Do bankers matter for main street? The financial intermediary labor channel*

Yuchen Chen† Jack Favilukis‡ Xiaoji Lin§ Xiaofei Zhao¶

April 23, 2023

Abstract

Financial intermediary (FI) stress, measured by leverage, is an important driver of asset prices and quantities. We identify a new and equally important FI channel driving risk and the real sector: FIs are stressed when FI labor share (FLS) is high. FLS negatively forecasts aggregate output, investment, and credit growth; it positively forecasts excess returns and cost of credit. High FLS banks lend less and are riskier. Firms connected to such banks borrow less, grow less, and pay more to borrow. A DSGE model where FIs face shocks to the quantity of labor needed to intermediate capital explains these findings.

Keywords: Financial intermediaries, Labor market frictions

JEL classification: E43, G21, J11.

*We thank seminar and conference participants at Midwest Finance Association 2023, China International Conference in Finance 2022, SFS Cavalcade 2022, American Finance Association 2022, China International Risk Forum 2022, and the finance department at Boston College, Imperial College London, London Business School, Norwegian Business School, Texas A&M University, SUFE, University of Minnesota, and University of Texas at Austin for helpful comments and discussions. We thank Olivier Darmouni, Yunzhi Hu, Mete Kilic, Jun Li, Kai Li, Ye Li, and Mindy Z. Xiaolan for helpful comments. We also thank Yicheng Wang for excellent research assistance.

†Carlson School of Management, University of Minnesota. Email: chen3912@umn.edu

‡Sauder School of Business, University of British Columbia. Email: jack.favilukis@sauder.ubc.ca

§Carlson School of Management, University of Minnesota. Email: xlin6@umn.edu

¶McDonough School of Business, Georgetown University. Email: xiaofei.zhao@georgetown.edu

1 Introduction

This paper studies how the labor needs and labor costs of the financial sector affect aggregate risk and the real economy. Financial intermediaries (FIs) have been shown to play a central role in driving aggregate fluctuations over the business cycle. However, existing studies mostly focus on the financial leverage channel of FIs in affecting bank risk; the effect of FI labor needs and labor costs on FI health and the real economy is usually overlooked. We show that the labor channel of FIs is an important driver of asset prices and quantities, not only of the financial sector but also of the real economy.

Empirically, a high FI labor share (FLS) appears to be associated with stress in financial sector, which spills over into the real economy.[1] A high FLS predicts high aggregate excess equity returns and borrowing costs; it predicts low growth of aggregate debt, investment, and output. Our estimates imply that when FLS is one standard deviation above its mean, the one year ahead excess equity return is 190bp higher, the one year ahead borrowing cost is 70bp higher, one year ahead debt, GDP, and investment are, respectively 3.5%, 0.5%, and 2% lower. In the cross-section, banks with a high labor share lend less and have higher credit risk. Firms connected to such banks borrow less, pay more to borrow, have higher credit risk, and lower earnings growth; they also invest less, especially if they are financially constrained.

To explain these empirical facts, we build a DSGE model where FIs face shocks to the quantity of labor needed to intermediate capital, we refer to these as FI labor need (FLN) shocks. FLN shocks affect the cost of intermediation and are analogous to the "financial shocks" in Jermann and Quadrini (2012) and Khan and Thomas (2013), but specific to the labor FIs need, as opposed to the collateral constraint shocks that they model. These shocks to the intermediation technology can be thought of as a reduced form way to model intermediary behavior in a changing investment environment.

We do not take a stand on the source of the FIs labor shocks, but we propose several possible channels: (*i*) If the investment environment deteriorates, for example due to worsening moral hazard or asymmetric information, then in order to avoid worsening returns on investment, FIs will require more labor to screen and to monitor their investments; (*ii*) Default and litigation risk may be higher during recessions, leading to higher demand for debt collection and legal services by FIs;[2] (*iii*) If households lose trust in the financial system or have alternative investment opportunities or have too many choices due to more intense competition, then, in order to avoid losses in their funding, FIs will require more labor to market themselves to depositors and to manage client relationships;

[1] FLS is defined as compensation as a fraction of value added. As discussed in section 2.1.7, this predictability is not simply driven by variation in value added.

[2] For example the debt collection industry boomed in the aftermath of the 2007 financial crisis (Blumberg (2010) and Bassett (2008)), as did debt related lawsuits (Martin (2010)). This implies that the labor needs of debt holders increased.

(*iv*) Regulatory shocks, like Dodd-Frank or Sarbanes-Oxley, can require FIs to hire more people to deal with additional regulation;[3,4] (*v*) During the Covid-19 pandemic, banks were extremely busy with PPP loans, as they needed to verify various information about borrowers in a short period of time. An FLN shock may be direct, such as (iv), or could be an endogenous response to another shock, such as (i). In the latter case, we may think of FLS as a reduced form way to proxy for shocks to the labor component of the bank's production function. In the literature review section below, we discuss empirical evidence in support of some of these channels. In section 2.4 we show direct evidence that individual banks' increased regulatory compliance burden is associated with an increase in labor share, and in turn, less future lending and higher rates; we also show that aggregate regulatory shocks, as in (iv) affect the compliance burden and labor share.

In the model, a positive shock to FI labor needs per dollar of intermediated capital immediately increases FI costs and their labor share, which measures the payments to labor per dollar of value added. In principle, labor share need not rise if wages were to fall sufficiently, but since FI wages are tied to aggregate wages through labor market clearing, wages do not fall much.[5]

A positive shock to FI labor needs per dollar of intermediated capital is associated, both contemporaneously and in the future, with a fall in lending and a rise in lending costs. This happens because as it becomes more expensive for FIs to do business, they contract their balance sheets. In order to cover their higher labor costs, FIs must charge higher interest.

A positive shock to FI labor needs per dollar of intermediated capital is also associated with a contemporaneous fall in the equity return as it becomes more expensive for firms to raise capital, and as a result to produce. However, expected future equity returns are higher. This is because the economy has a limited capacity to provide equity financing to firms – modeled by a convex equity

[3]For example, the Wall Street Journal writes: "A labor-market squeeze and evolving regulatory pressures are driving demand for compliance officers ... sectors such as financial services beefed up their compliance departments following the financial crisis of 2008 and the enactment of new regulatory regimes like the 2010 Dodd-Frank Act... Cryptocurrency is one area that has heated up for compliance jobs" (Sun (2022)). Similarly, the New York Times writes "New regulation has long been one of Washington's unofficial job creation tools. After the enactment of the Foreign Corrupt Practices Act in the late 1970s, hundreds of lawyers and accountants were hired by companies to strengthen their internal controls. The Sarbanes-Oxley Act of 2002 became a boon for the Big Four accounting firms as public corporations were forced to tighten compliance in the wake of the Enron and WorldCom scandals. Now, the Dodd-Frank Act is quickly becoming such a gold mine that even Wall Street bankers, never ones to undercharge, are complaining that the costs are running amok" (Dash (2011)).

[4]A survey of banks by S&P Global (S&P Global Market Intelligence (2017)) provides additional evidence for the importance of FLN shocks in the context of Dodd-Frank. 49% of responders said compliance costs were up at least 20%, 59% said compliance costs now account for at least 10% of their annual expenses. "Operating in the current regulatory environment significantly drives up our overhead costs," said a Texas community banker; "We just pass the lost revenue or cost onto the end consumer," said a community banker from Iowa; "It isn't profitable to make loans under $1 million" said a Florida community banker; "in 20 years I doubt we will be left with anything else besides megabanks... This will have a dramatic, chilling effect on small business creation and economic growth" said a credit union respondent.

[5]As shown in footnote 40, the aggregate wage is derived from labor demand in the productive sector $W_t = (1-\alpha)Z_t\left(\frac{K_t}{N_t}\right)^{\alpha}$. In this equation, the only variable that depends on FI labor demand is $N_t = 1 - N_{t,b}$. Since FIs hire approximately only 5% of the labor force, even large moves in FI labor $N_{t,b}$ have a relatively small (in percentage terms) effect on productive sector labor N_t, and therefore a relatively small effect on the aggregate wage.

issuance cost – and as firms switch away from debt toward equity capital, investors demand higher return as compensation for the higher costs.

Finally, a positive shock to FI labor needs per dollar of intermediated capital is associated with lower investment and output, both contemporaneously and in the future. The fall in output happens because the drop in lending pushes firms away from their optimal capital structure, making them less productive and because the hoarding of labor by financial intermediaries puts upward pressure on wages, making it more expensive for firms to produce. Because households are unwilling to significantly reduce consumption, lower output leads to a fall in investment, which further reduces future output as the capital stock is lower.

We verify the importance of FLN shocks by showing that a model with TFP shocks alone is unable to match the data along various dimensions. We also extend the model to allow for credit risk, wage rigidity, and labor adjustment costs; none of these extensions is able to substitute for FLN shocks. Importantly, we are able to identify the FLN shock by matching the dynamics of FI labor as a fraction of aggregate employment. In the data, the FI labor fraction rises when GDP falls, however, models without an FLN shock imply a falling share in bad times. Furthermore, because FLN shocks are the key driver of FLS in the model, we also provide an empirical identification by estimating an aggregate shock to FLS while controlling for various aggregate quantities and prices. The extracted shock captures the bulk of the variation in FLS and has similar predictive power for the aggregate variables of interest.

Although our model is about aggregate quantities, the same intuition holds for individual FIs. If a bank suddenly requires more labor to intermediate capital, the bank's labor share will rise and its lending will fall. Furthermore, if firms face switching costs when choosing their lenders, firms connected to the affected bank will be adversely affected. As discussed above, we empirically test these relationships at the aggregate, bank, and firm level. We find strong empirical support for the model: FI labor share appears to proxy for stress to lenders, which adversely affects the real sector and increases expected equity returns.

Literature review This paper builds on five broad literatures. First, the FI asset pricing literature, which studies how constraints on FIs affect asset prices and risk premia. Studies including Danielsson et al. (2004), Gromb and Vayanos (2010), He and Krishnamurthy (2011), Adrian and Boyarchenko (2012), He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), Gromb and Vayanos (2018), and Krishnamurthy and Li (2022) have argued theoretically that FI financial leverage should matter for risk and asset prices because they are marginal investors when they are constrained. Empirical support for these theories has been found by, among others, He et al. (2017), Etula (2013), Adrian et al. (2014), Haddad and Muir (2018), and Ma (2023); for example FI financial leverage is a priced factor for the cross-section of asset returns. Our paper contributes to this literature by showing that FI labor needs are an independent channel because FI labor share predicts stock market returns, cost of debt, banks' risk, and real outcomes, even when controlling for FI financial leverage.

Second, the macroeconomic literature studying the role of FIs in amplifying the shocks to business cycles.[6] Christiano et al. (2014) imbed agency problems associated with financial intermediation as in Bernanke et al. (1999) into a monetary dynamic general equilibrium model; they find volatility shocks are important in driving the business cycle. Gertler and Kiyotaki (2015) study the macro implications of banking instability in a DSGE model with financial accelerator effects and bank runs. Begenau and Landvoigt (2018) study the macroeconomic impact of capital regulation in a model with both commercial banking and shadow banking sectors. Elenev et al. (2018) investigate the macro-prudential policy in a large scale quantitative model with financially constrained producers and intermediaries. Diamond et al. (2020), Bolton et al. (2022), and Li (2022) all build macro models of intermediaries with a focus on the liquidity of either assets or liabilities. We complement this literature by showing that the labor needs and labor costs of the financial sector matter for FI health, which directly affects the loan supply to the real sector; this in turn affects the real investment and asset prices.

Third, the empirical literature investigating the relationship between FIs and firms' real decisions.[7] Peek and Rosengren (1997) document that shocks to Japanese stock market causes the US branches of Japanese banks reduce their loans, with the effect being stronger for weaker banks. Ivashina and Scharfstein (2010) document large drops in lending of banks during the financial crisis. Iyer et al. (2013) show that the during the 2008 financial crisis, firms connected to more affected banks had larger credit disruptions; Chodorow-Reich (2014) shows such firms decreased employment by more. We show that banks with higher labor share cut lending more and hence affect the real investment of their borrowers.

Fourth, this paper relates to the macroeconomic literature on wages and labor,[8] although only more recently has this literature begun to relate to financial economics.[9] On the other hand, financial economists have also recently begun exploring links between labor and asset prices both in structural models,[10] and empirical analysis.[11] However, there has been relatively little work

[6] Classic papers on the amplification of the frictions of financial intermediaries to aggregate shocks include Bernanke and Gertler (1989), Carlstrom and Fuerst (1997), Bernanke et al. (1999), Jermann and Quadrini (2012), Khan and Thomas (2013), etc.

[7] A partial list of papers include Bernanke (1983), Slovin et al. (1993), Gan (2007), etc.

[8] Examples include Pissarides (1979), Calvo (1983), Taylor et al. (1983), Taylor (1999), Shimer (2005), Hall (2005), Gertler and Trigari (2009).

[9] See Hall (2016) who reviews the recent literature and shows that a higher discount rate is associated with higher unemployment.

[10] Examples include Danthine and Donaldson (2002), Berk et al. (2010), Berk and Walden (2013), Petrosky-Nadeau et al. (2018), Belo et al. (2014), Donangelo (2014), Li and Palomino (2014), Palacios (2015), Favilukis and Lin (2015), Zhang et al. (2014), Blanco and Navarro (2016), Donangelo et al. (2010), and Favilukis et al. (2020).

[11] Many papers have linked asset returns or financing decisions to various measures of operating leverage, most related to labor. These include Ruback and Zimmerman (1984), Abowd (1989), Hirsch (1991), Chen et al. (2011), Lee and Mas (2012), Simintzi et al. (2014),Weber (2015), Favilukis and Lin (2016), Gorodnichenko and Weber (2016), Tuzel and Zhang (2017), D'Acunto et al. (2018), Donangelo et al. (2019), Donangelo (2018), Campello et al. (2017), and Qiu and Shen (2017). On the other hand Lettau et al. (2019) and Greenwald et al. (2023) show that the aggregate

focusing on the labor of FIs specifically. One notable exception is Philippon and Reshef (2012), which studies the long term evolution of compensation in the financial sector.

Finally, there is a growing literature that provides empirical support for the importance of FI labor and shocks to FI labor productivity. Flanagan (2022) estimates that banks create 190bp of value added on their syndicated loans, most of which is paid to the bank's employees. He attributes most of this to the bank's screening and monitoring activities and shows that this value added was higher in more complex situations – consistent with our assumption that there are certain times or circumstances when banks require more labor to intermediate capital.[12] Sharpe and Sherlund (2016), Choi et al. (2022), and Ma (2022) all document the importance of labor capacity constraints for mortgage lenders; this implies that the amount of lending is tied to the number of loan officers, as in our model. These papers also document that when demand is high and lenders are at their capacity constraint, they switch toward borrowers who are easier to process, for example refinancing (as opposed to new originations) and high credit score borrowers - in effect, this makes loan officers more productive in good times. In addition, Fuster et al. (2022b) document that the price of intermediation fluctuates significantly, reflecting capacity constraints, and that in 2008-2014, the price of intermediation increased by about 30bp per year, reflecting higher mortgage servicing costs and an increased legal and regulatory burden. Finally, Fuster et al. (2022a) show that during the Covid-19 pandemic, there was a large and sustained increase in intermediation markups, due to pandemic related labor market frictions and operational bottlenecks.[13]

2 Empirical evidence

In this section we explore empirical relationships between labor share in the financial sector and the fluctuations in asset prices, credit, and quantities of the real sector. We do so first, using aggregate, time series analysis of U.S. data, and second, using a cross-sectional analysis of bank-firm-level data.

In the aggregate-level time series analysis, we document that a high financial intermediary labor share (FLS) is associated with stress in equity markets, credit markets, and the real economy. Specifically, using aggregate data, FLS is negatively associated with contemporaneous stock market returns, but positively predicts future stock market returns and the Baa - Fed Funds spread; it is

labor share is related to the cross-section of equity returns and to asset price movements; they attribute to it proxying for redistribution risk.

[12] Specifically, he shows that the value added is higher for firms that are smaller, younger, and without a credit rating. It was also higher for firms previously audited by Arthur Anderson after its exit from auding following the Enron and Worldcom scandals.

[13] There is also a related literature on the busyness of agents impacting their financial decisions. Fich and Shivdasani (2006) show that when board members are busy, corporate governance is weaker. Kempf et al. (2016) show that firms whose shareholders are distracted are more likely to make bad decisions. Wang (2022) show that proxy advisors make worse recommendations when the proxy statement is more complex and when the advisors are especially busy.

negatively associated with both contemporaneous and future debt growth, investment growth, and output growth. These empirical findings mirror the prediction of our model in section 3.

Using bank-level data, a bank holding company's labor share positively predicts the bank's risk, measured as expected default frequency (EDF); it negatively predicts its loan growth. Furthermore, in the bank-firm pair analysis, using Dealscan loan origination data, we show that firms connected to a bank with a high labor share experience lower debt growth, have higher expected default risk, pay more to borrow, and see lower earnings growth. Their investment growth is negative but not statistically significant, however it is significant for a subset of firms who are financially constrained. These empirical findings mirror the aggregate empirical findings. While our model only speaks to aggregate quantities, the mechanism in our model should also work at the individual bank level, and would be consistent with these empirical findings.

2.1 Aggregate-level time series analysis

This section performs time series analysis using aggregate data. We show that when the labor share of the financial sector is high, current excess equity returns are low, but future excess equity returns and the cost of corporate borrowing tend to be high. At the same time, current and future corporate debt growth, GDP growth, and investment growth tend to be low. We first describe the data, then the empirical specifications and the results.

2.1.1 Data and variable definitions

Our dependent variables of interest are non-financial sector debt growth, Baa minus Fed Funds spread, aggregate GDP growth, aggregate private investment growth, and market excess return. Our key independent variable is labor share in the financial sector (FLS), which is the ratio of compensation of employees to net value added of the financial business sector from Integrated Macroeconomic Accounts (IMA). The measure of compensation includes salaries, wages, pensions, and other benefits such as bonuses. As controls, we include aggregate labor share (LS), aggregate GDP growth, aggregate wage growth (ΔW), credit spread (CS), term spread (TS), price-dividend ratio (PD), and financial sector value added growth (ΔFVA). We additionally control for FI leverage ratios constructed from Adrian et al. (2014) (hereafter "AEM") and He et al. (2017) (hereafter "HKM"). The final sample for aggregate time series regressions contains annual data from 1961 to 2019.[14] Appendix section A contains more detailed definitions of these variables as well as the summary statistics.

[14] We start in 1961 because that is the start of Integrated Macroeconomic Accounts (IMA) data and end in 2019 just before the Covid-19 pandemic. The time series of HKM (1970-2019) and AEM (1970-2012) are available for a shorter sample.

2.1.2 Descriptive statistics

Table 1 presents summary statistics for financial sector labor share (FLS), value added growth, and financial leverage ratios constructed from the literature ("HKM" and "AEM"). Other aggregate variables include GDP growth, non-financial corporate debt growth, investment growth, wage growth, consumption growth, and aggregate labor share. All the growth rates are calculated based on real quantities. The average FLS is 0.64, somewhat higher than the labor share for the aggregate economy, which is 0.55. The correlation of the two is just −0.02, suggesting that FLS contains different information than the aggregate labor share.[15] FLS is counter-cyclical, its correlation with real GDP growth is −0.30. FLS positively correlates with the financial sector leverage ratios but these correlations are 0.16 and 0.43, implying that FLS captures different information from financial leverage.

2.1.3 FLS and excess equity return

In this subsection, we explore the relationship between FLS and excess aggregate stock market returns. Table 2 shows that FLS positively predicts excess market returns at 1-year, 3-year, and 5-year horizons (Panels B, C, D). The first column presents the results from a univariate regression; FLS positively and statistically significantly predicts returns with t-statistics of 1.96, 2.94, and 3.25 for 1-year, 3-year, and 5-year horizons respectively.[16] A one standard deviation increase in financial labor labor share corresponds to an increase by a factor of 1.27 in the 1-year ahead market excess return.[17]

The remaining columns present the results from bivariate regressions, with one control at a time. When adding controls, the coefficient on FLS is always positive. It becomes insignificant for 1-year ahead returns with some controls; it is positive and statisitcally significant in all 3-year and 5-year ahead specifications. Importantly, FLS remains significant when including either "HKM" or "AEM", the two variables frequently used to proxy for FI health.

Panel A shows that unlike future expected return, where the relationship is positive, the contemporaneous relationship between FLS and realized return is negative, though not statistically significant.

These results are in line with our model, where a positive shock to the financial intermediary sector's labor needs (FLN) causes an increase in FLS. The same shock is also associated with lower aggregate equity returns contemporaneously, but higher expected future equity returns. Contem-

[15]Notably FLS does not display a downward trend in our sample, in contrast to the aggregate labor which has trended downward during the last 40 years. This implies that our econometric tests do not suffer the spurious tests issues due to non-stationarity raised in Granger and Newbold (1974).

[16]In our baseline regression, we use Newey-West standard errors with 13 lags. We also try 2, 4, and 8 lags. For some of these, the 1-year forecast becomes insignificant, although the 3-year and 5-year remain significant.

[17]Since the average historical equity premium is around 7%, this implies that the equity premium is 190 basis points higher.

poraneous returns are low because it will now become more expensive for firms to raise capital. Expected future returns are high because when FLS is high, firms shift toward more equity financing, which raises equity issuance costs, and leads investors to require higher compensation for holding equity.

2.1.4 FLS and credit markets

Next we turn to the impact of FLS on credit markets, specifically corporate debt growth and the cost of credit, measured by the spread between Baa bonds yields and the Federal Funds rate. We carry out exactly the same exercise as with market excess return in the previous subsection, but with these two dependent variables; these results are presented in Table 3 for debt growth and Table 4 for the Baa - Fed Funds spread.

FLS negatively and significantly predicts aggregate credit growth, with t-statistics of -5.22, -5.88, and -3.87 for 1-year, 3-year, and 5-year horizons respectively (Panels B, C, D). The univariate R^2's are 0.24, 0.23, and 0.19. The strong statistical significance remains when we add controls. In Appendix Table A.2 we show that this is also true for financial sector credit growth.

FLS positively and significantly predicts the cost of credit, with t-statistics of 4.21, 2.42, and 1.78 for 1-year, 3-year, and 5-year horizons respectively (Panels B, C, D). The univariate R^2's are 0.14, 0.05, and 0.01. The strong statistical significance remains for the 1-year horizon when we add controls; for 3-year and 5-year horizons, all coefficients remain positive but some become insignificant with controls.

Panel A shows that the same relationships – negative between FLS and credit growth and positive between FLS and cost of debt – hold contemporaneously. One exception is that the Baa - Fed Funds spread contemporaneous slope on FLS becomes negative and insignificant when controlling for term spread. This is because the two spreads are very strongly contemporaneously correlated.

These results are in line with our model, where a positive FLN shock is associated with lower lending and higher cost of lending, both contemporaneously and in the future. As it becomes more expensive for financial intermediaries to do business, they contract their business activities, and therefore lend less. In order to cover their higher labor costs, financial intermediaries must charge higher interest. Firms are willing to pay higher interest because as lending is cut, they are further away from their optimal capital structure, thus the benefit of an extra dollar of debt, relative to equity capital increases.

2.1.5 FLS and real outcomes

Finally, we study the impact of FLS on real quantities, specifically aggregate GDP growth and investment growth. Again, the exercise is analogous to the ones in the previous two subsections, but with two new dependent variables; these results are presented in Table 5 for GDP growth and Table 6 for investment growth.

FLS negatively and significantly predicts GDP growth, with t-statistics of -2.23, -1.78, and -1.52 for 1-year, 3-year, and 5-year horizons respectively (Panels B, C, D). Similarly, FLS negatively and significantly predicts investment growth, with t-statistics of -2.64, -1.89, and -0.17 for 1-year, 3-year, and 5-year horizons respectively (Panels B, C, D). However, this predictability has a shorter horizon than for credit variables in the previous section as these results become statistically insignificant for some controls and for the 5-year horizon.

Panel A shows that the same negative relationships between FLS and either GDP growth or investment growth hold contemporaneously, though it becomes statistically insignificant with some controls.[18]

These results are in line with our model, where a positive FLN shock is associated with lower investment and output, both contemporaneously and in the future. As financial intermediaries hoard labor, wages rise, leading to less labor and therefore lower output in the real sector, contemporaneously with the FLN shock. Lower output leads to lower investment as households are unwilling to substantially cut consumption. Going forward, output and investment continue to be low for two reasons. First, lower investment at the time of the shock leads to slower capital accumulation and lower future output. Second, because of lower lending, firms' capital strucutre is futher away from optimal, leading to lower productivity and lower output.

2.1.6 Drivers of FLS

To understand the drivers of FLS, we use two methods to estimate aggregate disturbances to FLS in the data. In the first, we regress FLS on well-identified macro shocks in the literature including shocks to TFP, time-varying uncertainty, financial frictions, etc., and extract the shock to FLS. In the second, we estimate a VAR that includes several variables related to business cycles including GDP growth, aggregate labor share, wage growth, price-to-dividend ratio, credit spread and FI leverage (denoted by HKM) and again extract a shock to FLS.[19] We show these two extracted shocks are highly correlated and drive 70-90% of the variation in FLS. This analysis shows that there is an aggregate shock that primarily drives the variation in FLS which is not captured by existing macro shocks documented in the literature. This is also the justification for why we introduce the FLN shock in the model.

The VAR exercise allows us to study how FLS respond to other macro variables. The impulse responses are shown in Appendix figure A.8. By far, the strongest response of FLS is to its own

[18] The negative contemporaneous correlation between FLS and GDP growth may raise concerns that the shock originates from firms and propagates to the financial sector. To aleviate this concern, we confirm that GDP growth does not Granger cause FLS, while FLS does Granger cause GDP growth at 10% significance.

[19] The sample for these two exercises are from 1970 to 2019. Results are available upon request.

shock. The responses to all other shocks are not significantly different from zero.

We then recompute all of the aggregate results using each of these shocks rather than FLS as our key explanatory variable. We find that the results are mostly robust: excess return predictability is reduced at a one year horizon but remains significant at other horizons; debt and investment growth predictability remains strong at all horizons; credit spread and GDP growth predictability remains significant at shorter horizons.

Lastly, in the model presented in Section 3, FLS is positively associated with expected stock returns and credit spreads, and negatively with output, investment, and credit issuance, which is why FLS is our independent variable of interest. However, FLS is an endogenous variable in the model, mostly driven by the exogenous FLN shock – the shock to the labor needed per unit of capital by financial intermediaries (ν_b in the model). In the data, the FI labor to capital share is non-stationary, declining significantly during our sample, therefore we compute its 1-sided HP filter. This variable has a 0.63 correlation with FLS. In Appendix Tables A.7, A.8, A.9, A.10, A.11, and A.12 we show that it has quantitatively similar predictive power as FLS.[20]

Appendix Table A.17 also shows that the three alternative measures of the financial sector's labor burden used in this section (ν_b, and the two extracted shocks) co-move closely with FLS.

2.1.7 Robustness

In the results above, we focus on bivariate regressions, comparing FLS to other predictors one at a time. In Appendix tables A.3, A.4, and A.5 we redo the results with multivariate regressions that include all predictors together. Although the danger of multicolinearity makes these results difficult to interpret, FLS remains significant in almost all specifications. The two exceptions are 1 year ahead equity predictability and 1 year ahead borrowing cost predictability, both of which keep the same sign, but become insignificant.

In all of our regressions, we have included aggregate labor share as a control, thus the results suggest that there is something unique to the labor share of financial intermediaries. As an additional placebo, we have constructed a labor share measure of high skilled workers, unfortunately, it is only available starting in 1997. In Appendix table A.6, we show that high skilled labor share does not predict any of our variables of interest. On the other hand, despite the shorter sample, financial sector labor share retains most of its predictive power. We have also checked that non-financial, non-corporate sector labor share, non-financial, corporate sector labor share, and government labor share do not exhibit the same predictability as financial labor share.

Since FLS is a ratio, it may be interesting to know whether its predictability is due to the numerator (compensation) or the denominator (value added). Both the numerator and the denom-

[20] We use a filtering parameter of 100, standard for annual data. The reason we use FLS in our main results, rather than filtered FI labor to capital ratio, is that FLS is stationary over our sample, whereas for FI labor to capital, we would need to choose a filtering parameter, which is an additional degree of freedom.

inator are non-stationary, therefore we cannot include both independently in the regression. In all regressions, we include the growth of value added (ΔFVA) as one of the controls, suggesting it is not just movements in value added that are driving FLS. For our bank level results in Sections 2.2, since the identification comes from the cross-section, we can include both the numerator of FLS (compensation) and the denominator of FLS (value added) in the regression independently. Results in Appendix Table A.14 suggest that it is variation in compensation, rather than value added that is mostly responsible for the predictability. Finally, in Appendix tables A.7, A.8, A.9, A.10, and A.11 we redo all of our aggregate using the FI labor to total capital ratio. As discussed in 2.1.6 this variable is closely related to the shock in the model in Section 3 and has has similar predictive power to FLS, despite not containing value added.

2.2 Bank-level analysis

In this section, analogous to the previous section, we explore the empirical relationships between bank level labor market fluctuatons and firm level fluctuations in credit, credit risk, and real outcomes. We do so through panel regressions. Bank-level regressions significantly expand sample size and allow us to include more granular variables and fixed effects to control for other factors and the credit demand effect. We show that banks with higher FLS tend to lend less and have higher risk, as measured by EDF.

2.2.1 Data and variables definitions

For bank-level regression analysis, we focus on bank holding companies and use balance sheet variables from FR Y-9C, available from Federal Reserve Bank of Chicago. Following the literature, we apply several filters to select bank holding companies.[21] The final sample for bank-level analysis is a panel consisting of 41,511 annual observations in total, including 4,307 unique bank holding companies from 1986 to 2019.[22]

Our key independent variable is bank i's labor share, which is defined as the ratio of labor expenses to the sum of earnings before interest and labor expenses: $FLS_{i,t} = \frac{XLR_{i,t}}{EBIT_{i,t}+XLR_{i,t}}$, where XLR is the labor expenses and EBIT is the earnings before interest. As with the aggregate results, this measure includes salaries, wages, pensions, and other benefits such as bonuses. The bank level dependent variables are the bank's average expected default frequency (EDF) over the next 3 years

[21] We drop observations with missing values or non-positive values for total assets; we keep bank holding companies (RSSD9331=28); we drop Grandfathered savings and loan holding company (RSSD9425=18); we drop lower-tier holding companies whose higher-tier also files Y-9C (BHCK9802=2); we keep holding company (RSSD9048=500), and exclude securities broker or dealer (RSSD9048=700), insurance broker or company (RSSD9048=550), utility company (RSSD9048=710), and other non-depository institution (RSSD9048=720) but keep Goldman Sachs, Morgan Stanley, Ally, and American Express. Finally, we drop observations with negative labor share.

[22] The number of bank holding companies by year is shown in Appendix Figure A.1.

and the 3 year growth in total loans.[23] Bank holding company characteristics used as controls include bank size, return to assets, capital ratio, interest expense, earnings growth, and share of non-performing commercial and industrial (C&I) loans.[24] We also include bank holding company fixed effect α_i and its state-year fixed effect $\delta_{s,t}$, where s is for state and t is for year. The state-year fixed effect is used to control for local demand and other local shocks effect including changes in bank regulation. We estimate the following model:

$$y_{i,t+k} = \alpha_i + \delta_{s,t} + \beta FLS_{i,t} + \Gamma' Controls_{i,t} + \epsilon_{i,t+k}, \tag{1}$$

where $y_{i,t+k}$ is either bank i's 3 year loan growth or its 3 year credit risk.[25]

2.2.2 Bank FLS and bank loan growth

In this subsection, we examine the bank's loan growth over the next 3 years as the variable of interest $y_{i,t+k}$. Table 7 shows that a bank's labor share ($\text{FLS}_{i,t}$) negatively and significantly predicts total loan growth over the next 3 years (columns (1) to (4)), as well as C&I loan growth (columns (5) to (8)). The relationship is strong, with t-statistics ranging from -7.8 to -26.2, depending on the specification. The coefficient estimates in the first rows of column (4) and (8) imply that a one-standard-deviation increase in bank labor share reduces total loan growth and business loan growth rates by 25.3% and 36.2%.[26]

2.2.3 Bank FLS and bank credit risk

In this subsection, we examine the bank's credit risk, as measured by its average EDF over the next 3 years, as the variable of interest $y_{i,t+k}$.[27] Table 8 shows that a bank's labor share ($\text{FLS}_{i,t}$) positively and significantly predicts the bank's future credit risk, with t-statistics between 5.2 and 7.8, depending on the specification. The coefficient estimate in the last column implies that a

[23] These are items BHCK2122+BHCK2123. We also consider sub-components like C&I loans (BHCK1766); C&I loans to firms in U.S. (BHCK1763), consumer loans (BHCK1975) and real estate loans (BHCK1410).

[24] Size is measured as log of total asset (BHCK2170), return to assets is measured as ratio of net income (BHCK4340) to total assets (BHCK2170), capital ratio is measured as ratio of total equity to total assets, interest expense is measured as the ratio of total interest expense (BHCK4073) to total deposits (BHDM6631+BHDM6636+BHFN6631+BHFN6636), while share of non-performing C&I loan is measured as ratio of total non-performing C&I loan (BHCK1606+BHCK1607+BHCK1608) to total loan. Note that capital ratio is a measure of financial leverage for banks, similar to the leverage ratios that we use in the aggregate analysis.

[25] We define loan growth as $y_{i,t+k} = \Delta Loan_{i,t+k} = 2\frac{Avg(Loan_{i,t+1:t+k}) - Avg(Loan_{i,t-k+1:t})}{Avg(Loan_{i,t+1:t+k}) + Avg(Loan_{i,t-k+1:t})}$ and credit risk as $y_{i,t+k} = Avg(EDF_{i,t+1:t+k})$ where the forecast horizon is 3 years ($k = 3$).

[26] The standard deviation of FLS is 0.298, leading to 0.298*0.14=4.2% lower growth rates of total and business loans. The average 3 year growth rates are 16.6% and 11.6% respectively, therefore the reductions are 4.2/16.6=25.3% and 4.2/11.6=36.2%.

[27] Unlike the loan growth sample, this sample is from 1992 to 2011 due to data availability.

one-standard-deviation increase in labor share increases EDF by 43.3%.[28]

2.3 Bank-firm pair analysis

In the previous subsection, we analyze how loan lending at the bank holding company level is affected by its labor share. However, if firms were to simply substitute their borrowing from affected to unaffected banks, then any effects on firms would be limited. On the other hand, if firms are "locked-in", as proposed by Sharpe (1990) and Rajan (1992), and empirically tested by Chodorow-Reich (2014), then firms with relationships to affected banks would also be affected. Indeed, below we show that firms that are connected to affected banks by lending relationships issue less debt, pay higher prices for the debt they issue, have higher expected default probability, and have slower earnings growth. Although they do not invest significantly less on average, those firms that are financially constrained do invest significantly less.

2.3.1 Data and variables definitions

We study lender-borrower pairs at an annual frequency by using loan issuance data from Dealscan and combining it with firms' accounting data from Compustat.[29] We focus on syndicated loans, which are usually large loans with long maturities that are frequently issued by multiple lenders. For each syndicated loan, we only consider the lead lender's balance sheet and we use allocation information to determine lead lender's loan amount.[30]

Our key independent variable is the labor share of the lead lender i in year t ($FLS_{i,t}$). If the firm borrows multiple facilities from different lead lenders in a year, we use the weighted average (by loan amount) of lead lenders' labor share. We examine the effect of FLS on various firm level variables of interest $y_{i,j,t+k}$ where borrower j is borrowing from lender i in year t. We control for both lender and borrower's characteristics in the fixed effect regression specification:

$$y_{i,j,t+k} = \alpha_i + \delta_{s,t} + \beta FLS_{i,t} + \Gamma' Bank\ Controls_{i,t} + \Theta' Firm\ Controls_{j,t} + \epsilon_{i,j,t+k}, \tag{2}$$

where α_i is the bank fixed effect and $\delta_{s,t}$ is either the year or state-year or industry-year fixed

[28]The standard deviation of FLS is 0.273, leading to 0.273*1.44 = 0.39 higher EDF. The average EDF is 0.90, therefore the increase is 0.39/0.90 = 43.3%.

[29]WRDS has updated the Dealscan dataset starting from the summer of 2021. The update is a reorganization of the entire dataset, combining all the information in a single table and changing loan identifiers. The analysis here is based on a vintage of Dealscan, which is now considered the "legacy" version on WRDS. In particular, we use data from the following tables: Facility-Legacy, Package-Legacy, Company-Legacy, Lenders-Legacy, Current Facility Pricing-Legacy and Dealscan-Compustat Linking Database.

[30]We apply the same filters to select bank holding companies as the ones used in the bank-level regression analysis, with additional details in Appendix section A.4. The merged sample contains 47 unique bank holding companies compared to 4307 in the full sample. The bank companies in the merged sample are larger ($18 billion versus $13 billion average size) and have higher FLS (0.67 versus 0.63), but are relatively similar in their ROE, leverage, capital ratio, and cost of funding.

effect. We include firm's state-year and 1-digit SIC-year fixed effects to address the concern that local economic conditions or industry conditions may affect firms' demand for loans.

The outcome variables $y_{i,j,t+k}$ we consider are firm j's growth in loan issuance over the next 3 years, average borrowing cost over the next 3 years, average distance to default over the next 3 years, change in investment rate over the next 3 years, or earnings growth over the next 3 years.[31,32] Firm characteristics used as controls include firm size, Tobin's Q, cash, financial leverage, past sales growth, tangibility and credit rating. Details about variable construction are provided in Appendix Table A.1.

The final sample for this pair panel regression analysis contains 17,907 bank-firm pair observations with 47 banks and 2709 firms from 1986 to 2019.[33] For bank-firm credit spread, we further merge the data with the loan pricing dataset, shrinking the sample to 15,601 bank-firm pair observations with 47 banks and 2342 firms. Summary statistics for bank holding companies are presented in Appendix Table A.13.

2.3.2 Bank FLS and firm credit outcomes

In this subsection, we examine the relationship between a bank's labor share (FLS) and various credit outcomes for firms connected to this bank. We find that firms connected to banks with high FLS borrow less, pay more to borrow, and have higher expected default rates. These results are presented in Table 9.

In Panel A, we investigate the growth rate of firm j's total loan borrowing over a 3-year window as the variable of interest $y_{i,j,t+k}$. A bank's labor share negatively and significantly predicts the growth rate of loan issuance by firms that are connected to the bank through a lending relationship, with t-statistics ranging from -2.3 to -2.9, depending on the specification. The coefficient estimate of -0.51 in column (3) implies that a one-standard-deviation increase in a bank's labor share reduces

[31] Loan issuance data from Dealscan is available at a quarterly frequency. We thus aggregate the amount of loan issuance every year for each bank-firm pair. We define issuance growth as $y_{i,j,t+k} = \Delta Loan\ Amount_{i,j,t+k} = 2\frac{\sum_{m=t+1}^{m=t+k} Loan\ Amount_{i,j,m} - \sum_{m=t-k+1}^{m=t} Loan\ Amount_{i,j,m}}{\sum_{m=t+1}^{m=t+k} Loan\ Amount_{i,j,m} + \sum_{m=t-k+1}^{m=t} Loan\ Amount_{i,j,m}}$. We measure borrowing cost as as the weighted average (by loan amount) of loan spread "All-in-drawn" from Dealscan Loan Pricing dataset. We only consider facilities that use "LIBOR" as the base rate and drop facilities that have negative "All-in-drawn" or "All-in-drawn" over 1000 basis points. We drop facilities that have maturities shorter than one year. The borrowing cost is defined as $y_{i,j,t+k} = Avg(Loan\ Spread_{i,j,t+1:t+k})$. We follow Merton (1974) and Gilchrist and Zakrajšek (2012) to measure firm-level distance to default (D2D) and define $y_{i,j,t+k} = Avg(D2D_{t+1:t+k})$. Change in investment rate is defined as $y_{i,j,t+k} = \frac{Avg(CAPX_{t+1:t+k}) - Avg(CAPX_{t-k+1:t})}{PPENT_t}$. Earnings growth is defined as $y_{i,j,t+k} = 2\frac{Avg(IB_{t+1:t+k}) - Avg(IB_{t-k+1:t})}{Avg(IB_{t+1:t+k}) + Avg(IB_{t-k+1:t})}$ where IB is Income Before Extraordinary Items. In all cases, the forecast horizon is 3 years ($k = 3$).

[32] To create a panel that is similar to a credit registry, we follow Lin and Paravisini (2013) for a modified approach of Khwaja and Mian (2008), sum the total amount of lending for each firm over subsequent three-year periods and use these aggregated loan amounts to compute the loan growth. Thus, when a new loan is initiated, we can compare the amount borrowed that year (and the following two years) to the amount borrowed in the three years prior to the new loan. We follow an analogous strategy for other variables of interest.

[33] In our final sample, 95.6% of the firm-year observations have single lender, 4.3% of the firm-year observations have two lenders. We drop observations where firms have over three lenders in that period.

new issuance of connected firms by 10.3%.[34]

In Panel B, we investigate firm j's borrowing cost over the next 3 years as the variable of interest $y_{i,j,t+k}$. A bank's labor share positively predicts the borrowing cost for firms that are connected to the bank through a lending relationship, although the statistical significance is marginal. The coefficient estimate of 0.33 in column (3) implies that a one-standard-deviation increase in a bank's labor share increases borrowing costs of connected firms by 5.0 bp or 3.0%.[35]

In Panel C, we investigate firm j's credit risk (measured as distance to default) over the next 3 years as the variable of interest $y_{i,j,t+k}$. A bank's labor share positively and significantly predicts the credit risk (negatively predicts distance to default) of firms that are connected to the bank through a lending relationship, with t-statistics between -2.8 and -3.8. The coefficient estimate of -1.61 in column (3) implies that a one-standard-deviation increase in a bank's labor share decreases the distance to default of connected firms by 3.9%.[36]

2.3.3 Bank FLS and firm real outcomes

In this subsection, we examine the relationship between a bank's labor share (FLS) and investment rate or earnings growth for firms connected to this bank. We find that firms connected to banks with high FLS experience lower earnings growth. They do not, on average, experience significant investment rate reductions, although the most financially constrained firms do reduce investment rate. These results are presented in Table 10.

In Panel A, we investigate the change of firm j's investment rate over a 3-year window as the variable of interest $y_{i,j,t+k}$. A bank's labor share negatively but insignificantly predicts a lower investment rate for firms that are connected to the bank through a lending relationship, with t-statistics between -0.8 and -1.09. However, as we show in Appendix Table A.16, when we focus on financially constrained firms, defined as in the top tercile by their Whited and Wu (2006) financial constraint index, the t-statistics rise to between -1.6 and -2.3 for constrained firms, while the point estimates are near zero for unconstrained. Since firms have other margins of adjustment – like using internal funds, borrowing from alternative lenders, or raising equity – it makes sense that financially constrained firms would be most affected.

In Panel B, we investigate the growth rate of firm j's earnings over a 3-year window as the variable of interest $y_{i,j,t+k}$. A bank's labor share negatively and significantly predicts the growth rate of earnings by firms that are connected to the bank through a lending relationship, with t-

[34]The standard deviation of FLS is 0.156, leading to a 0.156*51% = 8.0% lower growth rate of loan borrowing. The average loan growth rate over 3 years is 78%, therefore this is a 8.0/78 = 10.3% reduction.

[35]The standard deviation of FLS is 0.153, leading to a 0.153*33 bp = 5.0 bp increase in the borrowing cost. The average borrowing cost is 169 basis points per year, and therefore, this is a 5.0/169 = 3.0% increase.

[36]The standard deviation of FLS is 0.156, leading to a -1.61*0.156 = -0.251 change in the distance to default. The average three-year distance to default is 6.46, and therefore, this is a -0.251/6.46 = 3.9% decrease in firm's credit risk.

statistics ranging from -2.1 to -2.4, depending on the specification. The coefficient estimate of -0.64 in column (3) implies that a one-standard-deviation increase in a bank's labor share reduces earnings growth of connected firms by 37.7%.[37] In Appendix Table A.16 we show that as with investment, the effect is much stronger for financially constrained firms, and near zero for unconstrained.

2.4 Direct evidence of FLN shocks

Most of this paper provides indirect evidence for FLN shocks by showing that high FLS is associated with credit market stress both at the aggregate and individual bank level. In this section we provide more direct evidence for one specific source of FLN shocks. We do so by creating two proxies of compliance burden and showing that FLS is positively related to the compliance burden. We then show that the compliance burden components of FLS are negatively related to loan growth and positively related to loan spreads. These results are in Appendix Table A.18.

The first measure defines the regulatory compliance burden of bank i in year t as its legal and data processing expenses, scaled by total assets; this measure uses the same bank data as in Section 2.2. Analogous to an instrumental variables approach, in the first stage, we ask how much of the change in FLS can be explained by the change in regulatory burden – the relationship is significant, this is in Column (1) of Panel A. In the second stage, we show that the predicted change in FLS positively and significantly predicts the loan growth over the next three years, and negatively and significantly predicts the loan spreads on the bank's lending over the next three years. In Panel B, we carry out the same exercise but our measure of regulatory compliance burden is defined at the aggregate level (time-series variation only) using banking regulation documents.[38] Again, this proxy positively and significantly predicts loan growth and negatively and significantly predicts loan spreads. If changes in either of these two regulatory burden measures are exogenous to an individual bank, these proxies can be interpreted as instrumental variables.

In column (4) of Panel B we also show that the change in legal and processing expenses (the first measure) is itself positively and significantly related to the aggregate increase in regulatory burdens (the second measure). This is also consistent with survey evidence. For example, 49% of the respondents in an S&P Global Market Intelligence survey said compliance costs were up 20% or more since Dodd-Frank was implemented, and 59% said compliance costs now account for at least 10% of their annual expenses.

[37] The standard deviation of FLS is 0.156, leading to a 0.64* 0.156 = 0.10 lower growth rate of earnings. The average earnings rate over three years is 26.5% and therefore, this is a 0.10/0.265 = 37.7% reduction.

[38] To construct this measure, we follow Hogan and Burns (2019), who measure regulation burdens using the text of banks and banking regulation documents. More specifically, we use the number of regulatory restrictions, which captures the text of the Code of Federal Regulations Title 12 for language that restricts activities such as "shall" or "shall not" and "must" or "must not."

3 Model

In order to explain the empirical findings in section 2, we build a dynamic stochastic general equilibrium model in which banks intermediate between households, who invest capital, and corporations, who raise capital. The key mechanism in our model is that intermediation activities require banks to hire labor. The key shock in our model is a financial shock in the spirit of Jermann and Quadrini (2012) and Khan and Thomas (2013),[39] but affecting the amount of labor needed per dollar of intermediated capital, we refer to these as FLN shocks.

In section 3.1 we write down a version of our model without banks or debt. We take this step because for tractability, we set up the firm's problem in a non-standard way and believe it is helpful for the reader to understand the simpler problem first. Typically in models with capital adjustment costs firms are infinitely lived, which requires the firms' problem to be solved numerically. In our model new firms are born each period and live until next period only, which allows us to solve the firm's problem analytically as a function of the state. In sections 3.2.1, 3.2.2, and 3.2.3 we write down the problem of the households, firms, and banks for the more general case with banks and corporate debt. We then desribe the calibration in section 3.3 and explain the results in section 3.4. Finally, in section 3.5, we explore alternative mechanisms and argue that it is difficult to explain the data without FLN shocks. In Appendix sections C.2 and C.3 we extend this model to have corporate default and wage rigidity.

3.1 Frictionless problem

Households have CRRA utility and supply a constant amount of labor N_t, normalized to one. Let NW_t be the household's net worth, $W_t N_t$ the wage multiplied by the labor supply (equivalently labor income), C_t its consumption, θ_t the shares of equity it owns ($\theta_t = 1$ in equilibrium), $V_{t,o}$ (o for old) the t equity value of firms born at $t-1$ who pay out their profit at t and then shut down, and $V_{t,n}$ (n for new) be the t equity value of firms born at t. For brevity, we do not include a risk free asset in this problem, though it will be available in the full problem we write down further below. The household's problem is:

$$\begin{aligned}
&U(NW_t) = \max_{C_t} \frac{C_t^{1-\rho}}{1-\rho} + \beta E_t \left[U(NW_{t+1})\right] \quad \text{s.t.} \\
&\theta_{t+1} V_{t,n} = NW_t + W_t N_t - C_t \\
&NW_{t+1} = \theta_{t+1} V_{t+1,o} \\
&N_t = 1.
\end{aligned} \tag{3}$$

At t, a measure one of new firms are born. New firms raise equity in amount $V_{t,n} = K_{t+1} Q_t$ and use it to purchase capital K_{t+1} at a price per unit Q_t. At the same time, old firms choose how much

[39]These papers model a financial shock to how collateralizable capital is.

new capital S_t to create, pay adjustment costs associated with creation and installing new capital, sell their capital to new firms for S_tQ_t (in equilibrium $S_t = K_{t+1}$), sell their output, pay labor costs, pay the proceeds $V_{t,o}$ to their equity owners, and shut down. The new firms at t become old at $t+1$ and their value at $t+1$ is:[40]

$$V_{t+1,o} = Z_{t+1}K_{t+1}^{\alpha}N_{t+1}^{1-\alpha} - W_{t+1}N_{t+1} + K_{t+1}(1-\delta) - S_{t+1} - \nu_{k,0}\left(\frac{S_{t+1}}{K_{t+1}} - \nu_{k,1}\right)^2 K_{t+1} + Q_{t+1}S_{t+1}. \tag{5}$$

In the above equation, investment is $S_{t+1} - K_{t+1}(1-\delta)$. If there were no adjustment costs ($\nu_{k,0}$=0), then $Q_t = 1$ and the value of the old firm at $t+1$ is simply the value of output plus undepreciated capital: $V_{t+1,o} = Z_{t+1}K_{t+1}^{\alpha}N_{t+1}^{1-\alpha} - W_{t+1}N_{t+1} + K_{t+1}(1-\delta)$. With adjustment costs, firms who sell S_{t+1} units of new capital lose the capital itself, plus disassembly costs $\nu_{k,0}\left(\frac{S_{t+1}}{K_{t+1}} - \nu_{k,1}\right)^2$. The investment decision is orthogonal to the production decision, therefore all firms with undepreciated capital will make identical investment decisions and their FOC for investment implies:

$$Q_t = 1 + 2\nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right). \tag{6}$$

In Appendix section C.1 we show that the solution to this problem with overlapping generations of firms is identical to the standard Q-theory problem with infinitely lived firms who pay capital adjustment costs.

3.2 Full model

We next extend the above model to include banks who raise deposits from households and lend riskless corporate debt to firms. The key mechanism is that the intermediary services that banks engage in require banks to hire labor, and the cost of providing these services varies over time. In Appendix section C.2 we extend the model to allow default by firms, although the channel we are interested in works even with riskless debt. In Appendix section C.3 we extend the model to allow for wage rigidity. The overlapping generation modeling assumption makes these extensions computationally tractable because we can solve the firm's problem analytically.

[40] Firms take wages as given and make identical labor decisions, their FOC for labor implies $W_t = (1-\alpha)Z_t\left(\frac{K_t}{N_t}\right)^{\alpha}$ and $N_t = \left(\frac{(1-\alpha)Z_t}{W_t}\right)^{\frac{1}{\alpha}}K_t$. Define $X_t = \alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}}W_t^{\frac{\alpha-1}{\alpha}}Z_t^{\frac{1}{\alpha}} = \alpha Z_t\left(\frac{K_t}{N_t}\right)^{\alpha-1}$, which depends only on aggregate quantities Z_t and W_t (alternatively, on aggregate Z_t, K_t, and N_t) so the firm takes it as given. Equation 5 can therefore be rewritten as as:

$$V_{t+1,o} = X_{t+1}K_{t+1} + K_{t+1}(1-\delta) - S_{t+1} - \nu_{k,0}\left(\frac{S_{t+1}}{K_{t+1}} - \nu_{k,1}\right)^2 K_{t+1} + Q_{t+1}S_{t+1}. \tag{4}$$

3.2.1 Households

Households are identical to the specification above, with the following differences: i) households can invest in risk free bank deposits with face value $B_{t+1,d}$ and interest rate $R_{t,d}$, ii) households can invest in bank equity, iii) households receive a liquidity benefit from investing in deposits, iv) households pay an equity issuance cost increasing in the size of corporate equity issuance. We assume that banks hold corporate debt while households do not. The household's problem is now written as:

$$\begin{aligned}
&U(NW_t) = \max_{C_t, B_{t+1,d}} \frac{C_t^{1-\rho}}{1-\rho} + \beta E_t\left[U(NW_{t+1})\right] \quad \text{s.t.} \\
&\theta_{t+1,c}V_{t,cn} + \theta_{t+1,b}V_{t,bn} + B_{t+1,d}/R_{t,d} = NW_t + W_tN_t - C_t + \Lambda\left(\frac{B_{t+1,d}}{R_{t,d}}\right) - \Upsilon\left(\frac{\theta_{t+1,c}V_{t,cn}}{K_{t+1}Q_t}\right) \\
&NW_{t+1} = \theta_{t+1,c}V_{t+1,co} + \theta_{t+1,b}V_{t+1,bo} + B_{t+1,d} \\
&N_t = 1,
\end{aligned} \tag{7}$$

where $V_{t,cn}$ and $V_{t,bn}$ are the values of a new productive firm and a new bank that begin operating at t, $V_{t+1,co}$ and $V_{t+1,bo}$ are the values of an old productive firm and an old bank who shut down at $t+1$, and $\theta_{t+1,c}$ and $\theta_{t+1,b}$ are the number of shares of corporate equity and bank equity purchased by households. The function $\Lambda(x) = \lambda_0 x^{\lambda_1}$ specifies the liquidity benefit of deposits.[41] The function $\Upsilon\left(\frac{\theta_{t+1,c}V_{t,cn}}{K_{t+1}Q_t}\right) = \upsilon_0\left(\frac{\theta_{t+1,c}V_{t,cn}}{K_{t+1}Q_t}\right)^{\upsilon_1}$ specifies the cost of investing in corporate equity.[42]

The houshold's stochastic discount factor is $M_{t+1} = \beta\left(\frac{C_{t+1}}{C_t}\right)^{-\rho}$. The returns on productive firms equity and bank equity are, respectively, $R_{t+1,c} = \frac{V_{t+1,co}}{V_{t,cn}}$ and $R_{t+1,b} = \frac{V_{t+1,bo}}{V_{t,bn}}$. The Euler equations for productive firm equity, bank equity, and deposits are:

$$\begin{aligned}
&1 = E_t[\widehat{M}^c_{t+1}R_{t+1,c}] \quad \text{where } \widehat{M}^c_{t+1} = M_{t+1}\left(1 + \upsilon_0\upsilon_1\left(\frac{\theta_{t+1,c}V_{t,cn}}{K_{t+1}Q_t}\right)^{\upsilon_1-1}\frac{1}{K_{t+1}Q_t}\right)^{-1} \\
&1 = E_t[M_{t+1}R_{t+1,b}] \\
&1 = E_t[\widehat{M}^d_{t+1}R_{t+1,d}] \quad \text{where } \widehat{M}^d_{t+1} = M_{t+1}\left(1 - \lambda_0\lambda_1\left(B_{t+1,d}/R_{t,d}\right)^{\lambda_1-1}\right)^{-1}.
\end{aligned} \tag{8}$$

The last term in the $\widehat{M}^c_{t+1}$ equation reflects equity issuance costs, while the last term in the $\widehat{M}^d_{t+1}$ equation reflects the liquidity benefit of deposits.

[41]The liquidity benefit gives banks a reason to exist. In our model, banks have an additional reason to exist because firms with too little debt are less productive, and banks are the only way for firms to borrow. Therefore, we do not need the liquidity benefit for our model to work. However, if we were to shut down the optimal capital structure channel, we would need the liquidity benefits for banks to exist. An alternative to our modeling choice would be to put the liquidity benefit in the utility function rather than the budget constraint. We conjecture it would not affect our main result relating FLS to lending, output, and asset prices.

[42]These costs can arise either from direct transaction costs (e.g., flotation costs) or costs associated with information asymmetries or managerial incentive problems.

3.2.2 Productive firms

Firms are similar to the firms described in section 3.1, except that they can raise both riskless debt and equity to finance purchases of capital, and their output is reduced when deviating from an optimal quantity of debt.[43]

At t, a firm raises equity in amount

$$V_{t,cn} = K_{t+1}Q_t - B_{t+1,cd}/R_{t,cd}. \tag{9}$$

The firm's equity value at $t+1$ is similar to before, however it now owes creditors $B_{t+1,cd}$, and its output is affected by the quantity of debt.

$$\begin{aligned} V_{t+1,co} &= Z_{t+1}\left(\Psi_{t+1}K_{t+1}\right)^{\alpha} N_{t+1,c}^{1-\alpha} - N_{t+1,c}W_{t+1} \\ &\quad + K_{t+1}(1-\delta) - S_{t+1} - \nu_{k,0}\left(\frac{S_{t+1}}{K_{t+1}} - \nu_{k,1}\right)^2 K_{t+1} + Q_{t+1}S_{t+1} - B_{t+1,cd}, \end{aligned} \tag{10}$$

where $\Psi_{t+1} = 1 - \nu_{cd,0}\zeta_t^2$ reflects the reduction in a firm's productivity due to having too much or too little debt. Ψ_{t+1} is a function of $\zeta_t = \frac{B_{t+1,cd}/R_{t,cd}}{K_{t+1}} - \nu_{cd,1}$, which is the distance between the firm's debt-to-capital ratio, and its optimal debt-to-capital ratio $\nu_{cd,1}$.[44] We designate $N_{t,c}$ as the employment in the productive (corporate) sector, as opposed to financial sector employment $N_{t,b}$, and total employment $N_t = N_{t,c} + N_{t,b}$.

The firm's investment decision is identical to before: $Q_{t+1} = 1 + 2\nu_{k,0}\left(\frac{S_{t+1}}{K_{t+1}} - \nu_{k,1}\right)$. The firm takes the corporate interest rate as given. The firm's capital structure decision is independent of the investment decision – the firm chooses debt to maximize expected cashflows to equity holders $-V_{t,cn} + E_t[\widehat{M}^c_{t+1}V_{t+1,co}]$.[45] The choice of debt therefore satisfies:

$$1 - E_t[\widehat{M}^c_{t+1}]R_{t,cd} = 2\nu_{cd,0}\left(\frac{B_{t+1,cd}/R_{t,cd}}{K_{t+1}} - \nu_{cd,1}\right)E_t[\widehat{M}^c_{t+1}X_{t+1}]. \tag{12}$$

The above equation is intuitive. When the return on corporate debt is fairly priced from the point of view of the firm, then the left hand side is zero and leverage $\frac{B_{t+1,cd}/R_{t,cd}}{K_{t+1}}$ is equal to its target $\nu_{cd,1}$. On the other hand, when the interest rate is especially high (low) then the left hand side is negative (positive) and leverage is chosen below (above) target.

[43]There are several corporate finance theories that could be used to justify this last assumption. For example, having too little debt increases the need for outside equity and may reduce incentives of insiders. Having too much debt may lead to increased distress costs.

[44]By solving for the firm's optimal labor choice, the problem can be rewritten as:

$$\begin{aligned} V_{t+1,co} &= X_{t+1}\Psi_{t+1}K_{t+1} + K_{t+1}(1-\delta) - S_{t+1} - \nu_{k,0}\left(\frac{S_{t+1}}{K_{t+1}} - \nu_{k,1}\right)^2 K_{t+1} + Q_{t+1}S_{t+1} - B_{t+1,cd} \quad \text{s.t.} \\ X_t &= \alpha(1-\alpha)^{\frac{1-\alpha}{\alpha}} W_t^{\frac{\alpha-1}{\alpha}} Z_t^{\frac{1}{\alpha}}. \end{aligned} \tag{11}$$

[45]Equation 8 implies that this quantity is zero in equilibrium since equity is fairly priced

3.2.3 Banks

At t, new competitive banks are born who will live for one period. At t, they raise equity capital $V_{t,bn}$ and deposits $B_{t+1,d}/R_{t,d}$, pay labor costs $N_{t,b}W_t$, and lend all of their remaining capital to firms, with total lending being $B_{t+1,cd}/R_{t,cd}$. Note that $B_{t+1,d}$ and $B_{t+1,cd}$ are, respectively, the $t+1$ face values of deposits and corporate debt. At $t+1$, banks collect revenue from corporate lending, pay off depositors, pay the remainder of their capital to equity holders, and then shut down. At $t+1$, a new set of competitive banks are born.[46]

Deposits raised by banks provide liquidity, and therefore have a lower rate of return than the risk free rate. Equation 8 shows that they are also a cheaper (risk adjusted) source of financing than bank equity: $E_t[M_{t+1}R_{t,d}] \leq E_t[M_{t+1}R_{t+1,b}] = 1$. For this reason, all else equal, banks would maximize deposit financing and minimize equity financing. Banks face a capital constraint κ, limiting the ratio of deposits to equity:

$$B_{t+1,d}/R_{t,d} = \kappa V_{t,bn}. \tag{13}$$

The labor needed to intermediate capital is proportional to the bank's capital, with the proportionality constant $\nu_{b,t}$ subject to shocks – these FI labor need (FLN) shocks are the focus of our study:

$$N_{t,b} = \nu_{b,t}\left(V_{t,bn} + B_{t+1,d}/R_{t,d}\right) = \nu_{b,t}(1+\kappa)V_{t,bn}. \tag{14}$$

Equation 14 represents the bank's production function and FLN shocks are technology shocks to the production of intermediation, with production becoming more expensive when $\nu_{b,t}$ is high. They can be thought of as a reduced form way to model intermediary behavior in a changing investment environment. As we will show in section 3.5 below, we identify the FLN shock by matching the countercyclical behavior of the fraction of FI labor in the aggregate employment, which is hard to generate in other models without the FLN shock.

A bank that has raised equity capital $V_{t,bn}$, chooses deposits $B_{t+1,d}/R_{t,d}$ based on equation 13, pays labor costs in amount $W_tN_{t,b}$ with $N_{t,b}$ from equation 14, and invests a total of:

$$\begin{aligned} B_{t+1,cd}/R_{t,cd} &= V_{t,bn} + B_{t+1,d}/R_{t,d} - W_tN_{t,b} \\ &= V_{t,bn}(1+\kappa)(1-\nu_{b,t}W_t). \end{aligned} \tag{15}$$

[46] The standard FI asset pricing channel works by having banks suffer negative shocks, leading to low equity valuations, and causing them to contract balance sheets. This channel is dynamic. Because our banks live for two periods, that channel is absent by construction. One could reintrduce it either by having time-varying equity issuance costs, leading to low bank equity in some periods, or by linking banks intertemporaly, for example by having the new bank's equity issurance at $t+1$ be a function of the old bank's dividend payout at $t+1$.

The bank's payout at $t+1$ is:

$$\begin{aligned} V_{t+1,bo} &= B_{t+1,cd} - B_{t+1,d} \\ &= V_{t,bn}\left((1+\kappa)(1-\nu_{b,t}W_t)R_{t,cd} - \kappa R_{t,d}\right). \end{aligned} \quad (16)$$

From the firm's problem, we can solve for $R_{t,cd}$ as a function of $B_{t+1,cd}$, it falls when $B_{t+1,cd}$ is too large as firms refuse to take on additional debt unless it is very cheap. Similarly, from the household's problem, we can solve for $R_{t,d}$ as a function of $B_{t+1,d}$, it rises when $B_{t+1,d}$ is too large as households have lower marginal utility from additional deposits. Thus, banks are very profitable (per unit of capital) when bank assets are low, and unprofitable when bank assets are high. In equilbrium, the size of the bank's balance sheet (or equivalently, its equity value) will adjust in order to make the Euler equation hold: if $V_{t,bn}$ is too low (high) then the bank will be very profitable (unprofitable) and $E_t[M_{t+1}R_{t+1,b}]$ will be above (below) one.

3.2.4 Equilibrium

Total demand for equity shares are $\theta_{t+1,b} = \theta_{t+1,c} = 1$. Labor market clearing implies that $N_{t,c} = 1 - N_{t,b}$. Starting with the household's budget constraint and substituting in the definitions of productive firms equity and bank equity, one can compute the aggregate budget constraint.

$$\begin{aligned} C_t &= Z_t\left(1 - \nu_{cd,0}\left(\frac{B_{t,cd}/R_{t-1,cd}}{K_t} - \nu_{cd,1}\right)^2\right)K_t^{\alpha}(1-N_{t,b})^{1-\alpha} \\ &\quad +(1-\delta)K_t - K_{t+1} - \nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right)^2 K_t + \Lambda(B_{t+1,d}/R_{t,d}) - \Upsilon\left(\frac{\theta_{t+1,c}V_{t,cn}}{K_{t+1}Q_t}\right). \end{aligned} \quad (17)$$

On the right hand side in the equation above, the first line is aggregate output minus reductions due to deviations from target leverage; the second line is investment, capital adjustment costs, liquidity from deposits, and equity issuance costs. The equilibrium consists of household policies for consumption C_t and investment $\theta_{t+1,c}$, $\theta_{t+1,b}$, $B_{t+1,d}$; firm policies for investment S_t and borrowing $B_{t+1,cd}$; as well as prices $V_{t,cn}$, $V_{t,bn}$, W_t, $R_{t,cd}$, $R_{t,d}$ such that the household's Euler equations are satisfied, the firm's optimality conditions for investment and borrowing are satisfiied, and the aggregate budget constraint is satisfied. Appendix section C.5 describes the solution method.

3.3 Calibration

The model is calibrated annually. This subsection describes the parameter choices, which are listed in Table 11. The top panel of this table presents parameters associated with the model's business cycle dynamics, which are relatively standard in the literature. Specifically, the time discount factor β is 0.98, the risk aversion ρ is 2, the share of capital in production α is 0.35, the depreciation rate δ is 0.064, and the growth rate of TFP g is 0.018. The capital adjustment cost function is such that in steady state, when $K_{t+1} = (1+g)K_t$, the cost paid is zero. The strength of the capital adjustment cost is chosen to approximately match the ratio of the volatilities of investment growth to output growth in the data; the actual cost paid is 0.24% of output on average. The above model implies a capital to output ratio of 2.6, in line with the data. The top panel in Table 12 shows that consumption and investment in the model are similar to the data in terms of their size relative to output, their volatility, and their co-movement with output. The TFP shock grid is chosen to approximately match the volatility of private output growth in the data, it is 0.037 in the model, compared to 0.035 in the data for 1949-2021, and 0.051 for 1929-2021.

The bottom panel of this Table 11 presents moments specific to our channel. The key variable in our model is the FI's labor to asset ratio $\nu_{b,t}$. We choose its mean to be 0.018 to match the labor share of financial intermediaries; this quantity is 0.64 in the data and our model.[47] The grid for $\nu_{b,t}$ (FLN shocks) is chosen to approximately match the volatility of financial employment share as a fraction of total employment,[48] this quantity is 0.006/0.055=0.11 in the data and 0.10 in the model.

The model has two exogenous shocks, a TFP shock Z_t and an FLN shock $\nu_{b,t}$. The TFP shock has a non-stationary, deterministic component $(1+g)^t$ and a stationary, random component, while the FLN shock is stationary. Each stationary shock is Markov and takes on one of three values, shown in Table 11, implying a Markov chain of $3^2 = 9$ possible states for the random shock. Our goal in choosing the transition probability matrix is to approximately match the autocorrelation of HP-filtered private output, which is 0.33 in the data (1949-2021), the autocorrelation of HP-filtered $\nu_{b,t} = \frac{N_{t,b}}{V_{t,bn}+B_{t+1,d}/R_{t,d}}$, which is 0.50 in the data (1951-2021), and the correlation of HP-filtered private output with HP-filtered $\nu_{b,t}$, which is -0.23 in the data (1951-2021). Appendix section C.4 describes how we choose the transition probability matrix. In the model, the three quantities are 0.24, 0.42 and -0.36.

The remaining moments matter for modeling banks who borrow from households and lend to firms. While these affect the model quantitatively, they are not crucial for our channel. The maximum ratio of FI debt to equity κ is 4, in the data this quantity is 4.3.[49] The curvature of the liquidity function λ_1 is 0.5, it must be below one in order for the household's demand function to be increasing in the deposit rate. The strength of the liquidity function λ_0 is 0.025, which implies a liquidity premium of 100bp for deposits relative to the risk free rate.[50] The target debt to capital

[47] Alternately, we could have used $\nu_{b,t}$ to target the financial sector's employment share as a fraction of total employment. We do not do this for the following reason. In the data, financial sector employment share is approximately 5.5% of total employment, in our model, it is 3.6%. However, in our model, the financial sector intermediates only debt issuance by the productive sector, while in the real world the financial sector also intermediates mortgages and some purchases of corporate equity.

[48] $\sigma(x)/\mu(x)$ where x is financial employment as a share of total.

[49] In the Integrated Macro Accounts, the average $\frac{debtsecurities+loans}{marketequity+debtsecurities+loans}$ for 1960-2019 is 0.73, implying $\kappa = 4.3$.

[50] The only risk free asset available to households in the model is deposits, which are bundled with liquidity services. We can use the stochastic discount factor to compute the hypothetical risk free rate. The analog in the data is the spread between the Fed Funds rate and bank deposits. Drechsler et al. (2017) show that this spread varies significantly

ratio $\nu_{cd,1}$, at which trade-off theory costs and benefits cancel out, is 0.5, while the strength of the cost for deviating $\nu_{cd,0}$ is 0.05. We chose these parameters jointly to target a corporate debt to enterprise value ratio of 0.4.[51]

We do not have guidance from the literature as to the best way to model equity issuance costs, since they include both direct transaction costs and indirect costs associated with symmetric information and agency. We choose the strength of the equity issuance cost $\upsilon_0 = 0.35$ to target the Sharpe ratio of the aggregate stock market return, it is 0.41 in the data and 0.36 in the model. We choose the curvature of the equity issuance cost $\upsilon_1 = 8$ to match the increase in the expected market equity premium when the financial sector labor share rises. In the data, a one standard deviation increase in the financial sector labor share is associated with the expected equity premium over the next year rising by a factor of 1.27, and the equity premium over the next two years rising by a factor of 1.44, in the model these are 1.25 and 1.20. The actual cost paid is small, less than 0.2% of equity value on average, and 0.4% of equity value maximum.

The bottom panel of Table 12 presents selected asset pricing moments. The equity return is only about 1/3 as volatile as in the data, this is a problem common to asset pricing models unless some additional mechanism to increase equity volatility is included, however the Sharpe ratio is comparable to the data.[52] The premium on corporate bonds over deposits is also about 1/3 that of the data. The deposit rate is relatively smooth, as in the data, though it is higher than the data. The high average deposit rate is a reflection of the low equity premium.

3.4 Results

Figure 1 presents impulse responses to an FLN shock, showcasing our main results: an FLN shock is associated with an increase in FI labor share, and in FI templployment share of total employment. It is also associated with lower current and future output, investment and lending; higher current and future credit spreads; lower current stock returns, and a higher future equity premium. These are exactly the patterns documented for the data in section 2.[53]

across the business cycle, and across different types of deposits. Based on their Figure 1, the average spread 1997-2013 is -1.2% for time deposits, 1.3% for saving deposits, and 3.4% for checking deposits; however it is near zero when rates are low, and much higher when rates are high. We target 100bp as a conservative estimate, although our key results are not significantly different with a higher spread.

[51]The same debt to value ratio can arise in a model with a higher (lower) $\nu_{cd,1}$ combined with a lower (higher) $\nu_{cd,0}$. We do not attempt to identify each of these parameters independently.

[52]For example adding habit, as in Chen (2017), wage rigidity, as in Favilukis and Lin (2015), or depreciation shocks, as in Gomes and Michaelides (2007) can increase equity volatility. Despite low risk aversion, the Sharpe ratio is high due to equity issuance costs υ_0.

[53]Although we do not explore the implications of FI heterogeneity in our model, the same result should hold for individual FIs and the firms that are connected with FIs. In particular, if banks face idiosyncratic FLN shocks that raise their labor needs and labor costs, they will require more labor to intermediate capital, and hence banks' labor share will rise and their lending will fall. Furthermore, this effect will transmit to the real sector. If firms face switching costs when choosing their lenders, firms connected to the affected banks will cut investment and reduce output. This mechanism will be consistent with the cross-sectional result that we document in section 2.2.

To produce this figure, we first simulate the model for 50 periods but forcing both productivity Z_t and FLN $\nu_{b,t}$ to be neutral; $t = 0$ in the figure is the last such period. At $t = 1$, $\nu_{b,t}$ (the quantity of labor that intermediaries need per dollar of assets) rises unexpectedly, while the productivity shock remains neutral. After $t = 1$, the productivity shock remains neutral, while the FLN shock is allowed to vary randomly, as governed by the calibrated Markov transition probability. After $t = 1$, the lines in this figure represent averages over many random draws of the $\nu_{b,t}$ shock. We scale all quantities by their values at $t = 0$.

Upon impact of the shock, the FI's labor share rises, peaks at $t = 2$, and continues to remain high for about 6 years. The labor share is defined as compensation divided by compensation plus value added.[54] The labor share rises because intermediaries need to hire more labor per dollar of capital. In principle, the labor share could fall if wages fell sufficiently, however the change in wages is relatively small. This is because, as shown in footnote 40, the aggregate wage is derived from labor demand in the productive sector $W_t = (1-\alpha)Z_t\left(\frac{K_t}{N_{t,c}}\right)^{\alpha}$. In this equation, the only variable that depends on FI labor demand is $N_{t,c} = 1 - N_{t,b}$. Since FIs hire approximately only 5% of the labor force, even large moves in FI labor $N_{t,b}$ have a relatively small (in percentage terms) effect on productive sector labor $N_{t,c}$, and therefore a relatively small effect on the aggregate wage.

Because it becomes more expensive to operate, intermediaries contract their balance sheets and cut lending. Corporate lending falls by 6% on impact, and remains low for the subsequent 8 years. Corporate interest rates rise by about 50bp and remain high for the subsequent 6 years. This happens because reduced lending pushes firms further away from their optimal capital structure and they are willing to pay more to raise debt capital; at the same time, intermediaries need the higher spreads in order to pay for higher labor costs.

Output and investment fall by 0.4% and 2% on impact and remain low for the subsequent 10 years. Output falls for several reasons. First, the contraction in corporate lending causes firms to be further away from their optimal capital structure, which makes them less productive. Second, because intermediaries' balance sheets do not contract by as much as the increase in FI labor, overall FI labor demand rises, leading to an increase in the FI employment share of total employment, and leaving less labor available for the productive sector. In our model, aggregate labor is fixed, but this channel is likely relevant for the real world: Figure 3 and the bottom panel of Table 12 confirm that in the data, FI employment share of total employment goes up in bad times (Appendix figure A.2 makes this especially clear through a scatter plot). Third, investment falls, leading to a lower capital stock, which futher lowers output. Investment falls for two reasons. First, households wish to smooth consumption and the initial fall in output requires a fall in investment to avoid a fall in consumption. Second, going forward, firms become less productive and less profitable, reducing

[54] We define value added as the net cash flow paid to the FI's equity investors. This is revenue from lending to corporations, minus costs of repaying deposits, minus issues of FI equity. The last component is important because in our model, intermediaries live for just one period, thus, without subtracting issues of FI equity, this calculation would yield a gross return on FI equity, whereas the value added is analogous to a net return.

incentives to invest.

At $t = 1$, the realized equity premium falls concurrently with the realization of the FLN shock. Going forward, the expected equity premium rises and remains elevated for about 6 years. The reason for the increased expected equity premium is that as banks cut lending in response to higher labor costs, firms are forced to substitute toward equity issuance. However, equity issuance costs are convex, thus raising additional equity becomes increasingly expensive. The elevated equity premium is necessary to compensate households for increased equity issuance costs.

3.5 How important are FLN shocks?

In this section we show that neither TFP shocks alone (without FLN shocks) nor alternative mechanisms like credit risk, wage rigidity, credit shocks, or labor adjustment costs are able to produce the same patterns as in our baseline model and as we document in the data. First, while it is possible to qualitatively produce some of the patterns in Figure 1 using alternative mechanisms, the quantitative responses of lending and credit spread are much weaker. Second, these alternative mechanisms imply that financial sector employment share as a fraction of total employment should fall in bad times, however it rises in our baseline model. Figure 3, figure A.2, and the bottom panel of Table 12 show that it also rises in the data; Table A.17 shows that it is strongly correlated with various measures of financial industry labor burden used in our empirical analysis; Table A.19 shows that this is unlikely to be driven simply by high human capital. Third, we carry out an exercise similar to Jermann and Quadrini (2012) to show that FLN shocks significantly improve the model's ability to quantitatively match the data time series for several quantities of interest.

3.5.1 TFP versus FLN shocks

Figure 2 presents model impulse responses to a TFP shock. The responses of output and investment are much bigger than to a labor demand shock because TFP shocks in the model are the main driver of output fluctuations and are calibrated to match the volatility of output. However, FLS actually falls, rather than rises, meaning that a model with TFP shocks alone cannot explain the empirical findings in section 2 – low output and investment are associated with low, rather than high FLS. The reason that FLS falls is that after a negative TFP shock, the financial sector's value added rises significantly because the interest rate on corporate debt rises.[55]

To highlight the quantitative importance of FLN shocks, we carry out an exercise similar to Jermann and Quadrini (2012). First, we compute an annual time series of actual TFP in the data

[55] Although the interest rate on corporate debt rises, the deposit rate rises by even more, leading to a rise in the corporate spread. Despite this, value added rises because a bank's value added is defined as total corporate lending multiplied by the interest on corporate debt, minus total deposits multiplied by the deposit rate, minus total bank equity issued. The last component is not multiplied by any rate.

for 1948-2020.[56] Similarly, we compute a time series of FLN in the data by dividing financial sector employees by the total liabilities and equity of the financial sector.[57] We then HP filter each series; as discussed in section 3.3, the two are negatively correlated. Finally, we discretize each HP filtered series so that we can use the values as shocks to Z and ν_b in the model.[58]

We simulate the baseline model for 1000 periods while setting both shocks to their means in order to let the model reach its stochastic steady state. We then simulate the model for 73 additional periods, with each period corresponding to a year between 1948 and 2020. For each of these years, we set both the TFP and FLN shocks to be the discretized HP filtered values computed in the data. For comparison, we also solve a model with TFP shocks only, setting the FLN shocks to be their mean value. For each of these two simulations, table 13 reports the correlation between model implied and actual quantities of interest.

In the model with TFP shocks alone, both GDP and investment behave much as they do in the data, with correlations of 0.44 and 0.46, respectively. Adding FLN shocks leads to only a modest improvement, with the correlations rising to 0.45 and 0.49. The reason the improvement is modest is that TFP shocks in the model are calibrated to match output volatility and do most of the work for driving output and investment fluctuations. If we were to write down a model with a stronger link between credit and output, for example by adding explicit credit constraints or a working capital constraint, then FLN shocks would likely play a stronger role.

On the other hand, the model with TFP shocks alone cannot reproduce the actual patterns for debt growth, credit spread, and financial sector employment share, with correlations of 0.17, -0.11, and -0.08, respectively. On all of these dimensions, including FLN shocks in the simulation leads to a large improvement, with correlations rising to 0.33, 0.15, 0.51.

3.5.2 Credit risk

In Appendix section C.2 we solve a model with FLN shocks and credit risk. In this model, as in the data, defaults rise when there is a negative TFP shock. This fixes the problem of value added rising in bad times, which was discussed in the previous section and is unrealistic. In this model, higher defaults lead to a fall in value added and a rise in labor share after a negative TFP shock. Figure A.3 shows that impulse responses to an FLN shock look qualitatively similar to our baseline model

[56]We construct this series as $TFP_t = \frac{GDP_t}{K_t^\alpha \hat{N}_t^{1-\alpha}}$ where capital K_t is the historical cost net stock of private fixed assets, equipment, structures, and IP from BEA table 2.3 and $\hat{N}_t$ is the trend in hours, computed by regressing hours worked (FRED series B4701C0A222NBEA) on a time dummy. This is somewhat differerent from the standard computation of $TFP_t = \frac{GDP_t}{K_t^\alpha N_t^{1-\alpha}}$ because labor supply is inelastic in our model. The correlation between this series and TFP constructed by Fernald (2014), both HP filtered, is 0.74.

[57]These are FRED series USFIRE and FBLIEQQ027S.

[58]As discussed in section 3.3, Z and ν_b each take on three values – low, medium, and high – with unconditional probabilities $(0.28, 0.44, 0.28)$ for Z and $(0.175, 0.65, 0.175)$ for ν_b. To discretize the shocks, we choose cutoffs in real world data such that the low, medium, and high realizations have the same frequency as in the model.

(without credit risk), although the responses of investment, corporate lending, and price of capital are all about 50% larger than in the baseline model (Figure 1). Therefore, the realistic addition of credit risk only strengthens our channel.

Figure A.4 shows that in the model with credit risk, most of the impulse responses to a TFP shock look qualitatively like the impulse responses to an FLN shock: FLS rises; output, investment, and lending fall; credit spreads rise; the equity return falls on impact but the expected equity premium rises. However, quantitatively, the change in lending and credit spreads is approximately one quarter that of the FLN shock. Furthermore, the increase in FLS lasts for just one period and then falls because expected returns on corporate debt rise. More importantly, TFP shocks imply that financial sector employment share as a fraction of total employment falls in bad times, however it rises after FLN shocks and in the data. Therefore, adding credit risk to the model makes the behavior of value added more realistic and does not diminish the importance of FLN shocks. However, as in our baseline model, TFP shocks alone cannot reproduce the patterns in the data.

3.5.3 Wage rigidity

If FI wages are especially rigid, then a high financial labor share would potentially indicate stress in credit markets even without an FLN shock. This is because after a negative shock to productivity, intermediaries would be unable to lower their wages by much due to rigidity, leading to higher labor expenses. This would in turn lead to a contraction in FI activities for the same reason as an increase in labor needs does in our baseline model.

In Appendix section C.3 we extend the model to have downward wage rigidity in the financial sector. Therefore, following a negative TFP shock, financial sector wages do not fall as fast as aggregate wages. For clarity, we shut down the FLN shock by setting $\nu_{b,t}$ to be constant (at its mean value), thus the only exogenous shocks to the model are TFP shocks. We focus on the model with credit risk because in the model without credit risk, value added counterfactually rises following a negative TFP shock, as discussed in section 3.5.2.

Appendix figure A.5 compares impulse responses to a TFP shock in a model without wage rigidity to one with wage rigidity in the financial sector. Consistent with the intuition above, compared to no wage rigidity, the model with wage rigidity has more positive impulse responses for financial sector labor share and aggregate credit risk; more negative impulse responses for output, investment, and corporate lending. However, quantitatively, the effects are small. For example after a TFP shock, the corporate spread rises by 2% more in a model with rigidity compared to one without; corporate lending falls by 1% more in a model with rigidity compared to one without. The FLN shock causes much bigger resposnes: a 21% rise in the spread and a 6% fall in lending. The effect of rigidity on the responses of output and investment are even smaller. Finally, as with TFP shocks, financial sector employment share as a fraction of total employment falls after a TFP shock, and falls by even more when wages are rigid. Therefore, even though wage rigidity can lead to qualitatively similar effects as an FLN shock, it is difficult for wage rigidity to matter much quantitatively and wage rigidity cannot explain the behavior of financial sector employment.

An opposite concern may be that if FI wages are much more flexible than other industries, then it would be relatively easy for FIs to keep their labor in bad times, explaining the strong counter-cyclicality of financial sector employment share as a fraction of total employment. We find that this is unlikely to be the case because FI wages appear to be more rigid than other sectors.[59]

3.5.4 Labor adjustment costs

Here we argue that labor adjustment costs also cannot reproduce the same patterns as in the data.

First, as discussed earlier, the FI employment share of total employment is strongly counter-cyclical both in our model and in the data. Could labor adjustment costs be responsible for this counter-cyclicality? If true, then other high adjustment cost industries should see a similar counter-cyclicality. Since human capital is likely to be associated with higher adjustment costs, we check this for other high human capital industries and do not find the same pattern. In Appendix table A.19, we compute the correlation of GDP with an industry's employment share of total employment for high human capital industries. Like finance, healthcare is also very counter-cyclical, though this is likely due to health care demand being largely acyclical. However, we do not find strong counter-cyclicality for most other high human capital industries. In the longer 1952-2019 sample, where industry definitions are very broad, the correlation of growth rates of aggregate GDP and employment share for Finance is -0.668, compared to 0.171 for Information and -0.156 for Personal Services. In the shorter 1990-2019 sample, where finer industry definitions are available, for the nine industries likely to be high human capital,[60] the average correlation is -0.038, compared to -0.297 for finance; the only one of the nine with a more negative correlation than Finance being Legal Services.

Second, we extend our model to study labor adjustment costs. In order to model labor adjustment costs, we would need to add a state variable which records past bank labor. To avoid this, we solve a model where we shut down FLN shocks, and where bank labor is fixed at its average level. This can be interpreted as a case with infinite labor adjustment costs; we conjecture that a model with finite adjustment costs will behave like an average between this model and our baseline model.

Appendix figure A.7 shows impulse responses to a TFP shock. The responses of most variables

[59] For example, the volatility of FI wage growth relative to the volatility of FI value added is 0.43, compared to 0.64 for the aggregate economy.

[60] These are Computer and Electronic Manufacturing, Computing Infrastructure and Data Processing, Telecommunication, Professional and Scientific Services, Legal Services, Accounting Services, Architectural and Engineering, Computer System Design, and Management and Technical Consulting.

are similar to the baseline model's impulse responses to a TFP shock shown in Figure 2 and discussed in section 3.5.1. However, bank employment as a share of total employment is now constant – in the data, it is counter-cyclical. Since bank equity is linear in bank labor when there is no FLN shock, bank equity is also constant, as is total corporate lending. These are all counter-factual.

Stepping outside of the model, if aggregate labor was flexible and banks had higher labor adjustment costs, then indeed even without shocks to ν_b, financial sector employment share as a fraction of total employment would be counter-cyclical, as in the data. However, without shocks to ν_b, any attempt to make financial sector employment share as a fraction of total employment more counter-cyclical will make lending less pro-cyclical, which would be counterfactual. This is because the bank's production function in the model is such that lending is proportional to financial employment.

Finally, consider stepping further outside of our model to a more general production function where lending is not necessarily proportional to bank labor. However, as long as bank employees are doing something useful, if financial sector employment share as a fraction of total employment is higher in bad times (without shocks to ν_b affecting their productivity), banks would become especially good at intermediating capital in bad times, which is not likely to be the case in reality.

3.5.5 Credit shocks

Much of the FI literature has focused on credit shocks as important for lending and the business cycle. Here, we show that while they may be important, they are independent of FLN shocks and cannot produce the same patterns in the data. To capture credit shocks, we extend our baseline model by allowing the bank's maximum deposit to equity ratio κ to be time varying. Specifically, we shut down FLN shocks, setting ν_b to be its mean. We then allow κ to follow the same random process as $\nu_{b,t}$ in the baseline model, with $\kappa = 1.0$ in the bad state, $\kappa = 4.0$ in the medium state, and $\kappa = 7.0$ in the good state. The medium state κ is equal to its constant value in the baseline model, implying 80% deposits in the bank's capital structure; the bad state κ implies a credit tightening to 50% deposits in the bank's capital structure.

Appendix figure A.6 shows the impulse response to a negative credit shock, which causes κ to fall from 4.0 to 1.0. Similar to an FLN shock, output, investment, the price of capital, and lending all fall;[61] the credit spread rises, equity returns fall on impact but the expected equity premium rises. However, FLS falls implying that credit shocks cannot explain why high FLS is associated with

[61] In this model, the quantitative effects of a credit shock on real output and investment are small. The reason for this is that models which focus on credit shocks add various frictions, making it difficult for the bank to switch from debt to equity financing when the credit constraint tightens. This difficulty creates a financial contraction which spills into the real sector. Since credit shocks are not the focus of our model, we chose to not explicitly include such frictions. As a result, it is relatively easy for banks to raise less deposits and more equity when the constraint tightens, which quantitatively weakens the real effect. Furthermore, since banks shed labor after a credit shock and since aggregate labor is fixed, the real sector sees a labor inflow and output slightly rises on impact, although it falls in the long term.

bad times. Furthermore, financial sector employment share as a fraction of total employment falls in bad times, which is inconsistent with the data. The reason FLS and financial sector employment share fall is that a credit shock takes away deposits – a cheap source of financing – forcing banks to rely on equity. Banks shrink their balance sheets and contract lending. However, since their labor needs per dollar intermediated are unchanged, they cut their labor force significantly leading to a fall rather than rise in FLS.

4 Conclusion

We study the impact of shocks to the labor needs of the financial sector on asset prices and real quantities. Theoretically, we show that the labor share of financial intermediaries proxies for higher labor needs and therefore stress for financial intermediaries. This stress is important for explaining variations in the real sector's borrowing, investment, output, and asset prices. This differs from most existing studies, which focus on the financial leverage as a proxy for stress in the financial sector.

Empirically we show that financial sector labor share positively predicts aggregate stock market returns, and negatively predicts corporate debt growth, aggregate investment growth, and aggregate output growth. At the bank-level, banks with higher labor share lend less and are associated with higher credit risk. At the firm-level, firms connected to banks with a high labor share borrow less, pay more to borrow, have higher expected default risk, and lower earnings growth. These firms do not invest significantly less on average, but do invest less if they are financially constrained.

References

Abowd, John M, 1989, The effect of wage bargains on the stock market value of the firm, *The American Economic Review* 774–800.

Adrian, Tobias, and Nina Boyarchenko, 2012, Intermediary leverage cycles and financial stability, *Becker Friedman Institute for Research in Economics Working Paper* .

Adrian, Tobias, Erkko Etula, and Tyler Muir, 2014, Financial intermediaries and the cross-section of asset returns, *The Journal of Finance* 69, 2557–2596.

Bassett, Abigail, 2008, As debt grows, collections boom.

Begenau, Juliane, and Tim Landvoigt, 2018, Financial regulation in a quantitative model of the modern banking system, *Available at SSRN 2748206* .

Belo, Frederico, Xiaoji Lin, and Santiago Bazdresch, 2014, Labor hiring, investment, and stock return predictability in the cross section, *Journal of Political Economy* 122, 129–177.

Berk, Jonathan B, Richard Stanton, and Josef Zechner, 2010, Human capital, bankruptcy, and capital structure, *The Journal of Finance* 65, 891–926.

Berk, Jonathan B, and Johan Walden, 2013, Limited capital market participation and human capital risk, *The Review of Asset Pricing Studies* 3, 1–37.

Bernanke, Ben, and Mark Gertler, 1989, Agency costs, net worth, and business fluctuations, *The American Economic Review* 79, 14–31.

Bernanke, Ben S., 1983, Nonmonetary effects of the financial crisis in the propagation of the great depression, *The American Economic Review* 73, 257–276.

Bernanke, Ben S, Mark Gertler, and Simon Gilchrist, 1999, The financial accelerator in a quantitative business cycle framework, *Handbook of macroeconomics* 1, 1341–1393.

Blanco, Julio A, and Gaston Navarro, 2016, The unemployment accelerator .

Blumberg, Alex, 2010, Debt collector: Tough job but someone's got to do it.

Bolton, Patrick, Ye Li, and Yang Jinqiang, 2022, Dynamic banking and the value of deposits, *Working Paper* .

Bruche, Max, and Carlos Gonzalez-Aguado, 2010, Recovery rates, default probabilities, and the credit cycle, *Journal of Banking and Finance* 34, 754–764.

Brunnermeier, Markus K, and Yuliy Sannikov, 2014, A macroeconomic model with a financial sector, *American Economic Review* 104, 379–421.

Calvo, Guillermo A, 1983, Staggered contracts and exchange rate policy, in *Exchange rates and international macroeconomics*, 235–258 (University of Chicago Press).

Campello, Murillo, Janet Gao, Jiaping Qiu, and Yue Zhang, 2017, Bankruptcy and the cost of organized labor: Evidence from union elections, *The Review of Financial Studies* 31, 980–1013.

Carlstrom, Charles T., and Timothy S. Fuerst, 1997, Agency costs, net worth, and business fluctuations: A computable general equilibrium analysis, *The American Economic Review* 87, 893–910.

Chen, Andrew Y., 2017, External Habit in a Production Economy: A Model of Asset Prices and Consumption Volatility Risk, *The Review of Financial Studies* 30, 2890–2932.

Chen, Huafeng Jason, Marcin Kacperczyk, and Hernan Ortiz-Molina, 2011, Labor unions, operating flexibility, and the cost of equity, *Journal of Financial and Quantitative Analysis* 46, 25–58.

Chodorow-Reich, Gabriel, 2014, Effects of unconventional monetary policy on financial institutions, Technical report, National Bureau of Economic Research.

Choi, Dong Beom, Hyun-Soo Choi, and Jung-Eun Kim, 2022, Clogged intermediation: Were home buyers crowded out?, *Journal of Money, Credit and Banking* 54, 1065–1098.

Christiano, Lawrence J, Roberto Motto, and Massimo Rostagno, 2014, Risk shocks, *American Economic Review* 104, 27–65.

D'Acunto, Francesco, Ryan Liu, Carolin Pflueger, and Michael Weber, 2018, Flexible prices and leverage, *Journal of Financial Economics* 129, 46–68.

Danıelsson, Jón, Hyun Song Shin, and Jean-Pierre Zigrand, 2004, The impact of risk regulation on price dynamics, *Journal of Banking & Finance* 28, 1069–1087.

Danthine, Jean-Pierre, and John B Donaldson, 2002, Labour relations and asset returns, *The Review of Economic Studies* 69, 41–64.

Dash, Eric, 2011, Feasting on paperwork.

Diamond, Douglas W., Yunzhi Hu, and Raghuram G. Rajan, 2020, Pledgeability, industry liquidity, and financing cycles, *The Journal of Finance* 75, 419–461.

Donangelo, Andres, 2014, Labor mobility: Implications for asset pricing, *The Journal of Finance* 69, 1321–1346.

Donangelo, Andres, 2018, Untangling the value premium with labor shares, *Available at SSRN 3071030* .

Donangelo, Andres, Esther Eiling, and Miguel Palacios, 2010, Aggregate asset-pricing implications of human capital mobility in general equilibrium, Technical report, Working paper.

Donangelo, Andres, Francois Gourio, Matthias Kehrig, and Miguel Palacios, 2019, The cross-section of labor leverage and equity returns, *Journal of Financial Economics* 132, 497–518.

Drechsler, Itamar, Alexi Savov, and Philipp Schnabl, 2017, The deposits channel of monetary policy, *Quarterly Journal of Economics* 132, 1819–1876.

Elenev, Vadim, Tim Landvoigt, and Stijn Van Nieuwerburgh, 2018, A macroeconomic model with financially constrained producers and intermediaries, Technical report, National Bureau of Economic Research.

Etula, Erkko, 2013, Broker-dealer risk appetite and commodity returns, *Journal of Financial Econometrics* 11, 486–521.

Favilukis, Jack, and Xiaoji Lin, 2015, Wage rigidity: A quantitative solution to several asset pricing puzzles, *The Review of Financial Studies* 29, 148–192.

Favilukis, Jack, and Xiaoji Lin, 2016, Does wage rigidity make firms riskier? evidence from long-horizon return predictability, *Journal of Monetary Economics* 78, 80–95.

Favilukis, Jack, Xiaoji Lin, and Xiaofei Zhao, 2020, The elephant in the room: The impact of labor obligations on credit markets, *American Economic Review* 110, 1673–1712.

Fernald, John, 2014, A quarterly, utilization-adjusted series on total factor productivity, *Working paper* .

Fich, Eliezer M., and Anil Shivdasani, 2006, Are busy boards effective monitors?, *The Journal of Finance* 61, 689–724.

Flanagan, Thomas, 2022, The value of bank lending, *Working paper* .

Fuster, Andreas, Aurel Hizmo, Lauren Lambie-Hanson, James Vickery, and Paul Willen, 2022a, How resilient is mortgage credit supply? evidence from the covid-19 pandemic, *Working paper* .

Fuster, Andreas, Stephanie Lo, and Paul Willen, 2022b, The time-varying price of financial intermediation in the mortgage market, *Journal of Finance* .

Gan, Jie, 2007, The Real Effects of Asset Market Bubbles: Loan- and Firm-Level Evidence of a Lending Channel, *The Review of Financial Studies* 20, 1941–1973.

Gertler, Mark, and Nobuhiro Kiyotaki, 2015, Banking, liquidity, and bank runs in an infinite horizon economy, *American Economic Review* 105, 2011–43.

Gertler, Mark, and Antonella Trigari, 2009, Unemployment fluctuations with staggered nash wage bargaining, *Journal of political Economy* 117, 38–86.

Gilchrist, Simon, and Egon Zakrajšek, 2012, Credit spreads and business cycle fluctuations, *American Economic Review* 102, 1692–1720.

Gomes, Francisco, and Alexander Michaelides, 2007, Asset Pricing with Limited Risk Sharing and Heterogeneous Agents, *The Review of Financial Studies* 21, 415–448.

Gorodnichenko, Yuriy, and Michael Weber, 2016, Are sticky prices costly? evidence from the stock market, *American Economic Review* 106, 165–99.

Granger, C.W.J., and P. Newbold, 1974, Spurious regressions in econometrics, *Journal of Econometrics* 2, 111–120.

Greenwald, Dan, Martin Lettau, and Sydney Ludvigson, 2023, How the wealth was won: Factors shares as market fundamentals, *Working paper* .

Gromb, Denis, and Dimitri Vayanos, 2010, A model of financial market liquidity based on intermediary capital, *Journal of the European Economic Association* 8, 456–466.

Gromb, Denis, and Dimitri Vayanos, 2018, The dynamics of financially constrained arbitrage, *The Journal of Finance* 73, 1713–1750.

Haddad, Valentin, and Tyler Muir, 2018, Do intermediaries matter for aggregate asset prices?, *NBER Working Paper* .

Hall, Robert E, 2005, Employment fluctuations with equilibrium wage stickiness, *American economic review* 95, 50–65.

Hall, Robert E, 2016, Why has the unemployment rate fared better than gdp growth?, *September* 27, 2016.

He, Zhigu, and Arvind Krishnamurthy, 2011, A model of capital and crises, *The Review of Economic Studies* 79, 735–777.

He, Zhiguo, Bryan Kelly, and Asaf Manela, 2017, Intermediary asset pricing: New evidence from many asset classes, *Journal of Financial Economics* 126, 1–35.

He, Zhiguo, and Arvind Krishnamurthy, 2013, Intermediary asset pricing, *American Economic Review* 103, 732–70.

Hirsch, Barry T, 1991, Union coverage and profitability among us firms, *The Review of Economics and Statistics* 69–77.

Hogan, Thomas, and Scott Burns, 2019, Has dodd–frank affected bank expenses?, *Journal of Regulatory Economics* 55, 214–236.

Ivashina, Victoria, and David Scharfstein, 2010, Bank lending during the financial crisis of 2008, *Journal of Financial economics* 97, 319–338.

Iyer, Rajkamal, José-Luis Peydró, Samuel da Rocha-Lopes, and Antoinette Schoar, 2013, Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007–2009 Crisis, *The Review of Financial Studies* 27, 347–372.

Jermann, Urban, and Vincenzo Quadrini, 2012, Macroeconomic effects of financial shocks, *American Economic Review* 102, 238–271.

Kempf, Elisabeth, Alberto Manconi, and Oliver Spalt, 2016, Distracted Shareholders and Corporate Actions, *The Review of Financial Studies* 30, 1660–1695.

Khan, Aubhik, and Julia K. Thomas, 2013, Credit shocks and aggregate fluctuations in an economy with production heterogeneity, *Journal of Political Economy* 121, 1055–1107.

Khwaja, Asim Ijaz, and Atif Mian, 2008, Tracing the impact of bank liquidity shocks: Evidence from an emerging market, *American Economic Review* 98, 1413–42.

Krishnamurthy, Arvind, and Wenhao Li, 2022, Dissecting mechanisms of financial crises: Intermediation and sentiment, *Working paper* .

Lee, David S, and Alexandre Mas, 2012, Long-run impacts of unions on firms: New evidence from financial markets, 1961–1999, *The Quarterly Journal of Economics* 127, 333–378.

Lettau, Martin, Sydney Ludvigson, and Sai Ma, 2019, Capital share risk in U.S. asset pricing, *Journal of Finance* 74, 1753–1792.

Li, Erica XN, and Francisco Palomino, 2014, Nominal rigidities, asset returns, and monetary policy, *Journal of Monetary Economics* 66, 210–225.

Li, Yi, 2022, Fragile new economy: intangible capital, corporate savings glut, and financial instability, *American Economic Review* forthcoming.

Lin, Huidan, and Daniel Paravisini, 2013, The effect of financing constraints on risk, *Review of Finance* 17, 229–259.

Ma, Pengfei, 2022, Labor capacity constraints in mortgage lending: Evidence from loan officers, *Working paper* .

Ma, Sai, 2023, Heterogeneous intermediaries and asset prices: A semiparametric approach, *Working paper* .

Martin, Andrew, 2010, Automated debt-collection lawsuits engulf courts.

Merton, Robert C., 1974, On the pricing of corporate debt: The risk structure of interest rates*, *The Journal of Finance* 29, 449–470.

Palacios, Miguel, 2015, The value and the risk of aggregate human capital, *Review of Financial Studies* 28, 978–1023.

Peek, Joe, and Eric S Rosengren, 1997, The international transmission of financial shocks: The case of japan, *The American Economic Review* 495–505.

Petrosky-Nadeau, Nicolas, Lu Zhang, and Lars-Alexander Kuehn, 2018, Endogenous disasters, *American Economic Review* 108, 2212–45.

Philippon, Thomas, and Ariell Reshef, 2012, Wages and human capital in the u.s. finance industry: 1909-2006, *The Quarterly Journal of Economics* 127, 1551–1609.

Pissarides, Christopher A, 1979, Job matchings with state employment agencies and random search, *The Economic Journal* 89, 818–833.

Qiu, Yue, and Tao Shen, 2017, Organized labor and loan pricing: A regression discontinuity design analysis, *Journal of Corporate Finance* 43, 407–428.

Rajan, Raghuram G., 1992, Insiders and outsiders: The choice between informed and arm's-length debt, *The Journal of Finance* 47, 1367–1400.

Ruback, Richard S, and Martin B Zimmerman, 1984, Unionization and profitability: Evidence from the capital market, *Journal of Political Economy* 92, 1134–1157.

Sharpe, Steve A., and Shane M. Sherlund, 2016, Crowding out effects of refinancing on new purchase mortgages, *Review of Industrial Organization* 48, 209–239.

Sharpe, Steven A., 1990, Asymmetric information, bank lending, and implicit contracts: A stylized model of customer relationships, *The Journal of Finance* 45, 1069–1087.

Shimer, Robert, 2005, The cyclical behavior of equilibrium unemployment and vacancies, *American economic review* 95, 25–49.

Simintzi, Elena, Vikrant Vig, and Paolo Volpin, 2014, Labor Protection and Leverage, *The Review of Financial Studies* 28, 561–591.

Slovin, Myron B., Marie E. Sushka, and John A. Polonchek, 1993, The value of bank durability: Borrowers as bank stakeholders, *The Journal of Finance* 48, 247–266.

S&P Global Market Intelligence, 2017, Since Dodd-Frank, compliance costs up at least 20% for many U.S. banks.

Sun, Mengqi, 2022, Competition for compliance officers intensifies amid regulatory pressures.

Taylor, John B, 1999, Staggered price and wage setting in macroeconomics, *Handbook of macroeconomics* 1, 1009–1050.

Taylor, John B, et al., 1983, Union wage settlements during a disinflation, *American Economic Review* 73, 981–993.

Tuzel, Selale, and Miao Ben Zhang, 2017, Local risk, local factors, and asset prices, *The Journal of Finance* 72, 325–370.

Wang, Iris, 2022, Quality of proxy advice: Evidence from say-on-pay recommendations, *Working paper* .

Weber, Michael, 2015, Nominal rigidities and asset pricing, *Available at SSRN 2478500* .

Whited, Toni M., and Guojun Wu, 2006, Financial Constraints Risk, *The Review of Financial Studies* 19, 531–559.

Zhang, Xiaolan, et al., 2014, Who bears firm-level risk? implications for cash flow volatility, in *2014 Meeting Papers*, number 184, Society for Economic Dynamics.

Figure 1: Impulse responses to an FLN shock

This figure plots the impulse response functions to a one standard deviation FLN shock, $\nu_{b,t}$. To produce the figure, we simulate the model for 50 periods, keeping both the TFP shock, and the FLN shock at their average values. At $t = 1$, the TFP shock remains at its average value, but FLN rises unexpectedly. After $t = 1$, the TFP shock remains at its average value, while the FLN shock varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a high $\nu_{b,t}$, while $t > 1$ values are expected values.

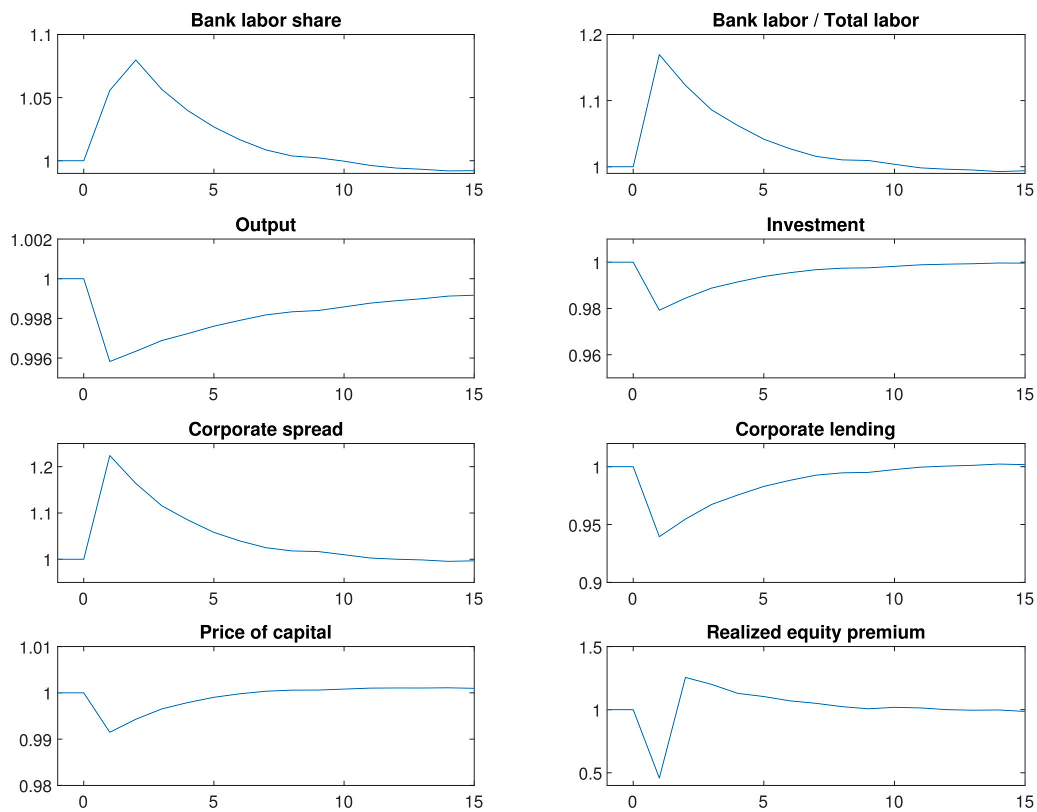


Figure 2: Impulse responses to TFP shock

This figure plots the impulse response functions to a one standard deviation shock to TFP. To produce the figure, we simulate the model for 50 periods, keeping both the TFP shock, and the FLN shock at their average values. At $t = 1$, the FLN shock remains at its average value, but TFP falls unexpectedly. After $t = 1$, the FLN shock remains at its average value, while the TFP shock varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a low TFP, while $t > 1$ values are expected values.

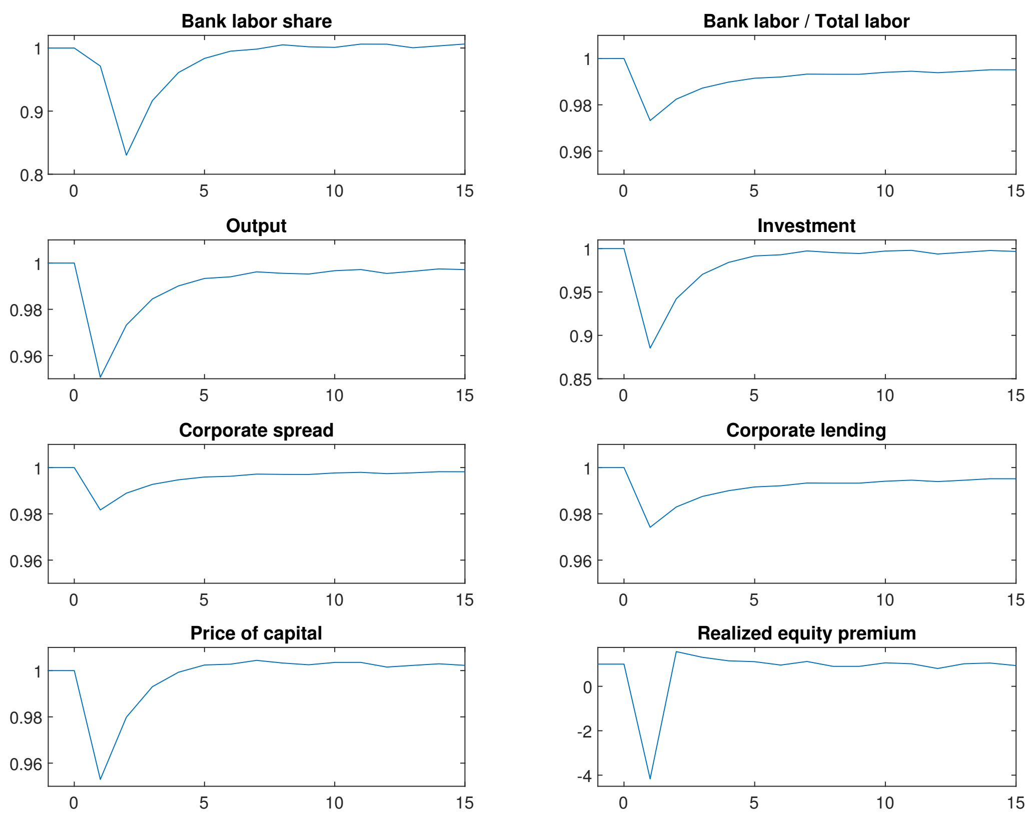


Figure 3: Financial sector employment share of total employment, time series

This figure plots the financial sector employment share of total employment over time, and compares it to GDP. The series are USFIRE, PAYEMS, and GDPC1 respectively in FRED. Since both series are non-stationary, the top panel plots HP-filtered values and the bottom growth rates.

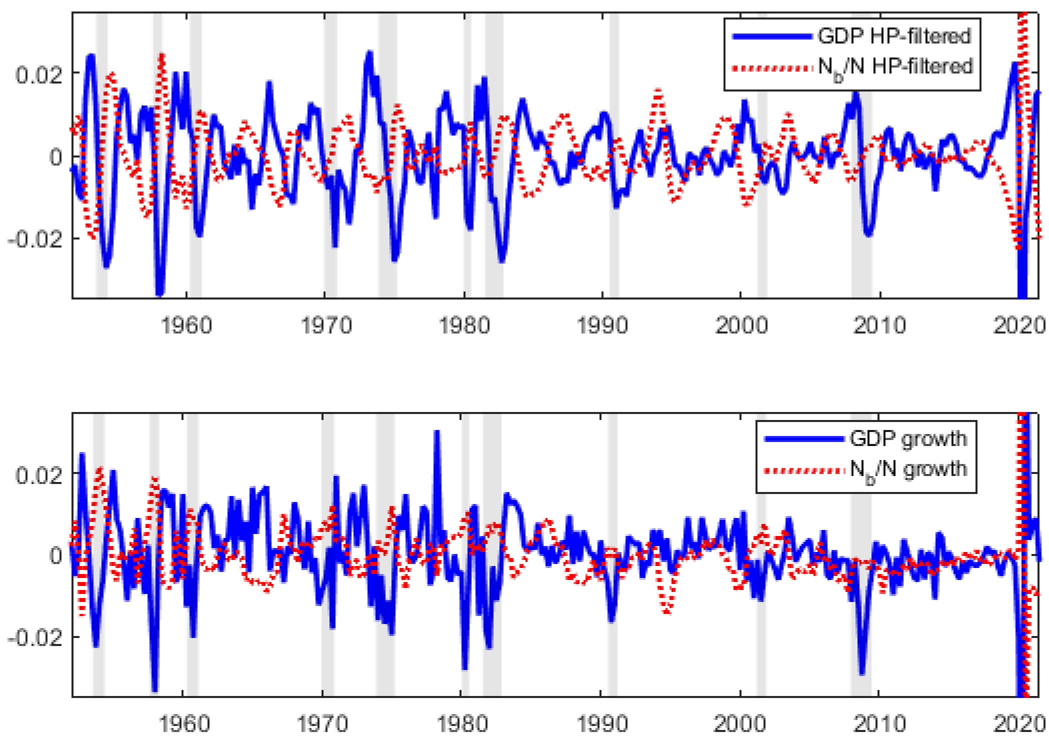


Table 1: Summary statistics

This table reports the summary statistics of key variables. Key variables include financial sector labor share (FLS), growth rate of net value added (ΔNVA_Fin), and leverage ratio of financial intermediaries constructed as in HKM and AEM. It also includes aggregate GDP growth (ΔGDP), debt growth of non-financial corporate sector (ΔDebt_NCOR), investment growth (ΔINV), aggregate wage growth (ΔWage), consumption growth (ΔCons), and aggregate labor share (Agg_LS). The sample consists of annual observations from 1961 to 2019. All the variables are real.

x	Mean	StDev	AC	Corr(FLS,x)
Panel A: Financial Sector				
FLS	0.64	0.05	0.54	1.00
ΔNVA_Fin	0.04	0.07	-0.13	-0.57
HKM	18.15	6.09	0.83	0.16
AEM	17.95	11.30	0.78	0.43
Panel B: Aggregate economy				
ΔGDP	0.03	0.02	0.37	-0.30
ΔDebt	0.03	0.07	0.47	-0.27
ΔINV	0.03	0.13	0.38	-0.33
ΔWage	0.03	0.02	0.48	-0.26
ΔCon	0.01	0.01	0.48	-0.16
LS_Agg	0.55	0.01	0.92	-0.02

Table 2: Aggregate FLS and excess equity return

This table reports the results of aggregate-level regressions of stock market excess return at $t+k$ on the financial labor share at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
FLS	-0.59	-0.59	-0.62	-0.50	-0.61	-0.98	-0.60	0.04	-0.59	-0.29
t	-1.17	-1.12	-1.15	-1.02	-1.16	-2.21	-1.20	0.09	-1.08	-0.76
Control		-2.04	-0.19	1.98	0.01	0.05	0.00	0.85	0.00	0.00
t		-1.41	-0.29	1.95	0.22	2.43	0.22	2.58	-0.01	-2.40
R2	0.02	0.01	0.00	0.03	0.00	0.10	0.00	0.08	0.00	0.03
Panel B: 1-year ahead										
FLS	0.36	0.36	0.20	0.26	0.28	0.17	0.42	0.67	0.18	0.49
t	1.96	1.90	0.85	1.60	1.39	1.00	2.78	1.83	1.13	1.86
Control		-1.32	-1.21	-2.18	5.70	2.75	-0.23	0.42	0.45	-0.11
t		-0.59	-1.15	-1.80	1.41	2.01	-3.87	1.57	2.71	-0.83
R2	-0.01	-0.02	0.00	0.01	-0.01	0.00	0.03	0.00	0.03	-0.02
Panel C: 3-years ahead										
FLS	1.93	1.98	1.70	1.67	1.90	1.35	1.99	2.59	1.61	2.56
t	2.94	2.91	2.45	2.94	2.61	2.07	3.14	3.71	2.37	3.80
Control		-5.51	-1.66	-5.70	2.97	8.30	-0.39	0.84	0.84	-0.56
t		-0.87	-1.19	-2.25	0.42	1.85	-1.67	3.08	2.35	-1.78
R2	0.09	0.10	0.09	0.15	0.08	0.15	0.11	0.10	0.13	0.11
Panel D: 5-years ahead										
FLS	5.17	5.42	4.61	4.60	4.83	4.26	5.35	6.58	4.20	5.80
t	3.25	3.42	2.70	3.54	2.66	3.22	3.83	4.28	2.86	3.83
Control		-13.25	-3.80	-12.63	28.59	12.11	-0.90	1.76	2.35	-0.59
t		-1.72	-1.61	-4.18	2.66	2.00	-3.51	2.07	3.74	-1.17
R2	0.26	0.30	0.27	0.38	0.30	0.30	0.33	0.28	0.40	0.26

Table 3: Aggregate FLS and debt growth

This table reports the results of aggregate-level regressions of debt growth in the non-financial corporate sector at $t + k$ on the financial labor share at t. The regressions are annual and include contemporaneous ($k = 0$), 1-year ($k = 1$), 3-year ($k = 3$), and 5-year ($k = 5$) ahead. Debt growth at $t+k$ is defined as $\frac{Debt_{t+k}}{Debt_t}$ when $k > 0$ and $\frac{Debt_t}{Debt_{t-1}}$ when $k = 0$. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
FLS	-0.37	-0.37	-0.13	-0.30	-0.27	-0.16	-0.36	-0.54	-0.26	-0.32
t	-2.83	-2.90	-0.79	-2.44	-1.22	-1.20	-2.70	-2.61	-1.68	-2.20
Control		1.03	1.82	1.56	-0.07	-0.03	0.00	-0.24	0.00	0.00
t		1.80	5.63	7.15	-1.84	-1.92	-0.54	-0.93	-3.24	-0.68
R2	0.06	0.06	0.35	0.14	0.18	0.20	0.04	0.07	0.15	0.04
Panel B: 1-year ahead										
FLS	-0.69	-0.69	-0.50	-0.60	-0.64	-0.74	-0.69	-0.65	-0.58	-0.60
t	-5.22	-4.97	-6.16	-5.85	-7.66	-10.97	-5.49	-2.29	-6.55	-4.71
Control		-0.70	1.44	2.01	-3.79	0.67	0.01	0.05	-0.29	-0.08
t		-0.86	4.05	3.08	-1.09	0.51	0.17	0.19	-4.62	-1.59
R2	0.24	0.23	0.42	0.39	0.27	0.23	0.23	0.23	0.34	0.24
Panel C: 3-years ahead										
FLS	-1.56	-1.55	-1.38	-1.44	-1.55	-1.84	-1.53	-1.52	-1.35	-1.16
t	-5.88	-5.66	-5.89	-6.78	-6.26	-7.70	-5.38	-3.55	-5.64	-2.81
Control		-1.18	127.76	258.18	-0.33	4.10	-0.17	3.99	-0.52	-0.35
t		-0.34	1.39	1.86	-0.04	2.47	-1.52	0.13	-2.51	-1.90
R2	0.23	0.22	0.24	0.27	0.21	0.27	0.24	0.21	0.28	0.27
Panel D: 5-years ahead										
FLS	-1.99	-2.03	-1.89	-1.91	-1.98	-2.28	-1.92	-2.27	-1.70	-1.19
t	-3.87	-3.65	-3.41	-4.11	-3.74	-4.91	-3.97	-3.49	-2.84	-1.27
Control		2.04	0.64	1.64	-0.76	3.87	-0.32	-0.35	-0.69	-0.75
t		0.36	0.41	0.62	-0.06	1.26	-2.34	-1.10	-1.26	-1.99
R2	0.19	0.18	0.18	0.19	0.17	0.20	0.23	0.18	0.24	0.30

Table 4: Aggregate FLS and Baa - Fed Funds spread

This table reports the results of aggregate-level regressions of the Baa - Fed Funds spread at $t+k$ on the finacnial labor share at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
FLS	0.11	0.11	0.11	0.13	0.10	-0.01	0.10	0.17	0.10	0.09
t	3.72	3.34	2.57	4.31	2.39	-0.40	3.74	3.24	3.47	4.14
Control		-0.47	0.24	0.30	1.28	1.73	0.02	7.26	-0.04	0.03
t		-1.94	0.01	1.23	1.65	14.23	2.18	1.72	-0.77	1.45
R2	0.09	0.13	0.07	0.13	0.15	0.90	0.13	0.12	0.06	0.08
Panel B: 1-year ahead										
FLS	0.14	0.14	0.10	0.14	0.12	0.07	0.13	0.14	0.12	0.10
t	4.21	4.24	2.90	4.50	4.35	2.01	4.88	2.85	3.28	4.32
Control		-0.04	-30.29	-5.55	1.76	0.97	0.03	-0.27	0.00	0.04
t		-0.19	-1.70	-0.24	3.42	8.94	3.15	-0.07	-0.11	4.03
R2	0.14	0.13	0.26	0.13	0.26	0.39	0.19	0.13	0.10	0.17
Panel C: 3-years ahead										
FLS	0.09	0.09	0.06	0.08	0.08	0.12	0.09	0.09	0.08	0.03
t	2.42	2.25	1.46	2.13	2.36	2.89	3.60	1.54	1.81	0.49
Control		0.24	-23.15	-21.30	0.85	-0.32	0.05	-0.30	-0.01	0.05
t		0.83	-3.29	-1.68	1.88	-1.25	2.97	-0.08	-0.13	1.93
R2	0.05	0.05	0.11	0.06	0.06	0.06	0.18	0.03	0.01	0.07
Panel D: 5-years ahead										
FLS	0.07	0.07	0.06	0.07	0.06	0.06	0.06	0.09	0.03	-0.01
t	1.78	1.70	2.02	2.28	1.96	2.02	2.23	2.19	1.04	-0.24
Control		-0.07	-5.12	6.17	0.49	0.08	0.03	3.67	-0.05	0.06
t		-0.14	-0.59	0.28	0.79	0.29	2.74	2.25	-1.69	1.81
R2	0.01	0.00	0.00	0.00	0.01	0.00	0.09	0.01	0.00	0.04

Table 5: Aggregate FLS and GDP growth

This table reports the results of aggregate-level regressions of GDP growth at $t+k$ on the financial labor share at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. GDP growth at $t+k$ is defined as $\frac{GDP_{t+k}}{GDP_t}$ when $k>0$ and $\frac{GDP_t}{GDP_{t-1}}$ when $k=0$. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
FLS	-0.13	-0.13		-0.09	-0.09	-0.14	-0.13	-0.07	-0.08	-0.09
t	-4.62	-4.11		-3.60	-3.31	-5.05	-5.33	-0.93	-3.36	-3.75
Control		-0.41		0.91	-0.03	0.00	0.00	0.08	0.00	0.00
t		-1.56		6.55	-4.39	0.39	0.68	0.87	-7.95	-1.23
R2	0.07	0.09		0.40	0.29	0.07	0.06	0.10	0.30	0.08
Panel B: 1-year ahead										
FLS	-0.11	-0.11	-0.06	-0.07	-0.10	-0.17	-0.11	-0.02	-0.07	-0.06
t	-2.23	-2.06	-1.70	-2.12	-2.66	-4.87	-2.30	-0.26	-2.13	-1.61
Control		-0.30	0.32	0.79	-0.42	0.98	-0.01	0.12	-0.10	-0.04
t		-2.66	5.39	3.93	-0.54	1.83	-0.43	2.12	-4.57	-1.85
R2	0.04	0.04	0.13	0.29	0.03	0.20	0.03	0.11	0.15	0.06
Panel C: 3-years ahead										
FLS	-0.19	-0.19	-0.17	-0.14	-0.19	-0.26	-0.18	-0.17	-0.10	-0.02
t	-1.78	-1.76	-2.29	-1.95	-2.24	-3.31	-1.61	-1.08	-1.61	-0.17
Control		0.05	0.14	1.02	0.01	1.02	-0.05	0.03	-0.23	-0.15
t		0.09	0.44	1.98	0.01	1.53	-1.20	0.33	-2.80	-1.96
R2	0.02	0.00	0.01	0.09	0.00	0.04	0.03	0.00	0.15	0.10
Panel D: 5-years ahead										
FLS	-0.24	-0.27	-0.22	-0.20	-0.23	-0.25	-0.23	-0.25	-0.11	0.02
t	-1.52	-1.69	-1.98	-1.71	-1.72	-1.63	-1.44	-1.13	-0.95	0.12
Control		1.49	0.15	1.00	-1.44	0.10	-0.08	-0.01	-0.32	-0.25
t		1.38	0.31	0.31	-0.36	0.19	-1.29	-0.09	-2.02	-2.13
R2	0.02	0.04	0.00	0.05	0.01	0.00	0.04	0.00	0.17	0.16

Table 6: Aggregate FLS and Investment growth

This table reports the results of aggregate-level regressions of investment growth at $t+k$ on the financial labor share at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. Investment growth at $t+k$ is defined as $\frac{INV_{t+k}}{INV_t}$ when $k>0$ and $\frac{INV_t}{INV_{t-1}}$ when $k=0$. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
FLS	-0.40	-0.40	-0.13	-0.34	-0.30	-0.43	-0.42	-0.31	-0.34	-0.43
t	-7.35	-8.78	-1.87	-4.24	-2.65	-4.49	-6.50	-1.73	-3.57	-5.91
Control		-1.11	2.12	1.37	-0.08	0.00	0.04	0.12	0.00	0.00
t		-1.60	10.30	3.69	-5.25	0.35	1.48	0.48	-4.28	0.25
R2	0.11	0.12	0.70	0.21	0.35	0.10	0.11	0.11	0.18	0.09
Panel B: 1-year ahead										
FLS	-0.40	-0.39	-0.29	-0.33	-0.37	-0.63	-0.40	-0.15	-0.36	-0.34
t	-2.64	-2.41	-2.10	-2.23	-2.86	-5.48	-2.70	-0.88	-2.62	-4.19
Control		-1.71	0.83	1.61	-1.81	3.40	0.00	0.32	-0.21	-0.11
t		-4.85	5.23	3.63	-1.14	3.86	-0.06	2.13	-1.77	-1.05
R2	0.11	0.16	0.18	0.24	0.10	0.39	0.09	0.18	0.13	0.12
Panel C: 3-years ahead										
FLS	-0.43	-0.41	-0.51	-0.39	-0.45	-0.84	-0.41	-0.16	-0.33	-0.10
t	-1.89	-1.62	-2.06	-1.75	-1.78	-4.93	-1.83	-0.54	-1.28	-0.32
Control		-2.46	-0.55	0.92	2.07	5.94	-0.14	0.34	0.02	-0.33
t		-1.30	-1.11	0.81	0.43	4.67	-1.28	1.73	0.06	-1.14
R2	0.01	0.02	0.00	0.00	0.00	0.18	0.02	0.01	-0.03	0.02
Panel D: 5-years ahead										
FLS	-0.06	-0.07	-0.20	-0.06	-0.03	-0.28	-0.02	0.23	0.15	0.69
t	-0.17	-0.17	-0.55	-0.19	-0.09	-0.78	-0.07	0.51	0.35	1.28
Control		0.18	-0.92	0.00	-2.62	2.92	-0.20	0.37	0.27	-0.37
t		0.05	-1.37	0.00	-0.42	1.32	-1.26	1.44	0.55	-0.82
R2	-0.02	-0.04	-0.02	-0.04	-0.03	0.00	0.00	-0.02	-0.03	0.03

Table 7: Bank level FLS and bank loan growth

This table reports the results of predicting loan growth in the U.S at $t+k$ by bank holding companies' labor share (FLS) at t using panel bank holding company data from FR Y-9C. This table presents both the univariate and multivariate regression results with bank holding company and year or state-year fixed effect. The coefficient estimates are obtained from the following regression:

$$\Delta Loan_{i,t+k} = \alpha_i + \delta_{s,t} + \beta_1 FLS_{i,t} + \Gamma' Controls_{i,t} + \epsilon_{i,t+k}$$

where $\Delta Loan_{i,t+k} = 2\frac{Avg(Loan_{i,t+1:t+k}) - Avg(Loan_{i,t-k+1:t})}{Avg(Loan_{i,t:t+k}) + Avg(Loan_{i,t-k+1:t})}$ is the loan growth of bank i over a 3-year window ($k = 3$). Column (1) to (4) present the predictability results with dependent variable to be growth rate of total loan and column (5) to (8) present the predictability results with dependent variable to be growth rate of commercial and industrial (C&I) loan. The control variables include size, ROA, capital ratio, non-performing C&I loan share, interest expense and earning growth. The online appendix provides additional details on variable construction. The t-statistics reported in the parentheses below each coefficient estimate are obtained using standard errors clustered by banks. The final sample is from 1986 to 2019.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Total loan growth			Commercial&Industrial loan growth			
FLS	-0.17***	-0.14***	-0.16***	-0.14***	-0.18***	-0.15***	-0.15***	-0.14***
	(-26.17)	(-22.19)	(-14.19)	(-13.35)	(-17.14)	(-14.66)	(-8.43)	(-7.76)
BHC Size			-0.08***	-0.08***			-0.08***	-0.07***
			(-9.08)	(-9.21)			(-5.86)	(-5.36)
BHC ROA			0.78	-0.20			0.42	-0.51
			(1.08)	(-0.27)			(0.37)	(-0.44)
BHC Capital Ratio			-0.26*	-0.10			0.28	0.54**
			(-1.84)	(-0.71)			(1.21)	(2.31)
BHC NPL Share			-4.44***	-3.62***			-10.45***	-9.24***
			(-12.33)	(-9.99)			(-17.00)	(-14.99)
BHC Interest Expense			-4.71***	-3.94***			-3.06***	-2.33***
			(-9.69)	(-8.35)			(-4.46)	(-3.38)
BHC ΔEBIT			0.01***	0.01***			0.01***	0.01***
			(9.06)	(8.25)			(6.47)	(5.65)
N	36969	36857	32555	32430	36949	36837	32516	32391
adj. R^2	0.501	0.546	0.542	0.577	0.401	0.428	0.436	0.459
BHC FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	No	Yes	No	Yes	No	Yes	No
State_Year FEs	No	Yes	No	Yes	No	Yes	No	Yes

Table 8: Bank level FLS and bank credit risk

This table reports the results of predicting of bank holding company's average expected default frequency (EDF) from $t+1$ to $t+3$ by bank holding companies' labor share (FLS) at t using panel bank data from FR Y-9C. This panel presents both the univariate and multivariate regression results with bank holding company and state-year fixed effect. The coefficient estimates are obtained from the following regression:

$$Avg(EDF_{i,t+1:t+k}) = \alpha_i + \delta_{s,t} + \beta_1 FLS_{i,t} + \Gamma' Controls_{i,t} + \epsilon_{i,t+k}.$$

The control variables include size, ROA, capital ratio, non-performing C&I loan share, interest expense and earning growth. The online appendix provides additional details on variable construction. The t-statistics reported in the parentheses below each coefficient estimate are obtained using standard errors clustered by banks. The final sample is from 1992 to 2011.

	(1)	(2)	(3)	(4)
	Expected default frequency (EDF)			
FLS	1.47***	1.32***	1.61***	1.44***
	(7.83)	(6.90)	(5.77)	(5.17)
BHC Size			0.52***	0.34***
			(4.35)	(2.72)
BHC ROA			15.84	13.77
			(1.26)	(1.01)
BHC Capital ratio			-9.78***	-8.84***
			(-3.74)	(-3.41)
BHC NPL Share			-3.10	-3.33
			(-0.39)	(-0.37)
BHC Interest Expense			7.84*	6.81
			(1.76)	(1.35)
BHC ΔEBIT			-0.05**	-0.05**
			(-2.33)	(-2.31)
N	6080	5928	5863	5706
adj. R^2	0.589	0.654	0.601	0.662
BHC FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
State_Year FE	No	Yes	No	Yes

Table 9: Bank level FLS and firm credit

This table reports the results of predicting borrowing quantity, price of bank loans, or distance to default for non-financial U.S firms over a 3-year window by bank holding companies' labor share (FLS) at t using panel data with bank-firm lending relationship. The coefficient estimates are obtained from the following regression:

$$y_{i,j,t+k} = \alpha_i + \beta FLS_{i,t} + \Gamma' Bank\ Controls_{i,t} + \Theta' Firm\ Controls_{j,t} + \epsilon_{i,j,t+k},$$

where $y_{i,j,t+k} = \Delta Loan\ Amount_{i,j,t+k} = 2\frac{\sum_{m=t+1}^{m=t+k} Loan\ Amount_{i,j,m} - \sum_{m=t-k+1}^{m=t} Loan\ Amount_{i,j,m}}{\sum_{m=t+1}^{m=t+k} Loan\ Amount_{i,j,m} + \sum_{m=t-k+1}^{m=t} Loan\ Amount_{i,j,m}}$ is the growth rate of loan borrowing in Panel A, $y_{i,j,t+k} = Avg(Loan\ Spread_{i,j,t+1:t+k})$ the average loan spreads measured as"All-in-drawn" from Dealscan Loan Pricing in Panel B, and $y_{i,j,t+k} = Avg(D2D_{t+1:t+k})$ is default risk in Panel C ($k = 3$). The control variables include bank characteristics (bank size, ROA, capital ratio, non-performing C&I loan ratio, interest expense and earning growth) and firm characteristics (firm size, Tobin's Q, cash, financial leverage, past sales growth, excess return and credit rating). The regressions are estimated under different fixed effect specifications. The t-statistics reported in the parentheses below each coefficient estimate are obtained using standard errors clustered by banks and firms. The final data sample is from 1986 to 2019.

	(1)	(2)	(3)
	Panel A: Loan borrowing growth		
FLS	-0.49***	-0.46**	-0.51**
	(-2.83)	(-2.26)	(-2.92)
N	15277	14916	15262
adj. R^2	0.121	0.123	0.123
	Panel B: Credit spread		
FLS	0.36*	0.29*	0.33*
	(1.88)	(1.70)	(1.87)
N	15008	14659	15000
adj. R^2	0.461	0.469	0.470
	Panel C: Distance to default		
FLS	-1.84***	-1.66***	-1.61***
	(-3.75)	(-2.79)	(-3.14)
N	14353	13994	14337
adj. R^2	0.499	0.507	0.514
BHC FEs	Yes	Yes	Yes
Year FEs	Yes	No	No
Firm State_Year FEs	No	Yes	No
1-digit SIC_Year FEs	No	No	Yes

Table 10: Bank level FLS and firm real outcomes

This table reports the results of predicting non-financial U.S firms' changes in investment rate or earnings growth over a 3-year window by bank holding companies' labor share (FLS) at t using panel data with bank-firm lending relationship. The coefficient estimates are obtained from the following regression:

$$y_{i,j,t+k} = \alpha_i + \beta FLS_{i,t} + \Gamma' Bank\ Controls_{i,t} + \Theta' Firm\ Controls_{j,t} + \epsilon_{i,j,t+k},$$

where $y_{i,j,t+k} = \frac{Avg(CAPX_{t+1:t+k}) - Avg(CAPX_{t-k+1:t})}{PPENT_t}$ for investment rate changes in Panel A and $y_{i,j,t+k} = 2\frac{Avg(IB_{t+1:t+k}) - Avg(IB_{t-k+1:t})}{Avg(IB_{t+1:t+k}) + Avg(IB_{t-k+1:t})}$ for earnings growth in Panel B ($k = 3$). The control variables include bank characteristics (bank size, ROA, capital ratio, non-performing C&I loan ratio and interest expense) and firm characteristics (firm size, Tobin's Q, cash, financial leverage, past sales growth, excess return, tangibility and credit rating). The t-statistics reported in the parentheses below each coefficient estimate are obtained using standard errors clustered by banks and firm. The final data sample is from 1986 to 2019.

	(1)	(2)	(3)
	Panel A: Investment rate change		
FLS	-0.03	-0.04	-0.04
	(-0.80)	(-0.96)	(-1.09)
N	14701	14337	14684
adj. R^2	0.267	0.270	0.285
	Panel B: Earnings growth		
FLS	-0.68**	-0.73**	-0.64**
	(-2.07)	(-2.42)	(-2.06)
N	14799	14427	14782
adj. R^2	0.005	0.004	0.008
Bank FEs	Yes	Yes	Yes
Year FEs	Yes	No	No
State_Year FEs	No	Yes	No
1-digit SIC_Year FEs	No	No	Yes

Table 11: Calibration

This table presents the values of the parameters used to solve the model.

Variable	Parameter	Description
	Standard parameters	
β	0.98	Time discount factor
ρ	2.0	Risk aversion
α	0.35	Capital share in production
δ	0.064	Depreciation rate
g	0.018	Growth rate
$\nu_{k,0}$	2.5	Strength of capital adjustment cost
$\nu_{k,1}$	$1+g$	Target (zero cost) capital growth
Z_t	(0.95,1.00,1.05)	TFP
	Non-standard parameters	
$\nu_{b,t}$	(0.0223,0.0180,0.0137)	FI labor to assets ratio
κ	4.0	FI leverage ratio
λ_0	0.025	Liquidity preference strength
λ_1	0.50	Liquidity preference curvature
υ_0	0.35	Equity issuance cost strength
υ_1	8.0	Equity issuance cost curvature
$\nu_{cd,0}$	0.05	Deviation from target debt cost strength
$\nu_{cd,1}$	0.50	Target (zero cost) debt to capital ratio

Table 12: Model moments

In Panel A, the data moments are from BEA tables 1.1.3 and 1.1.5 for 1949-2018. We define consumption as Personal Consumption Expenditures and Investment as Fixed Investment; we define private output as Gross Domestic Output minus Government expenditures. To compute each variable as a share of private output, we use nominal quantities; to compute volatility and correlation with private output, we use real quantities. In Panel B, the deposit rate is from Figure 1 in Drechsler et al. (2017), which is available for 1997-2013. The corporate bond return is for ICE BofA BBB total return index. In Panel C, we present the slope from regressing financial employment (USFIRE) as a share of total employment (PAYEMS) on GDP. Since both variables are non-stationary, we run regressions either on HP-filtered quantities, or on growth rates. For the data moments, t-statistics are shown in parentheses.

Panel A: Business cycle moments

	Data			Model		
x	$E[\frac{x}{y}]$	$\frac{\sigma[\Delta x]}{\sigma[\Delta y]}$	corr(Δx,Δy)	$E[\frac{x}{y}]$	$\frac{\sigma[\Delta x]}{\sigma[\Delta y]}$	corr(Δx,Δy)
c	0.79	0.61	0.81	0.80	0.62	0.99
inv	0.21	2.28	0.88	0.20	2.38	0.98

Panel B: Financial moments

	Data		Model	
x	$E[x]$	$\sigma[x]$	$E[x]$	$\sigma[x]$
r^{dep}	2.6	1.5	4.7	2.0
$r^{cd} - r^{dep}$	5.9	7.1	2.2	0.3
$r^{e} - r^{dep}$	7.2	17.5	2.4	6.6

Panel C: Relationship between N_b/N and GDP

	HP-filtered		Growth	
Data 1951-2021	-0.45	(-11.41)	-0.29	(-6.60)
Data 1951-2019	-0.56	(-8.43)	-0.54	(-3.74)
Model	-0.58		-0.17	

Table 13: Response to TFP and FLN shocks

The first column of this table reports the correlation between model implied and actual quantities of interest for 1948-2020. The model is simulated with a time series of TFP and FLN shocks extracted from the data. The extraction procedure is described in the text. The second column of this table is similar, but the simulation includes TFP shocks only, with FLN shocks set to their average level. The quantities of interest are GDP growth, investment growth, debt growth, the Baa - Fed Funds spread, and financial sector employment share as a fraction of total employment.

	TFP & FLN	TFP only
ΔGDP	0.45	0.44
ΔINV	0.49	0.46
ΔDEBT	0.33	0.17
Baa-FF	0.15	-0.11
$\frac{N_b}{N}$	0.51	-0.08

Appendix

A Details on Data and Sample Construction

Below are details of how we construct aggregate and firm-level variables, how we identify lead lenders for each loan origination, and the filters we apply to obtain our final sample.

A.1 Aggregate Variables Construction

The aggregate sample for aggregate time series regressions contains annual data from 1961 to 2019. Financial sector labor share is the ratio of compensation of employees to net value added of the financial business sector from Integrated Macroeconomic Accounts (IMA); while aggregate labor share is the ratio of aggregate compensation of employees to GDP. We apply one-sided HP filter to remove the trend of the aggregate labor share. Wage growth is the growth rate in the real wages and salaries per full-time equivalent employee from NIPA Table 6.6, deflated by the Consumer Price Index for All Urban Consumers from FRED. Market return and risk-free rate are from Kenneth French's data library. Debt growth is the growth rate of credit market instrument liabilities (sum of real debt and loans) for non-financial business sector from the Flow of Funds Table L.103. Non-financial business sector leverage is defined as the ratio of its liabilities to corporate equity. Similarly, we obtain debt growth and leverage ratio for financial business sector using debt, loans and equity data from IMA. Aggregate investment growth is the growth rate of fixed investment from NIPA Table 1.1.5. Value added growth is the growth rate of the real net value added for non-financial corporate sector from IMA. The credit spread is the Moody's Baa corporate bond yield in excess of Aaa corporate bond yield from the Federal Reserve. Term Spread is 10-year Treasury rate minus 1-year Treasury rate. The 3-month T-bill rate, corporate bond yield and Treasury rate are from St. Louis Fed. The price-dividend (PD) ratio is obtained from Shiller's webpage. We get the leverage ratio of AEM and HKM directly from Asaf Manela's website. We then take the simple average to obtain the annual observations.

Table A.1 below describes the definition and sources of the main variables.

A.1.1 Labor Skill Measure

Our benchmark analysis uses the Specific Vocational Preparation (SVP) data from the 1991 Dictionary of Occupational Titles (DOT)[62], available from the Department of Labor, and employee data from the Bureau of Labor Statistics (BLS), Occupational Employment Statistics (OES) program.

[62]Dictionary of Occupational Titles (DOT): Revised Fourth Edition, 1991 from U.S. Department of Labor. The data for 1991 DOT are obtained from the Inter-university Consortium for Political and Social Research (ICPSR) Study No 6100 v.1 (DOI:10.3886).

For each occupation defined in the DOT, it provides information about the Specific Vocational Preparation (SVP) level of the occupation. The SVP measures the amount of time required by a typical worker to learn the techniques, acquire the information, and develop the facility needed for average performance in a specific job-worker situation. SVP takes value from 1 to 9, where SVP = 1 corresponds to the lowest level of preparation and SVP = 9 corresponds to the highest level of preparation. We define high skill occupations to be those that have are associated with a SVP equal to or greater than 7 (over 2 years of preparation).[63] The total wage payment of high skill workers are computed as the product of total employment and average annual wage rate. The labor share of high skill workers ("HSLS") is defined as the ratio of total wage payment of high skill workers to GDP for the aggregate economy. The labor share of high skill workers in the finance industry ("HSFLS") is defined as the total wage payment of high skill workers to the net value added of finance industry. The aggregate high skill workers labor share has a mean of 0.2 and a standard deviation of 0.03. The high skill workers labor share in the finance industry has a mean of 0.142 and a standard deviation of 0.015. The correlation between HSFLS and FLS is around 0.62 and the correlation between HSFLS and HSLS is around 0.08.

[63]The following is the detailed explanation of SVP index: 1. Short demonstration only; 2. Anything beyond short demonstration up to and including 1 month; 3. 1 month $<$ preparation time $\leq$ 3 months; 4. 3 month $<$ preparation time $\leq$ 6 months; 5. 6 month $<$ preparation time $\leq$ 1 year; 6. 1 year $<$ preparation time $\leq$ 2 year; 7. 2 year $<$ preparation time $\leq$ 4 year; 8. 4 year $<$ preparation time $\leq$ 10 year; 9. over 10 years.

Table A.1: Variable Definitions

Definition	Variable Definitions	Data sources
Bank Characteristics		
Labor share	Labor expense over sum of labor expense and earning FLS = $\frac{\text{XLR}}{\text{XLR+EBITDA}}$	FR Y-9C
Size	Log of total book assets (BHCK2170)	FR Y-9C
ROA	Net income (BHCK4340) divided by total assets (BHCK2170)	FR Y-9C
Interest Expense	Total interest expense (BHCK4073) divided by total deposits (sum of BHDM6631, BHDM6636, BHFN6631, and BHFN6636)	FR Y-9C
Capital ratio	Total equity (BHCK3210) divided by total assets (BHCK2170)	FR Y-9C
Non-performing Loan	Sum of BHCK5525, BHCK5524, BHCK5526 and BHCK4635, divided by total loan	FR Y-9C
Loan growth	$\Delta \text{Loan}_t = \frac{\text{Loan}_t - \text{Loan}_{t-1}}{0.5(\text{Loan}_t + \text{Loan}_{t-1})}$	FR Y-9C
Earnings growth	$\Delta Earning_t = \frac{EBIT_t - EBIT_{t-1}}{0.5*(EBIT_t + EBIT_{t-1})}$	FR Y-9C
Total Loan	Sum of BHCK2122 and BHCK2123	FR Y-9C
Business Loan	BHCK1766 (Commercial & Industrial Loan)	FR Y-9C
Business Loan (U.S)	BHCK1763	FR Y-9C
Real Estate Loan	BHCK1410	FR Y-9C
Consumer Loan	BHCK1975	FR Y-9C
Data Processing Fees	BHCKC017	FR Y-9C
Legal expense	BHCK4141	FR Y-9C
Firm Characteristics		
Investment rate	Capital expenditure (CAPX) over lagged PPENT	Compustat
Earnings growth	$\Delta \text{Earnings}_t = \frac{\text{IB}_t - \text{IB}_{t-1}}{0.5(\text{IB}_t + \text{IB}_{t-1})}$	Compustat
Firm size	Log of total assets (AT)	Compustat
Financial leverage	Sum of short-term and long-term debt (DLC + DLTT), divided by total assets	Compustat
Cash	Cash and short-term investment (CHE), divided by total assets	Compustat
Tobin's Q	$\frac{\text{AT+CSHOxPRCC}_F\text{−CEQ}}{\text{AT}}$	Compustat
Credit rating	S&P long-term SPLTICRM	Compustat
Sales growth	$\Delta \text{Sales}_t = \frac{\text{Sales}_t - \text{Sales}_{t-1}}{0.5(\text{Sales}_t + \text{Sales}_{t-1})}$	Compustat
Tangibility	$(0.715 \times \text{RECT} + 0.547 \times \text{INVT} + 0.535 \times \text{PPENT})/\text{AT}$	Compustat
Excess return	RET − risk-free rate	CRSP
Whited-Wu index	WW Index = 0.65 - 0.091 CF - 0.062DIVPOS + 0.021TLTD - 0.044LNTA + 0.102ISG - 0.035SG.	Hennessy and Whited (2007)
Aggregate variables		
Financial sector labor share	Compensation of employees divided by net value added	IMA/NIPA
Aggregate labor share	Compensation of employees divided by GDP	NIPA
Wage growth	Growth rate of the real wages and salaries per full-time equivalent employee	NIPA
CPI	Consumer Price Index for All Urban Consumers	FRED
Debt growth	Growth rate of credit market instrument liabilities (sum of real debt and loans) for non-financial business sector	Flow of Funds
	Growth rate of credit market instrument liabilities (sum of real debt and loans) for financial business sector	IMA
Investment growth	Growth rate of nonresidential fixed investment	NIPA
GDP growth	Growth rate of real GDP	NIPA
Value added growth	Growth rate of real net value added	IMA
Credit spread	Moody's Baa corporate bond yield in excess of Fed Funds rate	St. Louis Fed
Term spread	10-year Treasury rate minus 1-year Treasury rate	St. Louis Fed
PD	price-dividend (PD) ratio	Shiller's webpage
Financial leverage	FI financial leverage (AEM and HKM)	Asaf Manela's website
Market excess return	Market return and risk-free rate	Kenneth French

A.2 Distance to Default (D2D)

Following Merton (1974) and Gilchrist and Zakrajšek (2012), the distance to default is defined as

$$D2D = \frac{log(V/D) + (\mu_V - 0.5\sigma_V^2)}{\sigma_V}, \tag{A.1}$$

where V is the total value of firm, μ_V is the annual expected return on V, σ_V is the annual volatility of the firm's value, and D is firm's debt. Firm value V is estimated following an iterative procedure,

1. Set an initial value for the firm value equal to the sum of firm debt and equity: $V = E + D$, where $E = \text{PRC} \times \text{SHROUT}$ (daily stock price times the number of shares outstanding from CRSP).

2. Estimate μ_V and σ_V over a 250-day moving window. The return on firm value is defined as the daily log return on assets, $\Delta logV$.

3. Get a new estimate of V for every day of the 250-day moving window based on the Black-Scholes-Merton option-pricing framework

$$E = V\Phi(\delta_1) - e^{-rT} D\Phi(\delta_2), \tag{A.2}$$

   where $\delta_1 = \frac{log(V/D)+(r+0.5\sigma_V^2)T}{\sigma_V^2\sqrt{T}}$ and $\delta_2 = \delta_1 - \sigma_V\sqrt{T}$ where r is the daily one-year constant maturity Treasury-yield from St. Louis Fed.

4. Iterate on steps 2 and 3 until convergence.

A.3 Identifying Lead Lenders

We use Dealscan, which contains origination information on both sole-lender loans and syndicated loans, to determine relationships between firms and banks. There are two variables in Dealscan that are useful in determining the lead agent: a text variable "LenderRole" that defines the lender role and a Yes/No lead arranger credit variable "LeadArrangerCredit". In the case of syndicated loans with multiple lenders, we follow lender's ranking hierarchy proposed by Chakraborty, Goldstein and MacKinlay (2018) to identify the lead lender for each loan:

1. LenderRole == "Admin Agent"
2. LenderRole == "Lead Bank"
3. LenderRole == "Lead Arranger"
4. LenderRole == "Mandated Lead Arranger"
5. LenderRole == "Mandated Arranger"
6. LenderRole == "Arranger" or "Agent" and LeadArrangerCredit == "Yes"
7. LenderRole == "Arranger" or "Agent" and LeadArrangerCredit == "No"
8. LenderRole is defined as other than those previously listed ("Participant" and "Secondary investor" are also excluded) and LeadArrangerCredit == "Yes"
9. LenderRole is defined as other than those previously listed ("Participant" and "Secondary investor" are also excluded) and LeadArrangerCredit == "No"
10. LenderRole == "Participant" or "Secondary investor"

For a given loan package, the lender with the highest title (following our ten-part hierarchy) is considered as the lead agent. About 81% of the matched facility in our sample has only one lead lender. About 76% of the matched facilities in our sample have a single lead lender that fall under one of the first six categories. Any loan where a single lead agent cannot be determined is excluded from the sample. To determine each lender's loan amount, we do the following: for those loans which have allocation information, we use the provided data (FacilityAmt $\times$ BankAllocation) . For those loans without allocation data, we estimate the average allotment given the lender's position in the syndicate and the syndicate size. Specifically, we estimate the missing values for "BankAllocation" in a Tobit regression where we include number of lenders, number of lead agents, lenders' ranking, loan amount and an indicator for lead agent.

A.4 Sample Selection

Compustat We apply the following filters to our Compustat firms sample:

- We drop firms in finance, insurance, and real estate sectors (SIC $\in$ [6000, 6799]), utilities (SIC $\in$ [4900, 4999]) and public administration (SIC $\in$ [9000, 9999]).
- We drop firms with negative or missing sales or assets, and negative cash.

FR Y-9C We apply the following filters to our bank holding company (BHC) sample:

- We drop observations with missing or negative total assets (BHCK2170)
- We keep bank holding companies (RSSD9331==28)
- We drop lower-tier holding companies whose higher-tier also files Y-9C (BHCK9802==2)
- We keep holding company (RSSD9048 ==500) and exclude securities broker or dealer (RSSD9048 ==700), insurance broker or company (RSSD9048 ==550), utility company (RSSD9048 ==710), and other non-depository institution (RSSD9048 ==720) but keep Goldman Sachs, Morgan Stanley, Ally and American Express.
- We drop observations with negative labor share and interest expense.

Dealscan We apply the following filters to our Dealscan sample:

- We keep facilities measured in U.S Dollars. (Currency==“United States Dollars”)
- We keep facilities with borrowers and lenders in USA. (Country==“USA”)
- We keep facilities with borrowers that are corporations. (InstitutionType==“Corporation”)
- We keep facilities with lenders that are U.S banks. (InstitutionType ==“US Bank”)
- We keep facilities that are either sole-lender loans or syndicated loans. (DistributionMethod ==“Syndication” or DistributionMethod ==“Sole Lender”)
- We keep facilities with single lead agent belongs to the first six categories listed above.
- We only keep holding companies that have issued at least 50 facilities in our merged sample.
- We keep firms that have at least three observations in the sample.

Loan pricing We apply the following filters to our loan pricing sample:

- We drop facilities with negative loan spread (“All-in-Drawn”) or facilities with loan spread over 1000 basis points.
- We drop facilities with maturity less than one year.

B Additional Empirical Results

This section provides additional empirical results, we summarize them here, although all are mentioned in the main text. Table A.2 shows the relationship between FLS and debt growth in the financial sector, it is analogous to Table 3 which does this for aggregate debt growth. Tables A.3, A.4, and A.5 provide multivariate results relating FLS and various controls to aggregate equity returns, debt growth, cost of credit, GDP growth, and investment growth; they are analogous to Tables 2, 3, 4, 5, and 6. Table A.6 recomputes the main aggregate results with the labor share of high skilled workers as a control; it is analogous to Tables 2, 3, 4, 5, and 6. Tables A.7, A.8, A.9, A.10, A.11, and A.12 recompute the main aggregate results replacing FLS by the financial sector's labor to capital ratio is the key independent variable; they are also analogous to Tables 2, 3, 4, 5, 6, and A.2. Table A.13 provides summary statistics for the firm level results. Table A.15 relates bank level FLS to bank level loan growth and is similar to Table 7, but it breaks down loans by type. Table A.16 relates bank level FLS to real firm level outcomes and is similar to Table 10 but it separates firms into constrained and unconstrained. Figure A.2 uses a scatterplot to highlight the negative relationship between output and the financial sector employment as a share of total employment.

In A.17, we report the correlation between two extracted FLS shocks: ϵ_1 and ϵ_2, and other key variables, including FLS, ν_b, and $\frac{N_b}{N}$. To obtain ϵ_1, we regress FLS on TFP growth, changes in credit spread, changes in term spread, macro uncertainty, and financial uncertainty using an expanding window and extract the residuals. To obtain ϵ_2, we estimate a VAR(1) that includes FLS, GDP growth, wage growth, aggregate labor share, term spread, the price-to-dividend ratio, credit spread, and HKM, and extract the residuals to FLS. The sample for these two exercises is from 1970 to 2019 since HKM has been available since 1970. The impulse responses are shown in figure A.8.

Table A.18 provides direct evidence for one specific source of FLN shocks. For example, a higher regulation burden raises the banks' legal and data processing expenses. A bank that has increasing legal and data processing expenses also has a higher FLS, a lower growth rate of loan lending, and a higher interest rate charged from its borrowers.

Figure A.1: Number of Bank Holding Companies

This figure plots the number of bank holding companies from FR Y-9C in our sample every year from 1986 to 2019. The number of bank holding companies increase from 1,321 in year 1986 to 2,204 in year 2005. The number of bank holding companies drops dramatically after 2005 to 304 in year 2019.

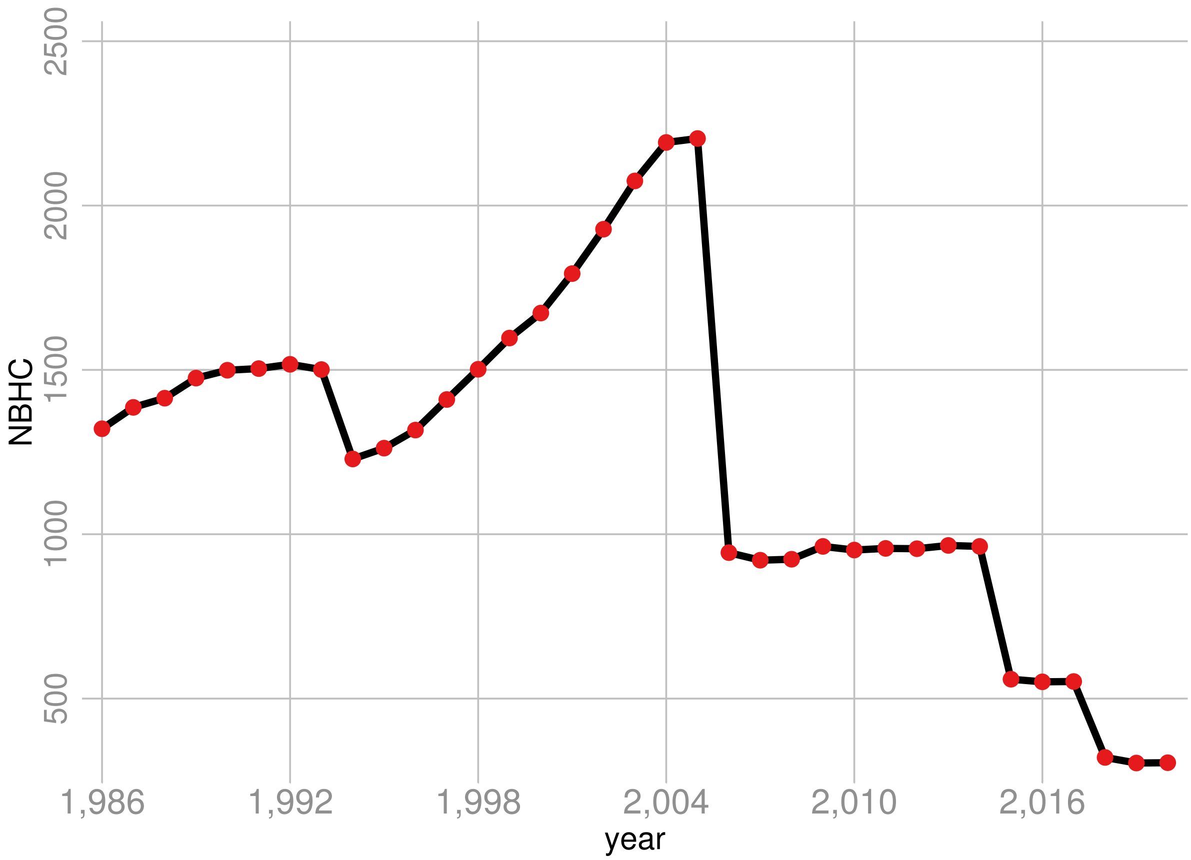


Table A.2: Aggregate FLS and financial sector debt growth

This table reports the results of aggregate-level annual time-series contemporaneous (t), 1-year ahead ($t+1$), 3-year ahead ($t+3$), and 5-year ahead ($t+5$) predictability of financial sector debt growth by financial sector labor share at t (FLS). The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	PD	ΔFVA	HKM	AEM
Panel A: Contemporaneous effect on debt growth, financial sector										
FLS	-0.27	-0.27	-0.05	-0.21	-0.20	-0.08	-0.26	-0.33	-0.15	-0.24
t	-1.93	-1.89	-0.37	-1.45	-1.51	-0.50	-1.89	-1.21	-0.92	-2.25
Control		0.20	1.66	1.22	-0.05	-0.03	0.00	-0.08	0.00	0.00
t		0.20	3.81	3.46	-1.45	-1.78	-0.45	-0.40	-1.93	-0.24
R2	0.02	0.01	0.28	0.07	0.09	0.15	0.01	0.01	0.13	0.01
Panel B: Predicting debt growth, financial sector, 1-year ahead										
FLS	-0.50	-0.50	-0.30	-0.42	-0.48	-0.49	-0.49	-0.40	-0.40	-0.43
t	-2.76	-2.74	-1.85	-2.25	-2.99	-2.53	-2.72	-1.55	-2.20	-3.50
Control		-0.99	1.52	1.85	-1.70	-0.15	-0.06	0.14	-0.26	-0.07
t		-1.08	3.94	3.42	-0.58	-0.08	-1.29	0.78	-1.98	-0.97
R2	0.13	0.13	0.34	0.26	0.12	0.11	0.14	0.12	0.21	0.12
Panel C: Predicting debt growth, financial sector, 3-year ahead										
FLS	-1.47	-1.47	-1.17	-1.36	-1.45	-1.36	-1.41	-1.42	-1.23	-0.95
t	-3.59	-3.41	-2.58	-3.26	-3.39	-2.81	-4.47	-2.11	-2.53	-3.61
Control		-0.37	2.18	2.46	-1.91	-1.62	-0.45	0.07	-0.61	-0.47
t		-0.12	1.73	2.45	-0.18	-0.38	-1.95	0.14	-1.38	-2.23
R2	0.14	0.13	0.19	0.16	0.13	0.13	0.26	0.13	0.19	0.19
Panel D: Predicting debt growth, financial sector, 5-year ahead										
FLS	-2.48	-2.63	-2.16	-2.38	-2.47	-1.92	-2.30	-2.57	-2.12	-1.05
t	-3.24	-3.10	-2.61	-3.21	-3.04	-2.96	-4.78	-1.99	-2.37	-1.78
Control		7.70	2.16	2.16	-1.23	-7.45	-0.89	-0.11	-0.87	-1.34
t		1.38	0.86	0.78	-0.06	-1.44	-2.52	-0.13	-0.97	-3.81
R2	0.14	0.17	0.15	0.14	0.13	0.18	0.32	0.13	0.18	0.33

Table A.3: FLS and excess equity return, multivariate

This table reports the results of aggregate-level annual time-series regressions predicting stock market excess return at $t + k$ by financial sector labor share at t (FLS). The forecast horizon is k=1, 3, or 5 years. The regressions are multivariate. The first column presents the coefficient on FLS and the remaining columns the coefficients on the controls: real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	FLS	ΔWage	ΔGDP	LS	TS	PD	ΔFVA	CS	HKM	R^2
$k = 1$	0.28	-1.98	-0.77	1.61	0.04	-0.24	0.43	-0.03	0.00	0.00
t	0.84	-0.57	-0.51	0.32	1.70	-3.32	1.45	-0.34	0.11	
$k = 3$	1.34	-8.18	-0.29	4.11	0.14	-0.49	0.72	-0.18	0.00	0.26
t	1.76	-1.91	-0.21	0.37	2.91	-2.22	1.19	-1.40	0.28	
$k = 5$	5.06	-17.41	2.87	6.03	0.17	-0.61	2.06	0.03	0.00	0.53
t	6.02	-4.00	1.84	0.48	6.03	-2.57	2.76	0.22	0.55	

Table A.4: FLS and credit markets, multivariate

This table reports the results of aggregate-level annual time-series regressions predicting debt growth or borrowing cost (measured by the Baa-FedFunds spread) at $t+k$ by financial sector labor share at t (FLS). The forecast horizon is k=1, 3, or 5 years. The regressions are multivariate. The first column presents the coefficient on FLS and the remaining columns the coefficients on the controls: real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	FLS	ΔWage	ΔGDP	LS	TS	PD	ΔFVA	CS	HKM	R^2
					Panel A: Debt growth					
$k=1$	-0.61	1.41	0.71	-1.67	0.00	-0.05	-0.15	0.00	0.00	0.41
t	-3.30	1.54	1.58	-0.84	0.40	-1.27	-1.08	0.01	-0.67	
$k=3$	-1.84	-0.85	0.18	0.72	0.07	-0.38	-0.27	0.11	-0.01	0.45
t	-4.73	-0.45	0.15	0.14	3.95	-6.80	-0.79	0.97	-4.96	
$k=5$	-2.83	-4.71	0.28	10.62	0.11	-0.64	-0.62	0.14	-0.02	0.48
t	-3.97	-2.16	0.16	1.11	3.23	-5.02	-1.51	1.17	-12.29	
					Panel B: Borrowing cost					
$k=1$	0.01	-0.04	-0.23	0.25	0.01	0.02	-0.02	0.01	0.00	0.56
t	0.54	-0.21	-1.79	0.80	8.19	4.36	-0.79	2.19	-0.47	
$k=3$	0.14	-0.19	0.04	0.09	-0.01	0.08	0.06	0.02	0.00	0.39
t	3.47	-1.11	0.46	0.27	-3.60	6.53	3.05	2.04	1.12	
$k=5$	0.08	0.49	-0.03	-0.42	0.00	0.05	0.03	0.00	0.00	0.19
t	2.35	1.78	-0.25	-0.36	-2.18	5.64	1.74	-0.59	4.28	

Table A.5: FLS and real quantities, multivariate

This table reports the results of aggregate-level annual time-series regressions predicting GDP growth and Investment growth at $t+k$ by financial sector labor share at t (FLS). The forecast horizon is k=1, 3, or 5 years. The regressions are multivariate. The first column presents the coefficient on FLS and the remaining columns the coefficients on the controls: real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	FLS	ΔWage	ΔGDP	LS	TS	PD	ΔFVA	CS	HKM	R^2
	Panel A: GDP growth									
$k=1$	-0.08	0.47	-0.10	-0.29	0.01	-0.04	0.04	0.01	0.00	0.46
	-2.21	1.44	-0.49	-0.93	3.65	-3.13	1.20	1.18	-3.84	
$k=3$	-0.26	0.29	-0.67	-0.16	0.02	-0.15	-0.06	0.04	-0.01	0.42
	-2.20	0.43	-1.59	-0.16	2.81	-4.40	-0.55	0.97	-4.14	
$k=5$	-0.26	-0.45	-0.54	1.27	0.02	-0.19	-0.04	0.04	-0.01	0.35
	-1.36	-0.48	-1.17	0.70	1.76	-3.23	-0.34	0.88	-4.61	
	Panel B: Investment growth									
$k=1$	-0.45	1.39	-0.26	-1.37	0.03	-0.09	0.06	-0.03	0.00	0.50
	-3.17	1.73	-0.53	-1.94	4.58	-2.47	0.56	-1.48	-0.59	
$k=3$	-0.88	0.03	-2.71	-1.72	0.08	-0.39	0.06	0.01	-0.01	0.41
	-3.01	0.02	-2.52	-0.48	3.17	-3.96	0.22	0.18	-3.92	
$k=5$	-0.21	-1.95	-2.98	0.50	0.07	-0.46	0.30	-0.02	-0.01	0.24
	-0.49	-1.40	-2.39	0.08	1.86	-3.54	1.42	-0.29	-4.37	

Table A.6: High skilled labor share as a placebo

This table reports the results of aggregate-level annual time-series 1-year ahead ($t + 1$) predictability of various variables of interest by high skilled labor share (HSLS) or by financial sector labor share (FLS) at t. The variables of interest are the market premium ($R^m - R^f$), debt growth (ΔDebt), Baa minus Fed Funds credit spread (CrSpr), investment growth (ΔInv) and GDP growth (ΔGDP) in columns 1-5. The top panel presents univariate results with just HSLS, the bottom panel presents bivariate results with HSLS and FLS. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1997 to 2019. All the variables are real.

	$R^m - R^f$	ΔDebt	CrSpr	ΔInv	ΔGDP
Panel A: Univariate					
HSLS	-0.21	-0.55	25.95	-1.69	-0.17
t	-0.10	-0.31	0.61	-0.98	-0.53
R^2	-0.05	-0.04	-0.01	-0.02	-0.03
Panel B: Bivariate					
HSLS	-1.44	1.87	-26.66	1.76	0.42
t	-0.61	1.89	-0.92	2.17	4.99
FLS	0.004	-0.008	0.17	-0.011	-0.002
t	1.40	-4.93	4.34	-8.50	-12.33
R^2	-0.09	0.36	0.28	0.20	0.39

Table A.7: Financial labor to total assets ratio and excess equity return

This table reports the results of aggregate-level regressions of stock market excess return at $t+k$ on the labor to total assets ratio at t. The regressions are annual and include contemporaneous ($k = 0$), 1-year ($k = 1$), 3-year ($k = 3$), and 5-year ($k = 5$) ahead. Because the financial sector labor to total assets ratio is non-stationary and falls during the sample, the predictor is 1-sided HP-filtered value of the ratio at t with a filtering parameter of 100. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
ν_b	-0.16	-0.19	-0.12	0.09	-0.16	-1.02	-0.20	0.07	-0.19	0.55
t	-0.44	-0.42	-0.30	0.22	-0.48	-2.02	-0.65	0.25	-0.37	0.95
Control		-2.12	0.17	2.33	0.00	0.06	0.02	0.84	0.00	0.00
t		-1.45	0.21	2.12	-0.05	2.37	0.22	3.20	-1.81	-1.96
R^2	-0.02	-0.02	-0.03	0.00	-0.03	0.05	-0.03	0.08	-0.03	0.03
Panel B: 1-year ahead										
ν_b	1.15	1.14	0.97	0.97	1.09	0.97	1.81	1.22	1.25	0.55
t	3.46	3.20	3.75	3.16	3.39	2.04	2.92	3.78	3.82	0.95
Control		-1.09	-0.74	-1.69	0.05	0.01	-0.37	0.21	0.01	0.00
t		-0.54	-0.75	-1.41	1.72	0.75	-3.39	1.39	3.18	-1.96
R^2	0.04	0.03	0.03	0.05	0.04	0.03	0.14	0.03	0.09	0.03
Panel C: 3-years ahead										
ν_b	3.28	3.25	3.04	2.76	3.24	2.31	4.66	3.26	4.23	4.32
t	4.23	3.96	4.05	3.75	3.92	1.65	4.43	4.09	5.30	3.70
Control		-4.50	-0.92	-4.84	0.03	0.06	-0.79	-0.08	0.02	-0.01
t		-0.72	-0.71	-1.80	0.40	1.18	-3.08	-0.27	2.86	-2.01
R^2	0.13	0.14	0.12	0.17	0.12	0.15	0.26	0.12	0.28	0.17
Panel D: 5-years ahead										
ν_b	6.35	6.26	5.39	5.07	5.96	4.63	9.19	6.14	7.46	7.64
t	3.71	3.61	2.55	3.10	2.91	2.69	8.21	3.57	5.95	3.78
Control		-8.37	-3.71	-11.77	0.32	0.11	-1.65	-0.70	0.05	-0.03
t		-0.85	-1.26	-2.71	2.62	1.88	-6.45	-1.50	4.52	-4.70
R^2	0.19	0.20	0.20	0.29	0.24	0.22	0.40	0.19	0.46	0.30

Table A.8: Financial labor to total assets ratio and non-financial corporate sector debt growth

This table reports the results of aggregate-level regressions of non-financial corporate debt growth at $t+k$ on the labor to total assets ratio at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. Because the financial sector labor to total assets ratio is non-stationary and falls during the sample, the predictor is 1-sided HP-filtered value of the ratio at t with a filtering parameter of 100. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
ν_b	-1.12	-1.11	-0.75	-1.00	-1.03	-0.87	-1.25	-1.14	-1.16	-1.20
t	-4.45	-4.84	-3.39	-3.48	-4.88	-4.66	-4.57	-4.03	-4.00	-3.20
Control		0.81	1.43	1.08	-0.06	-0.02	0.07	-0.08	0.00	0.00
t		0.97	9.61	2.10	-2.89	-1.44	1.31	-0.67	-3.94	1.64
R^2	0.30	0.30	0.47	0.33	0.42	0.33	0.31	0.29	0.36	0.26
Panel B: 1-year ahead										
ν_b	-1.04	-1.05	-0.69	-0.85	-0.98	-1.32	-1.21	-0.96	-1.04	-0.86
t	-5.22	-4.79	-3.17	-3.83	-4.92	-8.89	-5.85	-4.43	-4.60	-4.14
Control		-0.96	1.35	1.79	-0.04	0.02	0.09	0.26	-0.01	0.00
t		-0.76	2.88	2.80	-1.29	1.87	1.96	3.16	-3.82	-0.38
R^2	0.26	0.26	0.40	0.37	0.30	0.29	0.28	0.31	0.34	0.16
Panel C: 3-years ahead										
ν_b	-1.93	-1.94	-1.61	-1.68	-1.91	-2.88	-1.91	-1.76	-1.60	-1.29
t	-2.68	-2.73	-1.89	-2.53	-2.57	-4.10	-2.38	-2.40	-2.03	-1.09
Control		-1.90	1.23	2.30	-0.01	0.06	-0.01	0.59	0.00	0.00
t		-0.45	0.99	2.46	-0.20	3.13	-0.13	4.19	-1.70	-0.73
R^2	0.17	0.16	0.17	0.19	0.15	0.26	0.15	0.21	0.09	0.10
Panel D: 5-years ahead										
ν_b	-2.43	-2.42	-2.28	-2.30	-2.40	-3.33	-2.15	-2.28	-0.99	-0.43
t	-1.98	-1.98	-1.66	-2.00	-1.96	-2.67	-1.52	-1.86	-0.76	-0.21
Control		0.20	0.56	1.15	-0.02	0.06	-0.16	0.48	0.00	0.00
t		0.03	0.38	0.56	-0.22	1.34	-1.23	2.34	0.60	-0.46
R^2	0.14	0.12	0.12	0.13	0.12	0.17	0.13	0.14	0.00	-0.03

Table A.9: Financial labor to total assets ratio and Baa - Fed Funds spread

This table reports the results of aggregate-level regressions of the Baa - Fed Funds spread at $t+k$ on the labor to total assets ratio at t. The regressions are annual and include contemporaneous ($k = 0$), 1-year ($k = 1$), 3-year ($k = 3$), and 5-year ($k = 5$) ahead. Because the financial sector labor to total assets ratio is non-stationary and falls during the sample, the predictor is 1-sided HP-filtered value of the ratio at t with a filtering parameter of 100. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
ν_b	0.27	0.26	0.29	0.31	0.25	0.00	0.25	0.27	0.23	0.23
t	3.66	4.13	4.29	4.91	4.87	0.09	3.05	3.96	2.67	2.20
Control		-0.41	0.11	0.43	0.01	0.02	0.01	0.02	0.00	0.00
t		-1.53	1.09	2.71	2.88	12.79	0.53	0.88	-0.21	0.82
R^2	0.26	0.28	0.26	0.35	0.31	0.90	0.25	0.25	0.17	0.20
Panel B: 1-year ahead										
ν_b	0.28	0.28	0.22	0.28	0.25	0.15	0.26	0.26	0.22	0.17
t	4.02	3.92	4.32	4.81	6.82	2.29	3.71	3.92	3.18	3.05
Control		0.02	-0.24	0.05	0.02	0.01	0.01	-0.04	0.00	0.00
t		0.07	-1.75	0.31	7.02	5.66	1.00	-1.92	0.58	3.25
R^2	0.27	0.26	0.33	0.26	0.40	0.41	0.27	0.29	0.14	0.20
Panel C: 3-years ahead										
ν_b	0.19	0.19	0.14	0.17	0.18	0.29	0.13	0.18	0.16	0.09
t	3.01	3.05	2.38	3.04	3.68	4.44	1.84	2.74	2.05	0.94
Control		0.29	-0.19	-0.15	0.01	-0.01	0.03	-0.03	0.00	0.00
t		1.12	-2.81	-1.53	2.18	-2.47	2.46	-1.79	0.48	1.80
R^2	0.11	0.12	0.14	0.11	0.13	0.19	0.17	0.11	0.05	0.09
Panel D: 5-years ahead										
ν_b	0.16	0.16	0.16	0.17	0.15	0.18	0.11	0.16	0.04	-0.04
t	1.80	1.82	1.80	2.12	1.92	2.22	1.26	1.92	0.44	-0.57
Control		0.01	0.01	0.14	0.00	0.00	0.03	0.01	0.00	0.00
t		0.02	0.10	0.74	0.94	-0.72	1.95	0.31	-1.51	2.14
R^2	0.08	0.06	0.06	0.07	0.07	0.07	0.10	0.06	-0.01	0.04

Table A.10: Financial labor to total assets ratio and GDP growth

This table reports the results of aggregate-level regressions of GDP growth at $t+k$ on the labor to total assets ratio at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. Because the financial sector labor to total assets ratio is non-stationary and falls during the sample, the predictor is 1-sided HP-filtered value of the ratio at t with a filtering parameter of 100. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
ν_b	-0.25	-0.26		-0.16	-0.22	-0.34	-0.31	-0.23	-0.17	-0.13
t	-3.35	-3.10		-3.09	-6.16	-4.89	-3.64	-2.57	-3.84	-2.91
Control		-0.47		0.86	-0.03	0.01	0.03	0.09	0.00	0.00
t		-2.29		6.22	-6.28	1.53	1.96	1.68	-5.19	-0.43
R^2	0.15	0.17		0.42	0.36	0.18	0.18	0.21	0.24	0.01
Panel B: 1-year ahead										
ν_b	-0.21	-0.22	-0.14	-0.13	-0.21	-0.44	-0.23	-0.18	-0.15	-0.09
t	-2.61	-2.62	-1.93	-2.73	-2.83	-4.75	-2.67	-2.07	-3.04	-1.10
Control		-0.35	0.28	0.75	0.00	0.01	0.01	0.11	0.00	0.00
t		-3.36	4.79	4.29	-0.77	3.26	0.75	4.44	-3.72	-0.66
R^2	0.10	0.10	0.15	0.30	0.09	0.41	0.09	0.19	0.09	0.01
Panel C: 3-years ahead										
ν_b	-0.46	-0.46	-0.47	-0.37	-0.46	-0.76	-0.43	-0.44	-0.21	-0.10
t	-1.88	-1.88	-2.01	-1.96	-1.97	-3.04	-1.68	-1.75	-1.33	-0.41
Control		-0.06	-0.04	0.86	0.00	0.02	-0.02	0.07	0.00	0.00
t		-0.11	-0.14	2.19	0.05	3.60	-0.38	1.47	-1.31	-0.95
R^2	0.09	0.07	0.07	0.14	0.07	0.20	0.08	0.08	-0.01	0.00
Panel D: 5-years ahead										
ν_b	-0.65	-0.64	-0.68	-0.57	-0.64	-0.84	-0.60	-0.64	-0.10	0.02
t	-1.70	-1.72	-1.88	-1.87	-1.83	-1.83	-1.50	-1.64	-0.62	0.09
Control		1.19	-0.13	0.72	-0.01	0.01	-0.03	0.05	0.00	0.00
t		1.16	-0.50	1.31	-0.41	1.65	-0.49	0.74	0.11	-0.66
R^2	0.12	0.12	0.10	0.12	0.10	0.13	0.10	0.10	-0.04	-0.03

Table A.11: Financial labor to total assets ratio and Investment growth

This table reports the results of aggregate-level regressions of Investment growth at $t+k$ on the labor to total assets ratio at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. Because the financial sector labor to total assets ratio is non-stationary and falls during the sample, the predictor is 1-sided HP-filtered value of the ratio at t with a filtering parameter of 100. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
ν_b	-0.25	-0.26		-0.16	-0.22	-0.34	-0.31	-0.23	-0.17	-0.13
t	-3.35	-3.10		-3.09	-6.16	-4.89	-3.64	-2.57	-3.84	-2.91
Control		-0.47		0.86	-0.03	0.01	0.03	0.09	0.00	0.00
t		-2.29		6.22	-6.28	1.53	1.96	1.68	-5.19	-0.43
R^2	0.15	0.17		0.42	0.36	0.18	0.18	0.21	0.24	0.01
Panel B: 1-year ahead										
ν_b	-0.21	-0.22	-0.14	-0.13	-0.21	-0.44	-0.23	-0.18	-0.15	-0.09
t	-2.61	-2.62	-1.93	-2.73	-2.83	-4.75	-2.67	-2.07	-3.04	-1.10
Control		-0.35	0.28	0.75	0.00	0.01	0.01	0.11	0.00	0.00
t		-3.36	4.79	4.29	-0.77	3.26	0.75	4.44	-3.72	-0.66
R^2	0.10	0.10	0.15	0.30	0.09	0.41	0.09	0.19	0.09	0.01
Panel C: 3-years ahead										
ν_b	-0.46	-0.46	-0.47	-0.37	-0.46	-0.76	-0.43	-0.44	-0.21	-0.10
t	-1.88	-1.88	-2.01	-1.96	-1.97	-3.04	-1.68	-1.75	-1.33	-0.41
Control		-0.06	-0.04	0.86	0.00	0.02	-0.02	0.07	0.00	0.00
t		-0.11	-0.14	2.19	0.05	3.60	-0.38	1.47	-1.31	-0.95
R^2	0.09	0.07	0.07	0.14	0.07	0.20	0.08	0.08	-0.01	0.00
Panel D: 5-years ahead										
ν_b	-0.65	-0.64	-0.68	-0.57	-0.64	-0.84	-0.60	-0.64	-0.10	0.02
t	-1.70	-1.72	-1.88	-1.87	-1.83	-1.83	-1.50	-1.64	-0.62	0.09
Control		1.19	-0.13	0.72	-0.01	0.01	-0.03	0.05	0.00	0.00
t		1.16	-0.50	1.31	-0.41	1.65	-0.49	0.74	0.11	-0.66
R^2	0.12	0.12	0.10	0.12	0.10	0.13	0.10	0.10	-0.04	-0.03

Table A.12: Financial labor to total assets ratio and financial sector debt growth

This table reports the results of aggregate-level regressions of financial sector debt growth at $t+k$ on the labor to total assets ratio at t. The regressions are annual and include contemporaneous ($k=0$), 1-year ($k=1$), 3-year ($k=3$), and 5-year ($k=5$) ahead. Because the financial sector labor to total assets ratio is non-stationary and falls during the sample, the predictor is 1-sided HP-filtered value of the ratio at t with a filtering parameter of 100. The table presents univariate regressions in the first column, and bivariate regressions in the remaining columns. The first column presents the univariate predictability result while the rest of the columns present the bivariate predictability results with additional control variables including aggregate labor share (LS) (with 1-side HP filter), real GDP growth (ΔGDP), aggregate wage growth (ΔWage), credit spread (CS), term spread (TS), price dividend ratio (PD), financial sector value added growth (ΔFVA), and the leverage ratios from AEM and HKM. The online appendix provides additional details on variable construction. The coefficient estimates are in percentage terms. The t-statistics reported below each coefficient estimate are obtained using Newey-West standard error with number of lags equal to 13. The sample consists of annual observations from 1961 to 2019. All the variables are real.

	Univariate	Bivariate controls								
		LS	ΔGDP	ΔWage	CS	TS	P/D	ΔFVA	HKM	AEM
Panel A: Contemporaneous										
ν_b	-0.84	-0.84	-0.49	-0.75	-0.78	-0.57	-0.92	-0.84	-0.74	-0.80
t	-3.09	-3.07	-2.10	-2.62	-3.57	-2.51	-3.16	-2.93	-3.01	-2.86
Control		0.02	1.39	0.85	-0.05	-0.02	0.05	0.00	0.00	0.00
t		0.02	4.74	3.92	-1.85	-1.27	0.98	-0.03	-1.75	-0.70
R^2	0.17	0.16	0.34	0.19	0.23	0.21	0.17	0.16	0.16	0.17
Panel B: 1-year ahead										
ν_b	-0.90	-0.92	-0.55	-0.73	-0.88	-1.05	-0.91	-0.83	-0.81	-0.66
t	-3.20	-3.16	-2.14	-2.52	-3.33	-3.35	-3.24	-2.68	-3.12	-3.85
Control		-1.20	1.38	1.61	-0.02	0.01	0.00	0.25	0.00	0.00
t		-1.63	3.46	3.63	-0.75	0.57	0.01	3.30	-1.81	-1.31
R^2	0.20	0.21	0.37	0.30	0.20	0.20	0.19	0.25	0.19	0.22
Panel C: 3-years ahead										
ν_b	-2.56	-2.57	-2.14	-2.38	-2.53	-2.73	-2.08	-2.41	-2.33	-1.34
t	-3.02	-3.02	-2.57	-2.75	-2.99	-3.39	-3.43	-2.67	-2.84	-1.95
Control		-1.15	1.64	1.67	-0.02	0.01	-0.28	0.51	0.00	-0.01
t		-0.39	1.36	2.51	-0.25	0.33	-1.35	2.63	-0.95	-1.80
R^2	0.22	0.20	0.23	0.22	0.20	0.20	0.24	0.23	0.15	0.28
Panel D: 5-years ahead										
ν_b	-4.32	-4.27	-4.02	-4.25	-4.30	-3.71	-3.22	-4.11	-3.00	-0.80
t	-2.70	-2.77	-2.50	-2.71	-2.66	-2.66	-2.73	-2.48	-1.98	-0.63
Control		5.11	1.16	0.62	-0.02	-0.04	-0.64	0.71	0.00	-0.01
t		1.16	0.58	0.32	-0.12	-0.95	-1.99	2.58	0.27	-1.69
R^2	0.23	0.23	0.22	0.21	0.21	0.23	0.30	0.24	0.09	0.20

Table A.13: Summary statistics, bank holding company

This table reports the summary statistics of bank holding companies and Compustat firms from our merged sample. The sample consists of annual observations from 1986 to 2019.

	Mean	SD	p25	p50	p75	Count
Size	19.96	1.38	18.95	20.27	21.30	17907
Capital ratio	0.08	0.02	0.07	0.08	0.10	17907
ROA	0.01	0.00	0.01	0.01	0.01	17907
NPL share	0.01	0.00	0.00	0.00	0.01	17907
Labor share	0.66	0.16	0.56	0.61	0.69	17907
Business Loan (Billion)	84.62	64.85	27.61	66.63	130.35	17907
Total Loan (Billion)	396.71	337.64	86.28	251.47	726.92	17907
Business Loan (to U.S firms) (Billion)	62.38	51.30	19.45	41.35	98.00	17907

Table A.14: Predicting U.S bank loan growth: separating numerator and denominator

This table reports the results of predicting loan growth in the U.S at $t+k$ by bank holding companies' labor share (FLS) at t using panel bank holding company data from FR Y-9C. This table presents both the univariate and multivariate regression results with bank holding company and year or state-year fixed effect. The coefficient estimates are obtained from the following regression:

$$\Delta Loan_{i,t+k} = \alpha_i + \delta_{s,t} + \beta_1 FLS_{i,t} + \Gamma' Controls_{i,t} + \epsilon_{i,t+k}$$

where $\Delta Loan_{i,t+k} = 2\frac{Avg(Loan_{i,t+1:t+k}) - Avg(Loan_{i,t-k+1:t})}{Avg(Loan_{i,t:t+k}) + Avg(Loan_{i,t-k+1:t})}$ is the loan growth of bank i over a 3-year window ($k = 3$). Column (1) to (4) present the predictability results with dependent variable to be growth rate of total loan and column (5) to (8) present the predictability results with dependent variable to be growth rate of commercial and industrial (C&I) loan. The control variables include size, ROA, capital ratio, non-performing C&I loan share, interest expense and earning growth. The online appendix provides additional details on variable construction. The t-statistics reported in the parentheses below each coefficient estimate are obtained using standard errors clustered by banks. The final sample is from 1986 to 2019.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FLS	-0.157***	-0.144***							
	(-14.19)	(-13.35)							
ln(FLS)			-0.219***						
			(-12.05)						
ln(XLR)				-0.119***		-0.188***			
				(-7.51)		(-11.06)			
ln(XLR+EBIT)					-0.003	0.103***			
					(-0.24)	(8.21)			
XLR/TA							-6.200***		-6.206***
							(-6.88)		(-6.88)
EBIT/TA								-3.075	-3.277
								(-1.19)	(-1.27)
size	-0.075***	-0.079***	-0.085***	0.028*	-0.072***	-0.007	-0.085***	-0.074***	-0.086***
	(-9.08)	(-9.21)	(-9.73)	(1.79)	(-5.27)	(-0.42)	(-9.52)	(-8.63)	(-9.55)
roe	0.781	-0.201	-4.046***	6.068***	6.452***	0.736	6.095***	8.050***	7.946***
	(1.08)	(-0.27)	(-3.89)	(12.93)	(8.13)	(0.87)	(12.92)	(5.23)	(5.16)
cap ratio	-0.262*	-0.100	-0.088	-0.031	-0.168	-0.028	-0.049	-0.168	-0.047
	(-1.85)	(-0.71)	(-0.63)	(-0.21)	(-1.18)	(-0.20)	(-0.34)	(-1.19)	(-0.324)
int exp	-4.711***	-3.940***	-4.078***	-4.094***	-3.931***	-4.120***	-4.045***	-3.921***	-4.037***
	(-9.69)	(-8.35)	(-8.60)	(-8.65)	(-8.18)	(-8.74)	(-8.51)	(-8.15)	(-8.49)
ciNPL loan	-4.442***	-3.623***	-3.583***	-3.825***	-3.960***	-3.681***	-3.829***	-3.999***	-3.874***
	(-12.33)	(-9.99)	(-9.87)	(-10.40)	(-10.75)	(-10.08)	(-10.44)	(-10.85)	(-10.56)
ebitgr	0.009***	0.008***	0.006***	0.005***	0.004***	0.006***	0.005***	0.005***	0.005***
	(9.06)	(8.25)	(6.97)	(5.29)	(4.79)	(6.94)	(5.28)	(5.14)	(5.33)
N	32555	32430	32430	32430	32430	32430	32430	32430	32430
adj. R^2	0.542	0.577	0.578	0.576	0.570	0.579	0.574	0.570	0.574

Table A.15: Predicting U.S bank loan growth: other types of loans

This table reports the results of predicting loan growth in the U.S at $t+k$ by bank holding companies' labor share (FLS) or labor expenses (XLR) or value added (XLR+EBIT) at t using panel bank holding company data from FR Y-9C. All regressions include bank holding company and state-year fixed effect. The coefficient estimates are obtained from the following regression:

$$\Delta Loan_{i,t+k} = \alpha_i + \delta_{s,t} + \beta FLS_{i,t} + \Gamma' Controls_{i,t} + \epsilon_{i,t+k}$$

where $\Delta Loan_{i,t+k} = 2\frac{Avg(Loan_{i,t+1:t+k})-Avg(Loan_{i,t-k+1:t})}{Avg(Loan_{i,t+1:t+k})+Avg(Loan_{i,t-k+1:t})}$ is the loan growth of bank i over a 3-year window ($k=3$). Columns (1) and (2) are identical to columns (3) and (4) of Table 7 in the main text. The subsequent columns change the key forecasting variable to ln(FLS) in (3), ln(XLR) in (4), ln(EBIT+XLR) in (5), ln(XLR) and ln(EBIT+XLR) in (6), XLR/TA in (7). EBIT/TA in (8), and XLR/TA and EBIT/TA in (9). The control variables include size, ROA, capital ratio, non-performing C&I loan share, interest expense and earning growth. The online appendix provides additional details on variable construction. The t-statistics reported in the parentheses below each coefficient estimate are obtained using errors cluster over banks. The final sample is from 1986 to 2019.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	C& I (to U.S firms) loan growth				Real estate loan growth				Consumer loan growth			
FLS	-0.18***	-0.15***	-0.14***	-0.13***	-0.17***	-0.13***	-0.17***	-0.15***	-0.14***	-0.12***	-0.17***	-0.15***
	(-17.22)	(-14.68)	(-8.19)	(-7.53)	(-23.66)	(-19.51)	(-13.46)	(-13.07)	(-11.68)	(-9.73)	(-8.36)	(-6.91)
BHC Size			-0.08***	-0.07***			-0.08***	-0.09***			-0.10***	-0.09***
			(-5.87)	(-5.58)			(-8.33)	(-8.98)			(-6.22)	(-5.90)
BHC ROA			0.72	-0.15			0.21	-1.13			-2.28	-1.65
			(0.64)	(-0.13)			(0.25)	(-1.39)			(-1.62)	(-1.16)
BHC Capital ratio			0.34	0.57**			-0.28*	-0.14			-0.43	-0.14
			(1.49)	(2.47)			(-1.68)	(-0.89)			(-1.51)	(-0.48)
BHC NPL Share			-10.53***	-9.31***			-2.83***	-1.75***			-3.64***	-2.74***
			(-17.03)	(-14.92)			(-6.38)	(-3.92)			(-4.92)	(-3.63)
BHC Interest Expense			-2.93***	-2.18***			-5.30***	-4.45***			-3.77***	-2.73***
			(-4.32)	(-3.17)			(-9.11)	(-7.79)			(-4.11)	(-2.94)
BHC ΔEBIT			0.01***	0.01***			0.01***	0.01***			0.01***	0.00***
			(5.99)	(5.24)			(8.27)	(7.77)			(4.06)	(2.71)
N	36690	36567	32264	32128	36949	36837	32510	32385	36951	36839	32520	32395
adj. R^2	0.402	0.428	0.436	0.459	0.450	0.500	0.487	0.529	0.363	0.397	0.384	0.413
BHC FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
State_Year FEs	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Table A.16: Bank level FLS and firm real outcomes, constrained subsample

This table reports the results of predictability of non-financial U.S firms' changes in investment rate, earnings growth and default risk over a 3-year window by bank holding companies' labor share (FLS) at t using panel data with bank-firm lending relationship. Firms are split into financially constrained and unconstrained, where constrained firms are defined to be in the top 33% of the sample by the Whited-Wu index. The coefficient estimates are obtained from the following regression:

$$y_{i,j,t+k} = \alpha_i + \beta FLS_{i,t} + \Gamma' Bank\ Controls_{i,t} + \Theta' Firm\ Controls_{j,t} + \epsilon_{i,j,t+k},$$

where $y_{i,j,t+k} = \frac{Avg(CAPX_{t+1:t+k}) - Avg(CAPX_{t-k+1:t})}{PPENT_t}$ for investment rate changes in Panel A and $y_{i,j,t+k} = 2\frac{Avg(IB_{t+1:t+k}) - Avg(IB_{t-k+1:t})}{Avg(IB_{t+1:t+k}) + Avg(IB_{t-k+1:t})}$ for earnings growth in Panel B ($k = 3$). The control variables include bank characteristics (bank size, ROA, capital ratio, non-performing C&I loan ratio and interest expense) and firm characteristics (firm size, Tobin's Q, cash, financial leverage, past sales growth, excess return, tangibility and credit rating). The t-statistics reported in the parentheses below each coefficient estimate are obtained using errors cluster over bank and firm. The final data sample is from 1986 to 2019.

	(1)	(2)	(3)	(4)	(5)	(6)
	Constrained firms Top 33% of WW index			Unconstrained firms Bottom 33% of WW index		
	Panel A: Investment rate change					
FLS	-0.14	-0.33**	-0.17*	-0.01	-0.01	-0.02
	(-1.55)	(-2.34)	(-1.73)	(-0.42)	(-0.47)	(-0.64)
N	4672	4385	4656	5138	4772	5115
adj. R^2	0.284	0.283	0.299	0.198	0.224	0.233
	Panel B: Earnings growth					
FLS	-2.60*	-2.59*	-2.50*	-0.08	0.08	0.57
	(-1.75)	(-2.01)	(-1.76)	(-0.15)	(0.08)	(1.01)
N	4695	4404	4679	5186	4822	5164
adj. R^2	0.009	0.003	0.016	0.005	-0.011	0.007
Bank FEs	Yes	Yes	Yes	Yes	Yes	Yes
Year FEs	Yes	No	No	Yes	No	No
State_Year FEs	No	Yes	No	No	Yes	No
1-digit SIC_Year FEs	No	No	Yes	No	No	Yes

Table A.17: Correlations of extracted shocks

This table reports correlations for various ways to measure the financial sector's labor expense burden. FLS is the financial sector's labor share, as defined in section 2.1.1. As described in section 2.1.6, ϵ^1 is the shock to FLS, extracted by regressing it on several variables related to the business cycle, and ϵ^2 is the shock to FLS extracted through a VAR. ν_b is the financial sector's labor to asset share after a 1-sided HP-filtering to make it stationary, it is described in section 2.1.6; it is also the key shock in our model, as described in section 3.2.3. $\frac{N_b}{N}$ is the financial sector employment share of total employment, while we do not interpret it as a shock, as discussed in section 3.5, its behavior is closely related to the shocks in the model, and allows us to differentiate this model's predictions from several alternative models.

	FLS	ϵ_1	ϵ_2	ν_b	$\frac{N_b}{N}$
FLS	1.000	0.818	0.953	0.538	0.426
ϵ_1	0.818	1.000	0.834	0.288	0.319
ϵ_2	0.953	0.834	1.000	0.384	0.312
ν_b	0.538	0.288	0.384	1.000	0.676
$\frac{N_b}{N}$	0.426	0.319	0.312	0.676	1.000

Table A.18: Shock to bank labor expenses

In Panel A, we use the change in a bank's legal and processing fees scaled by total assets (defined for each bank i and year t) to measure banks' regulation compliance burden. Analogous to an instrumental variable approach, column (1) reports results from the first stage of regressing the change in a bank's FLS on the contemporaneous change in its legal and data processing fees, the unit of observation is bank-year. We define $\Delta\widehat{FLS}_{t,i}$=0.062 + 79.9*($\Delta$ Legal and data processing fees / TA)$_{t,i}$. Column (2) reports results from regressing the a bank's three-year loan growth from [t-2:t] to [t+1:t+3] on $\Delta\widehat{FLS}$. Column (3) reports results from regressing the average loan spreads (measured as "All-indrawn" from Dealscan Loan Pricing) for the loans that the bank issues from t+1 to t+3 on $\Delta\widehat{FLS}$. The unit of observation is bank-year and we aggregate the loan-level measures to the bank-year level for all loans available in Dealscan issued by a particular bank, weighted by the individual loan amount. Therefore, the number of observation in column (3) is substantially smaller as the number of banks in Dealscan is very small. Panel B is similar but we capture the compliance burden component for FLS with an aggregate measure of regulatory burden where $\Delta\widehat{FLS}_{t,i}$=0.045 + 0.259*($\Delta$ Regulatory Burden)$_t$. Column (4) of Panel B shows that the change in the legal and data processing fees (the instrument in Panel A) is also related to aggregate regulatory burden.

	(1) FLS	(2) Loans	(3) Spread	(4) Legal and data processing fees x 1000 / Total Assets
Panel A: Legal and processing fees				
Legal and data processing fees / TA	79.907***			
	(6.57)			
$\widehat{FLS}$		-0.251***	1.622**	
		(-6.95)	(2.16)	
Bank controls	-	Yes	Yes	
Firm and Loan controls	-	-	Yes	
N	15487	13021	316	
adj. R^2	0.007	0.581	0.611	
FEs	-	Bank and year	Bank	
Panel B: Aggregate regulatory burden				
Regulatory Burden	0.259***			0.193***
	(4.14)			(3.83)
$\widehat{FLS}$		-0.985***	1.690**	
		(-14.42)	(2.15)	
Bank controls	-	Yes	Yes	Yes
Firm and Loan controls	-	-	Yes	-
N	17426	14920	351	15218
adj. R^2	0.002	0.472	0.575	-0.033
FEs	-	Bank	Bank	Bank

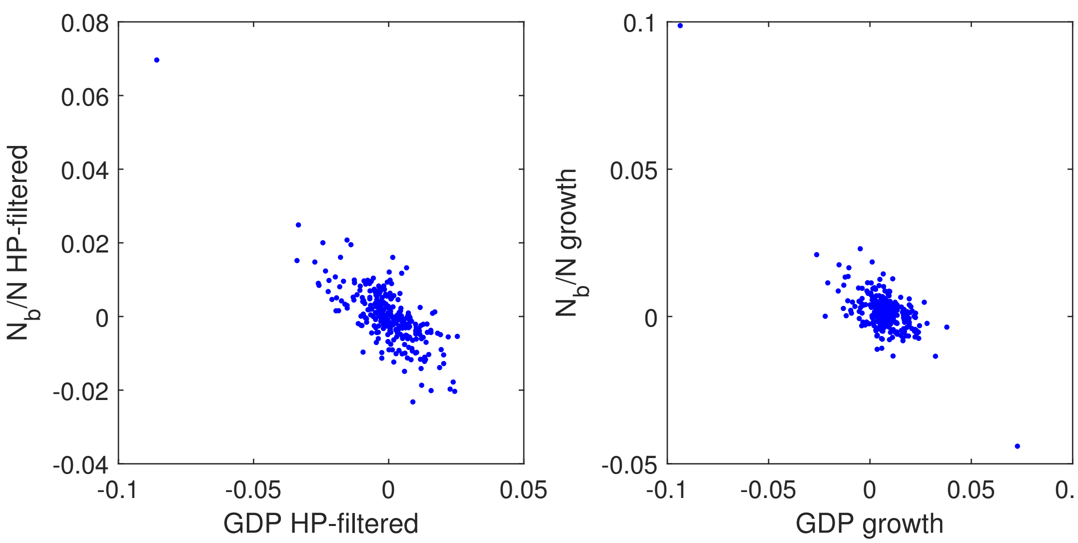
Table A.19: Cyclicality of labor relative to aggregate labor for selected industries

This table computes the cyclicality of an industry's employment share of total employment for selected industries likely to have high human capital. The first column presents the correlation of HP-filtered N_i/N with HP-filtered real GDP, while the second column presents the correlation of growth rates. All variables are from FRED. Real GDP is defined as GDPC1, financial employment is USFIRE, while the other variables can be found in Table B-1, Employees on nonfarm payrolls by industry sector.

	HP filter	Growth
	Broad categories, 1952-2019	
Finance	-0.668	-0.469
Information	0.171	0.132
Professional Services	-0.156	-0.096
Education and Health	-0.690	-0.542
	Finer categories, 1990-2019	
Finance	-0.297	-0.081
Computer and electronic manufacturing	0.054	0.054
Computing Infrastruct., Data Processing, Web Hosting	-0.034	0.085
Telecommunication	-0.108	0.142
Professional, Scientific, And Technical Services	0.010	0.106
Legal Services	-0.448	-0.285
Accounting services	-0.069	0.072
Architectural and Engineering	0.205	0.254
Computer system design	0.162	0.230
Management and technical consulting	-0.110	0.067
Healthcare and Social Assistance	-0.652	-0.560
Non-Fin, Non-Healthcare average	-0.038	0.081

Figure A.2: Financial sector employment share of total employment, scatter plot

This figure plots a scatter plot of the financial sector employment share of total employment compared to GDP. The series are USFIRE, PAYEMS, and GDPC1 respectively in FRED. Since both series are non-stationary, the left panel plots HP-filtered values and the right growth rates.



C Model extensions

This section shows that the frictionless version of our model with 2-period firms is isomorphic to the standard problem with dynamic firms. It then presents two model extensions: a model with credit risk and a model with wage rigidity in the FI sector.

C.1 Solution of frictionless model

Plugging equation 6 for Q_t into equation 4 for $V_{t+1,co}$, noting that $S_{t+1} = K_{t+2}$ and rearranging, we can rewrite the old firm's value at $t+1$ as:

$$V_{t+1,co} = \left(X_{t+1} + 1 - \delta + \nu_{k,0}(2\nu_{k,1} - 1)\left(\frac{K_{t+2}}{K_{t+1}} - \nu_{k,1}\right) + 2\nu_{k,0}\left(\frac{K_{t+2}}{K_{t+1}} - \nu_{k,1}\right)^2 \right) K_{t+1}. \quad \text{(A.3)}$$

This implies that the equity return is

$$R_{t+1} = \frac{V_{t+1,co}}{V_{t,cn}} = \frac{X_{t+1} + 1 - \delta + \nu_{k,0}(2\nu_{k,1} - 1)\left(\frac{K_{t+2}}{K_{t+1}} - \nu_{k,1}\right) + 2\nu_{k,0}\left(\frac{K_{t+2}}{K_{t+1}} - \nu_{k,1}\right)^2}{1 + 2\nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right)}, \quad \text{(A.4)}$$

where the numerator comes from $V_{t,cn} = Q_t K_{t+1}$. From footnote 40 in the main text:

$$X_t = \alpha Z_t \left(\frac{K_t}{N_t}\right)^{\alpha - 1}. \quad \text{(A.5)}$$

The household's problem leads to the standard Euler equation:

$$1 = E_t \left[\beta \left(\frac{C_{t+1}}{C_t}\right)^{-\rho} R_{t+1} \right]. \quad \text{(A.6)}$$

The aggregate budget constraint is:

$$C_t = Z_t K_t^{\alpha} N_t^{1-\alpha} + (1-\delta)K_t - K_{t+1} - \nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right)^2 K_t. \quad \text{(A.7)}$$

Equations A.4, A.5, A.6, and A.6 can be combined into a single functional equation with a single unknown: K_{t+1} as a function of the state (Z_t, K_t).

We now show that the more standard specification of a dynamic firm with adjustment costs leads to exactly the same equation, therefore, the two problems are isomorphic. Consider an infinitely lived firm maximizing the present value of future dividends:

$$V_t = Z_t K_t^{\alpha} N_t^{1-\alpha} - W_t N_t + K_t(1-\delta) - K_{t+1} - \nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right)^2 K_t + E_t[M_{t+1}V_{t+1}]. \quad \text{(A.8)}$$

Exactly as in the main text, this can be rewritten as

$$V_t = X_t K_t + K_t(1-\delta) - K_{t+1} - \nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right)^2 K_t + E_t[M_{t+1}V_{t+1}]. \quad \text{(A.9)}$$

One can guess and verify that the value function is linear in capital: $V_t = Q_t K_t$. In doing so, the firm's first order conditions imply that

$$\frac{K_{t+1}}{K_t} = \nu_{k,1} + \frac{E_t[M_{t+1}Q_{t+1} - 1]}{2\nu_{k,0}}. \quad \text{(A.10)}$$

Plugging equation A.10 into equation A.9 to substitute out $E_t[M_{t+1}V_{t+1}]$ and rearranging leads to exactly the same equation as equation A.3, that is $V_{t+1} = V_{t+1,co}$.

The firm's equity return is $R_{t+1} = \frac{V_{t+1}}{V_t - Div_t}$ where $V_t - Div_t = E_t[M_{t+1}Q_{t+1}] = \left(1 + 2\nu_{k,0}\left(\frac{K_{t+1}}{K_t} - \nu_{k,1}\right)\right) K_t$ and equation A.10 is used to derive the last equality. Plugging the equations for V_{t+1} and $V_t - Div_t$ into R_{t+1} leads to an equation identical to equation A.4. Equations A.5, A.6, and A.7 are also identical in both problems as they are unaffected by whether the firm is dynamic or not. Therefore, the solutions to both problems are characterized by exactly the same four equations.

C.2 Model with credit risk

In this subsection, we extend the baseline model to allow for risky corporate debt. The household's problem remains identical to the baseline model.

For firms, we add a shock which determines default. A fraction p_{t+1}^{δ} of firms suffer a big depreciation shock – a fraction $\overline{\delta}_{t+1}$ of the capital depreciates after production, where $\overline{\delta}_{t+1}$ is a large number close to one. These firms do not produce new capital. We calibrate the shocks so that p_{t+1}^{δ} is the default rate because firms who lose most of their capital are unable to pay back their debts; we choose $\overline{\delta}_{t+1}$ to roughly match the recovery rate. Firms that do not suffer a big depreciation shock see their capital depreciate at a normal rate $\underline{\delta}_{t+1}$, implying that the aggregate capital depreciation rate is $\delta = 1 - (1 - p_{t+1}^{\delta})(1 - \underline{\delta}_{t+1}) - p_{t+1}^{\delta}\overline{\delta}_{t+1}$. We choose $\underline{\delta}_{t+1}$ such that the aggregate depreciation rate δ is always constant, however, the default rate p_{t+1}^{δ} and recovery rate (closely related to $1 - \overline{\delta}_{t+1}$) may be time varying. When p_{t+1}^{δ} and $\overline{\delta}_{t+1}$ are constant, then there is no aggregate variation in the default rate and the default shock is purely cross-sectional.

All firms take wages as given and make identical labor decisions, leading to exactly the same equations for N_t and X_t as in the case with safe corporate debt.

Those firms whose capital did not depreciate choose how much new capital S_{t+1} to create, pay adjustment costs associated with creation of new capital,[64] sell their capital to newly formed firms for $S_{t+1}Q_{t+1}$, sell their output, pay labor costs, pay the proceeds to their equity owners, and shut down. Those firms whose capital fully depreciated simply sell their output, pay labor costs, sell their undepreciated capital, pay the proceeds to creditors, and shut down. The equity and debt values as a function of possible shock realizations is written below:

Shock	Fraction	Equity $V_{t+1,co}$	Debt
Depr.	p^{δ}_{t+1}	0	$\left(\left(1-\nu_{cd,0}\zeta_t^2\right)X_{t+1}+1-\overline{\delta}_{t+1}\right)K_{t+1}$
No Depr.	$1-p^{\delta}_{t+1}$	$\left(\left(1-\nu_{cd,0}\zeta_t^2\right)X_{t+1}K_{t+1}+1-\underline{\delta}_{t+1}\right)K_{t+1}-B_{t+1,cd}$ $-S_{t+1}-\nu_{k,0}\left(\frac{S_{t+1}(1-p^{\delta}_{t+1})}{K_{t+1}}-\nu_{k,1}\right)^2K_{t+1}+Q_{t+1}S_{t+1}.$	$B_{t+1,cd}$

(A.11)

The average values of the equity payout across all firms is:

$$V_{t+1,co} = (1-p^{\delta}_{t+1})\Big(\left(\left(1-\nu_{cd,0}\zeta_t^2\right)X_{t+1}+1-\underline{\delta}_{t+1}\right)K_{t+1}-B_{t+1,cd} -S_{t+1}-\nu_{k,0}\left(\frac{S_{t+1}(1-p^{\delta}_{t+1})}{K_{t+1}}-\nu_{k,1}\right)^2K_{t+1}+Q_{t+1}S_{t+1}\Big), \quad \text{(A.12)}$$

while for debt it is:

$$\text{Debt Payout} = (1-p^{\delta}_{t+1})B_{t+1,cd}+p^{\delta}_{t+1}\left(\left(1-\nu_{cd,0}\zeta_t^2\right)X_{t+1}+1-\overline{\delta}_{t+1}\right)K_{t+1}. \quad \text{(A.13)}$$

The investment decision is orthogonal to the production decision, therefore all firms with undepreciated capital will make identical investment decisions and their FOC for investment implies:

$$Q_{t+1}=1+2\nu_{k,0}(1-p^{\delta}_{t+1})\left(\frac{S_{t+1}(1-p^{\delta}_{t+1})}{K_{t+1}}-\nu_{k,1}\right)=1+2\nu_{k,0}(1-p^{\delta}_{t+1})\left(\frac{K_{t+2}}{K_{t+1}}-\nu_{k,1}\right), \quad \text{(A.14)}$$

where the last equality is true because in aggregate, $1-p^{\delta}_{t+1}$ of the firms produce new capital $S_{t+1,i}$:

$$K_{t+1}=S_t(1-p^{\delta}). \quad \text{(A.15)}$$

[64] We choose the adjustment cost function $\nu_{k,0}\left(\frac{S_t(1-p^{\delta}_t)}{K_t}-\nu_{k,1}\right)^2K_t$, which differs from the original function because of $1-p^{\delta}_t$ in the numerator. Since only those firms whose capital does not fully depreciate are able to produce new capital, the relationship between the capital created by an individual firm S_t and aggregate per capita capital K_{t+1} is $K_{t+1}=S_t(1-p^{\delta}_t)$. This implies that the aggregate adjustment cost is $\nu_{k,0}\left(\frac{K_{t+1}}{K_t}-\nu_{k,1}\right)^2K_t(1-p^{\delta}_t)$ and the aggregate cost of capital is $Q_t=1+2\nu_{k,0}(\frac{K_{t+1}}{K_t}-\nu_{k,1})(1-p^{\delta}_t)$. We chose this functional form because it implies that the level of capital growth K_{t+1}/K_t associated with zero adjustment costs is equal to a constant $\nu_{k,1}$, just as in the version without default. The alternative would be to allow the level of capital growth K_{t+1}/K_t associated with zero adjustment costs to be time varying, which is analogous to having a time varying $\nu_{k,1,t}$. Investment and stock returns in the alternative specification behave quite differently from the standard model and we find this unappealing. However, the bank labor channel we study in this paper is not affected by the choice of the adjustment cost specification.

The firm's capital structure decision is independent of the investment decision – the firm chooses debt to maximize expected cashflows to equity holders $-V_{t,cn} + E_t[M_{t+1}V_{t+1,co}]$ (note that this quantity is zero in equilibrium since equity is fairly priced). The choice of debt therefore satisfies:

$$1 - E_t[\widehat{M}^c_{t+1}(1 - p^\delta_{t+1})]R_{t,cd} = 2\nu_{cd,0}\left(\frac{B_{t+1,cd}/R_{t,cd}}{K_{t+1}} - \nu_{cd,1}\right)E_t[\widehat{M}^c_{t+1}(1 - p^\delta_{t+1})X_{t+1}]. \tag{A.16}$$

The bank's problem is similar to before but its payout is now risky and depends on the default rate.

$$\begin{aligned}
V_{t+1,bo} &= B_{t+1,cd} - B_{t+1,d} \\
&= V_{t,bn}\left((1+\kappa)(1-\nu_{b,t}W_t)\tilde{R}_{t+1,cd} - \kappa R_{t,d}\right) \\
B_{t+1,d}/R_{t,d} &= \kappa V_{t,bn} \\
N_{t,b} &= \nu_{b,t}\left(V_{t,bn} + B_{t+1,d}/R_{t,d}\right) \\
&= V_{t,bn}\nu_{b,t}(1+\kappa) \\
B_{t+1,cd}/R_{t,cd} &= V_{t,bn} + B_{t+1,d}/R_{t,d} - W_t N_{t,b} \\
&= V_{t,bn}(1+\kappa)(1-\nu_{b,t}W_t) \\
\tilde{R}_{t+1,cd} &= (1-p^\delta_{t+1})R_{t,cd} + p^\delta_{t+1}\tfrac{\left((1-\nu_{cd,0}\zeta_t^2)X_{t+1}+1-\underline{\delta}_{t+1}\right)K_{t+1}}{B_{t+1,cd}},
\end{aligned} \tag{A.17}$$

where the bank's risky realized return on corporate debt lending is $\tilde{R}_{t+1,cd}$.

The equilibrium and solution methods are analogous to the problem with safe debt. Many of the parameters are identical to the baseline model without credit risk, here we discuss those that are different. The time discount factor $\beta = 0.991$ is higher to match the capital to output ratio. The capital adjustment cost is $\nu_{k,0} = 1.0$ to match investment volatility. The grid for the financial sector labor to assets ratio is $\nu_{b,t} = (0.0178, 0.0140, 0.0102)$ to match the average labor share and the volatility of financial employment as a share of total employment.

Additionally, the model with default requires the calibration of the probability of default p^δ_t and depreciation shock $\overline{\delta}_t$. These random variables take on three possible values, just like TFP Z_t and are perfectly negatively correlated with Z_t, with probability of default and depreciation shock highest (recovery lowest) when TFP is low. However, note that these two variables are designed to have only cross-sectional effects, neither one directly affects aggregate output or investment. We choose these values based on estimates in Bruche and Gonzalez-Aguado (2010), where default rates are between 0.01 in good times and 0.04 in bad times, and recovery rates are between 0.50 in good times and 0.20 in bad times.[65]

Figures A.3 and A.4 show the impulse responses of various quantities after a shock to FLN, or to aggregate TFP, respectively. They are analogous to figures 1 and 2 in the main text. The response to an FLN shock is similar – qualitatively and quantitatively – to the baseline model.

[65] In the model, the capital to output ratio is 2.6, implying profit to capital of around $\alpha/2.6 = 0.13$. If between 0 and 0.12 of capital is recovered, then total amount recovered by creditors is between 0.13 and 0.25 of capital. The corporate debt to capital ratio is around 0.36, implying recovery rates between 0.35 and 0.70.

Therefore, credit risk, while realstic, is not important for understanding our channel of interest.

Recall that in the baseline model, the impulse responses of labor share, corporate spreads, and corporate lending to a TFP shock were quite different than to an FLN shock. Unlike the baseline model, in the model with credit risk, the impulse responses to a TFP shock are qualitatively similar to the impulse responses to an FLN shock. In the baseline model, financial sector labor share falls after a negative TFP shock because the interest rate on corporate lending rises, leading to an increase in the financial sector's value added, which is counterfactual. In the model with credit risk, upon impact of a negative TFP shock, some firms default, causing value added to fall and labor share to rise. Labor share then falls the following period as credit spreads adjust. Output and investment fall as they are impacted by the TFP shock directly. The corporate spread rises due to higher default risk, and corporate lending falls. Equity prices fall at the time the negative TFP shock is realized, but the equity premium rises going forward for the same reason as in the baseline model – firms shift from debt toward equity financing.

Despite the qualitative similarities to the FLN shock, the quantitative effect on credit markets is much weaker. The changes to debt issuance and corporate spreads are just one third that of the FLN shock. Furthermore, although financial sector labor share rises initially due to unexpected defaults, it immediately falls below its pre-shock level the next period as credit spreads rise. This is different from an FLN shock, after which the financial sector labor share remains persistently elevated.

C.3 Model with wage rigidity

In this subsection, we extend the baseline model to allow for wage rigidity in the financial sector. Most parts of the model remain identical to the previous section, however, we now differentiate between the wage in the financial sector $W_{t,f}$ and the wage in the productive sector $W_{t,p}$.

The productive sector wage is chosen to clear labor market, just as before. However, the financial sector wage follows the equation $W_{t,f} = \mu W_{t-1,f} + (1-\mu)W_{t,p}$ if $W_{t-1,f} > W_{t,p}$ and $W_{t,f} = W_{t,f}$ otherwise. This implies that financial sector wages are always at least as high as economy wide wages, and that there is downward rigidity in the financial sector. Since financial sector wages are higher, all employees would prefer to work in the financial sector. Without rigidity, this would push financial sector wages down. However, since the financial sector cannot lower its wages, it chooses employment $N_{t,b}$ given its (higher) wages by hosting a lottery; the remaining workers work in the productive sector and $W_{t,p}$ clears supply and demand in the corporate labor market. The aggregate wage is $N_{t,b}W_{t,b} + N_{t,c}W_{t,p}$ and all workers pool resources, thus only the aggregate wage matters for the representative agent.

To focus on the effect of rigidity, we shut down FLN shocks ($\nu_{b,t}$), thus TFP shocks are the only shocks driving the model. We also focus on the model with credit risk because, as discussed above, without credit risk, a negative TFP shock causes a fall in financial sector labor share. The parameters of this model are identical to the credit risk model, with the exception of $\nu_{b,t}$, which is contant and equal to its mean value in the credit risk model.

In Appendix figure A.5 we compare a model with rigidity ($\mu = 0.9$) to one without ($\mu = 0$). $\mu = 0.9$ implies that wages are unchanged, on average, 10 years. This is likely much stronger than rigidity in the real world, despite this, the effect of rigidity is quantitatively small. Financial sector labor share is higher after a negative TFP shock, but the effect is too small to see in the figure. Similarly, output and investment are lower in the wage rigidity model after a negative TFP shock, however, the effects are too small to be seen in figure. The corporate spread rises by 10% in the model with rigidity, comapred to 9% without rigidity. The biggest effect is on corporate lending, which falls by 3% in the model with wage rigidity, compared to 2% in the model without. All effect are much smaller than from an FLN shock.

C.4 Constructing the transition probability matrix

Recall that our goal is to construct a discrete Markov process with 9 states such that Z_t and $\nu_{b,t}$ are functions of the 9 states, the HP-filtered autocorrelation of output (endogenous quantity closely related to Z_t) is 0.33, the HP-filtered autocorrelation of $\nu_{b,t}$ is 0.50, and the correlation of the two HP-filtered quantities is -0.23.

We start with a symmetric 3-state Markov process for Z_t with transition probabilities $p_z = (0.6, 0.3, 0.1; 0.2, 0.6, 0.2; 0.1, 0.3, 0.6)$. Similarly, we start with a symmetric 3-state Markov process for $\nu_{b,t}$ with transition probabilities $p_\nu = (0.8, 0.2, 0.0; 0.1, 0.8, 0.1; 0.0, 0.2, 0.8)$. For each Markov process, a low realization was assigned a value of 1, a medium a value of 2, and a high a value of 3. To combine these into a 9-state Markov process in which Z_t and $\nu_{b,t}$ are independent, one would take a Kronecker product, however we target a negative correlation between Z_t and $\nu_{b,t}$, therefore follow a more complicated procedure below.

Next, we simulated two independent AR(1) processes: $x^Z_{t+1} = (1-\rho^Z)\mu^Z + \rho^Z x^Z_t + \sigma^Z \epsilon^Z_{t+1}$ and $x^\nu_{t+1} = (1-\rho^\nu)\mu^\nu + \rho^\nu x^\nu_t + \sigma^\nu \epsilon^\nu_{t+1}$ with uncorrelated $\epsilon^Z \approx N(0,1)$ and $\epsilon^\nu \approx N(0,1)$. We chose the parameters such that these two processes have the same autocorrelations and the same number of low (1), medium (2), and high (3) realizations as the analogous p_z and p_ν discrete processes above. Since x^Z and x^ν are continuous, in order to count the number of low, medium, and high realizations, we discretize them by rounding their values to the nearest integer, by setting any value below 1 to 1, and any value above 3 to 3. Define the discretized value of x to be $\hat{x}$. The parameter values $\mu^Z = 2$, $\rho^Z = 0.6$, $\sigma^Z = 0.69$, $\mu^\nu = 2$, $\rho^\nu = 0.92$, and $\sigma^\nu = 0.3$ achieve the goal stated above.

We then change the correlation between ϵ^Z and ϵ^ν to $\rho^{Z,\nu} = 0.5$ and resimulate the above process. Note that Z_t and $\nu_{b,t}$ need to be negatively correlated. We set the correlation between x^Z and x^ν (similarly between $\hat{x}^Z$ and $\hat{x}^\nu$) to be positive, but we set the grid for $\nu_{b,t}$ such that $\nu_{b,t}$ is high when $\hat{x}^{\nu}$ is low, leading to a negative correlation between Z_t and $\nu_{b,t}$.

Finally, we create a 9-state transition probability matrix by counting the total number of transitions from each possible state to each other possible state. Specifically, since $\hat{x}^Z \in (1,2,3)$ and $\hat{x}^{\nu} \in (1,2,3)$, we combine them into a 9-state process by defining the state as $i = (\hat{x}^Z_t - 1)*3 + \hat{x}^{\nu}_t \in (1, ...9)$. We then define the transition probability matrix as $p_{i,j} = \frac{\sum (\hat{x}^Z_t - 1)*3 + \hat{x}^{\nu}_t = i \quad \& \quad (\hat{x}^Z_{t+1} - 1)*3 + \hat{x}^{\nu}_{t+1} = j}{\sum (\hat{x}^Z_t - 1)*3 + \hat{x}^{\nu} = i}$. We set any entries below 0.002 to 0 and redistribute these values to other entries. The resultant transition probability matrix used in the paper is:

$$p = \begin{pmatrix} 0.5380 & 0.0613 & 0.0000 & 0.2309 & 0.1128 & 0.0000 & 0.0235 & 0.0337 & 0.0000 \\ 0.0847 & 0.4547 & 0.0050 & 0.0103 & 0.3597 & 0.0202 & 0.0000 & 0.0544 & 0.0110 \\ 0.0000 & 0.2203 & 0.2612 & 0.0000 & 0.0606 & 0.3784 & 0.0000 & 0.0000 & 0.0795 \\ 0.2468 & 0.0118 & 0.0000 & 0.3859 & 0.1379 & 0.0000 & 0.0910 & 0.1266 & 0.0000 \\ 0.0415 & 0.2027 & 0.0000 & 0.0196 & 0.4714 & 0.0216 & 0.0000 & 0.2032 & 0.0401 \\ 0.0000 & 0.1235 & 0.0935 & 0.0000 & 0.1264 & 0.3892 & 0.0000 & 0.0143 & 0.2532 \\ 0.0748 & 0.0000 & 0.0000 & 0.3449 & 0.0717 & 0.0000 & 0.2843 & 0.2244 & 0.0000 \\ 0.0104 & 0.0541 & 0.0000 & 0.0188 & 0.3583 & 0.0101 & 0.0052 & 0.4562 & 0.0869 \\ 0.0000 & 0.0334 & 0.0198 & 0.0000 & 0.1127 & 0.2359 & 0.0000 & 0.0583 & 0.5399 \end{pmatrix}$$

We then convert the 9 Markov states into values for Z_t and $\nu_{b,t}$ using the mapping

$$Z \in (0.95, 0.95, 0.95, 1.00, 1.00, 1.00, 1.05, 1, 05, 1.05)$$
$$\nu_b \in (0.0223, 0.0180, 0.0137, 0.0223, 0.0180, 0.0137, 0.0223, 0.0180, 0.0137),$$

where these values are chosen to match the volatilities of output and financial sector labor, as explained in sectin 3.3. The simulated model moments implied by the transition probability matrix are 0.24 for the autocorrelation of HP-filtered GDP, 0.42 for the autocorrelation of HP-filtered financial labor to financial capital (ν_b), and -0.36 for the correlation of the two, compared to targets of (0.33,0.50,-0.23).

Note that the inputs into the above algorithm were the two univariate transition probability matricies p_z and p_ν, and the correlation $\rho^{Z,\nu}$. These were not chosen arbitrarily but rather were the result of an iterative procedure where we updated their values to get model moments closer to targets. Above, we only report the final p_z, p_ν, and $\rho^{Z,\nu}$.

C.5 Solution algorithm

The model described in Section 3 is non-stationary. Before solving it numerically, it must be detrended by its balanced growth path $(1+g)^t$. The non-stationary variables Z_t, K_t, W_t, C_t, NW_t, $V_{t,cn}$, $V_{t,bn}$, $V_{t,co}$, $V_{t,bo}$, B_t, and S_t are all detrended by $(1+g)^t$; the value function $U(NW_t)$ is detrended by $(1+g)^{t(1-\rho)}$; the variables $N_{t,c}$, Q_t, $R_{t,i}$, $\theta_{t,i}$, M_t, $\nu_{b,t}$, ζ_t, and Ψ_t do not need to be detrended as they are stationary. After detrending, we can rewrite all of the equations in Section 3 as analogous equations but in terms of stationary variables. We use lower case letters to refer to the detrended stationary variables.

We then solve the model numerically. Note that because firms and banks in our model live for only two periods, we can solve their problems analytically as a function of the aggregate state. Furthermore, because of the overlapping generation set up, we do not need to keep track of and approximate the cross-sectional distribution of capital and productivity across firms. Therefore, our state space is the true state space, rather than an approximation of the true state space, as is often the case in models with heterogenous firms or agents. The state space includes four variables: the TFP shock z_t, the labor need shock $\nu_{b,t}$, the aggregate capital stock k_t, and the deviation from optimal capital structure ζ_{t-1}. The first two are exogenously specified Markov shocks whose realizations and transition probabilities are described in Section C.4. On the other hand k_t and ζ_{t-1} are endogenous; we discretize them on grids of sizes 40 and 11, respectively. We define $\Gamma_t = (z_t, \nu_{b,t}, k_t, \zeta_{t-1})$ as the aggregate state.

We begin by specifying a set of beliefs for k_{t+1}, ξ_t, c_t, w_t, and $v_{t,bn}$ as functions of the aggregate state Γ_t.[66] Note that since $\Gamma_{t+1} = (z_{t+1}, \nu_{b,t+1}, k_{t+1}, \xi_t)$, and since z_{t+1} and $\nu_{b,t+1}$ are exogenous random shocks with known probability distributions, the specified beliefs also provide us with a belief about the evolution of the aggregate state Γ_{t+1}. We use the term beliefs because in partial equilibrium, we can solve the firm's, bank's, and household's problems for any set of beliefs. However, since we are solving for a rational expectations equilibrium, in equilibrium the beliefs will be consistent with the actual behavior of these variables.

Using the specified beliefs, we are able to analytically solve the firm's problem (including the distribution of its equity return $R_{t+1,c}$), the bank's problem (including the distribution of its equity return $R_{t+1,b}$), the deposit rate $R_{t,d}$, the corporate borrowing rate $R_{t,cd}$, and the quantity of corporate debt $B_{t+1,cd}$. This is discussed in detail in Section C.5.2 below. The returns $R_{t+1,c}$, $R_{t+1,b}$, $R_{t+1,d}$, and $R_{t+1,cd}$ are functions of the state Γ_t, and in the case of $R_{t+1,c}$ and $R_{t+1,b}$ also of the realized shocks z_{t+1} and $\nu_{b,t+1}$. These are also beliefs, since we solve them conditional on the initially specified beliefs.

With beliefs about rates of return ($R_{t+1,c}$, $R_{t+1,b}$, and $R_{t+1,d}$), wages (w_t), and the evolution of the aggregate state (Γ_{t+1}), all as functions of the state and of the realized shock, it is straight forward to solve the household's problem in partial equilibrium. We are solving for a decentralized equilibrium, therefore, even though there is a representative agent, the household thinks of itself as atomistic when solving its problem. The household's individual state includes its individual wealth nw_t[67] and the aggregate state Γ_t. We discretize nw_t using a grid of size 40 and solve the household's problem using backward value function iteration. This gives us the household's policies

[66] Even though k_{t+1} and ξ_t are part of the $t+1$ state Γ_{t+1}, they are both determined at t and are functions of Γ_t.

[67] In equilibrium, household wealth is related to the aggregate state through equation 7.

for consumption c_t and portfolio choice $\theta_{t+1,c}$ and $\theta_{t+1,b}$ as functions of nw_t and Γ_t.

Next, starting at every possible point on the aggregate state space Γ_t, we use the policy functions to simulate the model one period forward. We do this in order to solve for the actual k_{t+1}, ξ_t, c_t, w_t, $V_{t,bn}$, and $N_{b,t}$ as functions of the aggregate state Γ_t. We then use these values to update the beliefs, putting a weight of 0.975 on old beliefs in each iteration in order to ensure a smooth convergence. Once the beliefs have been updated, we restart the process and repeat until convergence. There is one complication associated with clearing markets while simulating the model, which we describe below in Section C.5.1.

C.5.1 Clearing markets during simulation

The household's policies are functions of both the aggregate state Γ_t and of individual wealth nw_t, therefore, we cannot simulate the problem for each point of the aggregate state if we do not know individual wealth nw_t. In equilibrium, $nw_t = v_{t,co} + v_{t,bo} + b_{t+1,d}$ (equation 7), however, we cannot solve for $v_{t,co}$ without knowing aggregate investment s_t (equations 6 and 10), and we cannot solve for aggregate investment s_t without knowing aggregate consumption c_t (equation 17), which is itself a function of nw_t. Thus, the problem is circular. For this reason, when simulating this problem, at each point in the state space (or equivalently, each period if we are interested in a long simulation), we solve a fixed point problem to clear markets. We start with a guess for c_t, use equation 17 to solve for s_t, use equations 6 and 10 to solve for $nw_t = v_{t,co} + v_{t,bo}$[68], which we then use to update the policy c_t. We repeat this until convergence, that is, until we found a c_t such that markets clear.

C.5.2 Analytic solutions of firm and bank problems

Here we describe how to analytically solve the firm's and bank's problems starting from beliefs about k_{t+1}, ξ_t, c_t, w_t, and $v_{t,bn}$.

Using beliefs about c_t as a function of the state Γ_t and using beliefs about the transition of the state Γ_{t+1}, we can construct next period's c_{t+1} as a function of the state and the realized shocks. This can be used to construct the stochastic discount factor M_{t+1} and to solve for $b_{t+1,d}/R_{t,d}$ (equation 8).

Starting with beliefs about $v_{t,bn}$, one can solve for $b_{t+1,d}/R_{t,d}$ (equation 13), $N_{t,b}$ (equation 14), $b_{t+1,cd}/R_{t,cd}$ (equation 15 combined with belief about w_t). Combining the household's and bank's equations for $b_{t+1,d}/R_{t,d}$, we can solve for $b_{t+1,d}$ and $R_{t,d}$ independently.

Given beliefs about k_{t+1}, we can solve for $s_{t+1} = k_{t+1}$ and q_t (equation 6). Then using k_{t+1}, q_t,

[68] In equilibrium, the bank's value plus the value of deposits $v_{t,bo} + b_{t+1,d}$ is equal to the bank's revenue, which is the firm's payout of corporate debt $b_{t+1,cd}$. Therefore, to solve for $nw_t = v_{t,co} + v_{t,bo} + b_{t+1,d}$, we can simply solve for the unlevered value of the firm using equation 10. In this equation, we set $b_{t+1,cd} = 0$ since ultimately, any debt paid out by the firm still belongs to the representative agent, however, we keep ζ_{t-1} unchanged, reflecting losses in output due to deviations from optimal capital structure.

and $b_{t+1,cd}/R_{t,cd}$ from the bank's problem, we can solve for $v_{t,cn}$ (equation 9). Using k_{t+1}, q_t, $v_{t,cn}$, M_{t+1}, and $\theta_{t+1,c} = 1$ (equilibrium), we can solve for $\widehat{M}^c_{t+1}$ (equation 8). Given beliefs about w_t, we can solve for x_t (equation 11). We can combine $\widehat{M}^c_{t+1}$ and x_t to solve for the two expectations in equation A.16. We can then combine equation A.16 with $b_{t+1,cd}/R_{t,cd}$ from the bank's problem to solve for $b_{t+1,cd}$ and $R_{t,cd}$ independently.

Similar to our earlier construction of c_{t+1}, using beliefs about k_{t+1}, w_t, and $v_{t,bn}$ as functions of the state Γ_t and using beliefs about the transition of the state Γ_{t+1}, we can construct next period's k_{t+2}, w_{t+1}, and $v_{t+1,bn}$. We can use k_{t+2} to construct q_{t+1} (equation 6) and use $v_{t+1,bn}$ to construct $N_{t+1,b}$. We now have all the inputs to solve for the firm's realized equity value $v_{t+1,co}$ (equation 10). We also have everything we need to consruct $v_{t+1,bo}$ (equation 16). These can be combined with the $v_{t,cn}$ (solved earlier) and $v_{t,bn}$ (belief) to solve for the equity returns of the firm and the bank.

Figure A.3: Impulse responses to an FLN shock in a model with credit risk

This figure plots the impulse response functions to a one standard deviation shock to the FLN, $\nu_{b,t}$. To produce the figure, we simulate the model for 50 periods, keeping both the TFP shock, and the FLN shock at their average values. At $t = 1$, the TFP shock remains at its average value, but the FLN shock rises unexpectedly. After $t = 1$, the TFP shock remains at its average value, while the FLN shock varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a high $\nu_{b,t}$, while $t > 1$ values are expected values.

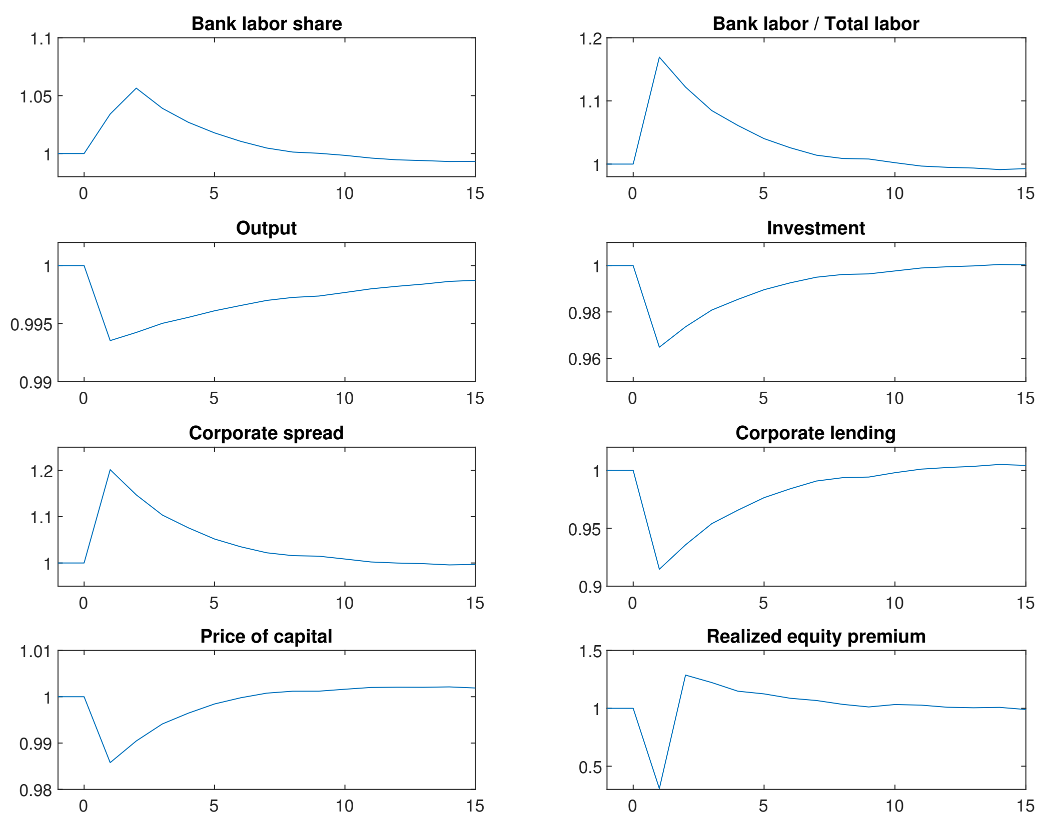


Figure A.4: Impulse responses to TFP shock in a model with credit risk

This figure plots the impulse response functions to a one standard deviation shock to TFP in a model with credit risk. To produce the figure, we simulate the model for 50 periods, keeping both the TFP shock, and the FLN shock at their average values. At $t = 1$, the FLN shock remains at its average value, but TFP falls unexpectedly. After $t = 1$, the FLN shock remains at its average value, while the TFP shock varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a low TFP, while $t > 1$ values are expected values.

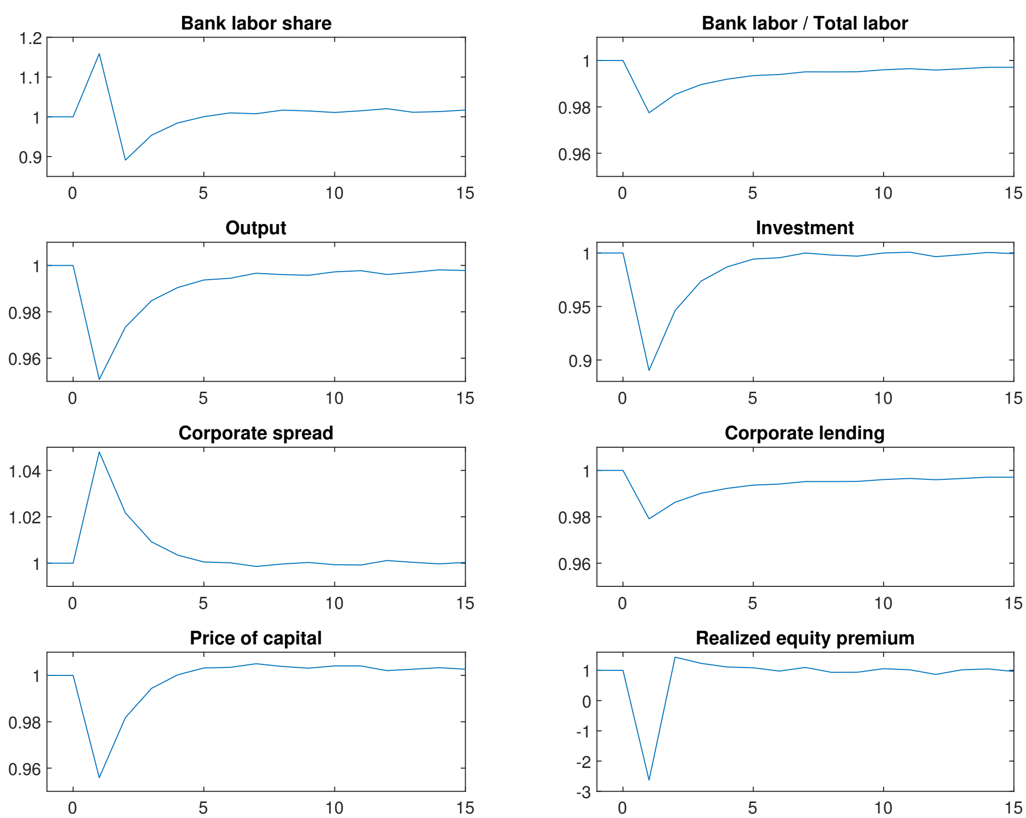


Figure A.5: Impulse responses to TFP shock in a model with wage rigidity

This figure plots the impulse response functions to a one standard deviation shock to TFP. It compares a model with wage rigidity ($\mu = 0.9$, solid blue line) to one without ($\mu = 0$, dashed red line). Both models have credit risk and do not have labor demand shocks ($\nu_{b,t}$ is a constant). To produce the figure, we simulate the model for 50 periods, keeping both the TFP shock, and the FLN shock at their average values. At $t = 1$, the FLN shock remains at its average value, but the TFP falls unexpectedly. After $t = 1$, the FLN shock remains at its average value, while the TFP shock varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a low TFP, while $t > 1$ values are expected values.

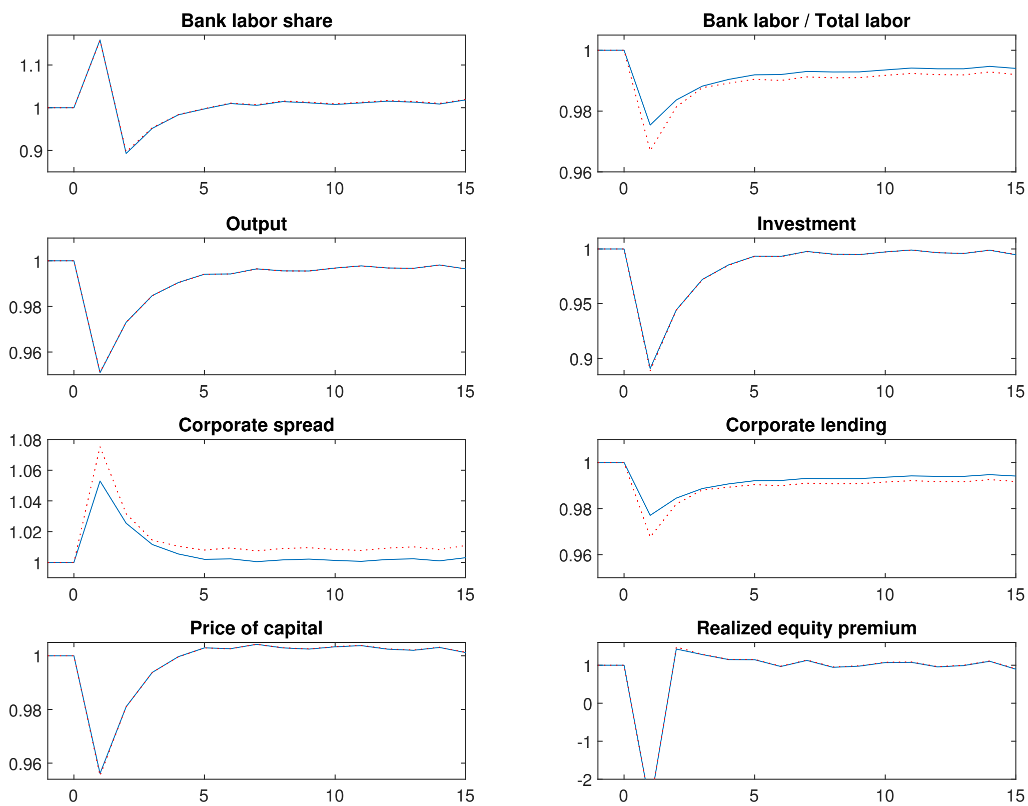


Figure A.6: Impulse responses to a credit shock

This figure plots the impulse response functions to a one standard deviation shock to the bank's maximum deposit to equity ratio κ. To produce the figure, we simulate the model for 50 periods, keeping both the TFP shock, and the credit shock at their average values. At $t = 1$, the TFP shock remains at its average value, but κ falls unexpectedly. After $t = 1$, the TFP shock remains at its average value, while κ varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a low TFP, while $t > 1$ values are expected values.

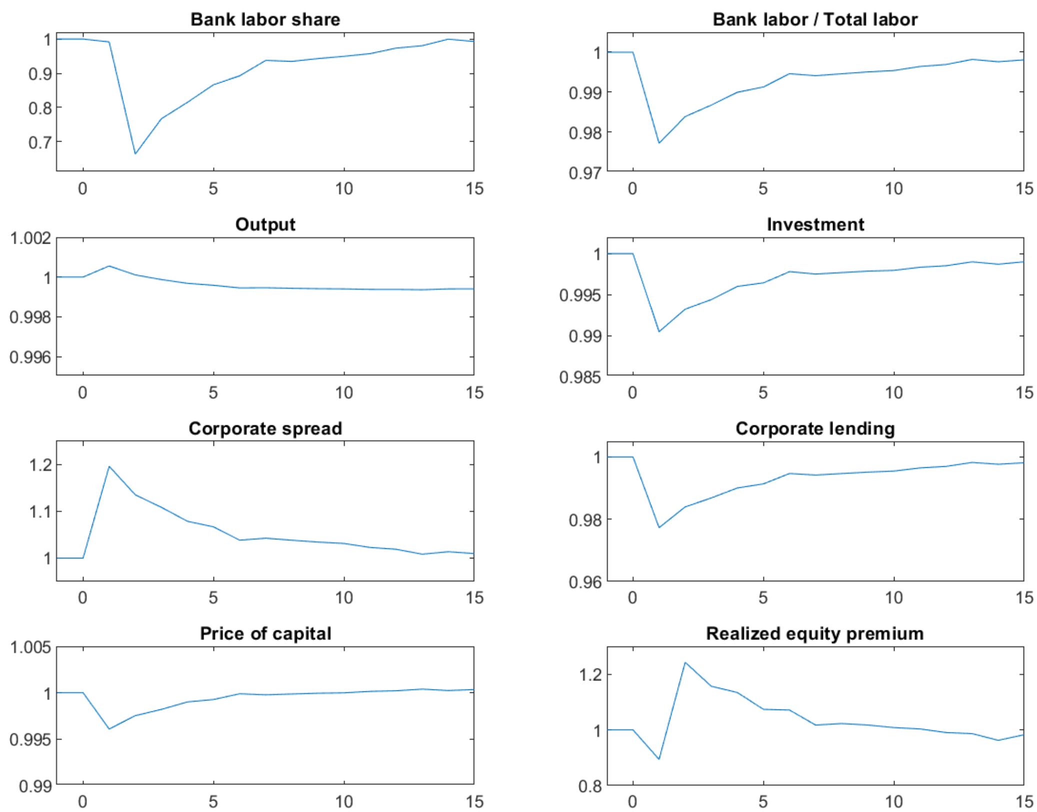


Figure A.7: Impulse responses to TFP shock in a model where bank labor is constant

This figure plots the impulse response functions to a one standard deviation shock to TFP in a model where there are no FLN shocks and where bank labor is set to be constant – this is a limiting case of infinite labor adjustment costs. To produce the figure, we simulate the model for 50 periods, keeping the TFP shock at its average value. At $t = 1$, the TFP falls unexpectedly. After $t = 1$, the TFP shock varies randomly. The figure reports the average financial sector labor share, aggregate output, aggregate investment, corporate spread, corporate lending, and the realized equity premium across many simulations. Note that the $t = 1$ values are realized value, conditional on a low TFP, while $t > 1$ values are expected values.

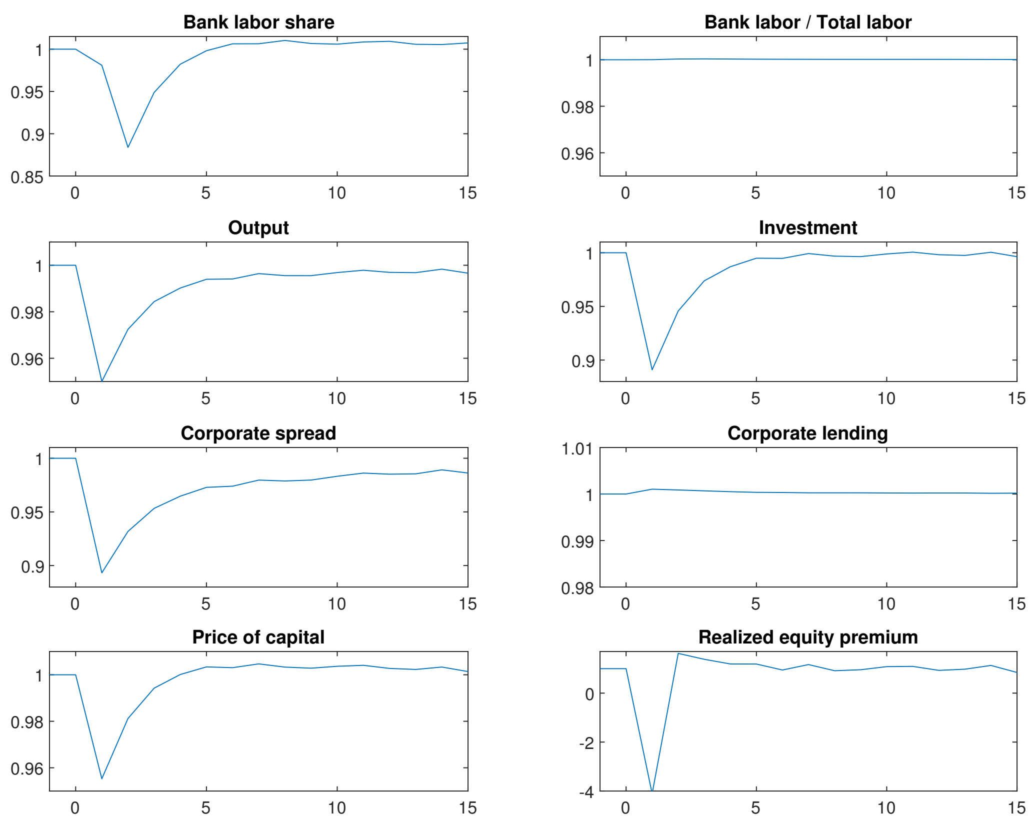


Figure A.8: Impulse responses of FLS from VAR

This figure plots the impulse response functions from a VAR(1) that includes FLS, GDP growth, wage growth, aggregate labor share, term spread, the price-to-dividend ratio, credit spread, and HKM. All the variables are expressed in percentages. The responses are drawn to one standard deviation of macro shocks.