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Evolving Nature of Financial Intermediation and Economic Growth: Insights from a Bayesian Vector-Autoregression Analysis

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Abstract

We compute the growth of financial intermediary (FI) assets as an indicator of liquidity provided by intermediaries to the economy, as is done in the existing literature, and analyze its impact on the economy. We find that shocks to aggregate FI assets have a significant impact on U.S. real GDP and other macroeconomic indicators. Furthermore, shocks to assets of individual FIs also impact economic growth. However, our sub-sample analysis reveals notable shifts in the nature of financial intermediation: i) an increasing importance of market-based intermediaries, such as securities brokers and dealers, while the relationship between banks and the overall economy has diminished; ii) mutual funds demonstrate a greater impact compared to pension funds, underscoring their relative significance in driving economic outcomes in recent years; iii) insurance companies and shadow banks exhibit consistent significance across the sub-sample periods. These results suggest adopting a holistic approach to policymaking that considers various FIs, enhancing regulation and oversight of systemically important non-bank financial institutions, and monitoring of large insurers to mitigate the risk of financial instability.

Keywords: business cycles, financial intermediation, consumption; investments, unemployment, systemic risk

JEL Classifications: G12; G21; E44; E47.

1. Introduction

The role of financial intermediaries in economic development has been debated at least since Bagehot (1873). The existing literature (e.g., Levine & Zarvos, 1998; and Kashyap et al., 2002), posits that intermediaries, especially banks, facilitate economic growth by reducing frictions between savers and borrowers and by creating liquidity (e.g., Gorton & Pennacchi, 1990) (Note 1). However, the existing literature on the relationship between bank lending and economic activity has produced inconclusive evidence regarding the existence of a “credit crunch” (e.g., Bernanke & Lown, 1991; Kashyap & Stein, 1994; Berger et al., 2020).

One possible explanation for these inconsistent results is that commercial banks, for reputational reasons, serve as a buffer for established customers with pre-arranged credit lines (e.g., Thakor, 2005). Another potential reason for the lack of a clear relationship between bank lending and the real economy is the changing landscape of financial intermediation, which can be attributed to various factors including regulations and/or deregulations, financial innovations, and the emergence of wholesale funding, among others. These factors have reshaped the functioning of financial intermediaries and the way they provide funding, potentially altering the traditional relationship between bank lending and economic activity. To address these issues, our study takes a comprehensive approach by incorporating a wide range of financial intermediaries in a Bayesian vector-autoregression (BVAR) framework, allowing for the endogenous evolution of monetary policy, credit constraints, financial intermediation, and economic growth.

If the theories on the relationship between financial intermediaries and economic growth are held, the balance sheets of financial intermediaries should contain valuable information about business cycles. Building upon previous research (e.g., Adrian & Shin, 2009), we analyze the growth of intermediary assets to evaluate the impact of financial intermediation on the real economy. This measure serves as an indicator of the liquidity created by intermediaries for the economy (see, e.g., Adrian & Shin, 2008, 2010; Adrian et al., 2014) (Note 2). Furthermore, it is important to acknowledge that not all financial intermediaries contribute to economic growth in the same way. In light of this, our study explores a wide range of intermediaries, including 17 distinct types categorized into six intermediary groups as outlined in Table 1. We begin our analysis by examining the effects of shocks to aggregate intermediary assets on real GDP and other macroeconomic indicators. Subsequently, we analyze the impacts in a disaggregated manner, considering each intermediary type individually. Our investigation yields several key findings that are summarized as follows.

First, our analysis shows that shocks to both aggregate intermediary assets and assets of individual intermediary types have substantial impacts on real GDP growth. Additionally, shocks to aggregate intermediary assets exhibit economically significant effects on various macroeconomic indicators, including industrial production, unemployment, personal consumption expenditures, and business fixed investment. These findings align with the existing literature (e.g., Adrian & Shin, 2010), which suggests that financial market liquidity can be more accurately understood as the growth rate of intermediary balance sheets. When the prices of assets held by intermediaries increase, leverage decreases with the accumulation of capital. Intermediaries utilize this surplus capital to expand their balance sheets by borrowing (issuing debt) and lending more. As a result, there is a strong interconnection between financial market liquidity and economic growth.

Second, we observe a shift in the overall financial intermediation process. We divide the sample into two based on breakpoint analysis and investigate two sub-samples: 1955-1984 and 1985-2018. The key findings of the sub-sample analysis focusing on the impacts on real GDP for shocks to assets of different intermediaries are as follows:

1) Market-based intermediaries such as securities brokers and dealers have gained significance over time.
2) The role of banks, on the other hand, appears to have become less closely tied to the overall economy.
3) The impact of mutual funds on the economy seems to be more pronounced than that of pension funds in recent years.
4) Insurance companies and shadow banks consistently demonstrate their ongoing significance throughout the sub-sample periods.

Our results contribute to the literature as follows. The existing literature (e.g., Adrian & Shin, 2008, 2009, 2010; Adrian & Ashcraft, 2016; Boot & Thakor, 2018, among others) argues for the declining role of deposit-based banks substituted by market-based intermediaries, such as securities brokers and dealers and/or shadow banks, that are financed by wholesale funding, such as commercial paper and repurchase agreements (Note 3). We contribute to this strand of the literature by showing that intermediaries such as insurance companies are equally important and their assets growth have significant impact on economic growth. In fact, we find that intermediaries such as mutual funds have gained increasing significance in recent years.

Importantly, our study contributes to the existing literature (e.g., Bencivenga & Smith, 1991, among others) on the relationship between financial intermediation and economic growth. We demonstrate that the expansion of intermediaries' balance sheets, particularly their assets, has a significant impact on crucial macroeconomic indicators, including real GDP.

Our findings further contributes to the extensive literature on the amplification of financial shocks through balance sheet channels, which can be broadly classified into two categories. The first channel operates through the borrower's balance sheet and relies on the creditworthiness of the borrower (e.g., Bernanke & Gertler, 1989; Kiyotaki & Moore, 1997, 2005). The second channel operates through the balance sheets of intermediaries such as banks (e.g., Bernanke & Blinder, 1998; Kashyap & Stein, 2002). Our results contributes to the second perspective, but we extend the analysis to include a more comprehensive range of intermediaries, including banks.

The policy implications of our results can be summarized as follows. First, our findings emphasize the dynamic nature of financial intermediation. While policymakers and academics often prioritize bank regulations and their impact on the economy, our results suggest that policymaking should adopt a more comprehensive approach that considers various segments of the financial sector. This is particularly important considering the events during the 2007-2009 global financial crisis, which revealed the emergence of systemic risks beyond the conventional banking sector. The collapse of Lehman Brothers and the potential failure of interconnected financial institutions like American International Group (AIG) underscore the necessity for strengthened regulations and oversight of systemically significant non-bank financial institutions. Second, our results underscore the ongoing significance of insurance companies. Consequently, regulators should exercise heightened scrutiny over large insurers such as AIG. Despite being bailed out during the 2007-2009 crisis, insurers like AIG still possess the potential to cause financial instability.

The remainder of this paper is organized as follows: In Section 2, we describe the data and their sources. Section 3 presents the results, and Section 4 concludes.

2. Data and Sample Construction

Our data sample spans from the first quarter of 1955 to the fourth quarter of 2018. We obtain the intermediary balance sheet data from the Federal flow of funds from the website of the Federal Reserve Board. The Federal flow of funds reports provide balance-sheet data at the subsidiary level to avoid any potential double-counting of intermediary balance sheet items.

Financial intermediaries (referred to as FIs) are categorized into six types as presented in Table 1: Banks (referred to as BANK), Shadow banks (referred to as SHADOW), Mutual Funds (referred to as MUTUAL), Pension funds (referred to as PENSION), Insurance Companies (referred to as INSURANCE), and Securities Brokers and Dealers (referred to as BROKERS). To derive the aggregate assets (referred to as ASSET) of FIs, we aggregate the assets across the six types. We calculate the percentage change in assets for each of the six types of FIs as well as their aggregate, resulting in the variables ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, and ΔASSET.

Table 1. Financial intermediaries

Groups	Group Members
Insurance Companies	a. Life Insurance; b. Property and Casualty Insurance
Pension Funds	a. Private Pension Funds; b. Federal Govt. Retirement Funds; c. State Govt. Retirement Funds
Banks	a. Commercial Banks; b. Credit Unions; c. Savings Institutions
Shadow Banks	a. Asset Backed Securities; b. Agency/GSE Mortgage Pools; c. Funding Corporations; d. Finance Companies
Mutual Funds	a. Money Market Funds; b. Mutual Funds; c. Closed End Funds; d. Exchange Traded Funds
Brokers & Dealers	a. Securities Brokers & Dealers

We examine the impact of FIs asset growth on the following macro variables that are obtained from either ALFRED of the Federal Reserve Bank of St. Louis or the Bureau of Economic Analysis: Real-time GDP, personal consumption expenditures (CONS), business fixed investment (INV), industrial production (IP), and unemployment (UNEMP). We calculate the percentage change of real GDP, CONS, and INV as ΔGDP, ΔCONS, and ΔINV, respectively. Additionally, we compute the changes in IP and UNEMP as ΔIP and ΔUNEMP, respectively.

Market-wide credit constraints and monetary policy stance must be included to examine economic growth, and hence we include the following variables based on the literature on real GDP prediction (e.g., Harvey, 1989; Adrian & Shin, 2010): the real Federal funds rate (FFR); the Treasury term spread (TS), calculated as the difference between the yields on the 3-month Treasury bill and the 10-year Treasury bond indices; and the corporate bond credit spreads (CS), represented by the difference between the yields on 10-year AAA and BAA rated corporate bonds. Data for FFR, CS, and TS are sourced from the Federal Reserve Bank of St. Louis. For these variables, we calculate the quarterly data by averaging the monthly data over a three-month period starting from January of each year. We also include stock market variables such as stock market returns (MKT) following the literature (Levine & Zarvos, 1998) that shows that stock markets are important for economic growth. We further include stock market volatility (VOL) to capture the risk-return dynamics of the stock market following Estrella and Mishkin (1998).

Panel A of Table 2 presents the descriptive statistics of intermediary assets growth (Note 4). The results indicate that ΔMUTUAL and ΔBROKER exhibit some of the highest volatility, while ΔASSET demonstrates the lowest volatility. These findings align with expectations, as the assets of mutual funds and securities brokers and dealers consist of financial securities that are more volatile. Conversely, the aggregation of assets in ΔASSET reduces the overall intermediary asset volatility, as is typically observed in any diversified portfolio of assets.

Panel B presents the pairwise correlations of selected variables of interest. As anticipated, we observe that the asset growth of intermediaries is not consistently correlated with ΔGDP across all types. Importantly, we do not detect any multicollinearity issues in our analysis.

Table 2. Intermediary descriptive statistics

Table 2 Panel A: Descriptive Statistics

	ΔASSET	ΔBANK	ΔBROKERS	ΔINSURANCE	ΔMUTUAL	ΔPENSION	ΔSHADOW
Mean	0.02	0.02	0.06	0.02	0.05	0.03	0.04
Max.	0.07	0.16	0.98	0.06	0.56	0.35	0.19
Min.	-0.01	-0.06	-0.44	-0.05	-0.35	-0.23	-0.06
Std. Dev.	0.01	0.03	0.23	0.02	0.11	0.07	0.04

Table 2 Panel B: Pairwise Correlation

	ΔASSET	ΔBANK	ΔBROKERS	ΔINSURANCE	ΔMUTUAL	ΔPENSION	ΔSHADOW	FFR	TS	CS
ΔBANK	-0.07									
ΔBROKERS	0.45***	0.02	1.00							
ΔINSURANCE	0.24***	-0.60***	-0.03							
ΔMUTUAL	0.39***	-0.50***	0.16***	0.46***						
ΔPENSION	0.42***	-0.45***	0.19***	0.54***	0.57***					
ΔSHADOW	-0.01	0.20***	-0.12*	-0.12*	-0.17***	-0.28***				
FFR	0.17***	-0.05	0.09	0.12*	0.18***	0.01	0.27***			
TS	0.02	-0.02	0.02	0.26***	-0.07	0.08	-0.07	-0.37***		
CS	0.00	0.08	0.06	0.15***	0.15***	0.04	0.03	0.36***	0.32***	
ΔGDP	0.16***	-0.06	-0.12*	0.13**	-0.01	0.10	0.10	-0.11*	0.08	-0.33***

Note. This table presents the descriptive statistics of the intermediary variables used in the study. Panel A presents the descriptive statistics of intermediaries' assets growth. Panel B presents the pairwise correlation of the asset growth of intermediaries and different micro and macro variables. ΔASSET is aggregate asset growth; ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS and ΔSHADOW are the asset growths of the different intermediaries in Panel A. FFR is the real Federal funds rate; TS is the Treasury term spread that is the difference between the yield on 3-month Treasury bills and 10-year Treasury bonds; CS is corporate bonds credit spread; and ΔGDP is real GDP growth. Quarterly sample is from 1955 to 2018.

3. Empirical Results

We begin our analysis by conducting simple pairwise Granger causality tests to examine whether ΔASSET contains information about future ΔGDP, ΔINV, ΔCONS, ΔUNEMP, and ΔIP. The objective is to ascertain if the theories concerning the relationship between financial intermediation and business cycles hold true, ΔASSET must have information about macro variables, and vice versa.

Using a VAR framework, we find an optimal lag of one quarter based on Schwarz and Akaike information criteria (SIC and AIC) for the Granger causality tests.

The Granger causality results in Table 3 Panel A indicate that ΔASSET and ΔGDP exhibit mutual Granger causality at a statistically significant level of 1%. Similarly, ΔASSET Granger causes ΔINV and ΔCONS, and we also observe reverse Granger causalities. Furthermore, we observe mutual Granger causality between ΔASSET and ΔIP, while ΔASSET Granger causes ΔUNEMP, no reverse Granger causality is found. Overall, the pairwise Granger causality analysis demonstrates that aggregate intermediary assets growth contain leading information regarding macroeconomic indicators.

Table 3 Panel B displays the pairwise Granger causality results for the asset growths of individual intermediary types. For parsimony, we do not report the results where no Granger causality is observed between a pair of variables. We further do not report the results for ΔIP, ΔUNEMP, ΔINV and ΔCONS to save space. We find a complex pattern of Granger causalities among individual intermediary assets, which is in line with expectations. For instance, ΔBANK and ΔBROKERS exhibit mutual Granger causality, while ΔINSURANCE Granger causes ΔBROKERS without any reverse Granger causality.

Table 3 Panel C shows that assets of some of these intermediary types and ΔGDP Granger cause each other. These results highlight the potential informational relationships between different intermediary types. However, it is important to note that in a multivariate setup, these variables are likely to evolve endogenously. Therefore, our subsequent analysis focuses on examining the relationship in an endogenous multivariate setup.

Table 3. Granger causality tests

Table 3 Panel A: Pairwise Granger Causality Tests for aggregate assets and macro variables	
Null Hypothesis:	Prob.
ΔASSET ≢> ΔGDP	0.00***
ΔGDP ≢> ΔASSET	0.00***
ΔASSET ≢> ΔINV	0.00***
ΔINV ≢> ΔASSET	0.01**
ΔASSET ≢> ΔCONS	0.05**
ΔCONS ≢> ΔASSET	0.02**
ΔIP ≢> ΔASSET	0.00***
ΔASSET ≢> ΔIP	0.01***
ΔASSET ≢> ΔUNEMP	0.00***
ΔUNEMP ≢> ΔASSET	0.11
Table 3 Panel B: Pairwise Granger Causality Tests of assets of intermediary types	
Null Hypothesis:	Prob.
ΔBANK ≢> ΔBROKERS	0.00**
ΔBROKERS ≢> ΔBANK	0.00**
ΔINSURANCE ≢> ΔBROKERS	0.00***
ΔBROKERS ≢> ΔINSURANCE	0.19
ΔMUTUAL ≢> ΔBROKERS	0.04**
ΔBROKERS ≢> ΔMUTUAL	0.12
ΔPENSION ≢> ΔBROKERS	0.00***
ΔBROKERS ≢> ΔPENSION	0.76
ΔSHADOW ≢> ΔBROKERS	0.93
ΔBROKERS ≢> ΔSHADOW	0.02**
Table 3 Panel C: Pairwise Granger Causality Tests of assets of intermediary types and GDP growth	
Null Hypothesis:	Prob.
ΔPENSION ≢> ΔGDP	0.00***
ΔGDP ≢> ΔPENSION	0.06*
ΔSHADOW ≢> ΔGDP	0.00***
ΔGDP ≢> ΔSHADOW	0.00***
ΔBROKERS ≢> ΔGDP	0.00***
ΔGDP ≢> ΔBROKERS	0.00***

Note. This table presents the Granger causality results. Panel A presents the results of Ganger Causality tests for ΔASSET and macroeconomic variables. Panel B present the Granger causality results for assets of intermediary types among each other. Panel C present the Granger causality results for assets of intermediary types and ΔGDP. ΔINV and ΔCONS are growths of business fixed investments, personal consumption expenditures; ΔIP and ΔUNEMP are changes in industrial production and unemployment, respectively; other variables are described earlier. An optimal lag of one is selected based on information criterion such as the Schwarz information criterion (SIC) and the Akaike information criterion (AIC); ≢> implies one variable does not Granger cause the other. ***, **, * represent the statistical significance at the 1% , 5% and 10% level of significances. Quarterly sample is from 1955 to 2018.

3.1 Financial Intermediation and Real GDP

We employ both standard VAR and Bayesian VAR (BVAR) methodologies in our analysis. Initially, we examine the impact of ΔASSET shocks on ΔGDP. Subsequently, we investigate the impact of ΔASSET shocks on ΔCONS, ΔINV, ΔIP, and ΔUNEMP. We further explore the impact of shocks to the assets of six intermediary types on ΔGDP. Lastly, we conduct sub-sample analysis.

For the full sample, which consists of 256 quarters of data, we utilize the standard VAR approach and work with 17 endogenous VAR variables that we discuss later. However, the Bayesian method is better suited for cases where the number of endogenous variables in the VAR model is relatively large compared to the length of the dataset (Koop & Korobilis, 2010).

In our sub-sample analysis, we have 17 endogenous VAR variables, and the dataset length is relatively short. For instance, one of the sub-samples we investigate comprises 120 quarters of data. Given this low ratio of VAR variables to dataset length, we opt to use BVAR for the sub-sample analysis. We utilize the “Minnesota Prior,” which is a commonly used prior specification in BVAR literature.

The ordering of the VAR variables is a subject of debate in the literature, with different views on the appropriate sequence. Some studies, such as Thorbecke (1997) among others, argue for ordering the endogenous VAR variables starting with the macro variables. Conversely, others, like Christiano, Eichenbaum, and Evans (1996), suggest that monetary policy should be able to respond to macro shocks contemporaneously, while the effects of monetary policy shocks on macro variables may have a time lag, thus advocating for policy variables to be ordered first. It is important to note that there are no established economic guidelines on the ordering of individual intermediary types.

To address the above issue, we adopt a generalized impulse definition, following Pesaran and Shin (1998), where the ordering of the VAR variables is not considered crucial. The endogenous VAR variables we include are: FFR, ΔGDP, ΔCONS, ΔINV, ΔIP, ΔUNEMP, ΔASSET, ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, TS, CS, MKT, and VOL.

We begin our analysis with a standard VAR for the full sample to understand the overall dynamics between financial intermediation and the macroeconomy. Based on both SIC and AIC, we find the VAR(1) best describes the dynamics of the system. In Figure 1, we show the accumulated impulse response functions (IRFs) of ΔGDP for a one standard deviation positive generalized shocks to selected variables. The responses are shown for 10 quarters (Note 5).

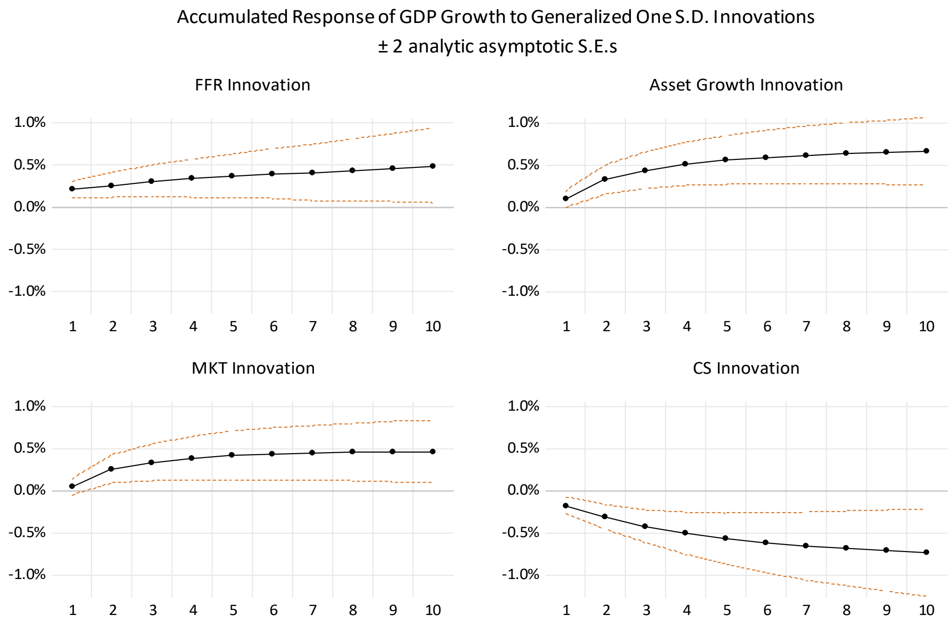

Figure 1. Dynamic responses of real GDP for shocks to intermediary aggregate assets

Note. The figures show the impulse responses of GDP growth to generalized one standard deviation for a VAR(1) model where the endogenous VAR variables are FFR, ΔGDP, ΔCONS, ΔINV, ΔIP, ΔUNEMP, ΔASSET, ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, TS, CS, MKT, and VOL; where MKT and VOL are stock market returns and volatility; other variables are described in earlier tables. The accumulated response functions are plotted for 10 quarters for generalized shocks where the ordering of the variables are not important. % in the figures means *percentage points*. For parsimony, the dynamic responses of ΔGDP to other shocks are not shown. Quarterly sample is from 1955 to 2018.

Figure 1 illustrates that ΔASSET has the most substantial impact on ΔGDP. An unanticipated positive shock to ΔASSET results in an accumulated response of appx. 0.7 percentage points in ΔGDP after 10 quarters. Similarly, shocks to FFR, MKT, and CS lead to an accumulated response of appx. 0.5 percentage points in ΔGDP. Notably, CS exerts a negative effect on ΔGDP, whereas the other three variables have a positive effect. Specifically, higher monetary policy rates (FFR) and stock market returns (MKT), lower credit spreads (CS), and higher intermediary aggregate assets (ΔASSET) have a positive effect on ΔGDP. These findings provide some evidence that at an aggregate level, the liquidity provided by intermediaries, as measured by ΔASSET, contributes to economic growth.

3.2 Financial Intermediation and other Macroeconomic Indicators

In this subsection, we investigate whether ΔASSET affects business fixed investment, personal consumption expenditures, industrial production and unemployment. We use the same VAR(1) model that we used earlier.

Figure 2 shows the IRFs of ΔCONS, ΔINV, ΔIP, and ΔUNEMP for shocks to ΔASSET.

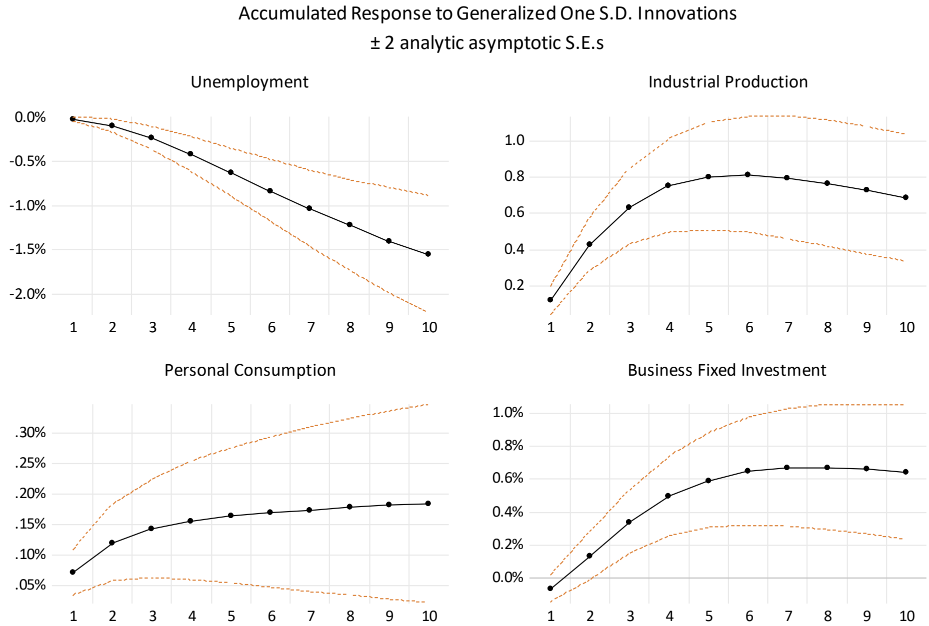

Figure 2. Responses of Macroeconomic Indicators to Intermediary aggregate asset growth shocks

Note. The figures show the impulse responses of macroeconomic indicators to generalized one standard deviation for a VAR(1) model where the endogenous VAR variables are FFR, ΔGDP, ΔCONS, ΔINV, ΔIP, ΔUNEMP, ΔASSET, ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, TS, CS, MKT, and VOL; variables are described in earlier tables. The accumulated response functions are plotted for 10 quarters for generalized shocks where the ordering of the variables are not important. % in the figures means *percentage points*. For parsimony, the dynamic responses to other shocks are not shown. Quarterly sample is from 1955 to 2018.

The accumulated IRFs reveal that positive unexpected shocks to ΔASSET lead to a reduction in unemployment (ΔUNEMP) and an increase in industrial production (ΔIP). These findings are in line with expectations, as the aggregate liquidity provided by intermediaries is likely to have such effects. However, without establishing a clear link between industrial production and financial intermediation, the argument that financial intermediation promotes growth remains incomplete. Additionally, financial intermediation should be able to explain the dynamics of unemployment in the economy. In summary, we find further evidence that financial intermediaries' assets growth impacts industrial production and unemployment.

Turning our attention to the accumulated IRF of ΔCONS to ΔASSET shocks, we observe that a one standard deviation positive generalized shock to ΔASSET in the current quarter leads to an accumulated increase in ΔCONS of appx. 0.2 percentage points after 10 quarters. In contrast, similar shocks to ΔASSET have a larger impact on ΔINV, with an increase of appx. 0.6 percentage points after 10 quarters. These findings suggest that ΔASSET has a stronger influence on investments compared to consumption, supporting the role of financial intermediaries as a provider of credit. Overall, the above results are consistent with the results we obtain for ΔGDP.

3.3 Contribution of Intermediary Types on Real GDP

So far, our analysis has primarily focused on the collective impact of intermediaries on macroeconomic indicators, such as real GDP. However, to gain a more nuanced understanding of the role of intermediaries, we now shift our attention to analyzing each intermediary group individually.

This investigation is important because it acknowledges that unexpected exogenous shocks may have differential effects on various intermediary groups. While some shocks may have an immediate impact on specific intermediaries, the effects on other groups may unfold gradually over time. By analyzing the specific effects of each intermediary group, we can assess their relative importance and understand the dynamics of the overall economy.

It can be argued that an exogenous shock to one intermediary should immediately affect other intermediaries due to their interconnected balance sheets. However, in the previous section, we examined the aggregate impact through the lens of aggregate assets. Now, by focusing on individual intermediary groups, we can delve deeper and gain a more comprehensive understanding of the overall impact of intermediaries on the economy.

We use the same VAR(1) model that we used before and investigate the impacts of ΔGDP to shocks to the assets of each intermediary group. In figure 3, we show accumulated IRFs of ΔGDP to shocks to ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, and ΔSHADOW.

We find that an unanticipated generalized positive shock to assets of each intermediary type have positive effect on ΔGDP, and these finds conform to the theories on the relationship between financial intermediation and economic growth . The lowest accumulated impact (appx. 0.1 percentage points) on ΔGDP is observed for shocks to ΔSHADOW, while among the largest (appx. 0.6 percentage points) impacts are observed for ΔINSURANCE and ΔPENSION after 10 quarters. In contrast, similar shocks to ΔBANK increases ΔGDP by appx. 0.4 percentage points after 10 quarters.

While the existing literature on the relationship between financial intermediation and economic growth primarily emphasizes the role of banks, our findings indicate that pension funds and insurance companies may have a greater impact on the economy than banks. The significance of insurance companies became particularly evident during the 2007-2009 financial crisis when the U.S. federal government intervened to bail out American International Group, Inc (AIG), highlighting their importance for the broader economy.

Our findings challenges the conventional view that banks are the primary drivers of economic growth through financial intermediation. We find that insurance companies, with their unique functions and risk management capabilities, play a crucial role in supporting economic stability by providing protection against various risks, insurance companies contribute to the smooth functioning of markets and provide critical support to businesses and individuals. The above findings expand our understanding of the financial system's dynamics and underscores the need for comprehensive analysis that encompasses a broader range of intermediaries beyond traditional banking institutions.

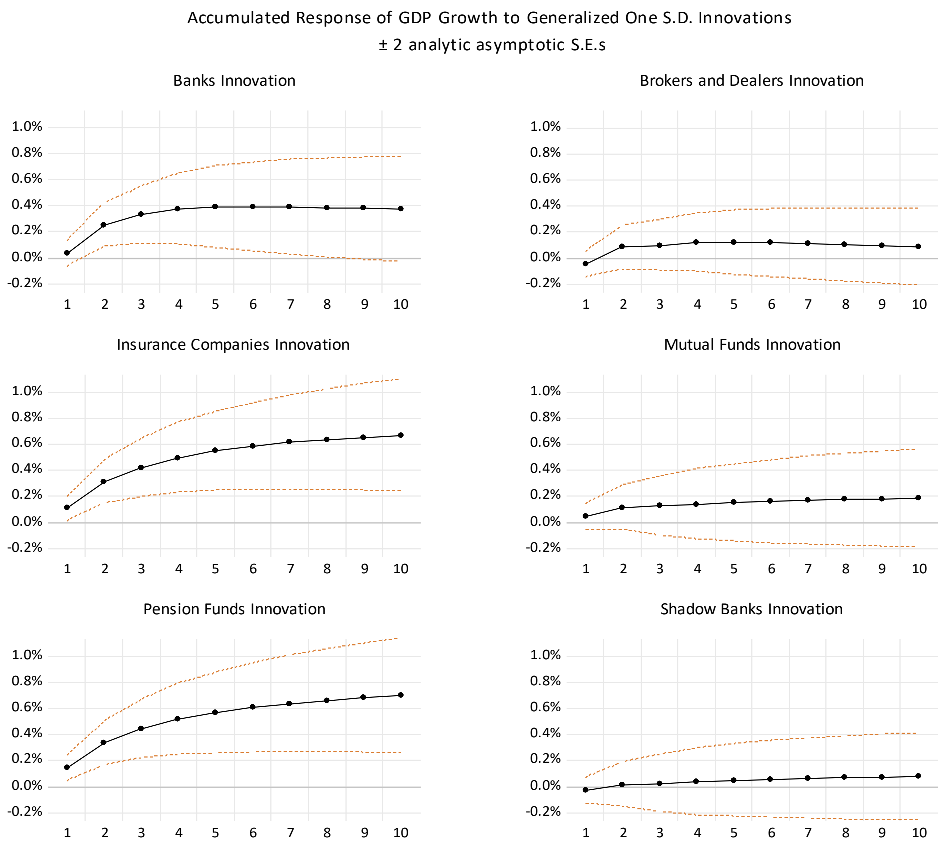

Figure 3. Dynamic responses of real GDP for shocks to assets of intermediary types

Note. The figures show the impulse responses of GDP growth to generalized one standard deviation for a VAR(1) model where the endogenous VAR variables are FFR, ΔGDP, ΔCONS, ΔINV, ΔIP, ΔUNEMP, ΔASSET, ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, TS, CS, MKT, and VOL; variables are described in earlier tables. The accumulated response functions are plotted for 10 quarters for generalized shocks where the ordering of the variables are not important. % in the figures implies *percentage points*. For parsimony, the dynamic responses of ΔGDP to other shocks are not shown. Quarterly sample is from 1955 to 2018.

3.4 The Changing Nature of Financial Intermediation

Given the time-varying nature of the financial intermediation process resulting from factors such as regulations, deregulations, and financial innovations, our analysis now shifts towards sub-sample analysis. Unreported results show an important trend: the bank assets to aggregate intermediary assets ratio declined from approximately 62% to 28% over the course of the sample period. Notably, a significant shift in this ratio occurred around 1984 when it subsequently decreased rapidly.

To validate the existence of this breakpoint, we conducted a Chow breakpoint test, which provides confirmation of our observations. This test further supports the notion of a shift in the relative importance of banks compared to other intermediaries. As a result, it becomes crucial to analyze the sub-samples separately in order to accurately capture these changes. Therefore, we examine two sub-samples: 1955-1984 and 1985-2018. This division approximately splits the entire sample into two nearly equal parts. Notably, the 1985-2018 sub-sample aligns closely with the period studied by Adrian and Shin (2010), allowing for meaningful comparisons between our findings and theirs. As discussed earlier, given the low ratio of VAR variables to dataset length, we use BVAR model for this analysis.

We use a BVAR (1) model with the same endogenous variables we used earlier. The IRFs of ΔGDP for shocks to ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, and ΔSHADOW are shown in Figures 4A and 4B show the IRFs of ΔGDP for the 1955-1984 and 1985-2018 sub-samples, respectively.

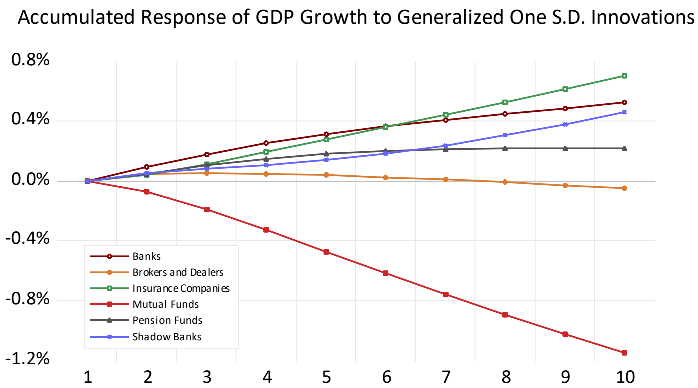

Figure 4A. 1955-1984 Sub-sample

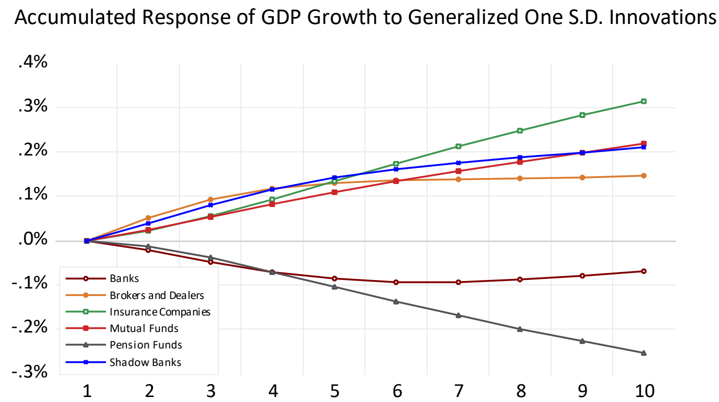

Figure 4B. 1985-2018 Sub-sample

Figure 4. Changing nature of financial intermediation

Note. The figures show the impulse responses of GDP growth to generalized one standard deviation for a BVAR(1) model where the endogenous variables are FFR, ΔGDP, ΔCONS, ΔINV, ΔIP, ΔUNEMP, ΔASSET, ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, TS, CS, MKT, and VOL; variables are described in earlier tables. The accumulated response functions are plotted for 10 quarters for generalized shocks where the ordering of the variables are not important. % in the figures implies *percentage points*. For parsimony, the dynamic responses of ΔGDP to other shocks are not shown. Panel A: Results for the 1955 to 1984 quarterly sub-sample. Panel B: Results for the 1985 to 2018 quarterly sub-sample. To save space and for visual clarity standard error bands are not shown.

First, comparing the Figures 4A and 4B we find that the impacts of shocks to intermediary types on ΔGDP are lower for 1985-2018 sub-sample than those for the 1985-2018 sub-sample, indicating a shift in impact.

Looking next, we observe notable changes in the impact of shocks to different intermediary types on ΔGDP between the 1955-1984 and 1985-2018 sub-samples. For shocks to ΔBANK, the impact on ΔGDP shifted from positive (approximately 0.5 percentage points) in the 1955-1984 sub-sample to negative (approximately -0.1 percentage points) in the 1985-2018 sub-sample. In contrast, shocks to ΔBROKERS exhibited the opposite pattern, with the impact changing from negative (approximately -0.1 percentage points) in the 1955-1984 sub-sample to positive (approximately 0.15 percentage points) in the 1985-2018 sub-sample. The relationship for ΔINSURANCE also experienced a change, with the impact decreasing from approximately 0.6 percentage points in the 1955-1984 sub-sample to approximately 0.3 percentage points in the 1985-2018 sub-sample. Regarding shocks to ΔMUTUAL, the impact on ΔGDP shifted from negative (approximately -1.2 percentage points) in the 1955-1984 sub-sample to positive (approximately 0.25 percentage points) in the 1985-2018 sub-sample. For shocks to ΔPENSION, the impacts changed from 0.2 to -0.25 percentage points for those two sub-samples. Interestingly, shocks to ΔSHADOW exhibited consistent impacts on ΔGDP, with approximately 0.4 percentage points observed in both the 1955-1984 and 1985-2018 sub-samples. These findings highlight the changing dynamics and varying contributions of different intermediary types to ΔGDP across the two sub-samples.

Based on the analysis conducted, we can draw several key insights:

1) Consistent with the findings of Adrian and Shin (2010), market-based intermediaries such as securities brokers and dealers have gained significance over time. This suggests a shift in the importance of these intermediaries in the overall economic landscape.
2) The role of banks, on the other hand, appears to have become less closely tied to the overall economy, aligning with existing literature on the subject. This indicates a change in the relationship between banks and economic activity.
3) The impact of mutual funds on the economy seems to be more pronounced than that of pension funds.
4) Insurance companies and shadow banks consistently demonstrate their ongoing significance throughout the analyzed period, suggesting their continued importance in the economy.

These takeaways provide valuable insights into the changing dynamics and contributions of different types of intermediaries to the overall economy over time.

3.5 Robustness

In this section, we conduct some robustness tests to ensure robustness of our results regarding the relationship between ΔGDP and ΔASSET under a BVAR specification. The impact of aggregate intermediation on the economy should remain unaffected even when the nature of financial intermediation varies over time. Therefore, conducting an analysis using both standard VAR and BVAR specifications should yield qualitatively similar results. We use the BVAR(1) as in the previous section, and Figures 5A and 5B show the IRFs of ΔGDP to ΔASSET, FFR, CS, TS, MKT, and VOL generalized positive shocks for the full sample and the most recent 1985-2018 sub-sample, respectively. Figures 5A and 5B show that the IRFs of ΔGDP to ΔASSET shocks remains positive under the BVAR (1) specification, and the findings align qualitatively with the VAR(1) model.

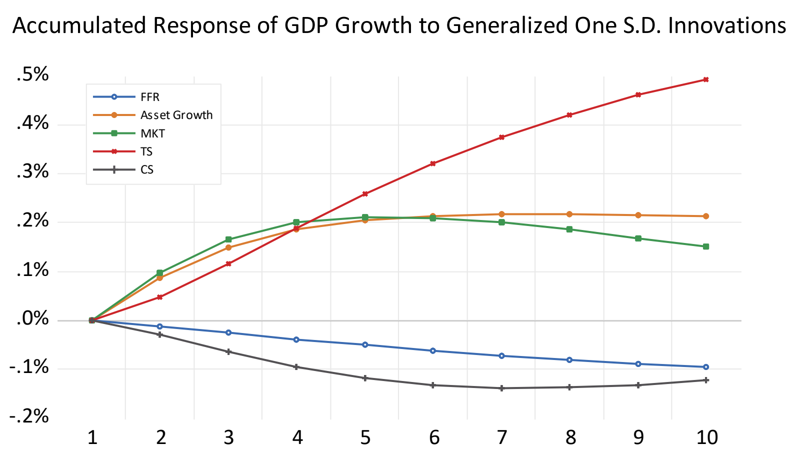

Figure 5A. 1955-2018 sample

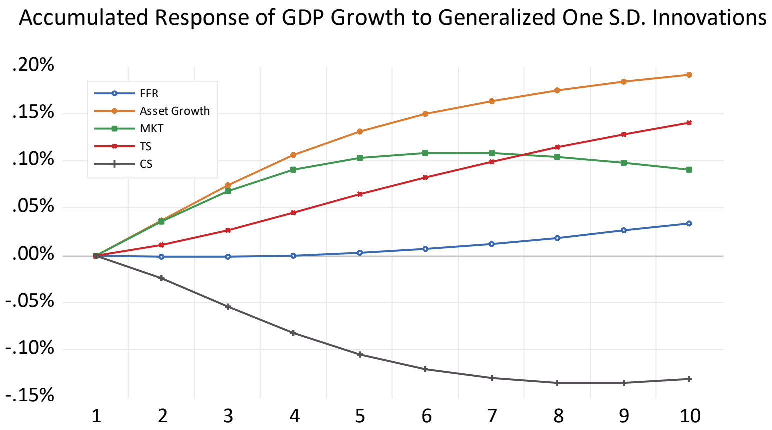

Figure 5B. 1985-2018 sub-sample

Figure 5. Robustness: Dynamic responses of real GDP for shocks to intermediary aggregate assets using BVAR

Note. The figures show the impulse responses of GDP growth to generalized one standard deviation for a BVAR(1) model where the endogenous variables are FFR, ΔGDP, ΔCONS, ΔINV, ΔIP, ΔUNEMP, ΔASSET, ΔBANK, ΔINSURANCE, ΔMUTUAL, ΔPENSION, ΔBROKERS, ΔSHADOW, TS, CS, MKT, and VOL; variables are described in earlier tables. The accumulated response functions are plotted for 10 quarters for generalized shocks where the ordering of the variables are not important. % in the figures implies *percentage points*. For parsimony, the dynamic responses of ΔGDP to other shocks are not shown. Figure 5A show the results for the full sample from 1955 to 2018, while Figure 5B shows the results for 1985-2018 sub-sample. To save space and for visual clarity standard error bands are not shown.

We perform additional robustness tests on our results by examining the impulse response functions (IRFs) using different impulse definitions. However, these robustness tests do not alter our results qualitatively, and these results are available upon request.

4. Conclusion

The role of financial intermediaries in economic development has been debated since Bagehot (1873). However, the relationship between bank lending and economic activity remains inconclusive, possibly due to banks serving as buffers for established customers or the ever-changing nature of financial intermediation.

Our study adopts a comprehensive approach, incorporating various financial intermediaries in a Bayesian vector-autoregression (BVAR) and a standard VAR framework to address some of the issues. We analyze the growth of intermediary assets as an indicator of liquidity provided by intermediaries to the economy. We examine the effects of shocks to assets growth of aggregate and individual intermediary types on real GDP and different macroeconomic indicators.

We find that shocks to aggregate intermediary assets significantly impact real GDP growth and other macroeconomic indicators such as unemployment and business fixed investment. We further find that there is a shift in the overall financial intermediation process. Our sub-sample analysis of two periods, 1955-1984 and 1985-2018, shows that market-based intermediaries, such as securities brokers and dealers, have gained significance over time, while the role of commercial banks appears to be less closely tied to the overall economy. Importantly, insurance companies and shadow banks consistently demonstrate their significance throughout the sub-sample periods.

Our study is the first step towards understanding the aggregate impact of financial intermediation on U.S. economic growth. There are several ways our findings could be followed up. One such avenue is to explore whether aggregate intermediation impacts economic growth of non-U.S. economies. Additionally, it is crucial to investigate how different intermediaries make investment decisions during unfavorable intermediation conditions, such as credit unavailability.

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Notes

Note 1. An incomplete list of studies that link banks/financial intermediaries to the real economy includes Bernanke and Blinder (1988); Boot et al. (1993); Jayaratne and Strahan (1996); Kashyap et al. (2002); Cetorelli and Strahan (2006).

Note 2. A short list of related literature includes Diamond and Rajan (2001); Diamond and Rajan (2005); Diamond and Dybvig (1983) .

Note 3. An incomplete list of related literature includes Moreira and Savov (2017); Meeks et al. (2017); Bernanke (2018, 2012); Aikman et al. (2019).

Note 4. We conduct ADF (Augmented Dickey-Fuller, 1979) unit-root tests in conjunction with KPPS (Kwiatkowski et al., 1992) stationarity tests to ascertain that the variables are stationary. Most variables exhibit stationarity, and for the variables found to be non-stationary, we apply transformations and denote them with the prefix “Δ” accordingly.

Note 5. We do not report the VAR(1) coefficient estimates for the sake of parsimony. We further do not report the impulse response functions of ΔGDP to all shocks, but these results are available on request.