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# A Macroprudential Perspective on the Regulatory Boundaries of U.S. Financial Assets\*

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## Abstract

This paper uses data from the Financial Accounts of the United States to map out the regulatory boundaries of assets held by U.S. financial institutions from a macroprudential perspective. We provide a quantitative measure of the regulatory perimeter—the boundary between the part of the financial sector that is subject to some form of prudential regulatory oversight and that which is not—and show how it has evolved over the past forty years. Additionally, we measure the boundaries between different regulatory agencies and financial institutions that operate within the regulatory perimeter and illustrate how these boundaries potentially become blurred in the face of regulatory overlap. Quantifying the regulatory perimeter and the boundaries for macroprudential regulators within the perimeter is informative for assessing financial stability risks over the credit cycle.

**Keywords:** Regulation; Regulatory reach; Boundary problem; Financial institutions

**JEL Classifications:** E 58; G 18; G28

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# 1 Introduction

The movement of financial activity between the regulated and the unregulated sector has important implications for financial stability. Goodhart (2008) and Goodhart and Lastra (2010) argue that a natural consequence of effective regulation is to reduce the return on capital for regulated financial entities relative to those that do not face regulation. As a result, financial activity naturally shifts into the unregulated sector. For example, in the run up to the Global Financial Crisis of 2007-'08, regulated entities circumvented regulatory boundaries by increasing off-balance-sheet activities in order to boost exposure to more profitable activity in the unregulated sector. This leakage can worsen the procyclicality of the credit cycle and has the potential to increase financial instability. Goodhart (2008) refers to this as the “boundary problem”. Effective regulation helps feed an expanding credit cycle because, through leakage, it creates an incentive to shift funding support toward more profitable financial activity in the unregulated sector.<sup>1</sup> However, in the face of panic or extreme risk aversion, these same funding sources may more readily withdraw support to unregulated entities in favor of reallocating toward the safety of the protected regulated sector.

The purpose of this paper is to provide quantitative measurement of the regulatory perimeter from a macroprudential perspective and illustrate how this measurement can be informative for assessing financial stability risks. We use publicly available data from the Financial Accounts of the United States to trace out the regulatory perimeter of U.S. financial assets; that is, the boundary between assets held by financial institutions that are subject to some form of prudential supervision and oversight versus those that are not. We then step inside the regulatory perimeter to assess the boundaries between different regulators that oversee various prudentially regulated financial institutions. Long run trends in both the regulatory perimeter and the boundaries within this perimeter offer insights into how financial development has shaped the regulatory landscape, and vice versa, over the past forty years. At the same time, the cyclical component of the regulatory perimeter offers useful insights into the state of the credit cycle.

The main contribution of this work is the empirical measurement of the reach of various macroprudential regulators, including the Federal Reserve, over the U.S. financial system. To our knowledge, this type of measurement has not been done elsewhere in the literature, but doing so is of interest to policymakers, to the legal community, as well as to academics working on the effects of financial regulation. It is essential, for example, for understanding how the regulatory reach of various macroprudential regulators has changed both cyclically as well as over the longer term as the structure of the financial economy evolves. Finally, while our contribution is narrowly focused on measurement, we want to be clear that we are not making any causal claims about what drives

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<sup>1</sup>See Aiyer, *et. al.* (2014) for empirical evidence on leakage of financial activity outside the regulated financial system following a change in regulation in the U.K.

the regulatory and/or credit cycle, nor do we make causal claims about how the two may co-evolve.

In terms of long run developments, we document the gradual expansion of the regulatory perimeter over the past forty years even as the overall size of the financial sector has grown. Our measurement exercise shows the share of total assets held by prudentially regulated financial institutions relative to total output—a proxy for the regulatory perimeter—increased steadily over this period, rising from roughly 65 percent in the early 1980s to about 75 percent in the most recent data. There were important compositional changes to the boundaries of different regulators operating within the perimeter over this period. Rapid expansion of intermediation outside the traditional banking system has reduced the regulatory footprint for federal banking regulators, including the Federal Reserve, relative to other agencies. In contrast, the regulatory reach of the SEC and the CFTC has expanded as assets held by nonbank financial intermediaries now constitute a larger fraction of total assets in the financial sector.

This compositional shift has two important implications for macroprudential policy. First, the main macroprudential tools available in the U.S. that can be deployed over the cycle are bank stress tests and the countercyclical capital buffer (CCyB). Both of these tools are heavily influenced by the Federal Reserve and they both operate through bank holding companies. Our measurement exercise suggests that, taken together, these tools reach only about one-third of all macroprudentially regulated assets, and this estimate leaves aside assets held on the balance sheet of financial institutions outside the regulatory perimeter. As long as macroprudential tools are limited to implementation through the banking sector their reach will be restricted, and even more so as market-based financial intermediation plays a larger role in financial activity going forward. The second implication comes from the fact that both the SEC and the CFTC tend to engage more actively in the regulation of market activity rather than direct regulation of the institutions that participate in those markets. As a result, the growing regulatory footprint of these two agencies over the last twenty years places increasing importance on market monitoring and regulation as opposed to monitoring and regulation from a purely institutional perspective.

Turning to the cyclical component, we show that the credit expansion in the mid-1980s occurred along side a cyclical expansion of the regulatory perimeter. In contrast, the opposite is true of the expansion of credit going into the Global Financial Crisis as institutions that are outside of the reach of prudential regulators played a larger role in credit intermediation. A lesson to take from this is that tracking flows of financial assets across the regulatory boundary is informative to assessing financial risks in the credit cycle. In particular, our exercise sheds light on the fact that inflows into the regulated sector in the credit expansion of the mid-1980s were driven by institutions that, at least in principle, were more resilient in their ability to withstand financial stress owing to some form of prudential supervision. However, the opposite was true going into the Global Financial

Crisis. From a financial stability monitoring perspective, expansions of the credit cycle that are concurrent with a cyclical decline in the regulatory perimeter are of particular concern as this is an indicator that credit growth is concentrated amongst the least resilient institutions. Cast in this light, tracking the expansion of flows into the unregulated sector during the credit boom might have acted as a warning sign pointing to increased fragility in the financial system.

Beyond its usefulness in monitoring financial stability, measuring boundaries is useful because it gives a better sense of “who regulates whom.” Given the overall complexity of financial regulation in the U.S., such an understanding may be critically important for effective communication with the public regarding macroprudential policy goals. Measuring boundaries helps to define *ex ante* responsibility and promotes *ex post* accountability. This seems particularly important for central banks. In many countries, including the United States, central banks are often relied on disproportionately to identify emerging vulnerabilities but are limited in their ability of implement policy to address these vulnerabilities once identified. Our attempt to quantify the regulatory reach of specific prudential regulators allows for a better understanding the point of entry for regulatory action for specific regulators, including the Federal Reserve. It also highlights the necessity of cooperation across different regulatory agencies to achieve macroprudential goals.

From a legal perspective, quantifying regulatory boundaries gives a better sense of how financial innovation might change the regulatory landscape going forward. Currently, one such development is “fintech” which facilitates increasing engagement of non-financial businesses in financial activity. For example, technology firms are engaging in partnerships (or merging) with banks to offer financial services. Banks are offering products such as cryptocurrencies and crypto-currency related products that potentially allow them to step outside the bounds of regulation in new ways. This paper can help put the effect of these innovations on the regulatory perimeter in a broader context.

Finally, from a academic perspective, our measurement exercise can help researchers build better models for financial intermediation. Examples of the types of papers we have in mind include Begenau, and Landvoigt (2018), Clerc, *et. al.* (2015), Crouzet (2018), Fiore and Uhlig (2011, 2015), Fève, *et. al.* (2016), Gertler, Kiyotaki, and Prestipino (2016), Meeks, *et. al.* (2017), Medicino, *et. al.* (2018), and Moreira and Savov (2017), among others. In the context of these paper, our exercise suggests the basic bank versus non-bank dichotomy, while certainly informative, is only a small part of a much larger picture. Migration also happens between different financial institutions that operate within the regulatory boundary and these institutions have different risk exposures and face differing degrees of regulatory scrutiny. All of this has implications for the implementation and effectiveness of macroprudential policy and its something researchers should take into account in macroeconomic models of financial regulation. This work also has implications for understanding the value of coordinated macroprudential policy implemented in a fractionalized

regulatory environment such as the United States.

The remainder of this paper is organized as follows. The next section describes the data and methodology used to separate total U.S. financial assets into different regulatory and institutional bins. Section 3 presents our measurement results. Section 4 discusses some limitations of our methodology and, finally, Section 5 concludes.

## 2 Data and Methodology

All data come from the Financial Accounts of the United States. The frequency is quarterly and they cover the period from 1980Q1 to 2020Q3.

Table 1 provides an overview of the types of financial institutions reported in the Financial Accounts of the United States (first column), as well as their regulatory status (second column) and broad institutional category (third column). We focus on assets held by the financial sector and, as such, do not report the assets held by: the household sector; nonfinancial corporate and non-corporate businesses; state and local governments; the federal government; the monetary authority; and entities not residing in the United States. As discussed in Section 4, hedge funds, private equity firms, and central counterparty clearing houses (CCPs) are not included in our data because they are not reported separately in the Financial Accounts.

To gauge the scope of regulation in the U.S. financial system, we break down total financial assets in the U.S. economy according to the regulatory status of the holder of those assets; that is, whether the financial entities that hold the assets are prudentially regulated and, if so, by which agency. As shown in the second column of the table, each financial entity from the Financial Accounts (in the first column) to fall into one of three mutually exclusive categories: (1.) those entities prudentially regulated by a federal banking agency, including the Federal Reserve (Fed), the Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), or the National Credit Union Administration (NCUA); (2.) those prudentially regulated by agencies other than a federal banking agency, including securities market regulators such as the Securities and Exchange Commission (SEC) and the Commodity Futures Trading Commission (CFTC), as well as state insurance regulators and the regulators of government sponsored enterprises (GSEs), including the Federal Housing Finance Agency (FHFA) and the Farm Credit Administration (FCA); and, finally, (3.) entities that are not prudentially regulated, which includes self-regulated organizations or institutions that only have aspects of consumer or investor protection.

This *regulatory perspective* of the data is useful for quantitatively assessing the regulatory perimeter—or the boundary between assets held by those institutions that are subject to some form of prudential regulation and those that are not.

A different cut of the data breaks out total assets held by financial institutions by the broad

nature of the activities or business model of those institutions. As shown in the third column of the table, we break financial institutions into five mutually exclusive categories: (1.) Depository Institution (DIs); (2.) Insurance Companies (ICs); (3.) Pension Funds (PFs); (4.) Government Sponsored Enterprises (GSEs); and (5.) Other Financial Intermediaries (OFIs). OFIs comprise a variety of smaller institutions including investment funds (e.g., bond and equity mutual funds and exchange traded funds), broker dealers, finance companies, real estate investment trusts (RIETs) and shell vehicles used in structured finance (asset-backed securities (ABS) issuers).

This *institutional perspective* highlights the relative importance of different financial activities in the broader financial system.<sup>2</sup> Financial institutions are defined by the activities they undertake in financial markets (i.e., their business models) and these activities, in turn, expose the institution to different vulnerabilities. For example, a traditional retail bank takes short-term deposits, typically backed by deposit insurance, and transforms these deposits into long-term loans. In doing so, the bank engages in both liquidity and maturity transformation. A different financial institution, finance companies, are nonbank lenders that engage in more or less the same activities as banks but differ in that their source of funding does not come from depositors protected by deposit insurance. In light of this, if we observed a shift in financial activity away from traditional banks toward finance companies, this suggests that overall financial stability risks have shifted in such a way that the financial system as a whole faces greater liquidity risk. In this sense, viewing the data through the institutional perspective is useful because highlights the changing nature of financial vulnerabilities over the credit cycle.

Finally, we complement the *regulatory and institutional perspective* by looking at total financial assets along these two dimensions simultaneously. This dual perspective is the main contribution of our paper. It is useful for a couple of reasons. First, it helps clarify the point of entry for macroprudential regulation and policy. As an example, imagine that some activity within a particular financial institution is identified as posing a significant risk to financial stability. Macroprudential regulators may want to take action. In terms of implementing macroprudential policy and communicating that policy to the public, it would be helpful to be as clear as possible about the agency that bears the ultimate responsibility for the oversight of that particular institution. Concretely, consider the case of money market reform following the 2008-'09 financial crisis. Members of the Financial Stability Oversight Committee (FSOC), the main cooperative body responsible for implementing macroprudential policy in the U.S., widely agreed that money market funds continued to pose a significant risk to the stability of the financial system following the crisis. While the FSOC was clear in identifying this risk, helped in communicating it to the public, and facilitated

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<sup>2</sup>This *institutional perspective* is informed by Chapter 3 of Allen and Gale (2000). In fact, the results here can be viewed as an update to these authors' earlier analysis of the structure of the U.S. financial system.

the design of a set of reforms, ultimately, it was the responsibility of the SEC to implement these reforms. In this sense, our approach of simultaneously looking at both the institutional and regulatory perspective makes clear the point of entry for macroprudential regulation of money markets is the SEC.

Beyond that, the dual perspective is also useful because it highlights potential regulatory overlap. For example, bank holding companies (BHCs) are comprised of separate legal subsidiaries. The simplest BHC might include a single banking subsidiary chartered as a national bank under its parent holding company. From a regulatory perspective, the primary regulator for the banking subsidiary is the OCC, while the holding company would be regulated by the Fed. In other words, even in this relatively simple arrangement, the structure of the BHC introduces some degree of regulatory overlap. The overlap grows as the structure of the holding company becomes more complex. Many BHCs have subsidiaries that are securities companies or, alternatively, broker dealers. Both are regulated by the SEC, which draws a third regulator into the mix. This regulatory overlap highlights the necessity for cooperation amongst different regulatory agencies with the common goal of identifying financial vulnerabilities and implementing policies to counteract them. While the Financial Stability Oversight Committee (FSOC) is designed to promote this type of interagency cooperation in the federal regulatory community, it nonetheless seems prudent to communicate these institutional details to the general public as well. This is especially true given the complex structure of the U.S. financial regulatory environment.

This basic approach to breaking out the data by various financial institutions, some of which operate under regulatory agencies and some of which do not, guides the remainder of the analysis.

### **3 Regulatory Boundaries**

In this section, we measure the regulatory perimeter and then, within this perimeter, map out regulatory boundaries across various financial institutions that are prudentially regulated. We also show a measure of regulatory overlap for prudentially regulated institutions.

#### **3.1 The Regulatory Perimeter**

Figure 1 shows total assets held by U.S. financial institutions as a share of GDP broken out prudentially regulated and unregulated financial institutions. In the roughly thirty years from 1980 until the late-2000s, the overall size of financial institutions in the U.S. as measured by total asset holdings has more than doubled, growing from just under 200 percent of GDP in 1980 to almost 500 percent in 2008. Since the onset of the 2007-'08 Global Financial Crisis, however, this growth has flattened, leaving the total size of the financial sector relative to output largely unchanged for



the past decade. An exception is in the most recent data, where financial assets as a share of GDP briefly spiked up in 2020Q2 before retracing part of this increase in the subsequent quarter. This spike reflects a sharp drop in output owing the COVID-19 pandemic, coupled with a large jump up in financial assets held by U.S. financial institutions.<sup>3</sup> Moving into the third quarter of 2020, financial assets continued to grow as output rebounded.

Decomposing total assets into those on the balance sheets of prudentially regulated institutions (light grey shaded) versus those on the balance sheets of non-regulated institutions (dark grey shaded) reveals that most of the growth in the thirty years prior to the Global Financial Crisis came from an expansion of the balance sheets of regulated financial institutions. The size of the unregulated sector grew steadily from 1980 until 2008, but it grew much more slowly relative to the regulated sector. In contrast, since the crisis, the size of the unregulated sector has modestly declined while the regulated sector has remained flat. All told, the differential growth rates of the two sets of institutions implies that the share of assets held by unregulated financial institutions has gradually fallen over time.

Indeed, the left panel of Figure 2 shows exactly that. The panel plots the regulatory perimeter, defined as assets held by unregulated financial institutions as a share of total assets in the financial sector, as the solid black line. The regulatory perimeter stayed largely constant in the neighborhood of 35 percent from 1980 until the late-1990s. Since that point, it has steadily declined approaching a historic low of about 25 percent in the most recent data. The dashed line in the left panel of Figure 2 represents the estimated trend extracted using the Hodrick and Prescott (1997) filter to capture fluctuations at frequencies typically associated with credit cycles.<sup>4</sup> The trend shows a pronounced decline over the past twenty years. For reference, the right panel of Figure 2 plots a standard measure of the credit cycle, private nonfinancial sector credit as a ratio to GDP, both in levels (solid black line) as well as its associated HP filtered trend (dashed line). Private nonfinancial credit has increased roughly 50 percent relative to GDP since 1980 and, as a result of this growth, the estimated trend has continuously increased.

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<sup>3</sup>GDP dropped from \$21.8 trillion in 2019Q4 to \$19.5 trillion in 2020Q2 while financial assets rose from \$101.5 trillion to \$107.3 trillion, implying the ratio of the financial assets to GDP rose from 4.7 to 5.5 over this period. Moving into 2020Q3, financial assets continued to grow to \$109.5 trillion while GDP bounced back to \$21.2 trillion, leading to a decline in the ratio of financial assets to GDP back to 4.7.

<sup>4</sup>The trend and cyclical components of credit-to-GDP ratio are estimated using the methodology of Borio and Lowe (2002), which the Bank of International Settlements has endorsed to inform the setting of the countercyclical capital buffer (see BCBS, 2010). That said, Edge and Meisenzahl (2011) and Buncic and Melecky (2013) question the ability of this precise methodology to identify periods of excessive credit growth. See Drehmann and Tsatsaronis (2014) for a response to these criticisms. For the purposes of this paper, we acknowledge the uncertainty surrounding the particular methodology used to estimate the credit gap but proceed using the BIS recommendation anyway, which we also extend to measure the regulatory cycle.

Figure 3 plots the cyclical component of the perimeter (i.e., the actual regulatory perimeter minus its estimated trend from the left panel of Figure 2) alongside the credit cycle (i.e., the actual credit-to-GDP ratio minus its estimated trend from the right panel of Figure 2). NBER recession dates are shown in the shaded vertical bars. As is well known from the literature, the red line reveals two credit cycles in the U.S. data since 1980.<sup>5</sup> The first is characterized by a rapid expansion of credit in late-1980s and into the early-90s before a subsequent decline with the bursting of the so-called tech bubble. The second is the aggressive expansion of credit in the early- to mid-2000s followed by an even more rapid credit contraction owing to the Global Financial Crisis. Beyond those two well-known credit cycles, it is also noteworthy that the most recent data show a sharp increase in the cyclical component of credit that occurs coincidentally with a drop in the cyclical component of the regulatory boundary. As noted above, the jump in the credit cycle primarily reflects the outsized decline in output due to the global pandemic and, to a lesser degree, an concurrent increase in corporate bond holdings.

Plotting the cyclical component of the regulatory perimeter (the solid black line in Figure 3) along side the credit cycle (the red dashed line) reveals some interesting information about the nature of credit cycles over time. In the earlier credit cycle of the mid-1980s, the expansion of credit occurred alongside a cyclical decline in the regulatory perimeter (given our definition, a decline in the perimeter occurs when activity shifts into the regulated sector). The correlation between the credit cycle and the cyclical component of the regulatory perimeter over the first twenty years of data presented in this paper is  $-0.67$ . In other words, the expansion of credit during this episode occurred in combination with an increase in activity of prudentially regulated financial institutions relative to their unregulated counterparts. From a financial stability monitoring perspective, there is some comfort to take from this as the negative correlation suggests the credit expansion occurred at the same time that regulated institutions—which, in principle, should be more resilient in their ability to withstand financial stress owing to some form of prudential supervision—played a larger role in aggregate financial activity. In contrast, the opposite is true of the expansion of credit going into the Global Financial Crisis, which coincided with a cyclical expansion of the regulatory perimeter as unregulated institutions played a larger role in credit intermediation. Indeed, the correlation between the two cyclical series flips sign and rises to  $0.40$  over the last twenty years of the data. This positive correlation is more worrisome from a stability monitoring perspective because it highlights the possibility that the nature of the credit cycle is more fragile as the institutions supporting the expansion of credit are potentially less resilient.

In the most recent data during the COVID-19 pandemic, the cyclical component of the reg-

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<sup>5</sup>Recent papers that stress the importance of the role of credit in the business cycle include Jorda, Schularick, and Taylor (2013), and Drehmann, Borio, and Tsatsaronis (2011), and Jorda, Schularick, and Taylor (2015). All of these papers measure the credit cycle using the same methodology as this paper.

ulatory boundary declined significantly as assets held by unregulated institutions increased only modestly as a share of GDP, while assets held by regulated institutions jumped up sharply.<sup>6</sup> This shift into the regulated sector could be interpreted through Goodhart’s (2008) view that regulatory boundaries enhance the procyclicality of credit. To see this, consider that the pandemic created considerable uncertainty. In the event, unprecedented actions by the Treasury and the Federal Reserve appear to have gone a long way to restoring health to financial markets so that overall financial assets did not experience the sharp decline seen in real economic activity. That said, it is possible that funding sources for financial activity may have reacted to pandemic-related uncertainty by gravitating toward the safety of the regulated financial system. Such a compositional shift highlights the fragility of funding unregulated financial activity in times of stress and uncertainty.

In summary, there are two main conclusions to take from our measurement of the regulatory perimeter. First, the significant expansion of the overall size of the financial sector since 1980 stems largely from institutions that face some form of prudential regulation. Accordingly, the regulatory perimeter has declined steadily over the past forty years. Second, cyclical fluctuations in the regulatory perimeter can be informative for understanding the nature of credit cycles. From a financial stability monitoring perspective, expansions of the credit cycle that are concurrent with a cyclical decline in the regulatory perimeter are of particular concern as this is an indicator that credit growth is concentrated amongst the least resilient institutions.

### 3.2 Boundaries within the Perimeter

We now assess the footprint of financial institutions that operate within the regulatory perimeter (institutional view) as well as the footprint of various macroprudential regulators (regulatory view).

Figure 4 shows assets held by prudentially regulated financial institutions expressed as a share of total output (i.e., the light grey portion in Figure 1), broken out by type of financial institution. The regulated financial institutions in this figure fall into one of four categories: Depository institution (DIs) and non-bank systemically important financial institutions (SIFIs); Insurance companies (ICs); Government-sponsored enterprises (GSEs); and regulated other financial intermediaries (OFIs).<sup>7</sup> Figure 5 presents the same information expressed as the share of assets held by all regulated financial institutions. In the early-1980s, roughly two-thirds of all regulated financial

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<sup>6</sup>GDP dropped from \$21.8 trillion in 2019Q4 to \$19.5 trillion in 2020Q2 while financial assets held by regulated financial institutions rose from \$75.4 trillion to \$79.1 trillion, implying the ratio of the regulated financial assets to GDP rose from 3.47 to 4.05 over this period. In contrast, financial assets held by unregulated financial institutions stayed roughly flat at \$28.2 trillion, implying the ratio of the regulated financial assets to GDP only rose from 1.29 to 1.45.

<sup>7</sup>Recall that pension funds are not macroprudentially regulated and hence assets held by these institutions fall into the unregulated category (the dark grey portion in Figure 1). Regulated OFIs include money market funds, bond and equity funds, and broker dealers.

assets were held in the banking sector, whereas OFIs only held about 10 percent of regulated assets. Over the next twenty years, the rapid growth of regulated nonbank financial institutions produced a striking shift in the structure of the regulated financial system. The footprint of the banking sector steadily declined, as the share of regulated assets held by DIs fell to about one-third by the early-2000s. At the same time, the share of financial assets held by regulated OFIs increased over three-fold, peaking at nearly 40 percent on the eve of the 2007-'08 financial crisis. The aftermath of the financial crisis resulted in a sharp drawback in the share of assets held by regulated OFIs, but growth in this sector resumed thereafter and surpassed its pre-crisis high in mid-2017, when the size of the regulated OFI sector surpassed the size of the banking sector. In the most recent data, regulated OFIs have the largest footprint in the regulatory landscape at 39.5 percent of all assets on the balance sheet of regulated institutions, followed by depository institutions (33.5 percent), insurance companies (14.6 percent), and government-sponsored entities (12.3 percent).

The rapid growth of nonbank financial intermediation warrants closer examination. Figure 6 and 7 present the assets held by the individual institutions that make up the OFIs as a share of GDP and as a share of all assets held by OFIs, respectively. In each figure, the data are broken out by regulated OFIs (MMFs, bond and equity mutual funds, and broker-dealers) and unregulated OFIs (REITs, finance companies, structured finance vehicles, captive financial institutions, and pension funds). In the early-1980s, pension funds, which are not macroprudentially regulated, held nearly 80 percent of all assets held by both regulated and unregulated OFIs. Subsequent growth over the next twenty years was mainly driven by bond and equity mutual funds and, to a lesser degree, broker-dealers and unregulated structured financial vehicles. On the eve of the crisis the footprint of pension funds had fallen to less than 40 percent of all assets held by OFIs, while bond and equity funds rose to about one quarter, broker-dealers increased to 12 percent, and structured finance vehicles increased to just over 11 percent. In the years since the crisis, the footprint of broker-dealers, REITs, and structured finance vehicles have all steadily declined while bond and equity mutual funds have continued to expand. In the most recent data, bond and equity mutual funds make up about a third of total assets held by OFIs, pension funds make up another third, and the remainder is accounted for by an assortment of other financial institutions, both regulated and unregulated.

A key takeaway is that the rapid growth of financial activity from the late 1980s to the mid-2000s was driven by a strong expansion of market-based financial intermediation as the footprint of the traditional banking sector in U.S. financial activity has steadily declined.

Turning away from the narrow focus on OFIs and taking a step back to look at prudentially regulated financial institutions more broadly, Figure 8 shows assets held by all regulated institutions as a share of GDP (the light grey shaded portion in Figure 1), but this time these assets are broken

out by the primary prudential regulator of the institution holding the asset (the regulatory view).<sup>8</sup> Depository institutions are regulated by federal banking regulators (the Fed, the OCC, the FDIC, and the NCUA). Insurance companies are regulated primarily by individual states. The GSEs have their own regulators (including the FHFA and the FCA) and, finally, regulated other financial intermediaries (OFIs), are regulated by the SEC and, to a lesser extent, the CFTC. Figure 9 shows the same information expressed in terms of the share of total regulated assets.

Taken together, the two figures map out regulatory footprint of various macroprudential regulators. In the mid-1980s, federal banking agencies regulated nearly 60 percent the assets held on the balance sheet of regulated financial intermediaries. While the Federal Reserve was the primary regulator for roughly 10 percent of these assets, the FDIC and the OCC played a much larger role as the primary regulator accounting for roughly 45 percent. The bulk of the remainder of assets held on the balance sheet of regulated intermediaries were regulated by state insurance companies (about 20 percent) and GSE regulators (15 percent), leaving the SEC and OCC with a relatively small footprint (the remaining approximately 10 percent of regulated assets) as of the mid-1980s.

However, the rapid growth of market-based financial intermediation over the course of the next twenty years brought about significant changes. On the eve of the Global Financial Crisis, Figure 9 shows that the regulatory footprint of the SEC and the CFTC grew significantly to roughly 30 percent of regulated assets by the mid-2000s. With the share of assets held by financial institutions whose primary regulator is either the Federal Reserve or one of the GSE regulators roughly constant over this period, the gradual increase in the regulatory footprint of the SEC and the CFTC came largely at the expense of the the FDIC and the OCC. These agencies saw the share of assets over which they had primary regulatory responsibility decline from 45 percent in the mid-1980s to about 25 percent in the mid-2000s. Viewed through the lens of the primary regulator, these shares have remained relatively unchanged since the mid-2000s. However, we will see in the next section that this view masks some important shifts in the footprints of various regulators when responsibility is considered from the point of view of the parent company.

### 3.3 Regulatory Overlap

The U.S. regulatory environment is complex and fragmented in a way that creates overlap across different financial regulators for a given institution. In the context of our data, one way this manifests is through assets held on the balance sheet of a subsidiary of a parent bank holding company (BHC). Consider a BHC comprised of separate retail banking and broker-dealer subsidiaries. The

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<sup>8</sup>By primary regulator we mean the regulatory agency responsible for the institution which directly holds a given asset. In some cases, this is trivial, but when the institution is a subsidiary of a parent holding company, it creates the possibility that the primary regulator at the subsidiary level is different from the regulator at the parent level. This is addressed in Section 3.3 below.

previous section considered boundaries defined by the primary regulator, so for the retail banking subsidiary the primary regulator is a federal banking agency (the Fed, the FDIC, or the OCC, depending on the charter), while the primary regulator for the broker-dealer subsidiary is the SEC. In contrast, the BHC itself is regulated as a single entity at the parent level by the Federal Reserve. In this section, we reexamine regulatory boundaries from the perspective of the parent holding company and we quantify the degree of regulatory overlap created by this fragmented system.

Figures 10 and 11 show the same information as Figures 8 and 9, respectively, but instead the data are broken out by regulator at the parent level. Redrawing the regulatory boundaries at the parent level highlights that the Federal Reserve had a much larger footprint when we account for its role as the regulator of BHCs. By the same token, the role of the other banking regulators, including the FDIC, is much more limited.<sup>9</sup> In the mid-1980s, the Federal Reserve had regulatory responsibility for about one half of all assets held on the balance sheet of regulated financial institutions. The expansion of market-based finance over the next twenty years decreased the regulatory reach of the Federal Reserve, which fell to 30 percent of regulated assets leading into the Global Financial Crisis.

Coming out of the Global Financial Crisis, the Dodd-Frank Act of 2010 expanded the regulatory reach of the Federal Reserve to the neighborhood of 35 percent of all regulated assets. Moreover, the light lined region in Figures 10 and 11 shows assets held on the balance sheet of BHCs which are subject to the Fed’s annual stress tests as per the Dodd-Frank Act. Stress testing is one of the key macroprudential tools available to help build resilience in the financial system and it has been actively used by the Federal Reserve in this regard. While the BHCs that are subject to stress testing are some of the largest and most systemically important in the financial system, the figures reveal that they only account for about 20 percent of total regulated assets. Another prominent macroprudential tool is the countercyclical capital buffer (or, the CCyB). The CCyB is a time-varying capital buffer that can move up and down between 0 and 2.5 percent of tier 1 capital as a share of risk-weighted assets. The setting of the CCyB is based on the discretion of bank regulators over the business and credit cycle and is intended to build resilience in the banking sector by dampen the cyclicity of credit. The CCyB expands the reach of macroprudential instruments to depository institutions beyond the CCAR banks, but even then this still accounts for only 35 percent of all regulated financial assets. As long as macroprudential tools are limited to implementation through the banking sector their reach will be restricted, and even more so as

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<sup>9</sup>It is worth pointing out that because the FDIC is responsible for deposit insurance for the vast majority of depository institutions, this measure of its regulatory footprint, which focuses on the asset side of the balance sheet of different financial intermediaries, understates the footprint of the FDIC. The next section addresses the limitations of our measurement exercise, including the fact that it does not address regulatory reach over the liability side of the balance sheet.

market-based financial intermediation plays a larger role in financial activity.

Finally, the fact that subsidiaries face primary regulators that are potentially different from the regulator of their parent BHC raises the possibility of regulatory overlap. That is, the assets on the balance sheet of a given subsidiary may face scrutiny from multiple regulators (both the primary regulator and the regulator of its parent BHC). Regulatory overlap could be good (greater scrutiny by multiple regulators could better identify emerging vulnerabilities) or it could be bad (it raises the cost of compliance for the institutions facing scrutiny from multiple regulators). Regardless, our data allows us to quantitatively measure the degree of regulatory overlap.

Figure 11 shows the share of assets held on the balance sheet of financial institutions that face more than one regulator (that is, depository institutions or broker-dealers that are subsidiaries of a BHC) as a share of total assets held by all regulated financial institutions. In the mid-1980s, about under \$0.35 of every dollar of assets held by all regulated financial institutions was subject to regulation by multiple authorities. This share fell steadily over the next 25 years, reaching about \$0.15 of every dollar on the eve of the Great Financial Crisis. Regulatory reform following the crisis lead to an increase to just over \$0.20 of every dollar and it has stayed relatively constant since that point. Of course, this is an imperfect measure of regulatory overlap because financial institutions face market regulation in addition to regulation based simply on their institutional charter. We discuss this, and other, limitations in the next section.

## 4 Some Limitations

A number of caveats apply to our analysis. First, our view of regulation is very narrow. In particular, we are concerned with *prudential regulation* of *financial institutions* from the perspective of promoting *financial stability*. This narrow definition is useful primarily because it facilitates measurement. Nevertheless, it is important to acknowledge that financial regulation is much broader along a number of dimensions. For example, the motivation for regulation goes beyond prudential objectives.<sup>10</sup> The objective might be oriented toward: enhancing transparency through disclosure and reporting requirements; promoting efficiency through standard setting; promoting competition; providing consumer protection; prevention of illicit activity; or, taxpayer protection. Beyond objectives, the regulations themselves might be implemented in ways that apply to financial activities that transcend institutional boundaries. For example, market activity, such as securities or commodities exchange, is regulated separately from the regulation of institutions which participate in those markets. Some of these activities are self-regulated by the institutions that participate in the markets. In a similar vein, concern for consumer protection factors into the regulation of

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<sup>10</sup>See Labonte (2017) for an excellent overview of the complicated structure of financial regulation in the U.S.

credit provision, which is an activity that spans a wide set of institutions. Ideally, a more accurate measure of regulatory boundaries would incorporate a wider definition of regulation, but doing so greatly complicates measurement.

Even operating within our narrow definition, we are limited by the fact that the Financial Accounts simply do not cover some relevant financial institutions. For example, there are no data on central counter party clearing houses (CCPs). CCPs are relatively small when gauged by the size of total assets held on the balance sheets but these institutions play an outsized role in the efficient functioning of financial markets. As such, they are a critical part of the regulatory landscape. Oversight of CCPs spans a variety of regulatory agencies, including the SEC, the CFTC, as well as the Fed. Hence, failing to include them adds noise to our measurement of boundaries within the perimeter. With regard to measurement of perimeter itself, it is also the case that the Financial Accounts do not account for hedge funds or private equity firms, neither of which are prudentially regulated. By some estimates, assets held by entities are as large as \$2.4 billion, accounting for 12.2 percent of GDP. This is a sizable omission, about which we can do little.<sup>11</sup> The implication is that our measurement likely overestimates the regulatory reach relative to what we might say if we had data on hedge funds or private equity firms.

Another caveat is that our measurement exercise risks sending a noisy signal about the financial stability concerns of certain institutions as well as the regulatory reach of the agencies that oversee these institutions. For example, based solely on asset size, regulatory supervision of the largest BHCs implies that the FED has a critical role in financial stability. However, other institutions which have smaller balance sheets may play an equally important role in financial stability. For example, CCPs play a critical role in the intermediation chain and, as discussed above, our measure does not pick this up. Hence, the stability footprint of these types of institutions and the footprint of their associated regulators may be understated based solely on the size of its balance sheet.

A related point is that using assets to measure boundaries also clouds the fact that financial stability risks are very different across the institutions we examine. A more accurate reading of how institutions map into financial stability risk requires a careful examination of the entire balance sheet, rather than simply focusing on assets. So, while a given institution might be small in terms of assets, it could be the case that its funding structure is quite fragile and therefore poses a considerable stability risk relative to financial institutions with more stable funding structures. Because our measure of boundaries does not capture this, there is a natural tendency to equate regulatory responsibility with size and that might not be appropriate. For example, a large bank that relies heavily on retail deposits to finance its operations may not pose a significant financial

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<sup>11</sup>The SEC only recently began releasing information on asset holdings of hedge funds and the limited history of the available data limits its usefulness for this exercise.



stability risk owing to deposit insurance, but a similar sized bank that is heavily dependant on short-term wholesale funding would be a major concern for banking regulators.

While these caveats and limitations are important to keep in mind, the view here is that there is still significant value in measuring regulatory boundaries.

## 5 Conclusions

This paper uses data from the Financial Accounts of the United States to draw the regulatory perimeter for U.S. financial assets. It shows that over the past forty years, the regulatory perimeter has expanded over time as the significant expansion of the financial sector since 1980 has come primarily from institutions that are prudentially regulated. That said, cyclical fluctuations in the regulatory perimeter reveal information about the nature of credit cycles. From a financial stability monitoring perspective, expansions of the credit cycle that are concurrent with a cyclical decline in the regulatory perimeter are of particular concern as this is an indicator that credit growth is concentrated amongst the least resilient institutions. In addition, we also measure the boundaries between different financial institutions and regulatory agencies within the regularly perimeter and provided a quantitative measure of regulatory overlap. These boundaries are important for communicating with the public about risks to financial stability as well as the implementation of macroprudential policy.

## References

- [1] Allen, F. and D. Gale, Comparing Financial Systems, The MIT Press, Cambridge, MA, 2000.
- [2] Aiyer, S., C. Calomiris, and T. Wieladek, (2014), “Does Macro-pru Leak? Evidence from a UK Policy Experiment”, *Journal of Money, Credit, and Banking*, 46(s1), 181-214.
- [3] Basel Committee on Banking Supervision (2010): Guidance for national authorities operating the countercyclical capital buffer, December.
- [4] Begenau, J. and T. Landvoigt, (2018), “Financial regulation in a quantitative model of the modern banking system”, Stanford Business School Working Paper #3558.
- [5] Borio, C. and P. Lowe. (2002), “Assessing the Risk of Banking Crises—Revisited,” *BIS Quarterly Review*, December, 43-54.
- [6] Buncic, D and M Melecky, (2013), “Equilibrium credit: the reference point for macroprudential supervision”, World Bank Policy Research Working Paper #6358.
- [7] Clerc, L.A., Derviz, C., Mendicino, C., Moyen, S., Nikolov, L., Stracca, L., Suarez, J., and A. Var doulakis. (2015), “Capital Regulation in a Macroeconomic Model with Three Layers of Default,” *International Journal of Central Banking*, 11, 9-63.
- [8] Crouzet, N., (2018), “Aggregate Implications of Corporate Debt Choices,” *Review of Economic Studies*, 85, 1635-1682.
- [9] Drehmann, M., C. Borio, and K. Tsatsaronis, (2011), “Characterizing the Financial Cycle: Don’t Lose Sight of the Medium Term!” Bank of International Settlements Working Paper #380.
- [10] Drehmann, M. and K. Tsatsaronis, (2014), “The Credit-to-GDP Gap and Countercyclical Captial Buffers: Questions and Answers” *BIS Quarterly Review*, March, 55-73.
- [11] Edge, R and R Meisenzahl, (2011), “The unreliability of credit-to-GDP ratio gaps in real-time: implications for countercyclical capital buffers,” *International Journal of Central Banking*, December, 261-98.
- [12] Fiore, F.D., and H. Uhlig, (2011), “Bank versus Bond Finance,” *Journal of Money, Credit, and Banking*, 43, 1399-1421.
- [13] Fiore, F.D., and H. Uhlig, (2015), “Corporate Debt Structure and the Financial Crisis,” *Journal of Money, Credit, and Banking*, 47, 1571-1598.

- [14] Fève, P., A. Moura, and O. Pierrard, (2019), “Shadow Banking and Financial Regulation: A Small-scale DSGE Perspective,” *Journal of Economic Dynamics and Control*, 101, 130-144.
- [15] Gertler, M., Kiyotaki, N., and A. Prestipino, (2016), “Wholesale Banking and Bank Runs in Macroeconomic Modeling of Financial Crises,” Elsevier, Vol. 2, of *Handbook of Macroeconomics*, Chapter 0, 1345-1425.
- [16] Goodhard, C. and R. Lastra, (2010), “Border Problems,” *Journal of International Economic Law*, 13(3), 705-718.
- [17] Goodhard, C., (2008), “The Boundary Problem in Financial Regulation,” *National Institute Economic Review*, 206, 48-55.
- [18] Jorda, O., M. Schularick, and A. Taylor, (2013), “When Credit Bites Back: Leverage, Business Cycles, and Crises,” *Journal of Money, Credit, and Banking*, 45(s2), 3-28.
- [19] Jorda, O., M. Schularick, and A. Taylor, (2015), “Leveraged Bubbles,” Center for Economic Policy Research Discussion Paper #10781.
- [20] Labonte, M., (2017), “Who Regulates Whom? An Overview of the U.S. Financial Regulatory Framework” Congressional Research Service, 7-5700.
- [21] Meeks, R.B., Nelson, B, and Alessandri, P., (2017), ‘Shadow Banks and Macroeconomic Instability,” *Journal of Money, Credit, and Banking*, 49, 1483-1516.
- [22] Mendicino, C., K. Nikolov, J. Suarez, and D. Supera, (2018), “Optimal Dynamic Capital Requirements,” *Journal of Money, Credit, and Banking*, 49, 1483-1516.
- [23] Moreira, A., and A. Savov, (2017), “The Macroeconomics of Shadow Banking,” *The Journal of Finance*, 72, 2381-2432.

**Table 1: Financial Institutions, by Regulator and Category**

<b>Financial Institution</b>	<b>Regulatory Status</b>	<b>Institutional Category<sup>1</sup></b>
U.S.-chartered depository institutions <sup>2</sup>	Federal banking agencies	DIs
Foreign Bank Offices in the US <sup>3</sup>	Federal banking agencies	DIs
Holding Companies	Federal banking agencies	DIs
Bank in US-affiliated areas	Federal banking agencies	DIs
Non-bank SIFIs	Federal Reserve	ICs, OFIs
Credit unions	Other agency regulated	DIs
Property-casualty insurance companies	Other agency regulated	ICs
Life insurance companies <sup>4</sup>	Other agency regulated	ICs
Money market mutual funds	Other agency regulated	OFIs
Mutual funds <sup>5</sup>	Other agency regulated	OFIs
Closed-end funds	Other agency regulated	OFIs
Exchange-traded funds	Other agency regulated	OFIs
Brokers and dealers <sup>4</sup>	Other agency regulated	OFIs
Government-sponsored enterprises	Other agency regulated	GSEs
Agency- and GSE-backed mortgage pools	Other agency regulated	GSEs
Private pension funds	Not prudentially regulated <sup>6</sup>	PFs
State and local gov't. retirement funds	Not prudentially regulated <sup>6</sup>	PFs
Federal government retirement funds	Not prudentially regulated <sup>6</sup>	PFs
Structured financial vehicles (until 2016) <sup>7</sup>	Not prudentially regulated <sup>6</sup>	OFIs
Finance companies	Not prudentially regulated <sup>6</sup>	OFIs
REITs	Not prudentially regulated <sup>6</sup>	OFIs
Funding corporations	Not prudentially regulated <sup>6</sup>	OFIs

<sup>1</sup> DIs: Depository institutions; ICs: Insurance companies; PFs: Pension funds; OFIs: Other financial intermediaries; GSEs: Government sponsored enterprises.

<sup>2</sup> U.S.-chartered depository institutions include institutions that are not directly regulated by the Federal Reserve, but may be part of a bank holding company or a savings and loan bank holding company, such as national bank (regulated by the OCC), state-chartered non-member banks (regulated by the FDIC), federal savings associations (regulated by the OCC), state-chartered savings associations (regulated by the FDIC).

<sup>3</sup> Foreign banking offices in U.S. include institutions that are not directly regulated by the Federal Reserve, but are part of a foreign bank organization, such as federal branches and agencies of FBOs (regulated by the OCC).

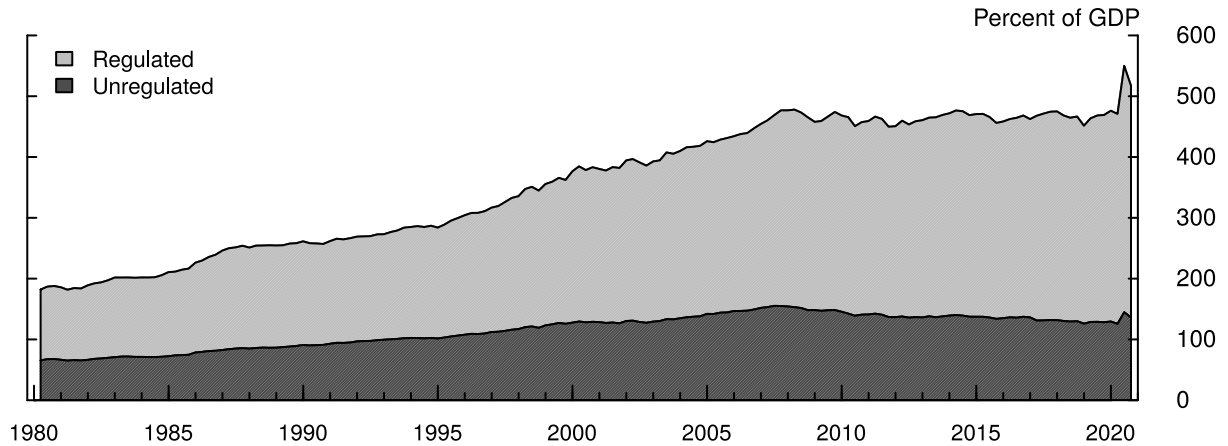
<sup>4</sup> Nonbank subsidiaries of BHCs, such as broker dealers and insurance companies, are not considered to be under FRS regulation according to the regulatory status of the holder. But, broker dealers will be considered under FRS regulation according to the regulatory status of the parent.

<sup>5</sup> Mutual funds, close-end funds, and ETFs are grouped into "equity funds" and "fixed income/mixed funds".

<sup>6</sup> Entities that only have aspects of consumer or investor protection are not considered to be prudentially regulated.

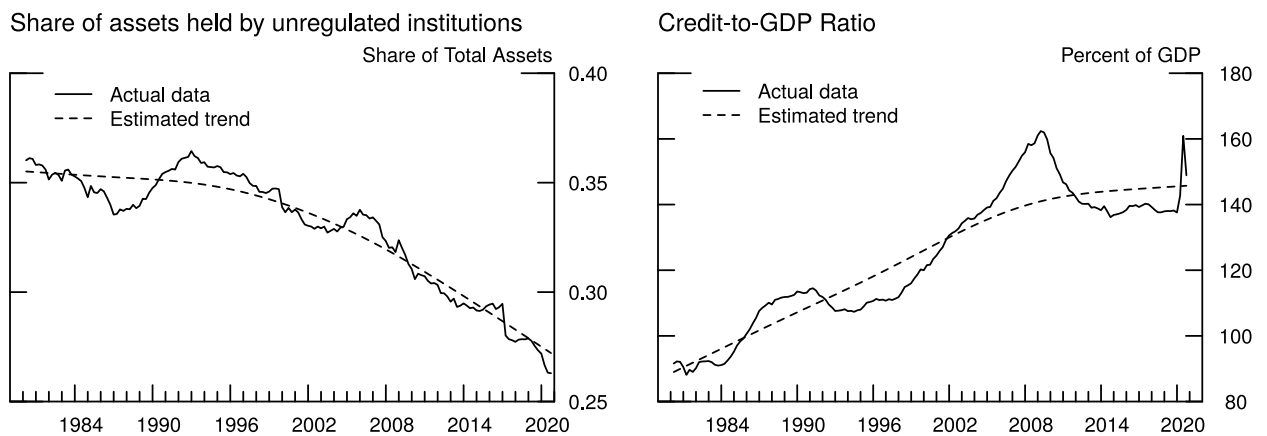
<sup>7</sup> Structured finance vehicles comprise issuers of asset-backed securities, which are subject to risk -retention rules since December 2016. Their assets for 2017 onwards will be reported in the "Other agency regulated " category.

**Figure 1: Assets held by U.S. financial institutions as a percent of GDP, by regulatory status.**



**Source:** Financial Accounts of the United States, NIPA, and author's calculations.

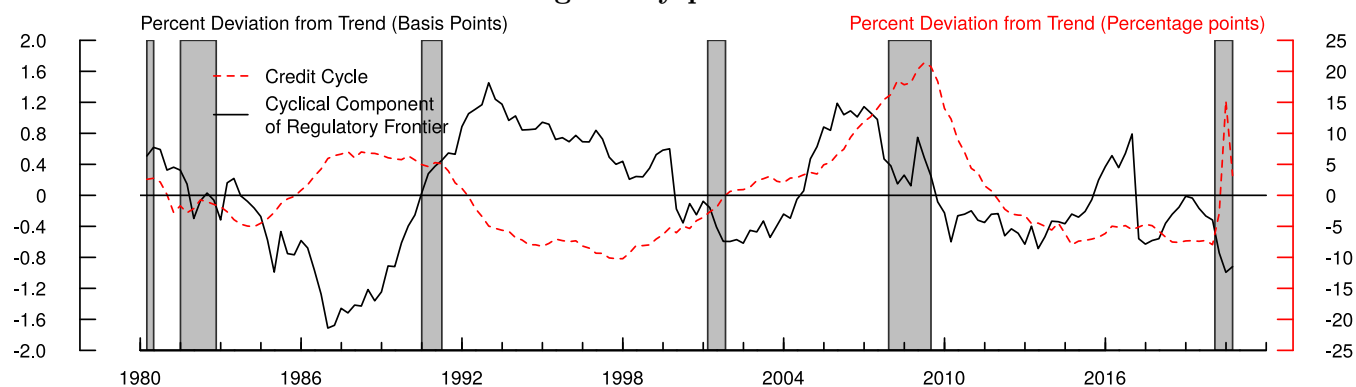
**Figure 2: The share of total financial assets held by unregulated financial institutions and the credit-to-GDP ratio**



**Notes:** Calculated using HP filter with  $\lambda = 14,000$  following Borio and Lowe (2002) and BCBS (2010).

**Source:** Financial Accounts of the United States, NIPA, and author's calculations.

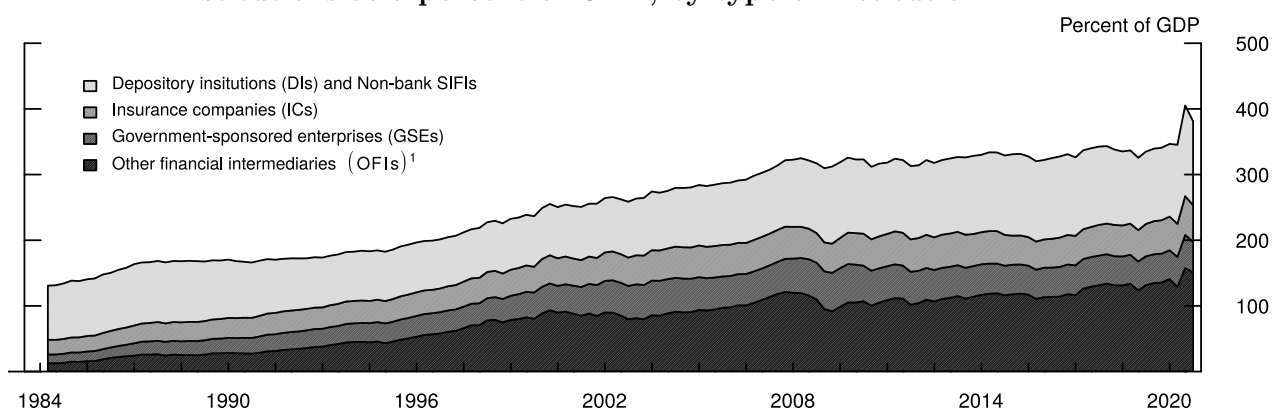
**Figure 3: The credit cycle and the cyclical component of the regulatory perimeter.**



**Notes:** Calculated using HP filter with  $\lambda = 14,000$  following Borio and Lowe (2002) and BCBS (2010).

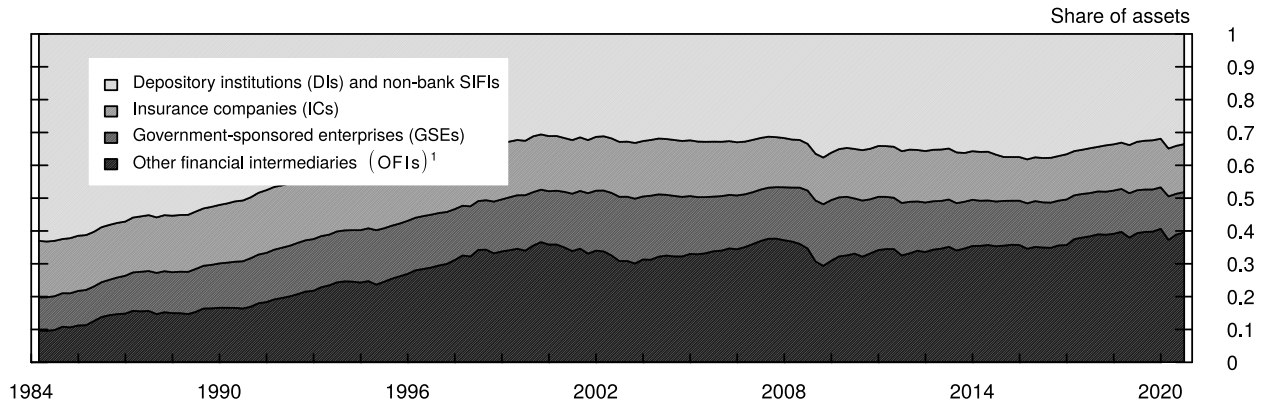
**Source:** Financial Accounts of the United States, NIPA, and author's calculations.

**Figure 4: Assets held by prudentially regulated U.S. financial institutions as a percent of GDP, by type of institution.**



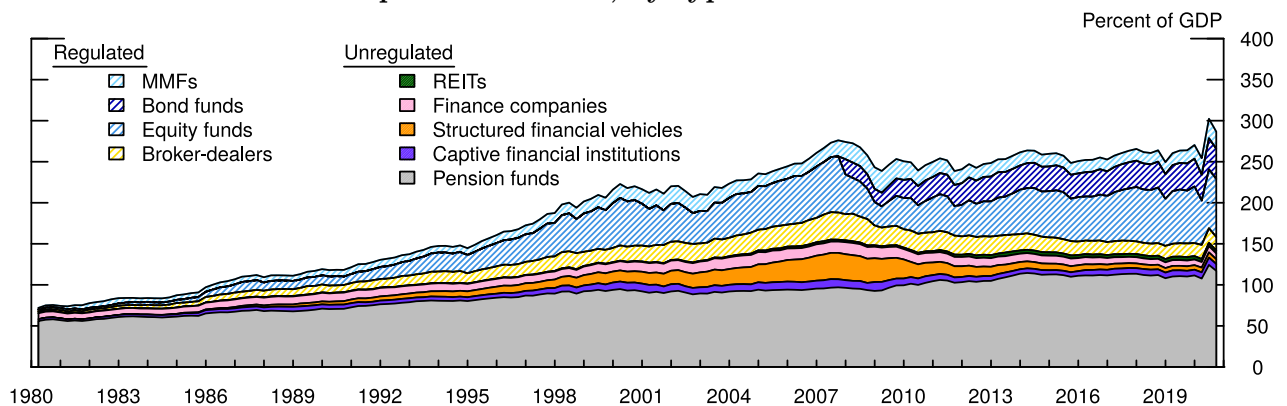
**Source:** Financial Accounts of the United States, NIPA, and author's calculations.

**Figure 5: The share of assets held by prudentially regulated  
U.S. financial institutions, by type of institution.**



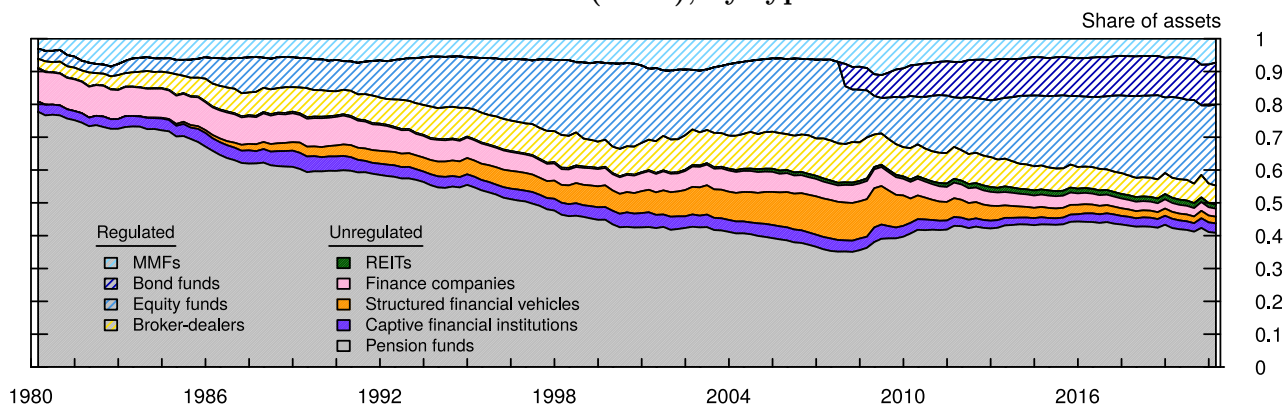
**Source:** Financial Accounts of the United States and author's calculations.

**Figure 6: Assets held by other financial institutions (OFIs)  
as a percent of GDP, by type of institution.**



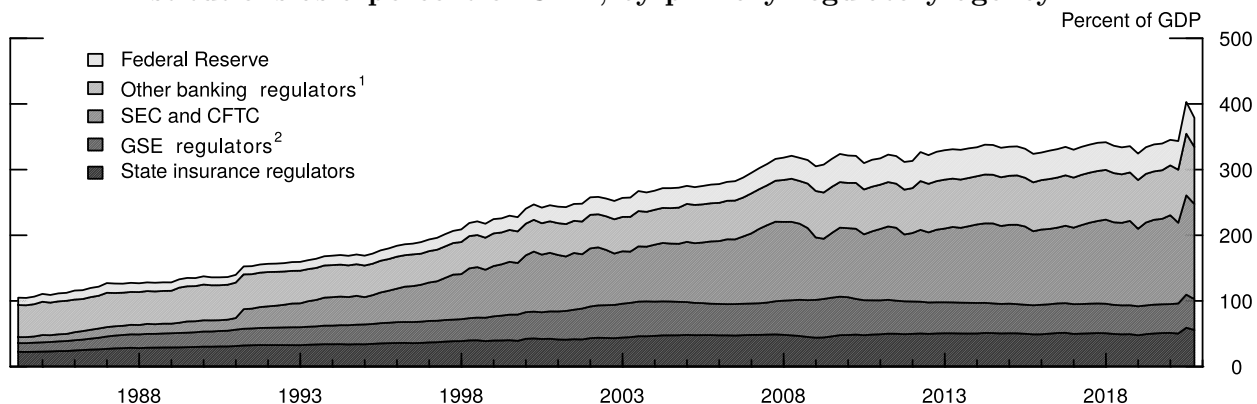
**Source:** Financial Accounts of the United States, NIPA, and author's calculations.

**Figure 7: The share of assets held by other financial institutions (OFIs), by type of institution.**



**Source:** Financial Accounts of the United States and author's calculations.

**Figure 8: Assets held by prudentially regulated U.S. financial institutions as a percent of GDP, by primary regulatory agency.**

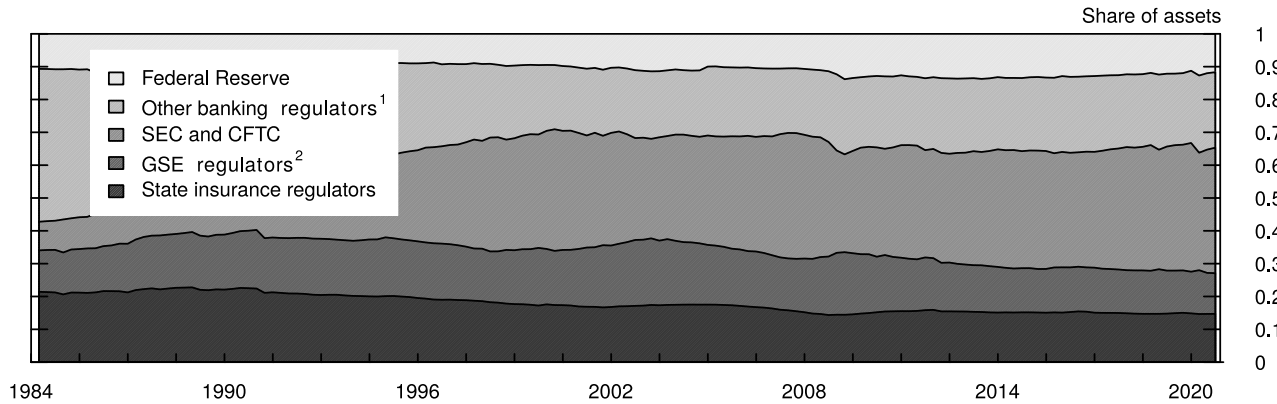


**Notes:** <sup>1</sup>Other banking regulators includes the OCC, the FDIC, and the NCUA. <sup>2</sup>GSE regulators includes the FHFA and the FCA.

**Source:** Financial Accounts of the United States, NIPA, and author's calculations.



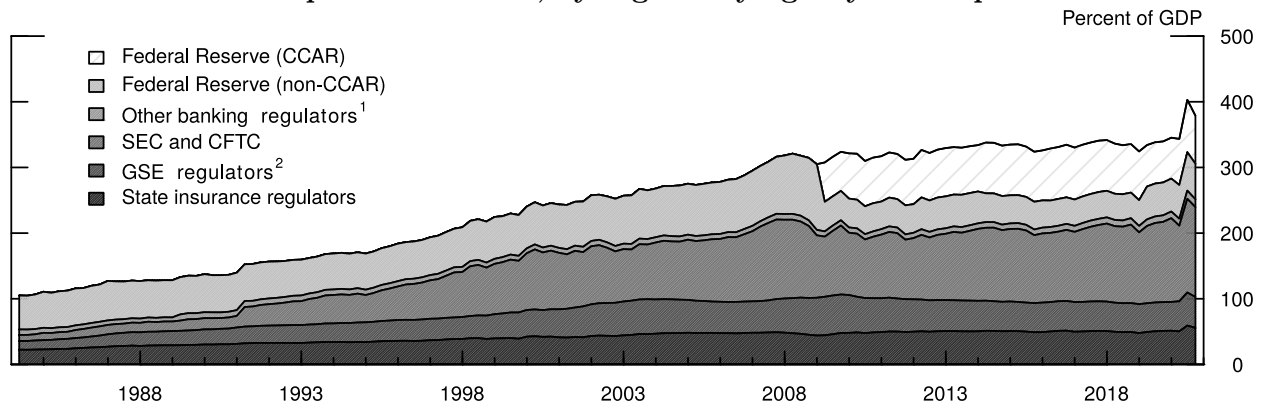
**Figure 9: The share of assets held by prudentially regulated U.S. financial institutions, by primary regulatory agency.**



**Notes:** <sup>1</sup>Other banking regulators includes the OCC, the FDIC, and the NCUA. <sup>2</sup>GSE regulators includes the FHFA and the FCA.

**Source:** Financial Accounts of the United States and author's calculations.

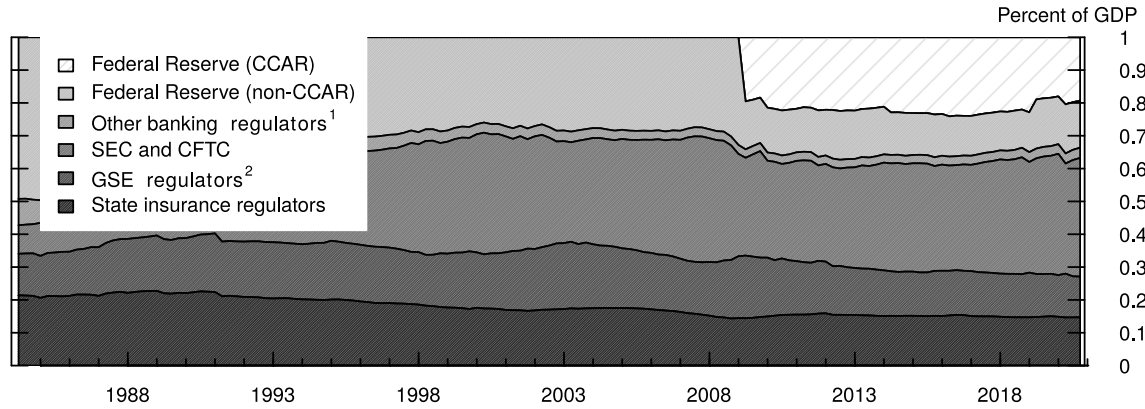
**Figure 10: Assets held by prudentially regulated U.S. financial institutions as a percent of GDP, by regulatory agency at the parent-level.**



**Notes:** <sup>1</sup>Other banking regulators includes the OCC, the FDIC, and the NCUA. <sup>2</sup>GSE regulators includes the FHFA and the FCA.

**Source:** Financial Accounts of the United States, NIPA, and author's calculations.

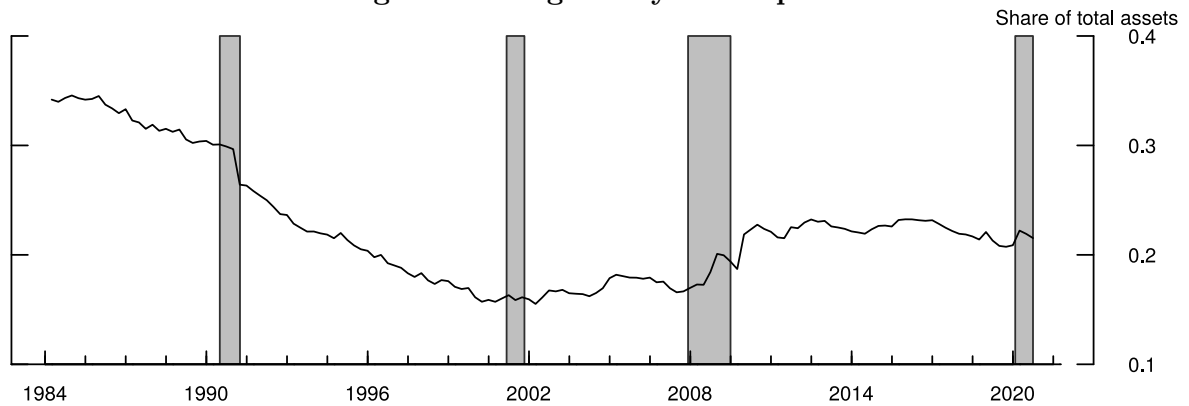
**Figure 11: Regulatory Overlap**



**Notes:** <sup>1</sup>Other banking regulators includes the OCC, the FDIC, and the NCUA. <sup>2</sup>GSE regulators includes the FHFA and the FCA.

**Source:** Financial Accounts of the United States and author's calculations.

**Figure 12: Regulatory Overlap**



**Notes:** Regulatory overlap is calculated as assets held by institutions that face more than one macroprudential regulatory (broker/dealers and BHCs) over total assets held by all regulated institutions.

**Source:** Financial Accounts of the United States and author's calculations.