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March 2014

WORKINGPAPER SERIES

Number 344

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RESEARCH INSTITUTE**

Long-term trends in intra-financial sector lending in the U.S. *

1950 - 2012

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March 1, 2014

Abstract

This paper examines the evolution of intra-financial sector lending in the United States, 1950-2012, presenting estimates constructed from the Federal Reserves Flow of Funds Accounts. We establish a number of stylized facts concerning the growth and composition of claims between financial institutions. We find that intra-financial lending as a share of total financial sector lending appears to have grown nearly five-fold since the 1950s. After comprising a tenth of all lending throughout 1950-1980, by 2011 lending between financial institutions accounted for nearly half of all financial sector lending. The stock of intra-financial assets has followed a similar trend. These grew rapidly during the 1980s and 1990s and presently account for nearly 30 percent of all financial sector assets. Although the growth of intra-financial assets accelerated after 1980, the fastest increase took place between 1991 and the bursting of the dotcom bubble in 2001, increasing from 15 to 25 percent of total financial sector assets. In the run up to the financial crisis of 2007-2008, the growth of intra-financial lending was concentrated in assets highly implicated in the genesis of the crisis, suggesting that this growth may have contributed to the crisis. This growth in intra-financial lending also raises questions about the contribution of the financial sector to the real economy: in the years before the financial crisis only 40 percent of financial lending was to the real economy. In recent years, we are witnessing similarly large shares of intra-financial lending.

JEL classification: G01, G10, G20

Keywords: Finance, Intra-financial lending, Financial crisis

*The authors thank the Institute for New Economic Thinking (INET) for financial support and participants in workshops at the University of Massachusetts, Amherst and the New School for Social Research for helpful comments.

1 Introduction

Since the outbreak of the Great Financial Crisis in 2007, economists and policy makers have expressed concern with the dangers posed by increased inter-connectedness among financial firms. Janet Yellen, Chair of the Board of Governors of the Federal Reserve, for example, noted that “interconnections among financial intermediaries are not an unalloyed good. Complex interactions among market actors may serve to amplify existing market frictions, information asymmetries, or other externalities.”¹ Her observation echoed those of other students of the financial crisis, including Jane D’Arista, who argued early on that the financial crisis of 2007 was precipitated by “a run on the financial sector by the financial sector” (D’Arista [8]; Gorton and Metrick [14]). Indeed, as early as 1993, Jane D’Arista and Tom Schlesinger had warned about the growth of a parallel banking system of non-bank financial institutions that were growing outside of the regulatory framework and were developing a thick web of inter-connected financial positions. By 2010, in identifying a “shadow banking system” economists at the New York Federal Reserve were describing in great detail a lengthening of the “credit chain” characterized by a sizeable amount of intra-financial lending.²

A growing theoretical literature has attempted to model this phenomenon. Beginning with the seminal paper by Allen and Gale [3], the early contributions to this literature examined the link between financial interconnectedness and financial instability, showing that greater interconnectedness generally led to a more robust financial system.³ But more recent work reflects the darker side of inter-connectedness and its role in increasing financial instability (Shin [19], Gai, et al. [13], Upper [21] Acemoglu et al. [1]).

In addition to concerns about financial instability associated with financial inter-connectedness, the Great Financial Crisis has raised questions about the social efficiency of the financial sector more generally. Prominent regulators, investors and economists have asked whether the financial system is “bloated”, whether financial innovation contributes to social welfare, and whether, at the margin, more financial activity contributes to economic productivity or economic growth. (Volcker [22]; Turner [20]; Phillipon [17]; Epstein and Crotty [11]; Arcand, et. al. [4] ; Greenwood and Scharfstein [15]; Bezemer [6]).

The increased level of intra-financial lending that this paper identifies puts a number of these questions into sharp relief: What role does intra-financial lending play in the over-all economy? Does it contribute to economic growth, productivity growth? Is it socially beneficial? Or does it mostly reflect the shifting around of economic rents within the financial sector, while generating a web of counter-party risks that is dangerous?

As we will show, in the run-up to the Great Financial Crisis of 2008, intra-financial lending comprised more than half of all financial sector lending. This was three times the share that characterized the so-called “golden age” period of rapid economic growth in the 1950s and 1960s. Such a massive increase in such lending at a time of slower economic and productivity growth, during a time punctuated by major financial crises certainly raises questions about the social value of such lending.

¹Yellen [23]

²See also D’Arista and Epstein [9] and Pozsar, et. al.[18].

³This literature is surveyed in Allen and Babus [2]. Other early contributions are Freixas et al. [12] and Dasgupta [10].

Despite the importance of these issues, few empirical accounts of the growth of intra-financial claims exist. This is mainly because regulatory and statistical agencies currently do not collect data on intra-financial claims. Indeed, in 2011 the Basel Committee on Banking Supervision formally recommended collecting data on intra-financial claims in order to better identify the “systemic impact of large banks, noting that this is likely positively related to its interconnectedness vis--vis other financial institutions.”⁴

To break through the data problems, we employ an approach developed by Bhatia and Bayoumi [7], who showed that “the financial sectors vast expansion over 1980-2007 primarily reflected an explosion of claims between financial intermediaries.” These authors utilized an approximation technique that we build on for our estimates and describe in detail below.

Our contribution in this paper is to provide a comprehensive account of these post-war trends in intra-financial lending in the United States. With these data, researchers can study further the impact of intra-financial lending on financial instability and the social efficiency of the financial sector (see Montecino and Epstein [16]).

While we are indebted to Bhatia and Bayoumi [7] for their estimation technique, our work differs in several respects. First, we devote our attention exclusively to lending between financial institutions and look at both intra-financial lending flows and asset stocks.⁵ Second, we estimate intra-financial lending and assets both including and excluding the Federal Reserve in order to get a clearer picture of the behavior of private financial institutions. The latter is especially important for understanding intra-financial activity during periods of financial turmoil. Finally, we decompose the growth of intra-financial lending into its major underlying financial instrument categories.

Our major findings are as follows: Intra-financial lending as a share of total financial sector lending appears to have grown nearly five fold since the 1950s. After averaging around a tenth of all lending throughout 1950-1980, lending between financial institutions now accounts for nearly half of all financial sector lending. The stock of intra-financial assets has followed a similar trend. These grew rapidly during the 1980s and 1990s and presently account for nearly 30 percent of all financial sector assets. Although the growth of intra-financial assets accelerated after 1980, the fastest increase took place between 1991 and the bursting of the dotcom bubble in 2001, increasing 10 percentage points from 15 to 25 percent of total financial sector assets.

Disaggregating our estimates into the underlying financial instruments, we also identify the main sources of increased lending between financial institutions. Increases in intra-financial lending during the 1980s and 1990s largely reflected developments in the money market, real estate-related credit, and growing holdings of bonds and securitized products issued by other financial institutions. However, during the lead up to the 2008 financial crisis, the growth of intra-financial lending was primarily driven by investments in money market mutual funds (MMMFs), repurchase agreements, and securitization.

The remainder of the paper is structured as follows. The next section summarizes the data and discusses

⁴BIS [5]

⁵Bhatia and Bayoumi limited their analysis to asset stocks.

our methodology. The third section presents our baseline results while the fourth considers the effects of excluding lending by the Federal Reserve from the calculations. The fifth section conducts a simple growth decomposition exercise to identify which financial instruments most contributed to intra-financial lending growth. The sixth and final section concludes by providing a broad overview of our results and suggesting future avenues for further research.

2 Data and Methodology

We use data from the Flow of Funds Accounts (FoF) of the Federal Reserve for the years 1950 to 2012 across 15 different financial instrument categories. The FoF is unparalleled in coverage and detail and offers a comprehensive overview of financial transactions in the US economy. Data are available for multiple sectors of the US economy and at fine levels of disaggregation. Financial flows are also presented in terms of particular financial instruments. The FoF distinguishes between 28 general instrument categories, which are in turn disaggregated according to the type of financial institution holding each specific instrument.

Unfortunately, the FoF is not designed to capture financial flows *between* sectors or *within* a particular sector. In other words, the FoF does not have data on how much of lending by the financial sector directly represents lending to other financial institutions. To illustrate the problem, consider a simple balance sheet for the US economy. Let A_s and L_s stand for the total assets and liabilities, respectively, of sector $s = f, n$ where f stands for the financial sector and n the nonfinancial sector, of a particular financial instrument. The FoF provides data of the following form:

$$A_f + A_n = L_f + L_n$$

We can observe the total assets and liabilities of each sector in a particular instrument category but cannot directly observe how much of each instrument held as an asset by a given sector translates into liabilities for other sectors. That is, ideally we would observe:

$$a_f^f + a_f^n + a_n^f + a_n^n = L_f + L_n$$

Where a_f^f stands for the assets held by the financial sector that represent claims on other financial institutions. Hence, the problem is that a_f^f , our object of interest, is unobservable .

We can approximate a_f^f by combining the two FoF series on sectors and instruments. A subset of the financial instruments contained in the FoF dataset can only appear on the liability side of the financial sector. This means that any assets of these instruments held by the financial sector are unambiguously claims on other financial institutions. We term these “unambiguous” instruments. These are: net interbank transactions, checkable deposits and currency, time and savings deposits, shares of MMMFs, mutual fund shares, open market paper, and federal funds and repurchase agreements. Together these six instruments makeup our *narrow measure* of intra-financial lending.

The remaining instrument categories are murkier because they can appear on the liability side of both the financial and nonfinancial sectors. In other words, when one of these instruments appears on the asset side of the financial sector there is no direct way of knowing what sector holds it as a liability. We term these “grey area” instruments. The full list is: agency and GSE-backed securities, corporate and foreign bonds, corporate equities, loans not elsewhere classified (n.e.c.), other loans and advances, total mortgages, trade credits, and security credits.

In order to unpack these grey area instruments we follow Bhatia and Bayoumi [7] in assuming fixed portfolio shares of each sector across instruments categories. Specifically, we assume financial sector claims on other financial institutions for each instrument reflect the sectors share of outstanding liabilities of that instrument. Let α_i stand for this share of instrument i . For all instruments i our assumption is that

$$\alpha_i = \frac{L_{f,i}}{\sum_{s \in S} L_{s,i}} \quad (1)$$

where $L_{f,i}$ denotes the outstanding liabilities of instrument i held by the financial sector, S is the set of sectors s , and the denominator stands for the total outstanding liabilities of instrument i across all sectors. For example, when the financial sector holds corporate and foreign bonds, a fraction alpha of these assets constitute claims on other financial institutions.⁶ Hence, although a_f^f is not directly observable, we approximate it for each year as the sum:

$$a_f^f = \sum_{i \in I} \alpha_i A_{f,i} \quad (2)$$

where I is the set of all grey area instruments and time subscripts have been omitted for notational ease. We should note that this is obviously an unrealistic assumption and estimates in each instrument category might contain non-trivial biases. Nevertheless, there is no clear reason to expect the biases to be correlated across instruments and when the estimates for each instrument are aggregated some of the biases should cancel out, likely resulting in a reasonable approximation. As a check, we present below estimates based on an alternative method proposed by Greenwood and Scharfstein [15] that gives similar results.

We start by calculating α_i for all grey area instruments in each year for the period 1950-2012. Summary statistics and levels are shown in [Table A.1](#) and [A.2](#) and [Figure A.1](#) in the [Appendix](#). The calculated shares are largely stable across the period for most instruments except for a couple exceptions. The financial sectors share of corporate and foreign bonds increases steadily throughout the period, from around 3 percent to 50 percent. The calculated alpha for agency and GSE-backed securities varies significantly throughout the period, starting out at about 80 percent in 1950, declining to around 25 percent by 1992, before increasing dramatically to 80 percent after 2009. The three instruments with the largest alphas sample mean are, in order, open market and commercial paper, security credits, and agency and GSE-backed securities.

The next step is simply to multiply each corresponding α_i by the corresponding assets series for each instrument and every year. We do this for both stocks and flows. The final step is to sum each component

⁶See the data appendix for more detail.

together to arrive at our estimate of grey area intra-financial sector lending. Together, the unambiguous and grey area instruments make up our *extended measure* of intra-financial sector lending.

3 Baseline Estimates

Panel (a) of [Figure 1](#) shows our baseline estimates of intra-financial lending in flows (as a percent of total financial sector lending in each year). The solid line shows the extended measure of intra-financial lending (grey area plus unambiguous instruments) while the dotted line shows the narrow measure, which consists of the unambiguous instruments alone. The narrow measure can be interpreted as a lower-bound estimate of the share of intra-financial lending since the unambiguous instruments are those that can only be liabilities of the financial sector - that is, we know with certainty that $\alpha_i = 1$.

The first thing to notice is that the share of intra-financial sector lending increased sharply during the lead up to the global financial crisis. It grew a staggering 371 percent from a trough of 14 percent of total financial sector lending in 2003 after the burst of the tech bubble and 2001 recession, to a peak of 66 percent in 2009 . The share of intra-financial lending had remained more or less stable around a low trend until around 1980, growing less than 10 percent between 1950 and 1979. The decade average during the 1950s was below 10 percent of total lending and hovered comfortably around 13 percent during the 1960s and 1970s ([Table 1](#)). But this changed in the early 1980s as the share of intra-financial lending started growing rapidly. Between 1980 and 1999 its share of total lending almost tripled. By 1999 nearly two-fifths of all financial sector lending represented lending to itself.

Table 1: Decade averages of intra-financial lending.

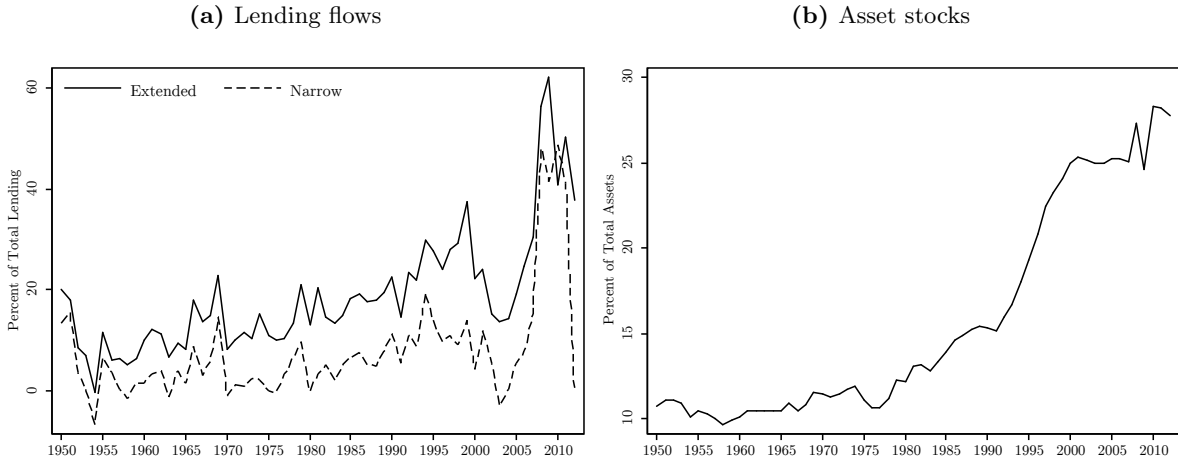
	1950's	1960's	1970's	1980's	1990's	2000's	2010's
	% of total lending						
Total Flows	8.9	12.7	12.1	16.9	25.9	28.3	42.9
<i>Unambiguous Instruments</i>	3.6	4.6	2.5	4.8	11.3	13.7	30.1
<i>Gray Area Instruments</i>	5.3	8.1	9.7	12.1	14.6	14.6	12.8
	% of total assets						
Total Stocks	10.4	10.6	11.3	13.8	19.1	25.3	28.1
<i>Unambiguous Instruments</i>	6.6	4.5	3.5	3.9	6.5	8.5	10.5
<i>Gray Area Instruments</i>	3.8	6.2	7.8	10	12.6	16.8	17.6

Source: Authors' calculations based on the flow of funds.

In terms of stocks, intra-financial sector assets experienced a similar increase. These increased from 12 percent of total financial sector assets in 1980 to 25 percent by 2007. As panel (b) of [Figure 1](#) shows, the most dramatic accumulation of intra-financial assets took place between 1991 and 2001. Throughout this period, the share of intra-financial assets grew from 15 percent to 25 percent of total financial sector assets, before remaining more or less stable until the outbreak of the crisis. In other words, roughly a quarter of

all financial sector assets represented intra-sectoral claims throughout the 2000s. Measured as a percent of GDP, intra-financial assets nearly tripled, increasing from 36.5 in 1990 to 94 percent of GDP in 2001 (see Figure 2).

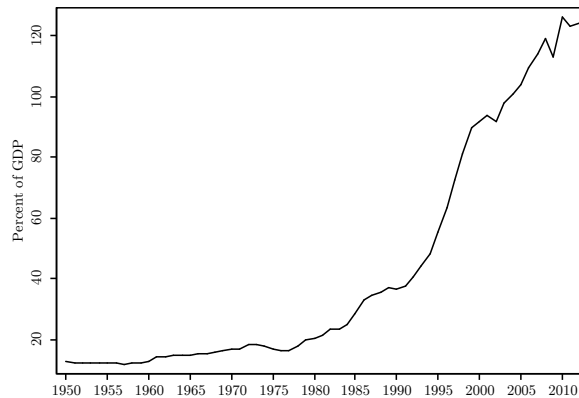
Figure 1: Baseline estimates of intra-financial lending as a share of total lending.



Source: Authors' calculations based on the flow of funds.

Two points follows from these estimates. First, in 2008 only around two-fifths of lending by the financial sector was to the real economy, raising questions about whether financial institutions were fulfilling their traditional role of mobilizing credit to businesses and financing long-term investment. Second, the data suggest that on the eve of the financial crisis interconnectedness between financial institutions had reached a historic high, potentially implying a major source of financial fragility.

Figure 2: Intra-financial asset stocks as a percent of GDP.



Source: Authors' calculations based on the flow of funds.

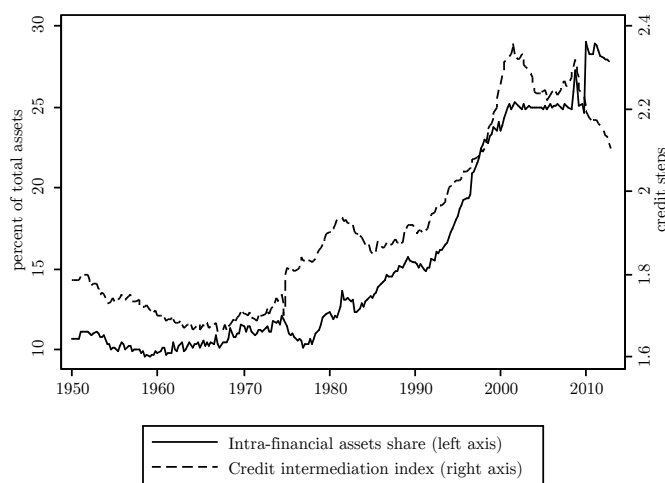
However, these figures should be interpreted with care. One reason is that they include lending by the Federal Reserve and therefore the estimates are skewed by the conduct of monetary policy, especially during periods of financial turmoil. In the next section we will estimate these same figures but will exclude lending by the Federal Reserve in order to get a clearer picture of the behavior of private financial institutions.

Finally, we conclude this section by comparing our baseline estimate to a related measure proposed by Greenwood and Scharfstein [15]. They propose a “credit intermediation index” (CII) intended to capture the average number of steps a dollar takes as it passes from households to the final end-users. Their CII is calculated as

$$CII = \frac{\text{total liabilities}}{\text{total liabilities} - \text{financial sector liabilities}} \quad (3)$$

where the numerator contains the total liabilities of the economy while the denominator contains the liabilities of the non-financial sector. In other words, the CII is the ratio of the economy's total liabilities to the liabilities of end-users of credit. Thus, an increase in the CII implies a lengthening of the intermediation chain and can be interpreted as a proxy for intra-financial lending. Figure 3 compares the CII for the US to our baseline estimate of the intra-financial assets share. As can be seen below, the two measures are broadly comparable and exhibit very similar trends throughout most of the sample (although the scales are not strictly comparable between the two measures)⁷. This provides a partial robustness check regarding the accuracy of our estimates.

Figure 3: Intra-financial asset share vs. the credit intermediation index.



Source: Authors' calculations based on the flow of funds.

⁷Our measure is a simple share of total financial sector assets while the CII measures the average number of steps in the credit intermediation chain.

4 Removing the Federal Reserve

In most cases removing the Federal Reserve from our estimates is fairly straightforward. On the asset side it simply involves identifying and subtracting Federal Reserve holdings from each appropriate instrument category, as well as subtracting total Federal Reserve assets from the total assets of the financial sector (for estimates of flows it involves doing the same but in terms of total *lending* instead of total *assets*). The liability side is trickier for two reasons. First, Federal Reserve liabilities need to be removed from the total liabilities of the financial sector in each instrument category in order to recalculate the share α_i of liabilities held by the financial sector. This is important because otherwise α_i would be biased upward, inflating our estimates of intra-financial lending.

Second, in the case of unambiguous instruments, it is now also necessary to account for financial sector assets that represent liabilities for the Federal Reserve. The most important example of this is bank reserves deposited at the Federal Reserve. The Federal Reserve also has liabilities to the financial sector in the form of reverse repo operations. These can be removed from the calculation by simply subtracting them from financial sector assets.⁸ However, in the case of checkable deposits and currency the data does not permit us to discern exactly how much of the financial sectors assets represent Federal Reserve liabilities. In this case, as before, we extend our previous assumption that financial sector lending is proportional to each particular sectors share of the outstanding liabilities across instruments. In other words, we calculate the Federal Reserves share of liabilities of checkable deposits and currency

$$\alpha^{\text{fed}} = \frac{\text{fed liabilities}}{\text{total liabilities}} \quad (4)$$

and then multiply the financial sectors assets by $(1 - \alpha^{\text{fed}})$. In the case of flows, we scaled the financial sectors *lending* by $(1 - \alpha^{\text{fed}})$.

One implication of this procedure is that, strictly speaking, checkable deposits and currency can no longer be considered *unambiguous intra-financial lending*. In other words, before we knew with certainty that all financial sector lending in this instrument represented financial sector borrowing but once we start distinguishing between the financial sector and the Federal Reserve we need to make assumptions, as we did with the grey area instruments, concerning the proportions of these flows that become liabilities for the Federal Reserve. As a consequence, the general precision of our estimates decreases somewhat.

Figure 4 shows the results after removing the Federal Reserve from the analysis in terms of both lending flows and asset stocks. Two immediate observations follow: first, lending by the Federal Reserve does not appear to significantly influence the measured share of intra-financial lending throughout most of the sample *except* in the post-2007 period. This is due to the Federal Reserves aggressive response to the financial crisis and dramatic expansion of its balance sheet. Second, the share of intra-financial sector lending now appears to have not only fully recovered after the crash but *was actually higher in 2011 than in any previous year on record*. According to these estimates, in 2011 less than two fifths of all financial sector lending went to

⁸See the appendix for a more detailed explanation.

Table 2: Decade averages of intra-financial lending excluding the Federal Reserve.

	1950's	1960's	1970's	1980's	1990's	2000's	2010's
	% of total lending						
Total Flows	7.1	12.1	11.2	17.2	25.7	25.7	44.1
<i>Unambiguous Instruments</i>	1.7	3.6	1.4	4.8	10.7	9.4	15.9
<i>Gray Area Instruments</i>	5.4	8.5	9.8	12.4	15	16.3	28.1
	% of total assets						
Total Levels	6.1	8.5	10.1	13.7	19	24.9	26
<i>Unambiguous Instruments</i>	1.6	1.7	1.8	3.4	6.1	7.8	8.6
<i>Gray Area Instruments</i>	4.5	6.7	8.2	10.3	12.9	17.1	17.4

Source: Authors' calculations based on the flow of funds.

the rest of the economy. This reflects two underlying factors. Although intra-financial lending recovered significantly during 2012, the elevated share also reflects depressed total financial sector lending. A similar, albeit less volatile, pattern holds for stocks of intra-financial assets as well.

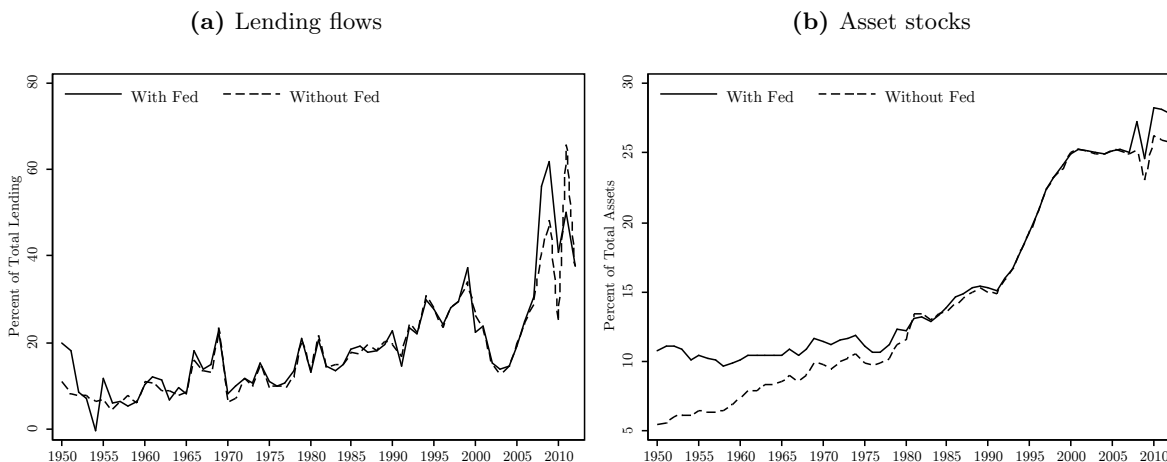
5 Composition of Intra-financial Lending

This section carries out a simple growth decomposition exercise to examine the main drivers of intra-financial lending in two key periods: 1983 to 1999 and 2003 to 2007. These two periods were chosen because they both witnessed large increases in intra-financial lending. The first period is meant to capture the long-term evolution of the financial sector from low interconnectedness to the high interconnectedness that characterizes the system at present, beginning with its acceleration in 1983. The second period is intended to capture changes in the financial system during the lead up to the financial crisis and to identify potential sources of financial fragility within intra-financial lending. Thus, the period begins at the trough of total intra-financial lending following the aftermath of the dotcom bubble and ends on the eve of the financial crisis. The main result that emerges from this exercise is that growth of intra-financial lending during these periods reflects two broad institutional changes in the financial system: the development of the wholesale money market and increasing securitization.

We calculate the contribution to intra-financial lending growth of each underlying instrument category as follows. Let $l_{i,t}$ and T_t be the amount of intra-financial lending of instrument i and total intra-financial lending at time t , respectively. The contribution of each instrument to overall growth between period $t - 1$ and period t is given by $(l_{i,t} - l_{i,t-1})/T_{t-1}$. Hence, the total growth of intra-financial lending is simply the sum of the individual contributions.

Figure 5 shows the results of this growth decomposition for 1983 to 1999. Between 1983 and 1999 total intra-financial lending grew over eightfold, increasing from \$95 billion to \$805 billion. As can be seen in the figure, the three largest drivers of this growth during the period were open market paper (contributing 145

Figure 4: Intra-financial lending as a share of total lending excluding the Federal Reserve.



Source: Authors' calculations based on the flow of funds.

percentage points), agency and GSE-backed securities (140 points), and corporate and foreign bonds (125 points). The next three most important instruments during this period were: MMMF shares (101 points), other loans and advances (81 points), and mutual fund shares (79 points).

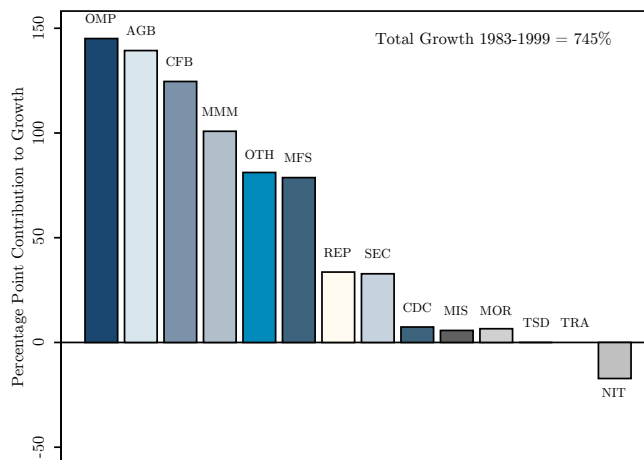
Open market paper covers bankers acceptances and commercial paper held by credit unions, insurance companies, brokers and dealers, pension funds, MMMFs, GSEs, as well as funding corporations. The large contribution of open market paper to intra-financial lending growth, in this sense, reflects the rise in importance of the money market as a source of short-term funding for financial institutions. Agency and GSE-backed securities largely includes financial sector holdings of bonds, mortgage-backed securities, and collateralized mortgage obligations issued by government-sponsored enterprises - Fannie Mae, Freddie Mac, and Federal Home Loan Banks. The large contribution of corporate and foreign bonds captures increasing financial sector holdings of bonds issued by other financial institutions as well as the increase in collateralized debt obligations and mortgage-backed securities.⁹

We now turn to the drivers of intra-financial lending growth between 2003 and 2007. As described above, intra-financial sector lending appears to have reached a trough in 2003, before expanding rapidly through 2007 until the onset of the global financial crisis. Between 2003 and 2007 it grew nearly 350 percent, from \$350 billion to a peak of over \$1.4 trillion. Figure 6, below, shows the percentage point contributions of each instrument category to total intra-financial lending growth between 2003 and 2007. By far the largest contribution came from MMMF shares, accounting for 117 percentage points of growth or over one third of all lending growth throughout this period. In other words, the growth of intra-financial lending in large part was a result of institutional investors appetite for high yield and highly liquid investments in MMMFs.

The next two largest contributors were federal funds and repurchase agreements, and other loans and

⁹See Table A5 in the appendix for a description of the instrument series.

Figure 5: Contributions to growth of intra-financial lending 1983-99.



Source: Authors’ calculations based on the flow of funds. **Note:** AGB = agency and GSE-backed securities, CDC = checkable deposits and currency, CFB = corporate and foreign bonds, CEQ = corporate equities, MFS = mutual fund shares, MIS = loans n.e.c., MMM= money market mutual fund shares, MOR = mortgages, NIT = net interbank transactions, OMP = open market paper, OTH = other loans and advances, REP = federal funds and repo, SEC = security credit, TRA = trade credits, TSD = time and savings deposits.

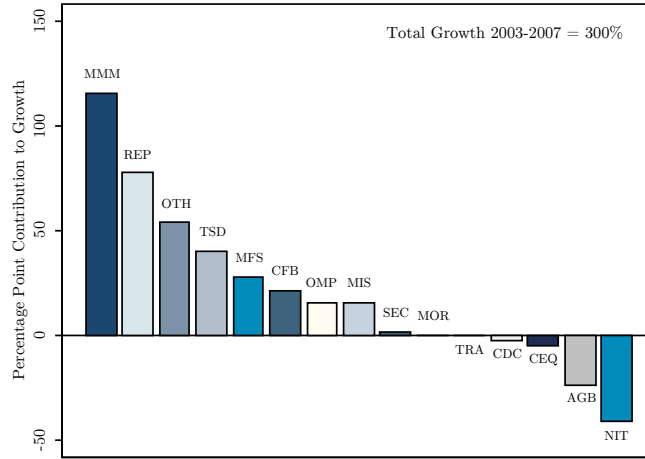
advances, contributing around 76 and 55 percentage points, respectively. Within other loans and advances, the most important subcomponents are GSE loans held by banks, securitized business loans or collateralized loan obligations (CLOs), and syndicated loans. The two largest drags on intra-financial lending growth were net interbank transactions as well as agency and GSE-backed securities. These two instrument types shrank between 2003 and 2007, “subtracting” a combined 66 percentage points from total lending growth.

The large percentage point contributions of repurchase agreements and MMMF shares are suggestive, as several observers have argued that these instruments played crucial roles in precipitating the financial melt-down of 2008. As Gorton and Metrick [14] argue, repos create short-term obligations that are economically equivalent to demand deposits in traditional banks and thus subject to panics similar in nature to old-fashion bank runs. The repo market, in this context, was an important source of financial fragility, operating as the initial trigger of the financial crisis. (D’Arista [8]).

6 Discussion

What can we learn from our data about the broader questions about the interconnectedness of the financial sector and the social function of finance? Regarding the extent of interconnectedness or intra-financial linkages, our data suggests that interconnectedness was at a historical high immediately prior to the financial crisis and does not appear to have decreased in the years since. In fact, if we consider intra-financial lending

Figure 6: Contributions to growth of intra-financial lending 2003-07.



Source: Authors' calculations based on the flow of funds. **Note:** AGB = agency and GSE-backed securities, CDC = checkable deposits and currency, CFB = corporate and foreign bonds, CEQ = corporate equities, MFS = mutual fund shares, MIS = loans n.e.c., MMM= money market mutual fund shares, MOR = mortgages, NIT = net interbank transactions, OMP = open market paper, OTH = other loans and advances, REP = federal funds and repo, SEC = security credit, TRA = trade credits, TSD = time and savings deposits.

flows excluding the Federal Reserve, 2011 was an all time record.

Nevertheless, it is important to keep in mind a few important caveats. First, because our data is constructed using the FoF and not individual firm-level data, it does not capture differences in the *network structures* of intra-financial linkages. In this sense, our data is best interpreted as providing an aggregate measure of interconnectedness capable of providing insight on broad trends and magnitudes. Second, our data does not capture other potentially important *indirect links* between financial institutions, such as, for instances, correlated asset and liability structures or exposures to similar shocks. Third and perhaps most importantly, since the FoF currently does not cover derivatives, our data most likely underestimates the true extent of interconnectedness.

Our work also sheds light on the question about the social function or usefulness of finance. Our data shows that since 1980 a dwindling share of credit has gone to the real economy. In other words, over the last three decades the function of finance appears to have shifted away from its traditional role of mobilizing savings and financing long-term business investment. This shift could still promote growth or be socially beneficial if, for instance, it led to increased risk sharing and optimal liquidity provision. However, as our results in the previous section shows, the growth of intra-financial lending was concentrated in financial instruments that likely contributed to systemic risk - MMMFs, Repos, and securitized products.

Related research should utilize these data on intra-financial lending to explore the impacts of such lending on the functioning of the macroeconomy. For example, does increased intra-financial lending contribute to

higher or lower levels of investment? (eg. Montecino and Epstein [16]). Does greater intra-financial lending contribute to financial instability and crisis? Finally, why has intra-financial lending increased to such an extent in the US and do we observe similar trends in other countries?

Developing the data set on intra-financial lending presented in this paper is just the first step in investigating these issues.

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A Data Appendix

Table A.1: Baseline alpha summary statistics.

	Obs.	Mean	Std. Dev.	Min	Max
Agency & GSE-backed Securities	63	0.56	0.2	0.26	0.9
Corporate & Foreign Bonds	63	0.25	0.15	0.03	0.54
Corporate Equities	63	0.14	0.04	0.09	0.23
Loans N.E.C.	63	0.11	0.04	0.05	0.29
Mortgages	63	0	0	0	0.01
Open Market Paper	63	0.78	0.1	0.47	0.94
Other Loans and Advances	63	0.15	0.1	0.03	0.35
Security Credits	63	0.7	0.06	0.59	0.85
Trade Credits	63	0.01	0	0	0.02

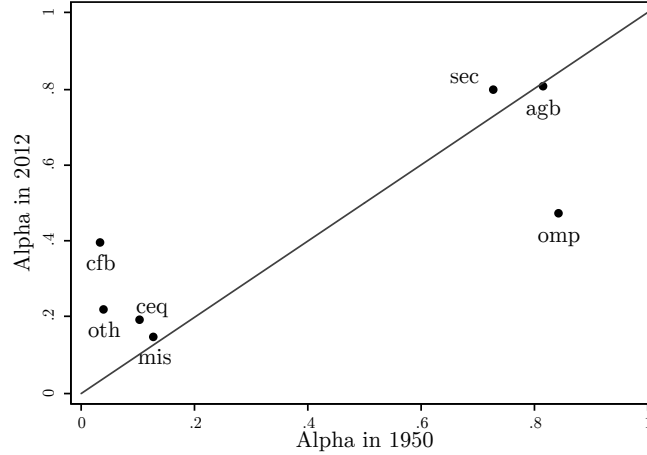
Source: Authors' calculations based on the flow of funds.

Table A.2: Alpha summary statistics excluding the Federal Reserve.

	Obs.	Mean	Std. Dev.	Min	Max
Agency & GSE-backed Securities	63	0.56	0.2	0.26	0.9
Checkable Deposits & Currency	63	0.7	0.11	0.42	0.81
Corporate & Foreign Bonds	63	0.25	0.15	0.03	0.54
Corporate Equities	63	0.14	0.04	0.09	0.23
Loans N.E.C.	63	0.11	0.04	0.05	0.29
Mortgages	63	0	0	0	0.01
Other Loans and Advances	63	0.15	0.1	0.03	0.35
Open Market Paper	63	0.78	0.1	0.47	0.94
Security Credits	63	0.7	0.06	0.59	0.85
Trade Credits	63	0.01	0	0	0.02

Source: Authors' calculations based on the flow of funds.

Figure A.1: Change in alphas between 1950-2012.



Source: Authors calculations based on the flow of funds. **Note:** AGB = agency & GSE-backed securities, CFB = corporate & foreign bonds, CEQ = corporate equities, MIS = loans N.E.C., OMP = open market paper, OTH = other loans & advances, SEC = security credits.

As explained above, we assume that a share alpha of each type of financial sector asset translates into liabilities for the financial sector. The share alpha is estimated as follows: let l_i^f and L_i be the liabilities of instrument i held, respectively, by the financial sector and all sectors combined. The share alpha of each instrument i is simply l_i^f/L_i . Alphas are calculated for each year.

Table A.3, below, shows the FoF code for each series used to calculate the baseline alpha shares (that is, those that include the Federal Reserve).¹⁰ For instance, the alpha for open market paper is calculated as:

$$\alpha_{omp} = \frac{FL793169100 + FL703169605}{FL893169175}$$

In order to remove the Federal Reserve from checkable deposits and currency, we calculate a separate alpha for Federal Reserve liabilities. This alpha equals

$$\alpha_{cdc}^{fed} = \frac{FL713120005}{FL793120005}$$

The amount of intra-financial assets of checkable deposits and currency were thus calculated as

$$IF_{cdc} = (1 - \alpha_{cdc}^{fed}) \cdot assets_{cdc}$$

In the case of net interbank transactions and federal funds and repurchase agreements it was possible to identify and therefore directly subtract Federal Reserve assets and liabilities from financial sector asset

¹⁰For a detailed explanation of how FoF series codes are structured see the FoFs online guide at: <http://www.federalreserve.gov/apps/fof/SeriesStructure.aspx>.

Table A.3: Flow of funds series used to calculate baseline alphas.

	Liabilities	
	Financial Sector	All Sectors
Agency & GSE-backed Securities	FL403161705	FL893161705
Corporate & Foreign Bonds	FL793163005	FL893163005
Corporate Equities	FL793164105	FL103164103 FL263164103 FL793164105
Loans N.E.C.	FL793168005	FL793068005 FL153165005 FL143165005
Mortgages	FL643165005	FL103165005 FL113165005 FL313165403 FL643165005
Other Loans & Advances	FL403169283 FL503169205 FL543169333 FL763169305 FL473169333	FL893169005
Open Market Paper	FL793169100 FL703169605	FL893169175
Security Credits	FL663167005	FL893167005
Trade Credits	FL663170003	FL893170005

stocks and lending flows in both instrument categories. This is necessary in order to avoid counting lending by the Federal Reserve as well as lending to the Federal Reserve. For net interbank transactions, we subtract Federal Reserve assets in this category (FL714010005), which include floats and loans to domestic banks; and also subtract Federal Reserve liabilities (FL714110005), which include depository institutions reserves and vault cash. For federal fund and repurchase agreements, we subtract the Federal Reserves reverse repurchase agreements (FL712150003) from total financial sector assets.

Table A.5, below, presents the underlying series used for the calculation of intra-financial assets and lending for each instrument category. For instance, the total assets of the instrument category agency and GSE-backed securities is calculated as the sum of these instruments held by the sub-sector series including U.S.-chartered depository institutions (FA763061705), mutual funds (FA653061703), issuers of asset-backed securities (FA673061705), etc. Detailed descriptions of each series are available in the FoF online guide (<http://www.federalreserve.gov/apps/fof/>) by searching for the appropriate series code.

It is worth mentioning one aspect of how the instrument categories are organized. In cases when types of instruments have been securitized, the broad instrument categories include both the underlying class of asset as well as the securitized product.¹¹ For instance, the other loans and advances category includes both collateralized loan obligations and the underlying business loans these are based on. Similarly, the agency and GSE-backed securities category includes both the original mortgage pools as well as the resulting mortgage-backed securities. In these instances we take care to only count the instrument sub-categories that result in intra-financial claims and not those that evidently represent claims on (e.g.) households or non-financial business.

¹¹This was ascertained through private correspondences with economists at the Flow of Funds division of the Federal Reserve.

Table A.4: Flow of funds financial sector asset series.

Instrument	Asset Series			
Agency & GSE-backed Securities	FL713061705	FL763061705	FL753061703	FL743061703
	FL473061705	FL513061703	FL543061703	FL573061705
	FL223061703	FL343061705	FL633061700	FL653061703
	FL403061705	FL673061705	FL643061773	FL663061703
	FL733061703			
Checkable Deposits & Currency	FL793020005			
Corporate & Foreign Bonds	FL763063005	FL753063003	FL743063005	FL473063003
	FL513063003	FL543063005	FL573063005	FL223063005
	FL343063005	FL633063003	FL653063005	FL553063003
	FL563063003	FL403063005	FL613063003	FL643063005
	FL663063005	FL733063003	FL503063005	
Corporate Equities	FL713064103	FL763064105	FL753064103	FL513064105
	FL543064105	FL573064105	FL223064105	FL343064105
	FL653064100	FL553064103	FL563064103	FL663064103
	FL503064105			
	FL712050000	FL512050003	FL542050003	FL572050005
Federal Funds & Repurchase Agreements	FL222050003	FL632050000	FL652050003	FL402050005
	FL732050003	FL502050003		
Loans N.E.C.	FL793068005			
Money Market Mutual Fund Shares	FL513034003	FL543034003	FL573034005	FL223034003
	FL503034003			
Mortgages	FL763065005	FL753065005	FL743065003	FL473065100
	FL513065503	FL543065000	FL573065005	FL223065003
	FL403065005	FL413065005	FL673065005	FL613065000
	FL643065005			
Net Interbank Transactions	FL894010005			
Other Loans & Advances	FL723069703	FL753069700	FL733069005	FL733069013
	FL733069023	FL543069403	FL403069305	FL763169305
	FL673069505	FL613069500	FL543069803	FL653069803
	FL673069803	FL663069803	FL503069805	
Open Market Paper	FL713069603	FL763069175	FL753069603	FL473069103
	FL513069103	FL543069100	FL573069105	FL223069103
	FL633069175	FL653069100	FL403069105	FL663069103
	FL503069105			
Security Credits	FL763067005	FL753067000	FL663067003	
Time & Savings Deposits	FL793030005			
Trade Credits	FL513070003	FL673070003		

Table A.5: Instrument category descriptions.

Instrument	Description
Agency & GSE-backed Securities	Obligations of government agencies and GSEs, as well as MBS, CMOs, REMICs, and stripped MBS, held by the financial sector.
Checkable Deposits & Currency	Cash and cash-equivalent assets held by the financial sector. On the liability side, includes deposit liabilities.
Corporate & Foreign Bonds	Debt obligations of corporate non-financial and foreign, MBS, ABS, CMOs, REMICs, as well as domestic structured products.
Corporate Equities	Equity securities; stocks held by financial institutions - banks, insurance companies, pension funds, mutual funds, brokers and dealers, and funding corporations.
Federal Funds & Repurchase Agreements	Repurchase agreements (short-term securities purchased under agreement to resell).
Loans Not Elsewhere Classified	Miscellaneous bank loans (mainly residual of total loans minus identified loans) and Federal Reserve loans to the banking system.
Money Market Mutual Fund Shares	Shares of money market mutual funds - derived as the total net assets of institutional investors MMMFs.
Mortgages	Total mortgages held by banks, pension funds, GSEs, issuers of ABS, finance companies. Mainly captures mortgages issued to real estate investment trusts.
Net Interbank Transactions	Short-term assets and liabilities of banks; monetary reserves held by the Federal Reserve.
Other Loans & Advances	Securitized business loans, syndicated loans held by issuers of ABS, brokers and dealers, GSE loans and FHLB advances by banks.
Open Market Paper	Commercial paper and bankers acceptances; short-term money market securities.
Security Credits	Bank loans to brokers and dealers for purchasing and carrying securities.
Time & Savings Deposits	Both small and large time deposits as well as savings accounts at banks.
Trade Credits	Accounts receivable and payable related to the sale of goods and services. Mainly includes issuers of ABS on the asset side and brokers and dealers on the liability side.

Source: Guide to the flow of funds.

Table A.6: Baseline intra-financial asset stocks: decade averages.

	1950's	1960's	1970's	1980's	1990's	2000's	2010's
Agency & GSE-backed Securities	0.4	0.8	1.9	2.4	2.7	3.7	7.2
Checkable Deposits & Currency	1	0.7	0.5	0.3	0.3	0.4	0.5
Corporate & Foreign Bonds	0.6	1.3	1.6	2.2	3.5	5	4.5
Corporate Equities	0.5	1.4	1.1	1.1	2.6	3.8	3.2
Depository Institutions Loans n.e.c.	1	0.9	1	0.6	0.3	0.5	0.6
Federal Funds & Repo	0.1	0.1	0.3	0.9	1.4	1.3	1.3
Money Market Mutual Funds	0	0	0	0.3	0.9	1.4	1.2
Mutual Fund Shares	0	0	0.1	0.3	1.9	3.5	4
Net Interbank Transactions	5.3	3.3	1.8	0.5	1.1	0.9	2.5
Open Market & Commercial Paper	0.2	0.3	0.9	2.2	2	1.5	0.5
Other Loans & Advances	0.1	0.3	0.5	1	0.7	1.4	0.7
Security Credit	1	1	0.8	0.5	0.6	0.7	0.7
Time & Savings Deposits	0.2	0.3	0.7	1.6	1	0.8	1
Total Mortgages	0	0	0	0	0.1	0.2	0.2
Trade Credit	0	0	0	0	0	0	0
Total Intra-financial Lending	10.4	10.6	11.3	13.8	19.1	25.3	28.1

Source: Authors' calculations based on the flow of funds.

Table A.7: Intra-financial asset stocks excluding the Federal Reserve

	1950's	1960's	1970's	1980's	1990's	2000's	2010's
Agency & GSE-backed Securities	0.5	0.9	1.9	2.4	2.8	3.7	6.3
Checkable Deposits & Currency	0.9	0.6	0.4	0.3	0.2	0.2	0.3
Corporate & Foreign Bonds	0.7	1.5	1.7	2.2	3.6	5.2	4.8
Corporate Equities	0.6	1.5	1.2	1.1	2.7	3.9	3.4
Depository Institutions Loans n.e.c.	1.1	1	1	0.6	0.4	0.5	0.6
Federal Funds & Repo	0	0.1	0.3	0.8	1.3	1.2	1.3
Money Market Mutual Funds	0	0	0	0.3	1	1.5	1.3
Mutual Fund Shares	0	0	0.1	0.3	2	3.6	4.2
Net Interbank Transactions	0.4	0.6	0.2	0.1	0.7	0.3	0.4
Open Market & Commercial Paper	0.2	0.4	1	2.3	2.1	1.6	0.5
Other Loans & Advances	0.1	0.3	0.6	1	0.7	1.4	0.7
Security Credit	1.2	1.1	0.8	0.6	0.6	0.7	0.8
Time & Savings Deposits	0.2	0.4	0.8	1.6	1	0.9	1.1
Total Mortgages	0	0	0	0	0.1	0.2	0.2
Trade Credit	0	0	0	0	0	0	0
Total Intra-financial Lending	6.1	8.5	10.1	13.7	19	24.9	26

Source: Authors' calculations based on the flow of funds.