final steps in the supervisory process. How else do supervisors influence risk-taking? If supervision results in reduced risk with little impact on profitability, why don't banks take these steps without supervisory intervention? What problems inside the bank are supervisors fixing? Are there internal governance or control problems? Are supervisors more firmly aligned with risk managers inside the firm, causing more

weight to be put on their concerns rather than the concerns of business managers, who might be more concerned with near-term profits? Does supervision provide incentives for banks to invest in information technology and risk-management infrastructure with large up-front costs but that facilitate better risk-return decisions? Are supervisors, who see a range of banks, fostering the spread of best practice across the industry? What role does, or could, disclosure of supervisory information play? If supervision actually does improve risk-performance trade-offs, why do banks argue so strenuously about supervisory burden? Finally, what can we learn from supervisory failures, where risks or poor internal controls were not identified in a timely way? These are all questions worthy of further analysis to get a better understanding of what works (and what doesn't) in the supervisor's toolkit.

How Do Supervisory Incentives Affect Outcomes?

A final strand of the economics literature on supervision considers how the incentives of supervisors at both the institutional and individual levels affect outcomes. This body of works considers questions such as whether bank supervision and regulation should be done by a central bank or by a separate supervisory authority and the distribution of supervisory responsibility between local and national or supra-national supervisors.[12] This literature is relevant in the United States, which has a dual banking system of licensing, regulation and supervision by both state and federal authorities, and in Europe, especially since the creation in 2014 of the Single Supervisory Mechanism (SSM) for large banks operating cross-border within the European Union. While this literature considers incentives and actions at the level of a supervisory agency, a longer-standing literature considers the incentives of individual supervisors. This literature focuses on the concept of regulatory or supervisory "capture," where, for a variety of posited reasons, individual supervisors are assumed to adopt the perspective and objectives of the supervised bank, rather than of the public.

Supervision and Central Banking

A long-standing literature examines the question of whether banking regulation and supervision should be done by the central bank or by a separate agency. The role of asymmetric information and supervisors' role in generating information about banks' true underlying condition again play important roles in this literature. As summarized in Masciandaro and Quintyn (2016), the advantages of having the

[12] A related body of work discusses the optimal division of responsibilities among the deposit insurer, the central bank and a stand-alone supervisory agency. For example, Kahn and Santos (2005) argue that there are advantages to investing the deposit insurer with supervisory authority, but that there are tradeoffs in housing the lender of last resort and deposit insurance function in the same agency. These tradeoff are complicated if there is asymmetric information, as supervisory agencies can have disincentives to sharing information with one another.

central bank conduct supervision include that the central bank may have better information about the economic and financial market conditions affecting the banking industry, that combining the information insights from supervising banks with information about the economy generated as part of the monetary policy process can improve both supervision and monetary policy, that there are potential efficiencies to having liquidity provision (lender of last resort) and supervision housed in the same entity, and that central banks may have a human capital advantage, since their staffs are exposed to a wider range of issues and perspectives. On the other side, combining responsibility for supervision and monetary policy in a single agency may create conflicts between the safety and soundness goals of supervision and the objectives of monetary policy if monetary policy actions have potential negative effects on banks. More broadly, combining the activities could create public concerns about centralization of power in a single agency that could threaten the independence of the central bank and its monetary policy authority.

Empirical evidence on the impact of central banks as supervisors on the health and performance of banks is mixed. For instance, Dincer and Eichengreen (2012) find that bank risk, as measured by non-performing loans, is lower in countries where the supervisor is the central bank, though credit provision may also be lower. In contrast, Barth et al. (2002) find that non-performing loans are higher in countries where the central bank is the supervisor, but the structure of supervision has little impact on bank profitability. Fraccaroli (2019) finds that bank risk is unrelated to whether the central bank is involved in supervision, but that non-performing loans are lower when supervisory authority is shared between the central bank and a separate supervisory agency. The paper attributes lower banking sector risk under the shared supervision approach to increased barriers and coordination costs of supervisory capture when supervisory authority is spread across multiple agencies. In terms of trade-offs with monetary policy objectives, Ampudia at al. (2019) find that in countries where the central bank is the supervisor, credit booms are less likely to become banking crises and that this stability does not come at the cost of slower GDP growth or larger deviations from inflation targets.

Local and National/Supra-National Supervisors

The question of shared supervisory responsibility has also been examined in the context of supervising large banking companies that operate across multiple jurisdictions. The key idea in the theoretical literature on this topic is a tradeoff between local supervisors having better information about the true condition of a bank relative to a more distant national or supra-national supervisor and the incentives that local supervisors have to allow troubled banks to continue to operate, due to factors such as career concerns or concerns about the impact of bank closure on the local economy. National or

supra-national supervisors, in contrast, may be more willing to liquidate a troubled bank or take more stringent supervisory actions (Repullo 2018, Carletti, Dell'Ariccia and Marquez forthcoming). The optimal balance between local and national/supra-national authority depends on the relative strengths of these two sets of factors. Calzolari, Colliard and Loranth (2019) note that this problem is further complicated because banks' corporate structures – in particular, whether to operate cross-jurisdiction via branches or subsidiaries – is endogenous and banks can change their corporate structures in ways that offset coordination gains from coordinated or supra-national supervision.

The empirical literature generally supports the idea that supervision by national or supra-national authorities results in more stringent assessments of banks and lower banking sector risk. For instance, Altavilla et al. (2020) find that supra-national supervision in the Euro area is associated with reduced credit supply to riskier borrowers and increased credit supply to safer firms and that these effects are stronger in countries experiencing greater degrees of economic stress. They attribute these findings to superior human capital at supra-national supervisors rather than to regulatory capture of local supervisors. Haselmann, Singla and Vig (2019) find that banks subject to the SSM evaluate loan risk more stringently (e.g., apply higher risk weights). Working with a global sample of banks, Beck, Silva-Buston and Wagner (2019) find that cross-border supervisory cooperation enhances bank stability. Finally, in the U.S. setting, Agarwal et al. (2014) find that federal supervisors are systematically more stringent than state supervisors in assigning supervisory ratings, attributing the differences to greater concern by state regulators about local economic conditions. They find no evidence of supervisor self-interest (e.g., career concerns) driving the results.

Supervisors' Incentives

An important thread that runs through this literature concerns supervisors' incentives to impose corrective actions on supervised banks. One idea that repeatedly surfaces is that individual supervisors may be motivated by concerns other than the safety and soundness of the banking system and the banks they supervise or that they place excessive weight on near-term economic conditions in their local jurisdictions. Quintyn and Taylor (2007) argue that the lack of a measurable objective for bank supervision complicates insulating supervisors from political pressure, much of which could be focused on supporting local banks or local economic activity.

A separate strand of the literature focuses on possible conflicts arising from supervisor's career concerns. The key idea in this literature is that in choosing whether to take disciplinary actions against banks, supervisors will be influenced not just by the public good, but by their private career goals. In particular, supervisors may hesitate to discipline a bank if they believe that problems at the bank will not

become public until after the supervisor has moved on to another job, most likely in the private sector (Kane 1989a, 1989b). An extreme form of this concern is the idea that a supervisor would deliberately give favorable assessments or prevent disciplinary actions from being taken as a way of currying favor and a future job at the bank ("quid quo pro"). A more benign version is that a supervisor who has worked extensively with a bank may unconsciously begin to adopt the perspective of the bank, rather than the perspective of the public good.

Both forms of this concern might be more acute if there is a "revolving door" job market in which supervisors become bankers and bankers become supervisors. For instance, Kane (1998b) argues that supervisory forbearance driven by career concerns played an important role in the S&L crisis during the 1980s. More recent work by Lucca, Seru and Trebbi (2014) uses publicly available data to track the careers of supervisors into and out of the private sector. They find that both flows in and flows out of the banking industry are strongest during periods of high supervisory enforcement activity, which they interpret as being more consistent with the idea that supervisors and banks are learning from one another ("regulatory schooling") than with a quid pro quo view. This finding is consistent with the work on local versus national or supra-national supervisors, which also finds little evidence of the capture of local supervisors (Altavilla et al. 2020; Agarwal et al. 2014).

Open Questions

Understanding the impact of supervisory incentives is critical in any assessment of whether the goals of supervision are being met. The costs and benefits of the "revolving door" between supervisory agencies and the banking industry seems a particularly good area for further work. Lucca, Seru and Trebbi's (2014) suggestion of "regulatory schooling" is related to questions raised in the previous section about the channels through which supervision works to improve the risk-return tradeoff at supervised banks. Is one potential channel that the "revolving door" fosters learning about best practice? Understanding how supervisors' career paths affect the quality and impact of supervision seems a fruitful area for additional work. More broadly, work on supervisory incentives could also be linked to the emerging work on the rationale and motivation for supervision. One obvious link is to Dewatripont and Tirole's (1994) idea that the goal of bank regulation should be to represent depositors ("representation hypothesis").

Review and Summary: The Important Unanswered Questions and How to Address Them

This paper provides a heuristic review of the economics literature on banking, banking regulation and banking supervision. The economics literature on banking suggests three primary

rationales for banks as unique institutions: asymmetric information and monitoring, liquidity and payments provision and the synergies of combining deposit-taking with contingent credit provision. The motivation for regulating these institutions draws on the same themes, filtered through the idea that there are significant negative externalities related to bank failure and distress. The theoretical literature examining the motivation for supervision (monitoring and oversight) as a distinct activity from regulation (the rules) is just now emerging, with very considerable room to grow. The empirical literature assessing the impact of supervision is more substantial, with initial results suggesting that supervision reduces risk at supervised banks, without meaningfully reducing profitability. The evidence is more mixed about whether more intensive supervision reduces credit supply. The channels through which supervision achieves these results have yet to be fully explored, however. Finally, there is a body of work exploring how supervisory incentives – both at the individual and institutional levels – affect outcomes. Supervisory incentives are fundamentally entwined with both the theoretical rationale for supervision as a distinct activity and with empirical assessments of its impact. Drawing these links more clearly is an additional area for fruitful future work.

An important challenge for new work in this area is that much of the information about supervisory activities and outcomes is confidential and accessible only to researchers inside the supervisory agencies. These economists have been active contributors to the growing literature on supervision, of course. Academic economists have made inroads on these topics by identifying plausibly exogenous differences in supervisory attention based on publicly known factors such as asset-size cut-offs for various reporting requirements or examination scheduling, and openings and closures of supervisory offices, as well as information about public enforcement actions. One road forward is for collaboration between economists at the supervisory agencies and academic colleagues, which is already occurring to some extent. Such collaboration is useful for generating new empirical work, as economists inside supervisory agencies can often access information ranging from databases of supervisory staffing and time allocations, information about the number and content of non-public supervisory actions such as MRAs and MRIAs, or confidential regulatory reports and bank-specific data underlying surveys or aggregate statistics released by supervisory agencies or the central bank.

More fundamentally, however, there is large scope for academic economists to explore the theoretical underpinnings of supervision, just as they have explored theories of banking and bank regulation. And just as those theories have drawn from the broader economics literature on topics such as symmetric information, moral hazard, adverse selection, networks and network externalities, and incomplete contracting, further development of theories of supervision can draw from many of these

same literatures. Further, as the emerging theoretical work suggests, theories related to “hard” versus “soft” information and rules versus discretion in policy seem particularly apt in this setting. Here, too, collaboration with economists at supervisory agencies or with supervisors themselves could be fruitful, as a way to increase understanding both of what supervisors actually do on a day-to-day basis and how they think about their own goals and objectives. Having deeply grounded theories of supervision could help frame the growing body of empirical analysis and make it easier to assess whether current and future supervisor efforts are successful and whether supervisory resources are being well-spent. Being able to answer such questions is important for the stability and productivity of the banking and financial system and thus of the broader economy.

References

Abbassi, Puriya, Rajkamal Iyer, José-Luis Peydró and Paul E. Soto. 2020. "Stressed Banks? Evidence From the Largest-Ever Supervisory Review." Deutsche Bundesbank *Discussion Paper* No. 26/2020.

Ackerlof, George. 1970. "The Market for Lemons: Quality Uncertainty and the Market Mechanism." *Quarterly Journal of Economics* 84, no. 3 (August): 488-500.

Agarwal, Sumit, David Lucca, Amit Seru and Francesco Trebbi. 2014. "Inconsistent Regulators: Evidence from Banking." *Quarterly Journal of Economics* 129, no. 2 (May): 889-938.

Altavilla, Carlo, Miguel Boucinha, Jose-Luis Peydro and Frank Smets. 2020. "Banking Supervision, Monetary Policy and Risk-Taking: Big Data Evidence from 15 Credit Registers." European Central Bank *Working Paper* no. 2349. (January 2020).

Ampudia, Miguel, Thorsten Beck, Andreas Beyer, Jean-Edouard Collard, Agnese Leonello, Angela Maddaioni and David Marques-Ibanez. 2019. "The Architecture of Supervision." European Central *Bank Working* Paper 2287. May 2019.

Ashcraft, Adam B. 2005. "Are Banks Really Special? New Evidence from the FDIC-Induced Failure of Healthy Banks." *American Economic Review* 95, no. 5 (December): 1712-1730.

Bach, G.L. 1949. "Bank Supervision, Monetary Policy and Governmental Reorganization." *Journal of Finance* 4, no. 4 (December): 269-285.

_____. 1950. "A Further Note on Bank Supervision and Monetary Policy." *Journal of Finance* 5, no. 4 (December): 421-424.

Barth, James R., Luis G. Dopico, Daniel E. Nolle and James A. Wilcox. 2002. "Bank Safety and Soundess and the Structure of Bank Supervision: A Cross-Country Analysis." *International Review of Finance* 3, no. 3-4 (September-December): 163-188.

Basel Committee on Banking Supervision. 2004. "International Convergence of Capital Measurement and Capital Standards: A Revised Framework." June 2004.

Bassett, William F., Seung Jung Lee and Thomas Popeck Spiller. 2015. "Estimating Changes in Supervisory Standards and their Economic Effects." *Journal of Banking and Finance* 60 (November): 21-43.

Bassett, William F. and W. Blake Marsh. 2017. "Assessing Targeted Macroprudential Regulation: The Case of the 2006 Commercial Real Estate Guidance for Banks." *Journal of Financial Stability* 30 (June): 209-228.

Beck, Thorsten, Consuelo Silva-Burton and Wolf Wagner. 2019, "The Economics of Supranational Bank Supervision." November 29, 2019.

Ben-David, Itzhak, Giovanni Cerulli, Franco Fiordelisi and David Marques-Ibanez. 2018. "Seeking My Supervisor: Evidence from the Centralization of Banking Supervision in Europe." December 2018.

Berger, Allen N. and Sally M. Davies. 1998. "The Information Content of Bank Examinations." *Journal of Financial Services Research* 14, no 2 (October): 117-144.

Berger, Allen N., Margaret K. Kyle and Joseph M. Scalise. 2001. "Did U.S. Bank Supervisors Get Tougher During the Credit Crunch? Did They Get Easier During the Banking Boom? Did it Matter to Bank Lending?" in *Prudential Supervision: What Works and What Doesn't*. University of Chicago Press.

Bisetti, Emilio. 2020. "The Value of Regulators as Monitors: Evidence from Banking." January 1, 2020.

Board of Governors of the Federal Reserve System. 2009. "The Supervisory Capital Assessment Program: Overview of Results." May 7, 2009.

Brunnermeier, Markus K., Andrew Crockett, Charles A.E. Goodhart, Avinash Persaud and Hyun Song Shin. 2009. *The Fundamental Principles of Financial Regulation*. Center for Economic Policy Research.

Calomiris, Charles W. and Charles M. Kahn. 1991. "The Role of Demandable Debt in Structuring Optimal Banking Relationships." *American Economic Review* 81, no. 3 (June): 497-513.

Calzolari, Giacomo, Jean-Edouard Colliard and Gyongyi Loranth. 2019. "Multinational Banks and Supranational Supervision." *Review of Financial Studies* 32, no. 8 (August): 2997-3035.

Candelon, Bertrand and Amadou N.R. Sy. 2015. "How Did Markets React to Stress Tests?" IMF Working Paper WP/15/75 April 2015.

Carletti, Elena, Giovanni Dell'Ariccia and Robert Marquez. Forthcoming. "Supervisory Incentives in a Banking Union." *Management Science*.

Curry, Timothy J., Gary S. Fissel and Carlos D. Ramirez. 2008. "The Impact of Bank Supervision on Loan Growth." *North American Journal of Economics and Finance* 19, no. 2 (August): 113-134.

Deli, Yota, Manthos D. Delis, Iftekhar Hasan and Liuling Liu. 2018. "Enforcement of Banking Regulation and the Costs of Borrowing." Bank of Finland *Research Discussion Papers* 19/2018 (October).

Delis, Manthos and Panagiotis K. Staikouras. 2011. "Supervisory Effectiveness and Bank Risk." *Review of Finance* 15, no. 3 (July): 511-543.

Delis, Manthos, Panagiotis K. Staikouras and Chris Tsoumas. 2017. "Formal Enforcement Actions and Bank Behavior." *Management Science* 63, no. 4 (April): 959-987.

Diamond, Douglas W. 1984. "Financial Intermediation and Delegated Monitoring." *Review of Economic Studies* LI, no. 3 (July): 393-414.

Diamond, Douglas W. and Philip H. Dybvig. 1993. "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91, no. 3 (June): 401-419.

Dincer, N. Nergiz and Barry Eichengreen. 2012. "The Architecture and Governance of Financial Supervision: Sources and Implications." *International Finance* 15, no. 3 (Winter): 309-325.

Dewatripont, Mathias and Jean Tirole. 1994. *The Prudential Regulation of Banks*. The Walras-Pareto Lectures, MIT Press.

Eber, Maximilian and Camelia Minoiu. 2016. "How Do Banks Adjust to Stricter Supervision?" November 2016.

Eisenbach, Thomas, Andrew Haughwout, Beverly Hirtle, Anna Kovner. David Lucca and Matthew Plosser. 2017. "Supervising Large, Complex Financial Institutions: What Do Supervisors Do?" Federal Reserve Bank of New York *Economic Policy Review* 23, no. 1 (February): 57-77.

Eisenbach, Thomas M., David O. Lucca and Robert M. Townsend. 2016. "The Economics of Bank Supervision: So Much to Do, So Little Time." Federal Reserve Bank of New York *Liberty Street Economics* Blog. April 12, 2016.

_____. 2020. "The Economics of Bank Supervision." Federal Reserve Bank of New York *Staff Report* No. 769 (March 2016; revised June 2020).

Fama, Eugene F. 1985. "What's Different About Banks?" *Journal of Monetary Economics* 15, no. 1 (January): 29-39.

Fernandes, Marcelo, Denis Igan and Marcelo Pinheiro. 2020. "March Madness in Wall Street: (What) Does the Market Learn from Stress Tests?" *Journal of Banking and Finance* 112 (March).

Fischer, Stanley. 1990. "Rules versus Discretion in Monetary Policy." *Handbook of Monetary Economics* volume 2 (1990): 1155-1184.

Flannery, Mark J. 1994. "Debt Maturity and the Deadweight Cost of Leverage: Optimally Financing Banking Firms." *American Economic Review* 84, no. 1 (March): 320-331.

Flannery, Mark, Beverly Hirtle and Anna Kovner. 2017. "Evaluating the Information in Federal Reserve Stress Tests." *Journal of Financial Intermediation* 29 (January): 1-18.

Fraccaroli, Nicolo. 2019. "Supervisory Governance, Capture and Non-Performing Loans." Bank of England *Staff Working Report* no. 820 (September 2019).

Gatev, Evan, Til Schuermann and Philip E. Strahan. 2007. "Managing Bank Liquidity Risk: How Deposit-Lending Synergies Vary with Market Conditions." *Review of Financial Studies* 22, no. 3 (November): 995-1020.

Gopalan, Yadav, Ankit Kalda and Asaf Manela. 2017. "Hub-and-spoke Regulation and Bank Leverage." Working paper, Washington University in St. Louis.

Goldstein, Itay and Haresh Sapra. 2014. "Should Banks' Stress Test Results be Disclosed? An Analysis of the Costs and Benefits." *Foundations and Trends in Finance* 8, no. 1: 1-54.

Gorton, Gary B. and Andrew Metrick. 2020. "Who Ran on Repo?" American Economic Association *Papers and Proceedings* 110 (May): 487-492.

Grossman, Sanford J. and Oliver D. Hart. 1986. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration." *Journal of Political Economy* 94, no. 4 (August): 691-719.

Hagendorff, Jens, Ivan Lim and Seth Armitage. 2017. "Does Bank Supervision Matter? Evidence from Regulatory Office Closures." Working Paper, University of Edinburgh.

Hart, Oliver D. and John Moore. 1990. "Property Rights and the Nature of the Firm." *Journal of Political Economy* 98, no. 6 (December): 1119-1158.

Hart, Oliver D. 1995. *Firms, Contracts and Financial Structure.* Oxford University Press.

Haselmann, Rainer, Shikhar Singla and Vikrant Vig. 2019. "Supranational Supervision."

Hirtle, Beverly, Anna Kovner and Matt Plosser. 2020. "The Impact of Supervision on Bank Performance." *Journal of Finance* 75, no. 5 (July): 2765-2808.

Hirtle, Beverly and Andreas Lehnert. 2015. "Supervisory Stress Tests." *Annual Review of Financial Economics* Volume 7 (2015): 339-356.

Hirtle, Beverly, Til Schuermann and Kevin Stiroh. 2009. "Macroprudential Supervision of Financial Institutions: Lessons from the SCAP." Federal Reserve Bank of New York *Staff Reports* no. 409. September 2009.

Jackson, Howell E. and Mark J. Roe. 2009. "Public and Private Enforcement of Securities Laws: Resouce-based Evidence." *Journal of Financial Economics* 93, no. 2 (August): 207-238.

Johnson, Matthew S. 2020. "Regulation by Shaming: Deterrence Affects of Publicizing Violations of Workplace Safety and Health Laws." *American Economic Review* 110, no. 6 (June): 1866-1904.

Kahn, Charles M. and João A.C. Santos. 2005. "Allocating Bank Regulatory Powers: Lender of Last Resort, Deposit Insurance and Supervision." *European Economic Review* 49, no. 8 (November): 2107-2136.

Kandrac, John and Bernd Schlusche. 2017. "The Effect of Bank Supervision on Risk Taking: Evidence from a Natural Experiment." Board of Governors of the Federal Reserve System *FEDS Working Paper* 2017-079 (June).

Kane, Edward J. 1989a. "Changing Incentives Facing Financial-Services Regulators." *Journal of Financial Services Research* 3, no. 2 (September): 265-274.

_____. 1989b. *The S & L Insurance Mess: How Did It Happen?* The Urban Institute.

Kashyap, Anil K., Raghuram Rajan and Jeremy C. Stein. 2002. "Banks as Liquidity Providers: An Explanation for the Coexistence of Lending and Deposit-Taking." *Journal of Finance* 57, no. 1 (February): 33-74.

Kim, Sooji, Matthew C. Plosser and João A.C. Santos. 2018. "Macroprudential Policy and the Revolving Door of Risk: Lessons from Leveraged Lending Guidance." *Journal of Financial Intermediation* 34 (April): 17-31.

Kiser, Elizabeth, Robin A. Prager and Jason Scott. 2012. "Supervisor Ratings and the Contraction of Bank Lending to Small Businesses." Board of Governors of the Federal Reserve System *FEDS Working Paper* 2012-69 (August).

Kocherlakota, Narayana. 2016. "Rules versus Discretion: A Reconsideration." *Brookings Papers on Economic Activity*, Fall 2016.xd

Krainer, John and Jose A. Lopez. 2009. "Do Supervisory Rating Standards Change Over Time?" Federal Reserve Bank of San Francisco *Economic Review 2009*: 13-24.

Leuz, Christian and Joao Granja. 2020. "The Death of a Regulator: Strict Supervision, Bank Lending and Business Activity." Goethe University Center for Financial Studies *Working Paper* 610 (July 2020).

Liberti, José María and Mitchell A. Petersen. 2019. "Information: Hard and Soft." *Review of Corporate Finance Studies* 8, no. 1 (March): 1-41.

Lucca, David, Amit Seru and Francesco Trebbi. 2014. "The Revolving Door and Worker Flows in Banking Regulation." *Journal of Monetary Economics* 65 (July): 17-32.

Masciandaro, Donato and Marc Quintyn. 2016. "The Governance of Financial Supervision: Recent Developments." *Journal of Economic Surveys* 30, no. 5 (December): 982-1006.

Mishkin, Frederic S. 2001. "Prudential Supervision: Why Is It Important and What Are the Issues?" in *Prudential Supervision: What Works and What Doesn't*. University of Chicago Press.

Morgan, Donald P. 2002. "Rating Banks: Risk and Uncertainty in an Opaque Industry." *American Economic Review* 92, no. 4 (September): 874-888.

Morgan, Donald P., Stavros Peristiani and Vanessa Savino. 2014. "The Information Value of the Stress Test." *Journal of Money, Credit and Banking* 76, no. 7 (October): 1479-1500.

Peek, Joseph and Eric Rosengren. 1995. "Bank Regulation and the Credit Crunch." *Journal of Banking and Finance* 19, no. 3-4 (June): 679-692.

Pereira, John, Irma Malafronte, Ghulam Sorwar and Mohamed Nurullah. 2019. "Enforcement Actions, Market Movement and Depositors' Reaction: Evidence from the U.S. Banking System." *Journal of Financial Services Research* 55, no. 2-3 (June): 143-165.

Petrella, Giovanni and Andrea Resti. 2013. "Supervisors as Information Producers: Do Stress Tests Reduce Bank Opaqueness?" *Journal of Banking and Finance* 37, no. 12 (December): 5406-5420.

Quintyn, Marc and Michael Taylor. 2007. “Robust Regulators and Their Political Masters: Independence and Accountability in Theory.” in *Designing Financial Supervision Institutions: Independence, Accountability and Governance.* Edward Elgar Press.

Repullo, Rafael. 2017. “Hierarchical Bank Supervision.” CEPR Discussion Paper No. DP12475. December 2017.

Rezende, Marcelo and Jason J. Wu. 2014. “The Effects of Bank Charter Switching on Supervisory Ratings.” Board of Governors of the Federal Reserve System *FEDS working paper* 2014-20 (March).

Sahin, Cenkhan, Jakob de Haan and Ekaterina Neretina. 2020. “Banking Stress Test Effects on Return and Risk.” *Journal of Banking and Finance* 117 (August).

Slovin, Myron B., Marie E. Soshka and John A. Polonchek. 1993. “The Value of Bank Durability: Borrowers as Bank Stakeholders.” *Journal of Finance* 48, no. 1 (March): 247-266.

Stiglitz, Joseph E. and Andrew Weiss. 1981. “Credit Rationing in Markets with Imperfect Information.” *American Economic Review* 71, no. 3 (June): 393-410.

Swindle, C. Sloan. 1995. “Using CAMEL Ratings to Evaluate Regulator Effectiveness at Commercial Banks.” *Journal of Financial Services Research* 9, no. 2 (June): 123-141.

Tirole, Jean. 2013. “Rethinking Macro Policy II: First Steps and Early Lessons.” International Monetary Fund Conference. April 16-17, 2013.

Warburton, Clark. 1950. “Co-Ordination of Monetary, Bank Supervisory, and Loan Agencies of the Federal Government.” *Journal of Fina*nce 5, no. 2 (June): 148-169.

White, Eugene N. 2011. “Lessons from American Bank Supervision for the Nineteenth Century to the Great Depression."in *Macroprudential Regulatory Policies: The New Road to Financial Stability?* World Scientific Publishing Co. Pte. Ltd.