Financing from Workers: Can Labor Market Power Mitigate Financial Frictions?*

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Abstract

We show that firms with labor market power can partially offset financial distress by financing through reduced worker compensation. Using U.S. Census quarterly employer-employee data, we find that workers in highly leveraged firms experience slower earnings growth following unexpected disinflation shocks that increase the real burden of firms' nominal debt. This response is stronger for firms with greater labor market power. We find no evidence of subsequent earnings compensation or increased worker separations, suggesting that workers remain despite relatively lower pay. We then develop a heterogeneous-firm model with labor market power and default risk. Quantitatively, labor market power mitigates about one-third of the negative effects of financial distress. This mitigation arises because, with heterogeneous firms, firm-specific wage adjustments through labor market power reduce misallocation and stabilize the economy more effectively than a uniform equilibrium wage decline in a competitive labor market.

Keywords: Inflation, debt disinflation, financial friction, labor market power, business cycles, firm heterogeneity.
JEL Codes: E31, E32, E44, G32, J31, J42.

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1 Introduction

A large literature has established the consequences of firm financial frictions over business cycles, including their effects on firm dynamics, the amplification of recessions, and the need for policy interventions to subsidize distressed firms. Building on this literature, our paper studies an underexplored channel that can potentially mitigate the impact of financial frictions: firms exploit their labor market power to lower worker earnings growth during periods of financial distress. We label this channel *financing from workers*.

We investigate this channel in two steps. First, we provide micro-level empirical evidence supporting the hypothesis. Using U.S. Census employer–employee matched data, we document that workers in highly leveraged firms experience slower earnings growth following unexpected disinflation shocks that increase the real burden of firms' nominal debt. This response is stronger for firms with greater labor market power, as measured by a higher Herfindahl-Hirschman Index (HHI), larger firms' employment shares, and lower unionization rates. We find no evidence of subsequent earnings compensation or increased worker separations, suggesting that workers remain with their firms despite relatively lower pay, consistent with the presence of firms' labor market power.

Second, we quantify the aggregate implications of financing from workers by constructing a dynamic general equilibrium model with heterogeneous firms that possess monopsony power in the labor market and face endogenous default risk. When jobs are imperfectly substitutable across firms, firms face an upward-sloping labor supply curve. As a result, firms can pay lower wages to remaining workers when financial distress reduces their labor demand. Calibrated to U.S. firm financing patterns and job substitutability, the model shows that labor market power mitigates about one-third of the negative effects of financial distress relative to a counterfactual with competitive labor markets. In a perfectly competitive labor market, the equilibrium wage also falls when labor demand declines. However, with heterogeneous firms, firm-specific wage adjustments arising from labor market power stabilize the economy more effectively than a uniform wage decline.

Our main empirical analysis estimates how workers' earnings growth responds when firms are subject to adverse financial shocks. A key challenge is finding shocks that affect firms' financial conditions while leaving productivity largely unchanged. This requirement rules out productivity shocks or monetary policy shocks. In addition, we prefer shocks that are observable and occur frequently over business cycles. Rare financial events—such as the Great Recession or the collapse of Lehman Brothers—are informative but occur too infrequently to generalize broadly across business cycles.

We find that unexpected disinflation shocks satisfy both criteria. This shock occurs when realized inflation falls short of expectations formed when debt contracts were originated. Because most debt contracts are denominated in nominal terms and unindexed to inflation, such shocks increase firms' debt burdens even when productivity remains unchanged (Fisher, 1933). Moreover, they generate substantial cross-firm variation in financial distress: firms with higher debt experience larger increases in their real debt burdens for the same disinflation shock. In this sense, disinflation acts as a general financial shock that reduces firms' net worth.

Motivated by the well-established debt-deflation channel, we construct quarterly unexpected inflation shocks as the difference between realized and expected inflation. We measure firm-level exposure to state-level inflation as the employment-weighted average of inflation across the states in which they employ workers, using state-level inflation data from Hazell, Herreno, Nakamura, and Steinsson (2022). Expected inflation is proxied by the median expectation from the Survey of Consumers, assuming financial markets are integrated across U.S. states so that expected inflation embedded in nominal interest rates is the same across states.

We then merge the constructed inflation shocks with two other quarterly datasets: the U.S. Census Bureau's Longitudinal Employer–Household Dynamics (LEHD) and Compustat Quarterly. These data allow us to track workers over time and link them to firm characteristics from Compustat. Using the local projection method, we regress individual workers' earnings growth on the interaction between firms' leverage and unexpected disinflation shocks. This specification exploits the variation that firms with higher ex-ante debt levels experience larger increases in their real debt burdens following disinflation. We include worker, firm, state, and sector-by-quarter fixed effects to control for unobserved heterogeneity. We also control for unemployment and monetary policy shocks that are typically correlated with inflation, as well as firm characteristics.

We find that workers in high-leverage firms experience relatively slower earnings growth following unexpected disinflation shocks. Standard implicit contract theory would interpret this pattern as implicit *borrowing* from workers, predicting that these workers should subsequently experience higher earnings growth to compensate for the initial losses. However, we observe no such compensation. Nor do we observe a significant increase in separations. Workers remain with their firms despite relatively lower pay. We therefore interpret these results as evidence of firms' labor market power: financially distressed firms can pay relatively lower earnings without losing workers.

To test this hypothesis, we exploit variation in firms' labor market power, for which we construct three commonly used measures. Using LEHD data, for each local labor market defined as an industry within a commuting zone, we compute the HHI of employment across firms and each firm's local employment share. We also compute unionization rates at the state–industry level. Higher HHIs, larger employment shares, and lower unionization rates indicate greater monopsony power in the labor market. We then extend our baseline regression by including a triple interaction between a labor market power measure, firm leverage, and unexpected disinflation. Following unexpected disinflation shocks, high-leverage firms with greater labor market power exhibit even slower earnings growth among their workers across all three measures of labor market power.

These results provide empirical evidence of *financing from workers*: firms with labor market power respond to financial distress by reducing workers' earnings growth. Our empirical analysis further shows that employment at high-leverage firms declines more following disinflation shocks through reduced hiring rather than increased separations.

To quantify the aggregate implications of the financing-from-workers mechanism, we develop a dynamic general equilibrium model with heterogeneous firms. The model features two key elements: labor market power and financial frictions. Labor market power arises because jobs are imperfectly substitutable across firms, so each firm faces an upward-sloping labor supply curve. Financial frictions arise because firms borrow through state-uncontingent debt contracts and have the option to default, with default being costly. Furthermore, we assume that firms choose employment and commit to wage payments before the realization of their productivity shocks.

Either friction in isolation leads to inefficiently low employment. Labor market power generates both aggregate and allocative inefficiency. On the aggregate margin, monopsony power enables firms to charge a markdown on wages, depressing the aggregate employment level. On the allocative margin, the upward-sloping labor supply curve implies that expanding employment requires offering higher wages to all workers. More productive firms hire more workers but at higher wages. Thus, the marginal product of labor varies across firms, in contrast with the perfectly competitive case in which all firms equate their marginal product of labor to a common wage. This dispersion in marginal products leads to misallocation of labor, further reducing efficiency.

Financial frictions also lead to inefficiency. Because employment is chosen before the realization of productivity shocks, firms' labor choices become risky investments. When realized productivity is low, a firm may be unable to cover its labor costs and service its outstanding debt, forcing it into default. As a result, the predetermined employment decision reflects not only the standard trade-off between the marginal cost of labor and the expected marginal product of labor, but also the marginal cost associated with higher default risk. That is, endogenous default risk acts as a labor wedge in firms' optimal employment decisions, pushing employment below the efficient level.

The interaction of the two frictions, however, mitigates allocative inefficiency during adverse financial shocks. When an adverse financial shock, such as unexpected disinflation, erodes firms' net worth, default risk rises, and firms become more reluctant to hire workers, especially those with high ex-ante leverage. Firms' labor market power, however, mitigates this decline in employment. Because firms face an upward-sloping labor supply curve, reducing employment allows them to lower wages for all remaining workers. Thus, firms need not cut employment as much to manage default risk. Moreover, lenders anticipate this mitigation channel and offer more favorable bond pricing schedules, which lower borrowing costs and further alleviate financial distress.

We calibrate the model to U.S. data on firm financing patterns and job substitutability. The calibrated model successfully reproduces the heterogeneous responses observed in the data: following a disinflation shock that increases firms' real debt burdens, firms with higher ex-ante leverage reduce wages by more. To quantify the aggregate implications of the financing-from-workers mechanism, we compare our benchmark model with a recalibrated counterfactual model with competitive labor markets. We consider an adverse financial shock that increases firms' real debt burdens proportionally to their debt levels. The shock size is chosen so that aggregate output declines by 1% on impact in the counterfactual economy without labor market power. In response to this shock, output, employment, and wages all decline as firms contract to manage default risk.

The benchmark model with labor market power mitigates about one-third of these aggregate declines. Firm heterogeneity is central to this mitigation effect. In a perfectly competitive labor market, the equilibrium wage declines in general equilibrium when labor demand falls due to financial shocks, but the wage decline is uniform across firms regardless of their financial conditions. By contrast, when firms possess labor market power, wage adjustments occur at the firm level. Highly leveraged firms facing greater financial distress shrink more and reduce wages more, while less leveraged firms adjust less. This firm-specific wage adjustment allows labor costs to respond more precisely to firms' financial conditions.

As a result, labor market power stabilizes aggregate output and employment more effectively than a uniform equilibrium wage decline in a competitive labor market. Paradoxically, average wages fall by less when firms possess labor market power because firm-specific wage adjustments reduce the need for large aggregate employment contractions. Thus, financing from workers goes beyond shifting the adjustment from employment to wages at the aggregate level; it also improves the allocation of resources across heterogeneous firms and stabilizes labor income in the aggregate.

Related Literature. Our paper contributes to several strands of the macro-finance and macro-labor literature. First, our model builds on the large literature studying the macroeconomic consequences of firm financial frictions (e.g., Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997; Cooley, Marimon, and Quadrini, 2004; Arellano, Bai, and Zhang, 2012; Buera and Shin, 2013; Khan and Thomas, 2013; Midrigan and Xu, 2014; Moll, 2014; Gomes, Jermann, and Schmid, 2016; Gilchrist, Schoenle, Sim, and Zakrajšek, 2017; Arellano, Bai, and Kehoe, 2019; Ottonello and Winberry, 2020; Wang, 2026; Bai, Lu, Tian, and Wang, 2026). This literature shows how borrowing constraints and default risk shape firm dynamics and amplify business cycle fluctuations. We introduce labor market power as a mechanism through which firms can partially relax financial constraints. Our contribution is to quantify the extent to which labor market power alleviates financial distress, with the model disciplined by micro-level data.

Second, our study is motivated by the growing body of research on firms' labor market power. Manning (2021), Rossi-Hansberg, Sarte, and Trachter (2021), Berger, Herkenhoff, and Mongey (2022), and Yeh, Macaluso, and Hershbein (2022) estimate the degree of firms' monopsony power in the U.S. Researchers examine its implications along multiple dimensions, including worker mobility (Bagga, 2023), wage pass-through (Chan, Mattana, Salgado, and Xu, 2023), inequality (Deb, Eeckhout, Patel, and Warren, 2024), competition for workers (Jarosch, Nimczik, and Sorkin, 2024), selection (Nevo, 2024), comparative advantage (Bils, Kaymak, and Wu, 2025), the transmission of monetary policy (Bardóczy, Bornstein, Maggi, and Salgado, 2025), and information frictions (Cheremukhin and Restrepo-Echavarria, 2025). We complement this literature by highlighting the interaction between labor market power and financial frictions. While each distortion is inefficient in isolation, we show that labor market power can partially offset financial frictions by allowing financially distressed firms to finance through workers.

Third, a considerable amount of research has shown that firms provide insurance to workers against shocks to their productivity, largely because firms typically have better access to financial markets (e.g., Baily, 1974; Azariadis, 1975; Guiso, Pistaferri, and Schivardi, 2005; Rute Cardoso and Portela, 2009; Souchier, 2025). In contrast, our study asks: do workers insure firms during financial distress? Our findings suggest the answer is yes. Using U.S. employer–employee matched data, we find that firms facing adverse financial shocks can partially finance through workers via their labor market power.

Fourth, more recent work studies credit within firms (Michelacci and Quadrini, 2009; Guiso, Pistaferri, and Schivardi, 2013; Michaels, Beau Page, and Whited, 2019; Malgieri and Citino, 2024; Wang, 2025). Existing studies primarily analyze cross-sectional patterns and document a "*borrowing*-from-worker" mechanism, in which new employees accept lower initial wages in exchange for steeper future wage growth—an intertemporal contract akin to a loan from workers to firms. We take a different approach: using quarterly data, we estimate local projections to trace workers' earnings dynamics at business cycle frequencies. We do not find evidence that firms "repay" workers. Instead, workers in financially distressed firms experience persistently lower earnings growth, without later compensatory increases. This suggests that "*financing*-from-workers" does not necessarily require backloaded wages through implicit contracts, but can instead arise directly from firms' monopsony power.

Lastly, our work complements the large literature on wage dynamics. One strand studies rent sharing between firms and workers (e.g., Abowd and Lemieux, 1993; Blanchflower, Oswald, and Sanfey, 1996; Card, Cardoso, Heining, and Kline, 2018). While this literature interprets wage responses as the sharing of firm rents, we show that wage adjustments can also arise from firms using labor market power to manage expected default risk. Another strand studies wage rigidity (e.g., Favilukis, Lin, and Zhao, 2020; Fukui, 2020; Schoefer, 2021; Bertheau et al., 2022; Afrouzi et al., 2024; Blanco et al., 2025; Hazell and Taska, 2025). Importantly, our results do not contradict existing evidence on downward wage rigidity, because our empirical analysis focuses on relative earnings across firms, while nominal wage levels need not decline.

The rest of the paper proceeds as follows. Section 2 documents empirical evidence using U.S. census employer-employee matched data. Section 3 develops a heterogeneous firm model with labor market power and firm default risk. Section 4 quantifies the model to explore aggregate implications of financing from workers. Section 5 concludes.

2 Empirical Analysis

This section starts with a simple model to motivate our empirical analysis, followed by a description of the data, the regression specifications, and the empirical evidence.

2.1 Motivating Simple Model

Here, we present a simple static model to illustrate the mechanism and motivate our empirical design. Firms produce output y using labor n according to $y = zn^{\alpha}$, where $z \in [\underline{z}, \bar{z}]$. Firms choose their labor input before shocks occur. Due to financial frictions, firms cannot borrow new debt or issue new equity, which corresponds to a non-negative dividend (NND) constraint. Firms also face financial shocks ζ, which broadly reduces their profitability. On the labor side, firms have monopsony power and face an upward-sloping labor supply curve $w(n) = n^{\frac{1}{\eta}}\bar{w}$.

We use three cases to illustrate the roles of financial frictions and labor market power: an efficient case without frictions, a case with financial frictions alone, and a case with both financial frictions and labor market power.

Proposition 1 (Efficient Case) *When firms have no labor market power and face complete financial markets, the optimal labor n^* is independent of financial shocks ζ and satisfies*

$$\alpha\,\mathbb{E}(z)(n^*)^{\alpha-1} = \bar{w}. \tag{1}$$

Proof: Appendix A. With a competitive labor market, all firms pay the same wage $\bar{w}$. Under the complete markets, firms can use state-contingent debt to ensure non-negative cash flows in every state. As a result, the non-negative dividend condition never binds. The firm's problem reduces to choosing labor to maximize expected profit before the realization of shocks: $\max_n \mathbb{E}\left(zn^{\alpha} - \bar{w}n - \zeta\right)$. This implies that equation (1) holds: the expected marginal product equals its marginal cost. Clearly, financial shocks ζ have no impact on the optimal labor under complete financial markets.

Now suppose labor markets remain competitive, but firms face financial frictions: they can neither borrow nor issue equity. In this case, firms choose labor to maximize expected payoff and must satisfy the NND condition. Namely,

$$\max_n \mathbb{E}\left(zn^\alpha - \bar{w}n - \zeta\right), \ \text{ s.t. } \ zn^\alpha - \bar{w}n - \zeta \geq 0, \ \forall z. \tag{2}$$

Proposition 2 (Financial Frictions Only) *With financial frictions but no labor market power, a firm's optimal labor satisfies*

$$\alpha\,\mathbb{E}(z)n^{\alpha-1} = \frac{1+\gamma}{1+(\underline{z}/\mathbb{E}\,z)\gamma}\bar{w}, \tag{3}$$

where $\gamma \geq 0$ is the Lagrangian multiplier associated with the NND condition. Furthermore, larger financial shocks reduce labor.

Proof: Appendix A. The key mechanism is the pre-committed labor choice combined with linearly increasing labor costs: firms that choose larger labor inputs face greater default risk when productivity z realizes at low values. The efficient labor n^*—which maximizes expected profit—may be too risky for low realizations of z, potentially leading to insolvency (e.g., $\underline{z}(n^*)^\alpha - \bar{w}n^* - \zeta < 0$). Thus, firms consider both marginal profit and insolvency risk when making decisions, yielding the first-order condition in equation (3). The *labor wedge* $\frac{1+\gamma}{1+(\underline{z}/\mathbb{E}\,z)\gamma}$ captures the gap between the firm's marginal product of labor and the wage $\bar{w}$, reflecting the distortion caused by financial frictions. When $\gamma > 0$, the optimal labor is smaller than efficient labor n^* since $\underline{z} < \mathbb{E}\,z$, and firms choose labor to satisfy the NND condition under the lowest z: $\underline{z}n^\alpha - \bar{w}n - \zeta = 0$.

Now, financial shocks ζ directly affect firm labor choices. A larger financial shock tightens the NND condition, increases the multiplier γ, thereby amplifying the labor wedge and reducing employment.

We next consider the case with both labor market power and financial frictions. To make this case comparable with the financial-frictions-only case, we assume that when the NND condition is not binding, the optimal labor equals n^*, as in the complete markets case.

Proposition 3 (Both Financial Frictions and Labor Market Power) *With both frictions, the firm's optimal labor satisifes*

$$\alpha\,\mathbb{E}(z)n^{\alpha-1} = \frac{1+\gamma}{1+(\underline{z}/\mathbb{E}\,z)\gamma}\frac{1+\eta}{\eta}w(n). \tag{4}$$

Larger financial shocks depress both firm-specific wages and labor. However, the response of labor to financial shocks is smaller than under financial frictions alone.

Proof: Appendix A. As before, a larger financial shock tightens the NND condition, raising γ, which amplifies the labor wedge and reduces labor. However, due to the firm's upward-sloping labor supply curve, the reduction in employment lowers the wages of all remaining workers since $w(n) = n^{\frac{1}{\eta}}\bar{w}$. This wage decline partially relaxes the NND condition, lowers γ, so the required reduction in labor is smaller than it would be without labor market power. We refer to this mechanism as *financing from workers*.

2.2 From Model to Data

The three cases in our simple model demonstrate a key feature of the financing-from-worker mechanism: firm-specific wages fall in response to adverse financial shocks. We now turn to the data to test whether this pattern holds and to quantify the magnitude of wage responses to such shocks.

To bridge our theoretical model and the data, we must first identify a suitable measure of financial shock. Directly observing pure financial shocks is challenging. We use unexpected disinflation as our proxy for the following reason: because debt contracts are signed in advance, unexpected disinflation increases the real debt burden faced by firms (Fisher, 1933; Gomes, Jermann, and Schmid, 2016). Empirical evidence also shows that firms with higher debt levels benefit more disproportionally from inflation (Chen, Liu, and Luo, 2022; Bhamra, Dorion, Jeanneret, and Weber, 2023; Fabiani and Fabio Massimo, 2024; Corhay and Tong, forthcoming), further validating this measure.

We extend the simple model to incorporate nominal debt and disinflation shocks. Suppose firms borrow a nominal amount B_t in period $t-1$ at nominal interest rate $(1+i_{t-1}) = (1+r_{t-1})\pi_t^e$, where $1+r_{t-1}$ is the real interest rate and π_t^e is the expected inflation rate for period t formed in period $t-1$. Firms choose labor after observing realized inflation but before their idiosyncratic productivity shock z_t materializes.[1] Let P_t be the price level at period t. The firm's nominal dividend is $P_t z_t n_t^\alpha - P_t w_t n_t - (1+i_{t-1})B_t$. We define real debt as $b_t = B_t/P_{t-1}$ and inflation $\pi_t = P_t/P_{t-1}$.

Firms solve the following problem

$$\max_{n_t} \mathbb{E}\left(z_t n_t^\alpha - w(n_t)n_t - (1+r_{t-1})\frac{b_t}{\pi_t/\pi_t^e}\right), \text{ s.t. } z_t n_t^\alpha - w(n_t)n_t - (1+r_{t-1})\frac{b_t}{\pi_t/\pi_t^e} \geq 0, \ \forall z. \quad (5)$$

When $\pi_t/\pi_t^e < 1$, the economy experiences unexpected disinflation, which raises the real burden of both principal and interest payments, acting as a financial shock in our simple model. Suppose an unexpected disinflation shock causes the NND condition to bind. Then n_t solves $\underline{z}n_t^\alpha - w(n_t)n_t - (1+r_{t-1})\frac{b_t}{\pi_t/\pi_t^e} = 0$, which implies $d\ln w = \frac{1}{\eta}\frac{(1+r_{t-1})}{\alpha\underline{z}n_t^\alpha - \frac{1+\eta}{\eta}w(n_t)n_t}b_t \times d\left(\frac{1}{\pi/\pi^e}\right)$. We can prove that under the constrained optimal labor, the marginal profit under $\underline{z}$ is negative, i.e.,

[1] In our full dynamic model, firms choose labor before the realization of all shocks, including inflation shocks.

$\alpha \underline{z} n_t^{\alpha} - \frac{1+\eta}{\eta} w(n_t) n_t \leq 0$. Thus, the wage growth Δwage has the following property,

$$\Delta \text{wage} = \beta \times \text{ debt} \times \text{disinflation}, \tag{6}$$

where $\beta = \frac{1}{\eta} \frac{(1+r_{t-1})}{\alpha \underline{z} n_t^{\alpha} - \frac{1+\eta}{\eta} w(n_t) n_t} \leq 0$ captures the markdown and the negative marginal profit. Equation (6) suggests that wages decline more for firms with higher debt in response to unexpected disinflation. As unexpected disinflation increases the real debt burden, the NND condition becomes tighter. Firms respond by reducing labor input, and wages decrease due to the upward-sloping labor supply curve. This effect is stronger for firms with higher debt levels, as they face tighter NND constraints. Equation (6) guides our empirical analysis below.

There are several reasons to use unexpected disinflation shocks. First, β in eq. (6) represents a general semi-elasticity of wages to any financial shock ζ that reduces firms' cash on hand, as captured by $\underline{z} n - w(n) n - \zeta = 0$. Second, debt disinflation provides a clear mechanism: the interaction between debt levels and unexpected disinflation effectively captures the Fisher effect and the resulting increase in a firm's real debt burden. This is particularly valuable because measuring firms' financial conditions empirically is often challenging. Third, debt disinflation is less likely to directly affect the marginal product of labor. Instead, it can affect wages through firms' financing constraints so that wage adjustments are not simply driven by changes in worker productivity. For this reason, unexpected disinflation is more suitable for the analysis than productivity or monetary policy shocks. Fourth, debt disinflation represents a type of financial shock that is both measurable and occurs frequently over business cycles. In contrast, rare financial events—such as the Great Recession or the collapse of Lehman Brothers—are informative but occur too infrequently to generalize broadly across business cycles.

2.3 Data

We use data from three main sources: the US Census Longitudinal Employer-Household Dynamics (LEHD), Compustat, and macro-level data as supplements. This allows us to build a quarterly panel that matches employers and employees, providing detailed information on individual workers' earnings and job separations, as well as firms' financial conditions and shocks.

We draw a 10% random sample of workers from the LEHD Snapshot 2021, which provides employees' quarterly earnings and firm identifiers.[2] We use a 10% sample rather than the full sample to alleviate the computational burden of high-dimensional fixed-effects regressions. The LEHD is based on UI wage records, recording any job with positive earnings. Unlike datasets

[2] This paper has access to 24 states of LEHD: Arizona, California, Colorado, Connecticut, Delaware, Indiana, Kansas, Maine, Maryland, Massachusetts, Missouri, Nevada, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, and Wisconsin.

that only report total wage bills, the LEHD provides individual workers' earnings, enabling us to control for worker heterogeneity in regressions and avoid the compositional effects of heterogeneous employees on firms' wage bills.

Using firm identifiers in the LEHD, we merge worker-firm data from the LEHD with Compustat Quarterly through the Longitudinal Business Database (LBD) and the Compustat-SSEL Bridge (CSB). Compustat Quarterly provides firm-level balance sheet data. Our primary measure of firms' financial condition is leverage, defined as the ratio of total debt to total assets, where total debt is the sum of a firm's short-term and long-term debt.

Next, we construct inflation shocks. A natural candidate is aggregate inflation minus expected inflation; however, this measure faces several challenges. First, inflation shows little variation at the aggregate level, making estimates highly sensitive to model specification and measurement choices (Mavroeidis, Plagborg-Møller, and Stock, 2014; Hazell, Herreno, Nakamura, and Steinsson, 2022). Second, since monetary policy targets national inflation, variation at the aggregate level is further dampened (McLeay and Tenreyro, 2020; Fitzgerald and Nicolini, 2014). Third, relying on aggregate inflation increases the risk of omitted variable bias, as many factors may move simultaneously at the aggregate level.

To address these concerns, we construct firm-level exposure to state-level inflation shocks using an employment-weighted (shift-share) measure:

$$\epsilon^{\pi}_{jt} = \sum_{s} \omega^{j}_{st} \pi_{st} - E_{t-4}\pi_t, \tag{7}$$

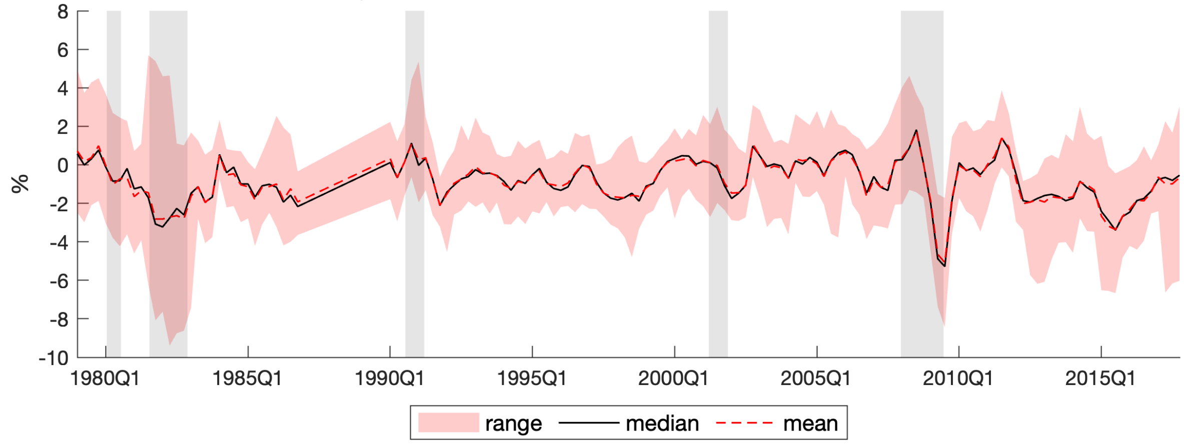
where j indexes firms, s represents states, and t denotes quarter. The first term, $\sum_s \omega^j_{st}\pi_{st}$, is firm j's exposure to state-level inflation, constructed as the employment-weighted average of inflation across the states in which the firm employes workers. We obtain quarterly state-level CPI inflation, π_{st}, from Hazell, Herreno, Nakamura, and Steinsson (2022), which covers the period from 1978 to 2018. Using Census LEHD data, we compute each firm's employment shares across states as $\omega^j_{st} = \frac{n^j_{st}}{\sum_s n^j_{st}}$, where n^j_{st} denotes firm j's employment in states s in time t.

The second term, $E_{t-4}\pi_t$, is the median expected inflation over the next 12 months from the University of Michigan's Survey of Consumers. Using this measure assumes that financial markets are integrated within the United States and that there is no arbitrage, so that expected inflation embedded in nominal interest rates is common across states.

To visualize the range of inflation shocks, we compute state-level unexpected inflation as $\epsilon^{\pi}_{st} = \pi_{st} - E_{t-4}\pi_t$. Figure 1 plots its range over time, showing significant variation across states and over time. By construction, firms' employment-weighted unexpected inflation, ϵ^{π}_{jt}, lies within this range.

Lastly, we obtain state-level unemployment from Hazell, Herreno, Nakamura, and Steinsson

Figure 1: Unexpected Inflation Shocks



Note: This figure plots the state-level unexpected inflation $\epsilon^{\pi}_{st} = \pi_{st} - E_{t-4}\pi_t$. The solid black line shows the median across states, the dashed red line represents the mean, and the red shaded area depicts the min-max range.

Table 1: Summary Statistics

Variables	Notations	N (observations)	Mean	St. Dev.
Worker earnings growth	$\Delta \ln w_{ijt}$	29,700,000	0.055	0.327
Firm-level exposure to unexpected inflation	ϵ^{π}_{jt}	29,700,000	-0.007	0.013
State-level unexpected inflation	ϵ^{π}_{st}	29,700,000	-0.008	0.015
Firm leverage	lev_{jt}	29,700,000	0.268	0.181
Worker separation indicator	$\mathbb{1}^{\text{seperation}}_{ijt}$	48,980,000	0.078	0.269

This table shows the summary statistics of the main variables used in the regressions. This research was performed at a Federal Statistical Research Data Center under FSRDC Project Number 2652. (CBDRB-FY22-P2652-R9856) The numbers are rounded according to the Census Bureau's disclosure avoidance requirements.

(2022) and monetary shocks from Gürkaynak, Karasoy-Can, and Lee (2022) as control variables in our regressions. The merged sample spans from 1989 to 2017. Table 1 reports summary statistics for the main variables used in the regressions.

2.4 Local Projections

Our goal is to test whether firms can finance through workers when facing adverse financial shocks. Motivated by our simple model, we use the interaction between a firm's leverage and disinflation shocks to capture adverse financial shocks. Intuitively, disinflation increases firms' real debt burden and worsens their financial situations, especially for firms with ex-ante high leverage. To alleviate such financial pressure, firms may reduce the growth of wage payments to workers.

2.4.1 Responses of Worker Earnings

Motivated by eq. (6) in our simple theory, we estimate the following local projection regression (Jordà, 2005) to examine the heterogeneous responses of workers' earnings growth to increases in firms' real debt burden:

$$\ln w_{ijt+h} - \ln w_{ijt-4} = \beta_h (lev_{jt-5} - \mathbb{E}_j[lev_{jt}])(-\epsilon^{\pi}_{jt-1}) + \Gamma'_h Z_{jt-1} + \alpha_{ih} + \alpha_{jh} + \alpha_{sh} + \alpha_{cth} + e_{ijth},\ h \geq 0, \tag{8}$$

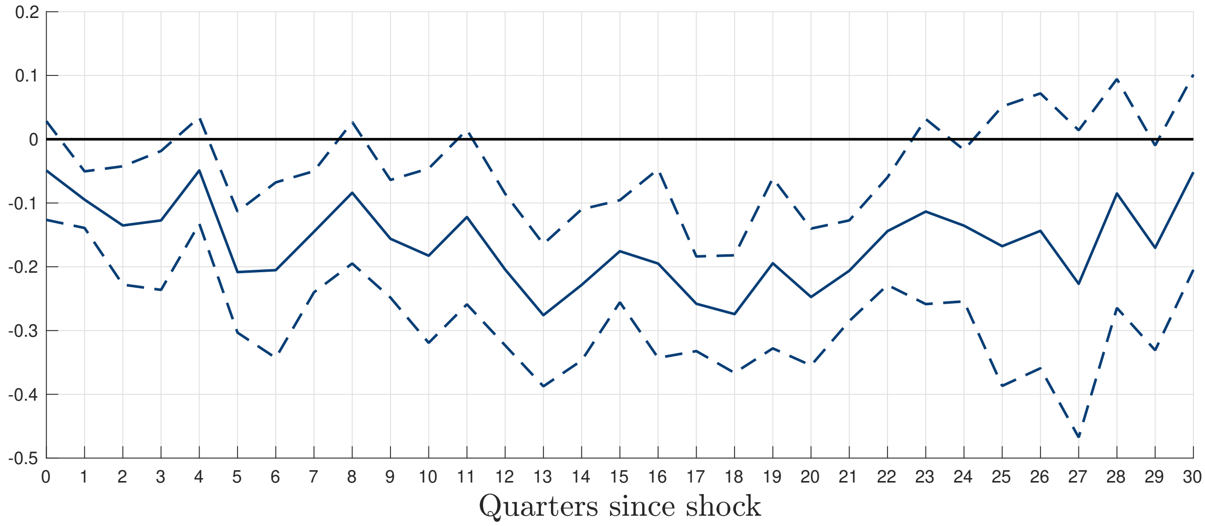
where $\ln w_{ijt+h} - \ln w_{ijt-4}$ is the earnings growth of worker i in firm j from time $t-4$ to $t+h$, with h denoting the forward-looking horizon. lev_{jt-5} is firm j's leverage in $t-5$, which is lagged to capture ex-ante leverage and avoid overlap with the left-hand side earnings growth. $\mathbb{E}_j[lev_{jt}]$ is the average leverage of firm j, so the demeaned leverage, $lev_{jt-5} - \mathbb{E}_j[lev_{jt}]$, represents within-firm leverage variations, following Ottonello and Winberry (2020). ϵ^{π}_{jt-1} denotes firm j's unexpected inflation shock at quarter $t-1$, with the one-quarter lag mitigating simultaneity between inflation and earnings growth.

The vector of control variables, Z_{jt-1}, includes lagged firm-level exposure to unexpected inflation, ϵ^{π}_{jt-1}; the corresponding lagged employment-weighted unemployment rate across states, u_{jt-1}; demeaned leverage, $lev_{jt-5} - \mathbb{E}_j[lev_{jt}]$; the interaction between demeaned leverage and lagged exposure to state-level unemployment; and the interaction between demeaned leverage and lagged monetary policy shocks from Gürkaynak, Karasoy-Can, and Lee (2022). In addition, following Ottonello and Winberry (2020), we include lagged total assets, lagged sales growth, lagged current assets as a share of total assets, and a fiscal-quarter dummy. The regression also includes worker fixed effects α_{ih}, firm fixed effects α_{jh}, state fixed effects α_{sh}, and sector-by-quarter fixed effects α_{cth}. The error term is denoted by e_{ijth}. Standard errors are two-way clustered by firm and quarter, as in Ottonello and Winberry (2020).

The coefficient of interest is β_h. We make two adjustments to facilitate its interpretation. First, we include a minus sign in front of ϵ^{π}_{jt-1}, so β_h captures the heterogeneous responses to unexpected disinflation. Second, we standardize the demeaned leverage to have a mean of zero and a standard deviation of one.

Figure 2 presents the estimated β_h along with the 90% confidence intervals for the regression specification (8). The coefficient β_h remains significantly negative for 21 quarters. Specifically, a 1% disinflation reduces earnings growth by approximately 0.1% on impact for workers at firms with one standard deviation higher leverage. It takes about five years for these workers' earnings to fully recover. Cumulatively, workers in firms with one standard deviation higher leverage experience 3.96% lower earnings growth. A back-of-the-envelope calculation suggests that this reduction in payroll offsets roughly 47% of the increase in the real debt burden caused

Figure 2: Heterogeneous Responses of Worker Earnings Growth



Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (8), showing the heterogeneous responses of workers' earnings growth to unexpected disinflation shocks, conditional on firm leverage.

by the disinflation shock for the average Compustat firm.[3]

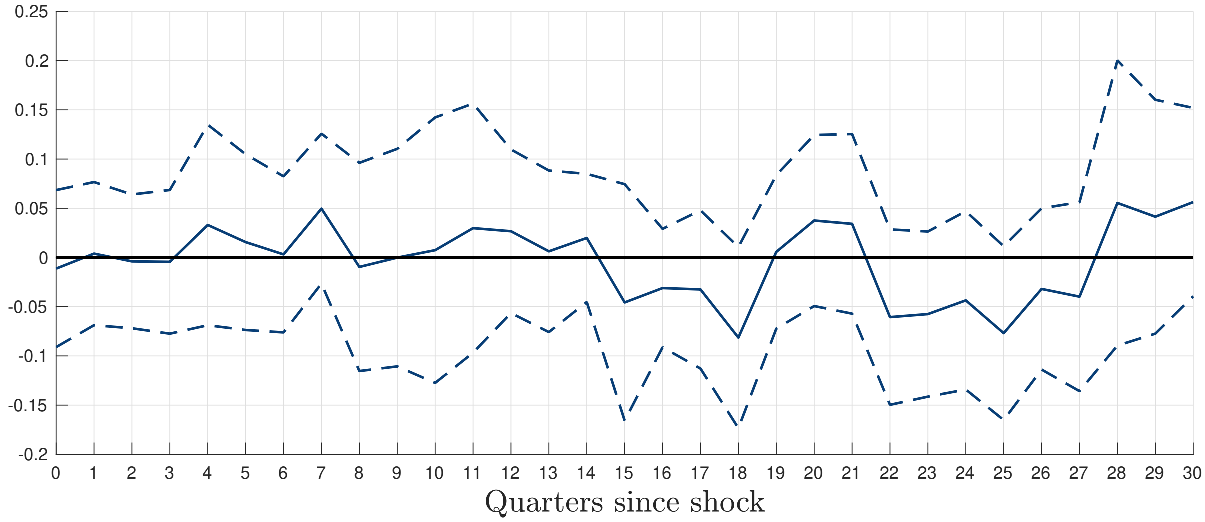
Importantly, our empirical finding does not suggest that firms *borrow* from workers. As shown in Figure 2, the estimated β_h remains negative for around 21 quarters before becoming statistically insignificant, and it never turns significantly positive. This pattern indicates that workers in high-leverage firms experience persistently lower earnings growth relative to those in low-leverage firms, without subsequent compensation in the form of higher earnings growth. We interpret this as evidence of firms exercising monopsony power to *finance* from workers, rather than backloading repayment.

2.4.2 Responses of Worker Separations

We further study the heterogeneous responses of separations. We re-estimate regression (8), replacing the dependent variable with the separation indicator $\mathbb{1}_{ijt}^{\text{sep}}$, which equals one if worker i has positive earnings from firm j in quarter t but no earnings from firm j in $t+1$. Figure 3 presents the results, showing no significant heterogeneous responses of separations to unexpected disinflation. This suggests that while highly leveraged firms pay lower earnings growth in response to unexpected disinflation, workers still remain working in these firms—further

[3] According to the BLS, the average quarterly wage from 1989 to 2023 is \$10,556.8. In Compustat, the average firm employs 8,511 workers and has \$763.65 million in debt. A 1% unexpected disinflation increases the real debt burden by 1%, adding \$7.64 million on average per firm. Meanwhile, the cumulative decrease in workers' earnings is 3.96%, reducing payroll by \$3.56 million on average (\$10,556.8 × 8,511 × 3.96% ÷ 10^6). Thus, the decline in payroll offsets 46.57% (\$3.56 million ÷ \$7.64 million) of the increase in the debt burden.

Figure 3: Heterogeneous Responses of Worker Separations



Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (8), replacing the dependent variable with the separation indicator $\mathbb{1}^{sep}_{ijt+h}$. It shows the heterogeneous responses of workers' separation probability to unexpected disinflation shocks, conditional on firm leverage.

supporting the presence of monopsony power.

These empirical results validate our hypothesis that firms can finance through workers by reducing workers' earnings growth when facing financial distress. Note that these findings do not contradict the literature on downward wage rigidity, as our focus is on relative earnings growth across firms with different leverage, so absolute nominal wages may not necessarily decline.

2.4.3 Roles of Labor Market Power

If our hypothesis is correct, then firms with greater labor market power should exhibit larger declines in worker earnings growth following adverse financial shocks. To test this prediction, we extend the benchmark regression (8) by including a triple interaction term—along with the corresponding double interactions—to capture how the response to leverage and disinflation varies with firms' labor market power:

$$\left(lev_{jt-5} - \mathbb{E}_j\left[lev_{jt}\right]\right) \times \left(-\epsilon^{\pi}_{jt-1}\right) \times \left(LMP_{ijt-5} - \mathbb{E}_j\left[LMP_{ijt}\right]\right),$$

where LMP_{ijt-5} denotes measures of labor market power. We consider three commonly used measures: the Herfindahl-Hirschman Index (HHI) of the job's local labor market, employment share of firm j in the job's local labor market, and the unionization rate. As with leverage, all labor market power measures are lagged and demeaned at the firm level.

Figure 4: Responses of Earnings Growth Conditional on Firms' Labor Market Power

Note: The figures plot the coefficients of the triple interaction $\left(lev_{jt-5} - \mathbb{E}_j\left[lev_{jt}\right]\right)\left(-\epsilon^{\pi}_{jt-1}\right) \times$ labor market power on an extension of equation (8) with this triple interaction, under three different measures of labor market power. Panel A uses the Herfindahl-Hirschman Index, Panel B uses the employment share in the local labor market, and Panel C uses the unionization rate to approximate a firm's labor market power. Note that the higher HHI, higher employment share, or lower unionization rate implies higher labor market power. Dashed lines are 90% confidence intervals.

Specifically, a firm's labor market power increases with its Herfindahl–Hirschman Index (HHI) and local employment share, and decreases with the unionization rate. HHIs and employment shares are computed using LEHD data, where a local labor market is defined as the firm's industry within the commuting zone in which the job pair ij is located. Unionization rates are obtained from the Current Population Survey (CPS), aggregated to the state–industry level, and merged using firms' industry classifications and job locations.

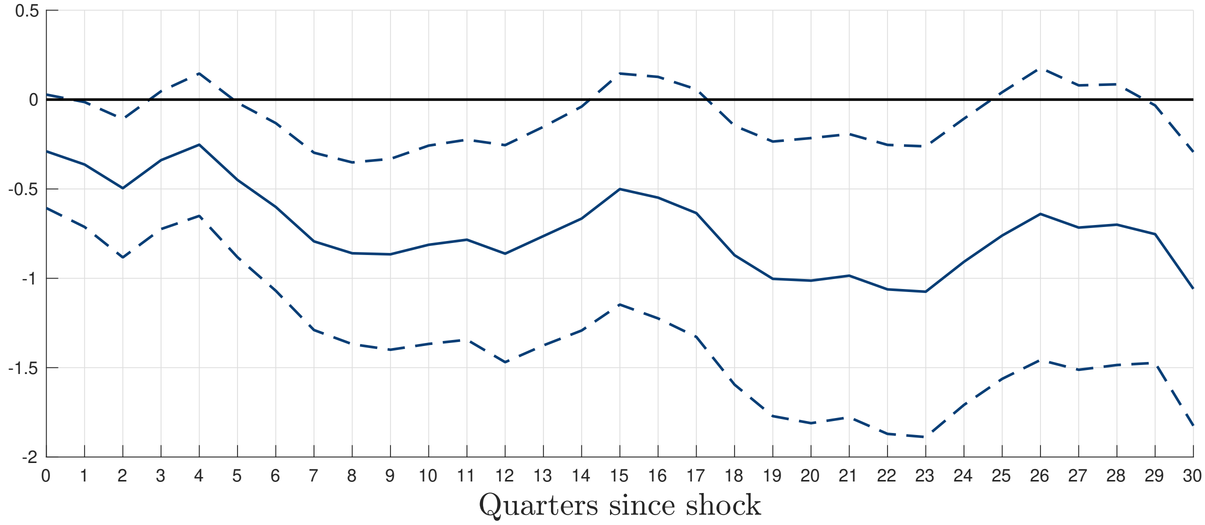
Figure 4 displays the coefficients on the triple interaction across all three labor market power measures. The results consistently show that workers experience larger earnings growth declines when employed by firms with higher leverage and greater labor market power during disinflation shocks. Estimates using unionization rates have larger standard errors, as the underlying survey data are noisier. These findings further support our hypothesis that firms rely on labor market power to finance through workers.

2.4.4 Responses of Firm-Level Employment and Hiring

We next analyze the heterogeneous response of firm employment to the disinflation shocks. We consider a firm-level regression as

$$\ln n_{jt+h} - \ln n_{jt-4} = \beta_h (lev_{jt-5} - \mathbb{E}_j[lev_{jt}])(-\epsilon^{\pi}_{jt-1}) + \Gamma'_h Z_{jt-1} + \alpha_{jh} + \alpha_{sh} + \alpha_{cth} + e_{jth}, \; h \geq 0, \quad (9)$$

Figure 5: Heterogeneous Responses of Firms' Employment Growth



Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (9), showing the heterogeneous responses of firms' employment growth to unexpected disinflation shocks, conditional on firm leverage.

where the dependent variable, $\ln n_{jt+h} - \ln n_{jt-4}$, is the employment growth rate of firm j from period $t - 4$ to period $t + h$. The explanatory variables remain the same as in the previous specifications, except for the removal of worker-fixed effects. Figure 5 reveals how employment responds to unexpected disinflation shocks: highly leveraged firms exhibit significantly lower employment growth, with the decline most pronounced around the 8th quarter after the shock.

Taken together with the earnings decline in Figure 2, the employment response suggests that firms face upward-sloping labor supply curves—earnings fall as employment declines. Motivated by this, our model incorporates an upward-sloping labor supply curve to capture firms' labor market power.

The combination of reduced employment growth and no significant changes in separations (Figure 3) indicates that firms primarily adjust their workforce through reduced hiring rather than increased separations. To test this, we define new hires in the LEHD as workers with positive earnings from the firm in the current period but none in the previous period. We re-estimate the firm-level regression in equation (9), using hiring growth as the dependent variable. Panel A of Figure B.7 in the Appendix confirms that highly leveraged firms reduce hiring growth more than other firms following a disinflation shock.

2.4.5 Robustness and Other Results

Here we present a series of robustness checks and explore alternative shocks and firm-level outcomes. For our baseline regression on worker earnings growth, we (i) replace firm-level exposure to state-level inflation with aggregate inflation; and (ii) use inflation in firms' headquarters states instead of the employment-weighted average across states. To test for asymmetries in the debt-deflation channel, we separately examine unexpected inflation and unexpected disinflation shocks. We also investigate heterogeneous responses to monetary policy shocks and disentangle the roles of leverage and debt maturity. In addition, we examine the responses of worker layoffs (involuntary separations), apart from overall separations. Finally, we extend the analysis to study how firm-level investment responds to unexpected disinflation shocks.

Alternative Disinflation Measures. Our baseline regression uses firm-level exposure to state-level disinflation shocks, which provides greater variation and reduces concerns about omitted variable bias relative to aggregate measures. Nevertheless, to account for the possibility that some firms set prices based on national inflation conditions, we conduct a robustness check using aggregate CPI inflation to construct inflation shocks common to all firms. Figure B.1 in the appendix plots the estimated coefficients β_h from equation (8) using aggregate unexpected disinflation. The results are similar to our baseline findings: workers' earnings growth declines in response to unexpected disinflation shocks when they are employed by highly leveraged firms.

Another hypothesis is that firms set product prices based on inflation in the state where their headquarters are located, rather than on inflation in all states in which they have employees. To accommodate this possibility, we use firms' headquarters-state inflation as our measure of realized inflation and construct unexpected disinflation shocks accordingly. This approach also introduces meaningful cross-state variation in inflation shocks that is less subject to aggregate monetary-policy smoothing. Figure B.2 in the appendix reports the regression results, which are similar to our baseline findings: workers employed by highly leveraged firms experience lower earnings growth following an unexpected disinflation shock.

Responses to Inflation and Disinflation Shocks. To examine whether workers' earnings growth responds differently to inflation and disinflation shocks, we decompose ϵ^{π}_{jt-1} into unexpected inflation shocks, $\epsilon^{\pi}_{jt-1}\mathbb{1}\{\epsilon^{\pi}_{jt-1} \geq 0\}$, and unexpected disinflation shocks, $\epsilon^{\pi}_{jt-1}\mathbb{1}\{\epsilon^{\pi}_{jt-1} < 0\}$. We then run the regression with leverage interactions for both components. Figure B.3 presents the estimated coefficients for the two interaction terms in Panels A and B, respectively. The results indicate that earnings responses are statistically significant for both inflation and disinflation shocks; the estimated coefficients for inflation shocks are larger in magnitude but are accompanied by larger standard errors.

Monetary Policy Shocks. The literature has emphasized the role of monetary shock on firm investment in the presence of financial frictions. To account for this channel, our baseline regression includes monetary policy shocks and their interaction with firm leverage as control. Figure B.4 shows that the coefficient on this interaction is insignificant, indicating no heterogeneous response of workers' earnings growth to monetary policy shocks.

Debt Maturity. Following Gomes, Jermann, and Schmid (2016), who emphasize the importance of long-term debt for firms' investment decisions, we test the robustness of our results using a measure of debt maturity—defined as the ratio of long-term debt to total debt. Panel A of Figure B.5 shows that incorporating debt maturity does not materially affect the baseline coefficients on the interaction between leverage and disinflation shocks. Panel B further shows that the interaction between debt maturity and disinflation shocks is statistically insignificant.

Layoffs. Figure 3 shows that the response of worker separations is statistically insignificant. Note that separations include both voluntary and involuntary separations (i.e., layoffs). To assess whether layoffs respond differently, we re-estimate regression (8), replacing the dependent variable with a layoff indicator, $\mathbb{1}_{ijt}^{\text{lay}}$. Although the LEHD data do not directly distinguish layoffs from other separations, we define the layoff indicator to equal one if worker i has positive earnings from firm j in quarter t but has no earnings from firm j in $t+1$ and no earnings from any other firm in the U.S. Hyatt, McEntarfer, McKinney, Tibbets, and Walton (2014) show that this definition closely matches layoff patterns observed in the Job Openings and Labor Turnover Survey (JOLTS). Figure B.6 shows that the response of layoffs to unexpected disinflation shocks is also statistically insignificant.

Firm-Level Investment. Finally, we examine heterogeneous firm-level investment responses to disinflation shocks. Since investment does not directly involve workers, we estimate the firm-level regression in equation (9), using investment as the dependent variable. Investment is measured as the log change in firms' capital stock from Compustat. Panel B of Figure B.7 presents the estimated coefficients for the interaction between firm leverage and disinflation shocks. We find no statistically significant investment response. Accordingly, we abstract from capital in our model.

In summary, using employer–employee matched data and firm-level exposure to unexpected disinflation shocks, we find that workers experience slower earnings growth following disinflation shocks when employed by highly leveraged firms, which also exhibit larger declines in employment growth. This heterogeneity in earnings responses is more pronounced for firms with greater labor market power. Our findings are robust across a range of alternative specifications and empirical setups. Taken together, the results reveal a novel mechanism through which firms, during periods of financial distress, obtain financing from workers by exercising monopsony power.

To assess the macroeconomic implications of this mechanism, below we construct a heterogeneous firm model incorporating both labor market power and firm-level default risk. Using this model, we can quantify the aggregate impact of financing from workers and evaluate the extent to which it helps the economy insure against financial distress.

3 Model

This section explores how labor market power interacts with financial frictions. We consider a small open economy with a representative household and a continuum of measure-one firms. The model features two key elements: firms can issue only state-uncontingent debt and may default, and households view jobs across firms as imperfect substitutes, resulting in firm-specific wages. There is no aggregate uncertainty. In Section 4.3, we study the transition path in response to an unexpected disinflation shock, $\pi_t = P_t/P_{t-1} < 1$. As shown in Section 2.1, this shock is isomorphic to a financial shock that reduces firm net worth.

The aggregate labor supply is a CES aggregator over jobs from firms,

$$N_t = \left[\int_0^1 n_{jt}^{\frac{\eta+1}{\eta}} dj\right]^{\frac{\eta}{\eta+1}}, \tag{10}$$

where η is elasticity of substitution and $1/\eta$ reflects firms' labor market power. When $\eta \to \infty$, the labor market becomes perfectly competitive. As discussed in Berger, Herkenhoff, and Mongey (2022), this inelastic substitution across jobs can be micro-founded with worker preference over firms, different amenities offered by firms, or the cost of switching jobs, etc.

Firms are competitive and produce using labor with decreasing return to scale technology, $y = zn^{\alpha}$, where z denotes firm-level productivity. Firm j contracts period-t employment n_{jt} at nominal wage W_{jt} in period $t-1$, before period t shocks realize. Firms can default on their state-uncontingent borrowings. Default triggers immediate exit and zeroes out shareholder value. A defaulting firm uses its current output to pay workers. When output is insufficient to cover wage payments, the government steps in to guarantee worker compensation through lump-sum taxation.

The mass of firms is normalized to one. Each defaulting firm is replaced by a new entrant firm characterized by productivity z_e and subject to a fixed entry cost $\bar{\omega}$. New entrants can choose their employment for the next period and can finance entry costs through debt issuance. In equilibrium, the labor market clears in each period.

3.1 Households

The representative household has a per-period utility $u(C, N)$ and discount factor β. The household supplies labor n_{jt} to firm j at real wage $W_{jt}/P_t = w_{jt}/\pi_t$, receives dividend Π_t and lump-sum transfers T_t. The household can also borrow and lend b_{t+1}^H at gross nominal rate $1 + i_t$

internationally. The household's budget constraint is

$$C_t + b^H_{t+1} = \int_0^1 \frac{w_{jt} n_{jt}}{\pi_t} dj + (1 + i_{t-1}) \frac{b^H_t}{\pi_t} + \Pi_t + T_t.$$

Under perfect foresight transition path over aggregate states, the household's stochastic discount factor is $\Lambda_{t+1} = \beta u_{ct+1}/u_{ct} = \pi_{t+1}/(1 + i_t)$.

The household's optimal labor supply decision for each firm j yields the first-order condition:

$$w_{jt} = \frac{u_{Nt}}{\mathbb{E}_{t-1}[u_{Ct}/\pi_t]} \left(\frac{n_{jt}}{N_t}\right)^{\frac{1}{\eta}}.$$

This optimality condition consists of two key terms. The first term, $\frac{u_{Nt}}{\mathbb{E}_{t-1}[u_{Ct}/\pi_t]}$, represents the standard marginal rate of substitution between leisure and consumption. The expectation operator $\mathbb{E}_{t-1}[\cdot]$ highlights the timing friction: labor contracts (specifying both employment n_{jt} and wages w_{jt}) are signed at period $t - 1$, while consumption and inflation are realized at t. Although we analyze a perfect foresight transition path, this timing structure matters because the household commits to labor supply before observing period-t outcomes. The second term, $(n_{jt}/N_t)^{\frac{1}{\eta}}$, captures the imperfect substitutability of labor across firms. Define the aggregate wage index $\bar{W}_t = \frac{u_{Nt}}{\mathbb{E}_{t-1}(u_{Ct}/\pi_t)}$. The firm-level labor supply curve is then

$$w_t(n_{jt}) = (n_{jt}/N_t)^{\frac{1}{\eta}} \bar{W}_t, \tag{11}$$

which is increasing in firm employment n.

3.2 Firms

We incorporate an additional financial friction: firms cannot issue new equity, which mechanically generates a non-negative dividend constraint. Firms are owned by households and face an additional discount factor of $1 - \delta$. Each firm j can issue nominal debt B_{jt+1} with bond price Q_{jt}. The real value of new debt issuance is $Q_{jt} b_{jt+1}$ where $b_{jt+1} = B_{jt+1}/P_t$. The real value of existing debt liability is $B_{jt}/P_t = b_{jt}/\pi_t$. Thus, an unexpected disinflation (a decrease in π_t) increases the real burden of nominal debt, creating a debt-disinflation channel through which disinflation affects firm balance sheets.

Firms face two types of shocks: a persistent productivity shock z and an idiosyncratic fixed-cost shock κ, where κ has cumulative distribution Φ. A firm's state includes (z, κ), pre-determined employment level n, and the real outstanding debt b/π_t. Given prices, the firm first chooses whether to default. If it does not default, it chooses next-period employment n' and debt b'. Finally, the exit shock δ is realized, and firms must exit if they are hit by it. This timing follows Ottonello and Winberry (2020).

Due to default risk, bond prices are firm-specific and incorporate the expected lender losses in the event of default. The bond price $Q_{jt} = Q_t(z, n', b')$ depends on (n', b') since these decisions affect default probability. As κ is i.i.d, its current realization provides no information about future default risk and therefore does not affect bond pricing.

The firm's dividend payment is given by

$$div_t = zn^{\alpha} - \frac{w_t(n)n}{\pi_t} - \frac{b}{\pi_t} - \kappa + Q_t(z, n', b')b' \geq 0. \tag{12}$$

Since the value of default is zero, a firm will choose to continue operating as long as it can borrow sufficiently to satisfy the non-negative dividend constraint $div_t \geq 0$. Therefore, defaults in this model arise from liquidity constraints rather than strategic considerations. When the idiosyncratic shock κ is small, the firm can use its sales and new borrowings to cover wage bills and current debt obligations. However, there exists a threshold value $\kappa_t^*(z, n, b)$ above which default becomes inevitable. This default threshold is characterized by:

$$\kappa_t^*(z, n, b) = zn^{\alpha} - \frac{w_t(n)n}{\pi_t} - \frac{b}{\pi_t} + \max_{n', b'}\{Q_t(z, n', b')b'\}.$$

A firm defaults if and only if its realized fixed cost exceeds this threshold, $\kappa > \kappa_t^*(z, n, b)$.

Conditional on repaying, the firm chooses labor n' and debt b' to solve the following problem,

$$\boldsymbol{V}_t(z, \kappa, n, b) = \max_{n', b'} \; div_t + \mathbb{E}_t \, \Lambda_{t+1}(1 - \delta) \left[\int^{\kappa_t^*(z', n', b')} \boldsymbol{V}_{t+1}(z', \kappa', n', b') d\Phi(\kappa) \right], \tag{13}$$

subject to the upward labor supply curve (11) and the non-negative dividend condition (12).

3.3 Bond Price Schedule

International lenders are risk-neutral and competitive, facing a constant world risk-free rate r. The nominal interest rate on household deposits satisfies the Fisher equation $1 + i_t = (1 + r)\mathbb{E}_t[\pi_{t+1}]$. Lenders price firm debt to break even in expectation, accounting for their losses during firm default. The bond price schedule is given by

$$Q_t(z, n', b') = \frac{1}{1 + r} \mathbb{E}_t \left[\Phi(\kappa_{t+1}^*(z', n', b')) \frac{1}{\pi_{t+1}} \right], \tag{14}$$

where $\Phi(\kappa_{t+1}^*(z', n', b'))$ is the repayment probability at period $t + 1$, conditional on the firm's productivity and policy choices (n', b'). The bond price reflects both default risk through the repayment probability $\Phi(\cdot)$ and inflation risk π_{t+1}, which erodes the real value of nominal debt repayments.

3.4 Mechanism: Financing From Workers

To illustrate the interaction between labor market power and firms' financial frictions, we characterize the firms' problem by studying their first-order condition (FOC) for labor. The optimal labor choice satisfies:

$$-(1+\gamma)\frac{\partial Q_t}{\partial n'}b' = \mathbb{E}_t\Lambda_{t+1}(1-\delta)\left\{\left(\alpha z'(n')^{\alpha-1} - \frac{1+\eta}{\eta}\frac{w_{t+1}(n')}{\pi_{t+1}}\right)\left[(1+\gamma')\Phi(\kappa^*_{t+1}) + V^*_{t+1}\phi\left(k^*_{t+1}\right)\right]\right\}, \tag{15}$$

where γ is the Lagrange multiplier on the non-negative dividend condition (12) , and the default cutoffs and continuation value are evaluated at the firm choices (n', b'): $\kappa^*_{t+1} = \kappa^*_{t+1}(z', n', b')$ and $V^*_{t+1} = \boldsymbol{V}_{t+1}(z', \kappa^*_{t+1}, n', b')$. This optimality condition balances two effects. The left-hand side captures the marginal cost of labor through its impact on bond prices: higher future labor n' increase the wage bill and raise default risk in low productivity, thereby worsening bond prices today.

The right-hand side reflects the future marginal benefit of n', captured through future profits and the default outcome. It works through two channels. First, the marginal profit in each future state is $\alpha z'(n')^{\alpha-1} - \frac{1+\eta}{\eta}\frac{w_{t+1}(n)}{\pi_{t+1}}$. The firm charges a constant markdown $(1+\eta)/\eta$ over wages and faces a firm-specific wage schedule $w_{t+1}(n')$ that rises with employment. Second, the labor choice influences future financial conditions through two mechanisms: it affects the likelihood that the NND condition binds (captured by γ') and matters for default risk. When the firm defaults, it loses continuation value V^*_{t+1}, as reflected in the second term weighted by the density $\phi(\kappa^*_{t+1})$.

Only Labor Market Power. To understand the mechanism, we abstract from unexpected inflation and consider two cases. In the first, there are no financial frictions, so $\gamma = \gamma' = 0$ and $\partial Q_t/\partial n' = 0$. The optimality condition (15) simplifies to

$$\mathbb{E}\left[\alpha z'(n')^{\alpha-1}\right] = \frac{1+\eta}{\eta}w(n').$$

Labor market power generates two types of inefficiency: aggregate and allocative. Aggregate inefficiency arises from the markdown $(1+\eta)/\eta$, which depressed overall employment below the efficient level. Allocative inefficiency arises because firms face upward-sloping labor supply curves and choose employment based on their idiosyncratic productivities, leading to dispersion in marginal products across firms. In a competitive labor market, all firms face the same wage and equalize their marginal products of labor. With labor market power, however, marginal products differ across firms. In particular, high-productivity firms have higher marginal products, creating misallocation. Both inefficiencies reduce aggregate employment.

Only Financial Frictions. In the second case, there are is no labor market power but only financial frictions. All firms face the same competitive wage $\bar{W}$. The FOC on labor is similar to equation (15) with $w(n') = \bar{W}$ and $\eta \to \infty$. We can rewrite it as

$$\mathbb{E}\left[\alpha z'(n')^{\alpha-1}\right] = \bar{W} + \frac{(1+\gamma)}{\mathbb{E}\,M'}\left(-\frac{\partial Q}{\partial n'}\right)b' - \frac{cov(\alpha z'(n')^{\alpha-1}, M')}{\mathbb{E}\,M'},$$

where $M'(z', k', b') = (1+\gamma')\Phi(\kappa'^{*}) + V^{*}\phi\left(k'^{*}\right)$ incorporates future NND tightness and default risk, reflecting future financial distress. The left-hand side is the expected marginal product of labor. The right-hand side consists three terms: the competitive wage $\bar{W}$, a term reflecting the effect of labor on the bond price schedule and, in turn, on the bindingness of the current NND condition $\frac{(1+\gamma)}{\mathbb{E}\,M'}\left(-\frac{\partial Q}{\partial n'}\right)b' \geq 0$, and the covariance between future productivity and financial distress, $cov(\alpha z'(n')^{\alpha-1}, M')$, which tends to be negative since high productivity states are associated with lower default risk. Financial frictions thus generate differential marginal products across firms, creating allocative inefficiency. In particular, a binding NND condition ($\gamma > 0$) raises the marginal cost of labor and reduces firm employment.

Mitigation Effect. With both labor market power and financial frictions, the optimal labor decision reflects their interaction:

$$\mathbb{E}\left[\alpha z'(n')^{\alpha-1}\right] = \frac{1+\eta}{\eta}w(n') + \frac{(1+\gamma)}{\mathbb{E}\,M'}\left(-\frac{\partial Q}{\partial n'}\right)b' - \frac{cov(\alpha z'(n')^{\alpha-1}, M')}{\mathbb{E}\,M'}.$$

Marginal costs now reflect both labor market power (first term) and financial frictions (last two terms), both of which lead to misallocation of resources across firms. However, labor market power mitigates financial distress.

Consider an unexpected financial shock or disinflation that tightens the NND condition (12), raising current γ and thus reducing employment. Labor market power allows firms to reduce wages when cutting employment, which partially offsets the increase in marginal cost. Specifically, when a firm reduces labor by a small amount, the wage adjusts downward along the upward-sloping labor supply curve, lowering the total wage bill by more than the direct reduction in employment. This wage adjustment mitigates the tightness of the NND condition, lowering γ and leading to a smaller employment decline relative to the case without labor market power. Thus, while each friction alone generates misallocation and reduces hiring, their interaction reveals that labor market power relaxes financial constraints and dampens the employment response to financial shocks.

4 Quantitative Analysis

Our analysis proceeds in three steps to evaluate how much labor market power can alleviate financial distress. We begin by calibrating our model using micro-level data on firm financing patterns. We then validate the model by demonstrating that it reproduces the differential earnings responses observed in our empirical analysis. Finally, we consider a reference model that preserves financial frictions but removes firm labor market power. By comparing aggregate responses to disinflation shocks between our baseline and the reference model, we quantify the degree to which firms' labor market power serves as a buffer against financial distress.

4.1 Parameters and Moments

Functional Forms. We assume households have GHH preference (Greenwood, Hercowitz, and Huffman, 1988):

$$u(C, N) = \frac{\left(C - \chi \frac{N^{1+1/\nu}}{1+1/\nu}\right)^{1-\sigma}}{1-\sigma}. \tag{16}$$

Under GHH preferences, the marginal rate of substitution between consumption and labor is independent of consumption. As a result, labor supply depends on the Frisch elasticity, ν, not on σ.

We assume firms' productivity follows a log AR(1) process with a persistence ρ_z and standard deviation of innovation σ_z:

$$\log z_{jt+1} = \rho_z \log z_{jt} + \sigma_z \epsilon^z_{jt}, \ \epsilon^z_{jt} \sim \mathcal{N}(0, 1). \tag{17}$$

Assigned Parameters. We externally assign five parameters to parameterize the model. First, we set the Frisch elasticity $\nu = 1$. Second, we set the decreasing returns to scale coefficient α to 0.66, corresponding to the average labor share in the United States. Third, we target a 4% annual interest rate by setting the risk-free rate $r = 0.01$ (quarterly). Fourth, following Bloom, Floetotto, Jaimovich, Saporta-Eksten, and Terry (2018), we calibrate the productivity persistence parameter $\rho_z = 0.95$. Lastly, we follow Berger, Herkenhoff, and Mongey (2022) and adopt their estimated job substitutability elasticity $\eta = 10.85$, which is a relatively conservative number for firms' labor market power in the literature. This parameterization implies that a 1% reduction in employment size enables firms to lower wages by approximately 0.1% for its all remaining workers.

Fitted Parameters. We jointly calibrate the remaining parameters by matching the most relavent empirical moments. Table 2 reports these endogenously determined parameters and their matched moments.

Table 2: Moment Matching: Parameters and Moments

Parameters	**Notations**	**Benchmark**	**No Labor Maker Power**
SD of productivity	σ_z	0.084	0.068
Discount rate	$\beta(1-\delta)$	0.81	0.803
Mean of operating costs	$\bar{\kappa}$	0.001	0.001
SD of operating costs	σ_κ	0.095	0.087
Entrants' relative productivity	$z_e/\bar{z}$	0.76	0.76
Moments (%)	**Data**	**Benchmark**	**No Labor Market Power**
IQR of firm sale growth	19	19	19
Median leverage	26	26	26
25th-percentile credit spread	1.0	1.5	1.4
Median credit spread	1.5	2.0	2.0
75th-percentile credit spread	2.8	2.1	2.1
Entrants' relative productivity	0.75	0.75	0.76

Note: This table reports the endogenously calibrated parameters and matched moments for both the benchmark model (with labor market power) and the counterfactual model without firms' labor market power. Data sources: Bloom, Floetotto, Jaimovich, Saporta-Eksten, and Terry (2018) and Arellano, Bai, and Kehoe (2019).

Our calibration targets four empirical moments: (1) the interquartile range (IQR) of firm sales growth rates, (2) median firm leverage, (3) the distribution of credit spreads, and (4) the relative productivity of entrants versus incumbents. We define leverage as the ratio of debt to annual sales: leverage = $\frac{b/\pi}{4zn^\alpha}$ if $b > 0$, and leverage is zero if $b \leq 0$. The annualized spread is defined as the difference from the risk-free rate: $4 \times [1/Q(z, n', b') - (1+r)]$. The IQR of sales growth rates is obtained from Bloom, Floetotto, Jaimovich, Saporta-Eksten, and Terry (2018), while the remaining data moments are from Arellano, Bai, and Kehoe (2019).

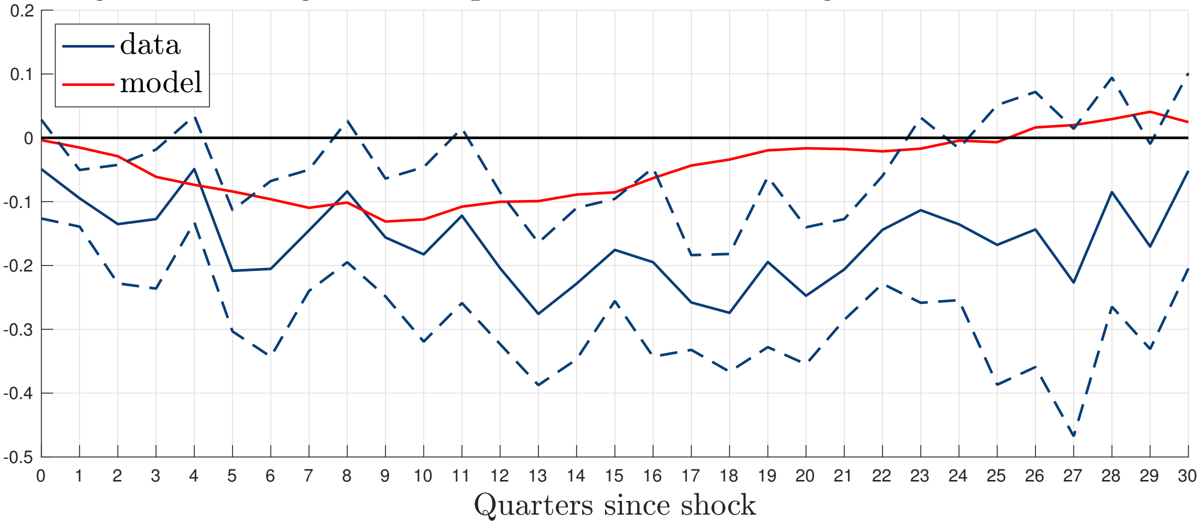
Table 2 shows the model's strong fit to the empirical moments. The calibrated quarterly discount rate of $\beta(1-\delta) = 0.81$, while seemingly low, is consistent with incomplete markets models featuring uninsurable risks. This value reflects the need to incentivize external borrowing to match observed firm leverage. An alternative approach would be to explicitly model agency frictions, as in Arellano, Bai, and Kehoe (2019), which would yield a higher discount rate while achieving similar leverage moments.

4.2 Model Validation: Heterogeneous Wage Responses

To validate our model and quantify the importance of the financing-from-workers mechanism, we conduct a model-simulated local projection regression that is comparable with our empirical analysis.

Our validation exercise proceeds as follows: Our empirical sample has access to 24 states.

Figure 6: Heterogeneous Responses of Worker Earnings: Model versus Data



Note: This figure compares our baseline empirical estimates (blue lines) from Figure B.2 with the model-simulated results (red line). The solid lines plot the estimated coefficients (β_h) from equation (8), with the blue dashed lines representing empirical 90% confidence intervals. The solid red line shows the corresponding model-predicted responses. They demonstrate the heterogeneous responses of workers' earnings growth to unexpected disinflation shocks.

Accordingly, we simulate 24 economies, each experiencing a one-time unexpected inflation shock at period $t = 5$. These shocks are drawn from a normal distribution whose parameters are estimated from the historical distribution shown in Figure 1. Each simulated economy contains 1,000 firms, with all simulations initialized from the steady state. We discard the first quarter of each simulation to eliminate initialization effects.

We pool data from all 24 simulated economies and estimate the local projection regression using the specification in equation (8). In the model-simulated regression, we define leverage as the debt-to-capital ratio (with capital normalized to 1). Unlike the empirical analysis, our model is not subject to seasonal fluctuations, allowing us to directly use contemporaneously lagged variables (w_{jt-1} and lev_{jt-2}) rather than the longer lags (w_{jt-4} and lev_{jt-5}) required in the empirical estimation.

Figure 6 compares these model-simulated results (red line) with our baseline empirical estimates (blue lines) from Figure B.2. The model successfully reproduces the key empirical pattern—the differential decline in workers' earnings growth conditional on the firm's leverage—though the simulated response exhibits less persistence than observed in the data.

4.3 Quantification of Financing from Workers

In our model, the upward-sloping labor supply curve is the key to enabling financing from workers, distinguishing it from typical firm financial friction models. To isolate this mechanism's quantitative importance, we recalibrate a reference model that maintains financial frictions but eliminates labor market power. As shown in Table 2, this reference model achieves comparable moment matching to our benchmark model. Next, we compare bond price schedules, firm-level decisions, and aggregate impulse responses across the two models to quantify the role of financing from workers.

Bond Price Schedules. Figure 7 plots the bond price schedules $Q(z, n', b')$—as defined in equation (14)—for the average-productivity firm, as a function of next-period debt b'. The solid black line depicts the model without labor market power, while the dash-dot red line corresponds to the baseline model with labor market power.

The bond price schedule $Q(z, n', b')$ is the amount a firm can borrow today per dollar of promised repayment in the next period. In both models, bond prices decline with higher borrowing levels, as the probability of default increases with debt. Lenders respond to this elevated risk by demanding a higher return, thereby reducing the bond price.

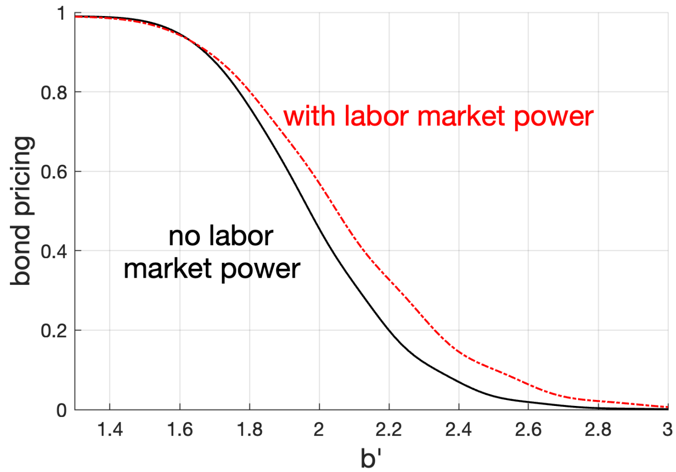
Notably, the price schedule $Q(z, n', b')$ is higher in the model with labor market power, implying lower borrowing costs for firms in that setting. When firms possess monopsony power, lenders anticipate a lower probability of default, given firms' ability to reduce wages during downturns. Consequently, lenders require lower repayment per dollar borrowed, endogenously lowering the cost of external financing. This channel operates alongside the direct wage suppression effect and highlights an additional financing advantage associated with firms' labor market power.

Firm Decision Rules. Figure 8 shows the optimal policies of the average-productivity firm as a function of cash on hand. The left panel plots next-period employment n', and the right panel shows the corresponding wage rate. To facilitate interpretation, both panels are normalized such that the maximum value in the no-labor-market-power model is set to one.

We begin by examining the model without labor market power (solid black lines), which features only financial frictions. As shown in the left panel, the firm's employment decision depends on its cash on hand. When cash on hand is sufficiently high, the non-negative dividend constraint (12) is slack, so employment remains constant regardless of cash levels. As cash on hand falls, the constraint becomes binding, and the firm must borrow to meet its obligations. Increased borrowing raises default risk, making employment riskier, so the firm shrinks its workforce.

The decision rules as a function of cash on hand help illustrate how firms respond to an unexpected disinflation shock. Such a shock—characterized by a decline in π and a corresponding

Figure 7: Bond Price Schedules

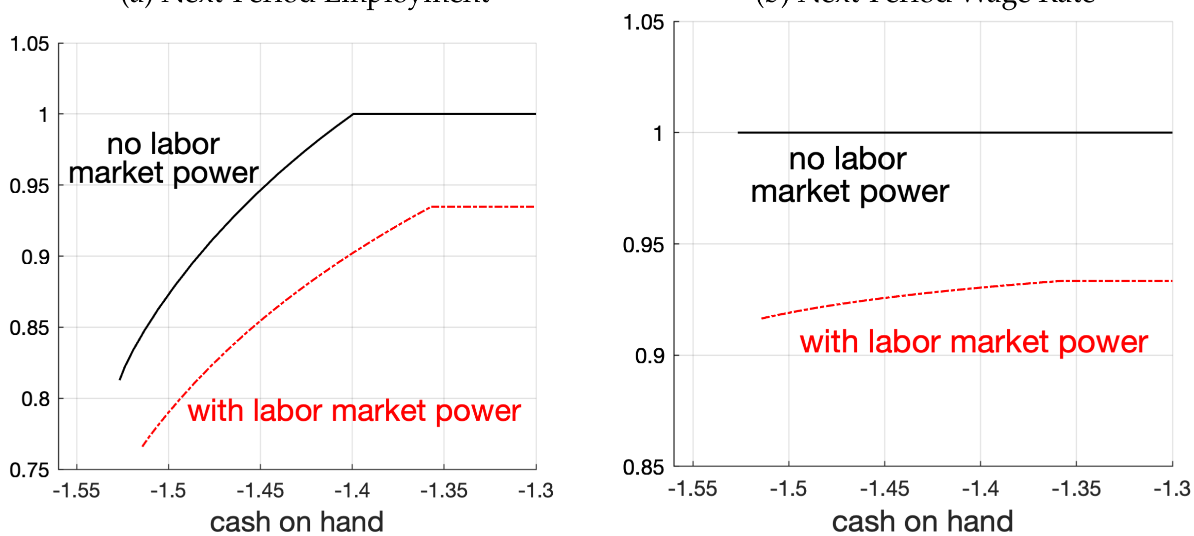


Note: This figure plots the bond price schedules $Q(z, n', b')$ for the average-productivity firm as a function of borrowing b'. The solid black line represents the model without labor market power, while the dash-dot red line corresponds to the baseline model with labor market power.

Figure 8: Average Firm Decisions

(a) Next-Period Employment

(b) Next-Period Wage Rate



Note: This figure displays the optimal policies of the average-productivity firm as a function of cash on hand. The left panel plots next-period employment n', and the right panel shows the corresponding wage rate. The solid black line represents the model without labor market power, while the dash-dot red line corresponds to the baseline model with labor market power. To facilitate interpretation, both panels are normalized such that the maximum value in the no-labor-market-power model is set to one.

increase in $\frac{b}{\pi}$—increases the firm's real debt burden and reduces its cash on hand. When the non-negative dividend constraint (12) binds, this decline forces the firm to reduce employment in order to meet its financial obligations. Additionally, the employment decision is concave, so an unexpected disinflation is more contractionary if the firm has higher ex-ante leverage and lower cash on hand, consistent with our empirical findings.

The dash-dot red line in the left panel shows the average firm's employment decision under labor market power. First, firms optimally choose lower employment levels due to monopsony power, leading them to operate at a smaller size. Second, similar to the reference model without labor market power, employment declines as cash on hand decreases. However, the decline is more gradual.

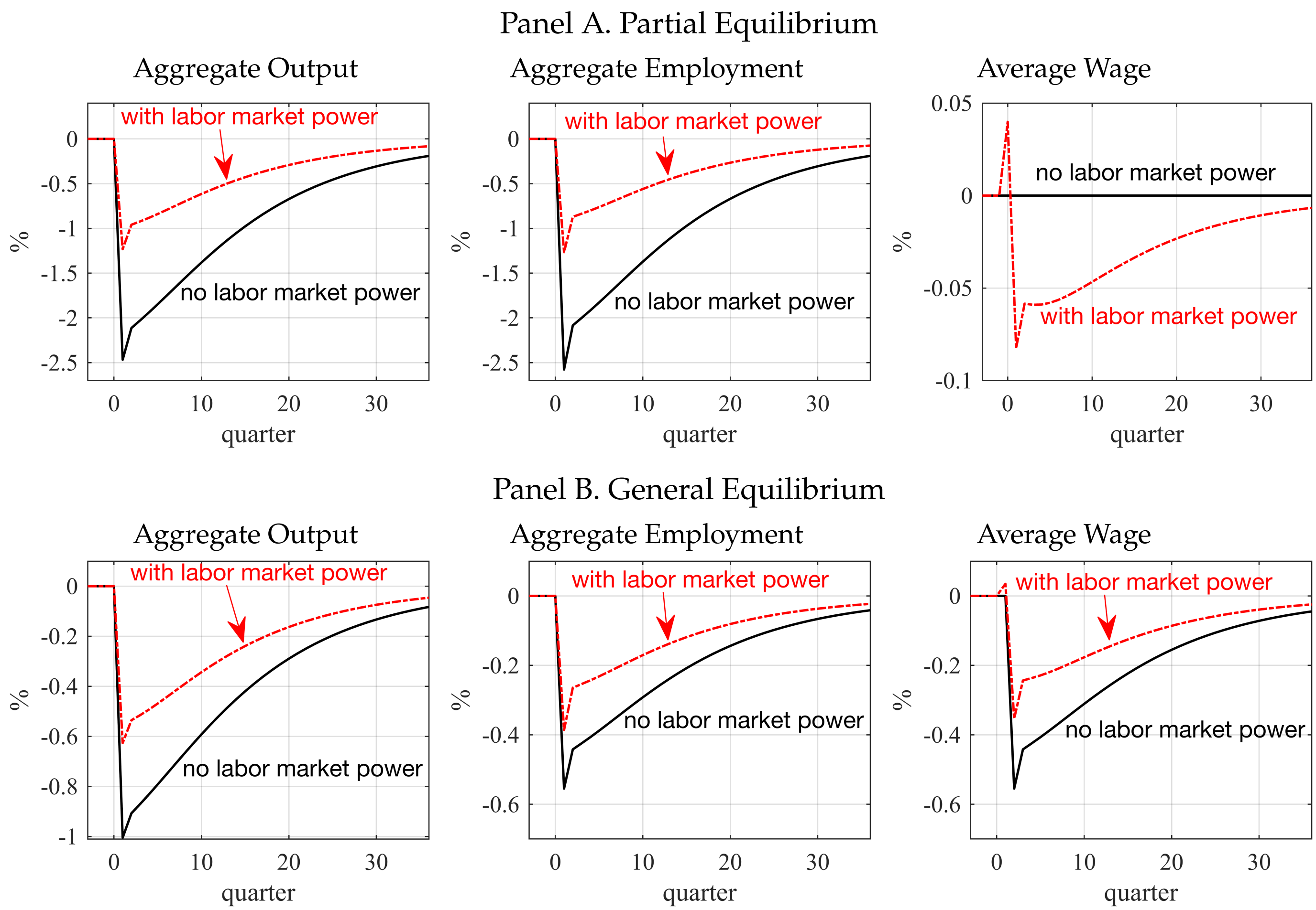
This mitigated decline arises from an additional margin of adjustment: the wage rate. As shown in the right panel, in the absence of labor market power, the labor market is perfectly competitive, so the wage rate is the same across firms—regardless of their cash on hand. In contrast, when firms have monopsony power, they face an upward-sloping labor supply curve. As firms demand less labor, their remaining workers' wage rate also declines. This response of wages helps firms to finance from workers: lower wages relieve the firm's financial burden of payroll and mitigate the impact of adverse shocks on employment. Therfore, labor market power enhances firms' resilience to financial distress.

Aggregate Impacts: Mitigation from Labor Market Power. To evaluate the aggregate implications of labor market power, we compare the responses of the two economies to an unexpected decrease in firms' cash on hand in Figure 9. The shock is common across firms and proportional to firms' debt levels. The shock size is chosen so that aggregate output declines by 1% on impact in the model without labor market power under general equilibrium. Both models are (re)calibrated to match the same set of data moments and thus start from comparable firm distributions.

Panel A shows the impulse responses under partial equilibrium, where the wage index $\bar{W}$ is held constant at the level before the unexpected fall in cash on hand. In response to such shock, firms face tighter financial constraints and reduce their employment for the subsequent period, leading to contractions in aggregate employment and output. The decline in output is larger than that in employment due to a fall in aggregate labor productivity. This occurs because some firms exit following the shock, and new entrants tend to be less productive, lowering overall productivity. These dynamics remain qualitatively similar across both our baseline model with labor market power and the case without it.

However, the model with labor market power (dash-dot red lines) predicts smaller declines in both employment and output than the model without labor market power (solid black lines). The rightmost panel reveals the stabilizing mechanism at work: in our baseline model, average wages fall even though the aggregate wage index remains constant in this partial equilibrium. With an upward-sloping labor supply curve, liquidity-constrained firms can reduce their wage payments to workers by cutting employment. This wage adjustment helps cushion the impact of debt disinflation on firms' balance sheets, particularly for more financially constrained firms. Moreover, lenders internalize this mechanism, recognizing its mitigating effect on default risk,

Figure 9: Impulse Response Functions to an Unexpected Decrease in Cash on Hand



Note: This figure displays the aggregate impulse responses to an unexpected decrease in firms' cash on hand, simulated as a common shock proportional to firms' debt levels. The shock size is chosen so that aggregate output declines by 1% on impact in the model without labor market power under general equilibrium. Panel A shows the partial-equilibrium results where the wage index $\bar{W}$ is held constant, while Panel B shows the general-equilibrium results where the labor market clears. Each panel plots the responses of aggregate output, aggregate employment, and the average wage rate. The solid black line represents the model without labor market power, while the dash-dot red line represents the benchmark model with labor market power. All models are (re)calibrated.

and respond by offering more favorable bond prices. Together, these two channels—wage adjustment and improved credit terms—enable firms to maintain more stable employment and output levels following the adverse shock. In contrast, the model without labor market power lacks these mechanisms. Firms facing liquidity constraints can only reduce employment, with no ability to adjust wages. As a result, this model exhibits sharper reductions in labor and output.

In the general equilibrium, the aggregate wage index falls in response to declining labor demand. Panel B presents the general-equilibrium results. Lower labor demand reduces the equilibrium wage in both models, partially offsetting the downturn. In the reference model without labor market power, the cash-on-hand shock generates a 1% decline in aggregate output by construction, accompanied by a 0.55% decline in both aggregate employment and the average wage rate. The model with labor market power, however, exhibits a substantially milder contraction: output falls by only 0.63%, employment by 0.39%, and the average wage by 0.35%. Put differently, labor market power mitigates 38% of the output decline, 30% of the employment decline, and 36% of the wage decline relative to the reference model.

In the end, the average wage decrease turns out to be smaller in the model with labor market power because firms can use monopsony power to make idiosyncratic wage adjustments based on their financial conditions. This mechanism is much more effective in stabilizing aggregate labor demand than a uniform, economy-wide wage decline, resulting in a smaller aggregate wage decrease in the model with labor market power.

Note that labor market power mitigates financial frictions only when misallocation arises due to firm heterogeneity. To see why, consider a case with homogeneous firms and financial frictions. Recall the labor supply curve when firms have labor market power: $w_{jt} = \frac{u_{Nt}}{\mathbb{E}_{t-1}[u_{Ct}/\pi_t]} \left(\frac{n_{jt}}{N_t}\right)^{\frac{1}{\eta}}$. When all firms are identical, each firm's employment equals the aggregate, $N_t = n_{jt}$, so the wage becomes

$$w_{jt} = \frac{u_{Nt}}{\mathbb{E}_{t-1}[u_{Ct}/\pi_t]},$$

which is independent of η and therefore identical with or without labor market power.

In this case, the general equilibrium response to financial shocks is the same regardless of labor market structure. However, with heterogeneous firms, financial frictions generate misallocation of labor across firms, and the uniform adjustment of the aggregate wage index can offset only part of this distress. The upward labor supply curve, by contrast,allows for firm-specific wage adjustment, enbling more distressed firms to reduce wages by more than less distressed ones, thereby alleviating misallocation and stablizing the economy more effectively.

5 Conclusion

Using Census employer-employee data, we find that workers in high-leverage firms experience significantly slower earnings growth following an unexpected disinflation shock that increases the real burden of firms' nominal debt. Thus, with labor market power, firms can finance from workers through reduced compensation to partially mitigate financial distress. To explore this mechanism, we develop a heterogeneous firm model incorporating both labor market power and endogenous default risk. When calibrated to US firm financing patterns and labor market elasticities, our model shows that labor market power significantly mitigates the negative impacts of financial distress on firms.

References

Abowd, John A and Thomas Lemieux. 1993. "The effects of product market competition on collective bargaining agreements: The case of foreign competition in Canada." *The Quarterly Journal of Economics* 108 (4):983–1014.

Afrouzi, Hassan, Andres Blanco, Andres Drenik, and Erik Hurst. 2024. "A theory of how workers keep up with inflation." Tech. rep., National Bureau of Economic Research.

Arellano, Cristina, Yan Bai, and Patrick J Kehoe. 2019. "Financial frictions and fluctuations in volatility." *Journal of Political Economy* 127 (5):2049–2103.

Arellano, Cristina, Yan Bai, and Jing Zhang. 2012. "Firm dynamics and financial development." *Journal of Monetary Economics* 59 (6):533–549.

Azariadis, Costas. 1975. "Implicit contracts and underemployment equilibria." *Journal of political economy* 83 (6):1183–1202.

Bagga, Sadhika. 2023. "Firm market power, worker mobility, and wages in the US labor market." *Journal of Labor Economics* 41 (S1):S205–S256.

Bai, Yan, Dan Lu, Xu Tian, and Yajie Wang. 2026. "When do financial frictions matter for misallocation?" Tech. rep., National Bureau of Economic Research.

Baily, Martin Neil. 1974. "Wages and employment under uncertain demand." *The Review of Economic Studies* 41 (1):37–50.

Bardóczy, Bence, Gideon Bornstein, Chiara Maggi, and Sergio Salgado. 2025. "Monopsony power and the transmission of monetary policy." Tech. rep., Working paper.

Berger, David, Kyle Herkenhoff, and Simon Mongey. 2022. "Labor market power." *American Economic Review* 112 (4):1147–1193.

Bernanke, Ben S and Mark Gertler. 1989. "Agency costs, net worth, and business fluctuations." *American Economic Review* 79 (1):14–31.

Bertheau, Antoine, Marianna Kudlyak, Birthe Larsen, and Morten Bennedsen. 2022. "Why firms lay off workers instead of cutting wages: Evidence from matched survey-administrative data." *Available at SSRN 4267332* .

Bhamra, Harjoat S, Christian Dorion, Alexandre Jeanneret, and Michael Weber. 2023. "High inflation: Low default risk and low equity valuations." *The Review of Financial Studies* 36 (3):1192–1252.

Bils, Mark, Bariş Kaymak, and Kai-Jie Wu. 2025. "Robinson meets Roy: Monopsony power and comparative advantage." Tech. rep., National Bureau of Economic Research.

Blanchflower, David G, Andrew J Oswald, and Peter Sanfey. 1996. "Wages, profits, and rent-sharing." *The Quarterly Journal of Economics* 111 (1):227–251.

Blanco, Julio, Andrés Drenik, Christian Moser, and Emilio Zaratiegui. 2025. "The Macroeconomics of Wage Rigidity and Job Separations." *Available at SSRN 4124811* .

Bloom, Nicholas, Max Floetotto, Nir Jaimovich, Itay Saporta-Eksten, and Stephen J Terry. 2018. "Really uncertain business cycles." *Econometrica* 86 (3):1031–1065.

Buera, Francisco J and Yongseok Shin. 2013. "Financial frictions and the persistence of history: A quantitative exploration." *Journal of Political Economy* 121 (2):221–272.

Card, David, Ana Rute Cardoso, Joerg Heining, and Patrick Kline. 2018. "Firms and labor market inequality: Evidence and some theory." *Journal of Labor Economics* 36 (S1):S13–S70.

Chan, Mons, Elena Mattana, Sergio Salgado, and Ming Xu. 2023. "Wage setting and passthrough: The role of market power, production technology and adjustment costs." *Production Technology and Adjustment Costs (August 17, 2023)* .

Chen, Guojun, Jinyu Liu, and Shaowen Luo. 2022. "Sticky leverage and debt overhang: Evidence from foreign-denominated debt in Latin America." *SSRN 4309826* .

Cheremukhin, Anton and Paulina Restrepo-Echavarria. 2025. "An Information-Based Theory of Monopsony Power." .

Cooley, Thomas, Ramon Marimon, and Vincenzo Quadrini. 2004. "Aggregate consequences of limited contract enforceability." *Journal of political Economy* 112 (4):817–847.

Corhay, Alexandre and Jincheng Tong. forthcoming. "Inflation risk and the finance-growth nexus." *Review of Economic Studies* .

Deb, Shubhdeep, Jan Eeckhout, Aseem Patel, and Lawrence Warren. 2024. "Walras–Bowley Lecture: Market power and wage inequality." *Econometrica* 92 (3):603–636.

Fabiani, Andrea and Piersanti Fabio Massimo. 2024. "Inflation, capital structure and firm value." *Bank of Italy Temi di Discussione (Working Paper) No* 1434.

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 (6):1673–1712.

Fisher, Irving. 1933. "The debt-deflation theory of great depressions." *Econometrica: Journal of the Econometric Society* :337–357.

Fitzgerald, Terry J and Juan Pablo Nicolini. 2014. "Is there a stable relationship between unemployment and future inflation? Evidence from US cities." *Federal Reserve Bank of Minneapolis Working Paper* .

Fukui, Masao. 2020. "A theory of wage rigidity and unemployment fluctuations with on-the-job search." *Job Market Paper, Massachusetts Institute of Technology* .

Gilchrist, Simon, Raphael Schoenle, Jae Sim, and Egon Zakrajšek. 2017. "Inflation dynamics during the financial crisis." *American Economic Review* 107 (3):785–823.

Gomes, Joao, Urban Jermann, and Lukas Schmid. 2016. "Sticky leverage." *American Economic Review* 106 (12):3800–3828.

Greenwood, Jeremy, Zvi Hercowitz, and Gregory W Huffman. 1988. "Investment, capacity utilization, and the real business cycle." *The American Economic Review* :402–417.

Guiso, Luigi, Luigi Pistaferri, and Fabiano Schivardi. 2005. "Insurance within the firm." *Journal of Political Economy* 113 (5):1054–1087.

———. 2013. "Credit within the Firm." *Review of Economic Studies* 80 (1):211–247.

Gürkaynak, Refet, Hatice Gökçe Karasoy-Can, and Sang Seok Lee. 2022. "Stock market's assessment of monetary policy transmission: The cash flow effect." *The Journal of Finance*

77 (4):2375–2421.

Hazell, Jonathon, Juan Herreno, Emi Nakamura, and Jón Steinsson. 2022. "The slope of the Phillips Curve: Evidence from US states." *The Quarterly Journal of Economics* 137 (3):1299–1344.

Hazell, Jonathon and Bledi Taska. 2025. "Downward rigidity in the wage for new hires." *American Economic Review* 115 (12):4183–4217.

Hyatt, Henry R, Erika McEntarfer, Kevin L McKinney, Stephen Tibbets, and Doug Walton. 2014. "Job-to-job (J2J) flows: New labor market statistics from linked employer-employee data." *US Census Bureau Center for Economic Studies Paper No. CES-WP-14-34* .

Jarosch, Gregor, Jan Sebastian Nimczik, and Isaac Sorkin. 2024. "Granular search, market structure, and wages." *Review of Economic Studies* 91 (6):3569–3607.

Jordà, Òscar. 2005. "Estimation and inference of impulse responses by local projections." *American economic review* 95 (1):161–182.

Khan, Aubhik and Julia K Thomas. 2013. "Credit shocks and aggregate fluctuations in an economy with production heterogeneity." *Journal of Political Economy* 121 (6):1055–1107.

Kiyotaki, Nobuhiro and John Moore. 1997. "Credit cycles." *Journal of political economy* 105 (2):211–248.

Malgieri, Cedomir and Luca Citino. 2024. "Wage contracts and financial frictions." *Standard working paper* .

Manning, Alan. 2021. "Monopsony in labor markets: A review." *ILR Review* 74 (1):3–26.

Mavroeidis, Sophocles, Mikkel Plagborg-Møller, and James H Stock. 2014. "Empirical evidence on inflation expectations in the New Keynesian Phillips Curve." *American Economic Journal: Journal of Economic Literature* 52 (1):124–188.

McLeay, Michael and Silvana Tenreyro. 2020. "Optimal inflation and the identification of the Phillips curve." *NBER Macroeconomics Annual* 34 (1):199–255.

Michaels, Ryan, T Beau Page, and Toni M Whited. 2019. "Labor and capital dynamics under financing frictions." *Review of Finance* 23 (2):279–323.

Michelacci, Claudio and Vincenzo Quadrini. 2009. "Financial markets and wages." *The Review of Economic Studies* 76 (2):795–827.

Midrigan, Virgiliu and Daniel Yi Xu. 2014. "Finance and misallocation: Evidence from plant-level data." *American economic review* 104 (2):422–458.

Moll, Benjamin. 2014. "Productivity losses from financial frictions: Can self-financing undo capital misallocation?" *American Economic Review* 104 (10):3186–3221.

Nevo, Guillaume. 2024. "Large Firms, High Concentration, High Wages." *Working Paper* .

Ottonello, Pablo and Thomas Winberry. 2020. "Financial heterogeneity and the investment channel of monetary policy." *Econometrica* 88 (6):2473–2502.

Rossi-Hansberg, Esteban, Pierre-Daniel Sarte, and Nicholas Trachter. 2021. "Diverging trends in national and local concentration." *NBER Macroeconomics Annual* 35 (1):115–150.

Rute Cardoso, Ana and Miguel Portela. 2009. "Micro foundations for wage flexibility: Wage insurance at the firm level." *Scandinavian Journal of Economics* 111 (1):29–50.

Schoefer, Benjamin. 2021. "The financial channel of wage rigidity." Tech. rep., National Bureau of Economic Research.

Souchier, Martin. 2025. "Insurance inside and outside the firm." *Available at SSRN 5137109* .

Wang, Yajie. 2026. "Uncertainty and unemployment revisited: The consequences of financial and labor contracting frictions." *Available at SSRN 4110474* .

Wang, Yicheng. 2025. "Limited firm insurance and aggregate implications." *Management Science* 71 (7):5997–6046.

Yeh, Chen, Claudia Macaluso, and Brad Hershbein. 2022. "Monopsony in the US labor market." *American Economic Review* 112 (7):2099–2138.

Appendix to "Financing from Workers: Can Labor Market Power Mitigate Financial Frictions?"

by Yan Bai and Yajie Wang

A Proofs

Proof of Proposition 1 When the labor market is perfectly competitive and financial frictions are absent, a firm solves the following problem:

$$\max_n \mathbb{E}\left(zn^\alpha - \bar{w}n - \zeta\right).$$

The first-order condition with respect to n is

$$\alpha\,\mathbb{E}(z)(n^*)^{\alpha-1} = \bar{w}.$$

Proof of Proposition 2 With only financial frictions, a firm solves the following problem

$$\max_n \mathbb{E}\left(zn^\alpha - \bar{w}n - \zeta\right), \quad \text{s.t. } zn^\alpha - \bar{w}n - \zeta \geq 0,\ \forall z,$$

which is equivalent to solving

$$\max_n \mathbb{E}\left(zn^\alpha - \bar{w}n - \zeta\right), \quad \text{s.t. } \underline{z}n^\alpha - \bar{w}n - \zeta \geq 0.$$

Let γ be the multiplier on the NND condition. The first order condition over n is given by

$$\alpha\,\mathbb{E}\,zn^{\alpha-1} - \bar{w} + \gamma(\underline{z}\alpha n^{\alpha-1} - \bar{w}) = 0.$$

After combining terms, we obtain

$$\alpha\,\mathbb{E}\,zn^{\alpha-1} = \frac{1+\gamma}{1+(\underline{z}/\mathbb{E}\,z)\gamma}\bar{w}.$$

We now prove that labor falls with a larger financial shock ζ.

When the NND condition is not binding, $\gamma = 0$, and the labor $n = n^*$ is efficient and solves $\alpha\,\mathbb{E}\,zn^{\alpha-1} = \bar{w}$. When ζ is large enough, NND condition under $\underline{z}$ binds at n^*. In this case, labor has to fall to satisfy the NND condition. Now labor and multiplier (n, λ) solves

$$\underline{z}n^\alpha - \bar{w}n - \zeta = 0,$$

$$\alpha\,\mathbb{E}\,zn^{\alpha-1} = \frac{1+\gamma}{1+(\underline{z}/\mathbb{E}\,z)\gamma}\bar{w}.$$

Taking derivatives over ζ, we have

$$\frac{dn}{d\zeta} = \frac{1}{\underline{z}\alpha n^{\alpha-1} - \bar{w}} \leq 0.$$

The inequality holds because for any $n > \underline{n}$, the marginal return is smaller than the marginal cost. Thus, labor falls with financial shock.

Proof of Proposition 3 With both financial frictions and labor market power, the firm solves

$$\max_n \mathbb{E}\left(zn^\alpha - w(n)n - \zeta\right), \ \text{ s.t. } \ \underline{z}n^\alpha - w(n)n - \zeta \geq 0.$$

The first order condition over labor is given by

$$\alpha\,\mathbb{E}\,zn^{\alpha-1} = \frac{1+\gamma}{1+(\underline{z}/\mathbb{E}\,z)\gamma}\frac{1+\eta}{\eta}n^{\frac{1}{\eta}}\bar{w}.$$

We now prove that labor market power mitigates the adverse impact of financial shock on labor. To make this case comparable with that with only financial frictions, assuming that when the NND condition is not binding, the optimal labor is the same as the complete market case $n = n^*$. When the NND condition binds, optimal labor satisfies

$$\underline{z}n^\alpha - w(n)n - \zeta = 0.$$

Let $\hat{x}$ denote the percentage deviation of variable x from some initial level x_0: $\hat{x} = (x - x_0)/x_0$. Let $\xi^* = \bar{z}(n^*)^\alpha - w(n^*)n^*$. When $\zeta > \zeta^*$, firms have to reduce labor. Using the binding NND condition,

$$\zeta = \underline{z}n^\alpha - w(n)n.$$

We can derive the response of labor to financial shocks:

$$\hat{n}^L = -\frac{\zeta^*}{\frac{\eta+1}{\eta}w(n^*)n^* - \alpha\hat{z}(n^*)^\alpha}\hat{\zeta} \leq 0.$$

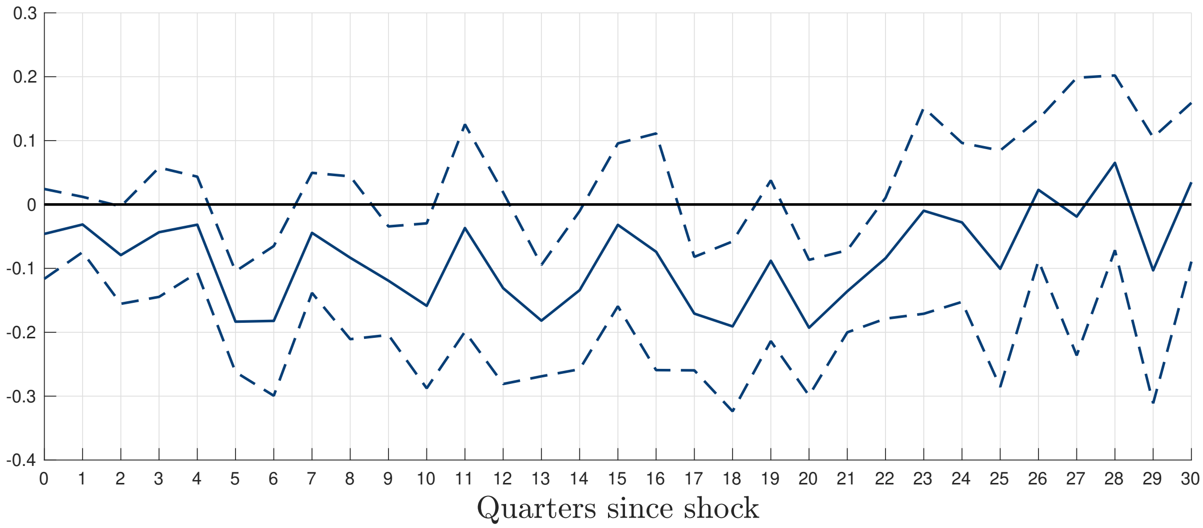
For comparison, in the case without labor market power:

$$\hat{n}^{noL} = -\frac{\zeta^*}{\bar{w}n^* - \alpha\hat{z}(n^*)^\alpha}\hat{\zeta} \leq 0.$$

When the labor supply curve is upward sloping, the markdown factor $(\eta+1)/\eta$ appears in the denominator, which mitigates the response of labor to a financial shock. As a result, $\hat{n}^L < \hat{n}^{noL}$.

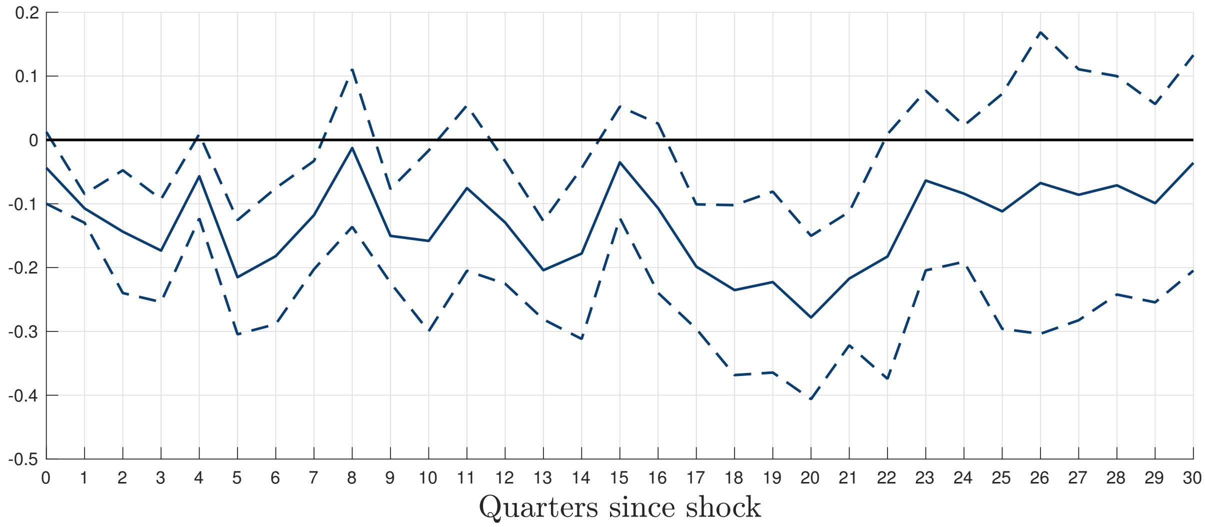
B Empirical Robustness

Figure B.1: Heterogeneous Responses of Worker Earnings to Aggregate Disinflation



Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (8), using nationwide CPI-based unexpected disinflation. It illustrates the heterogeneous responses of workers' earnings growth to aggregate disinflation shocks, conditional on firm leverage.

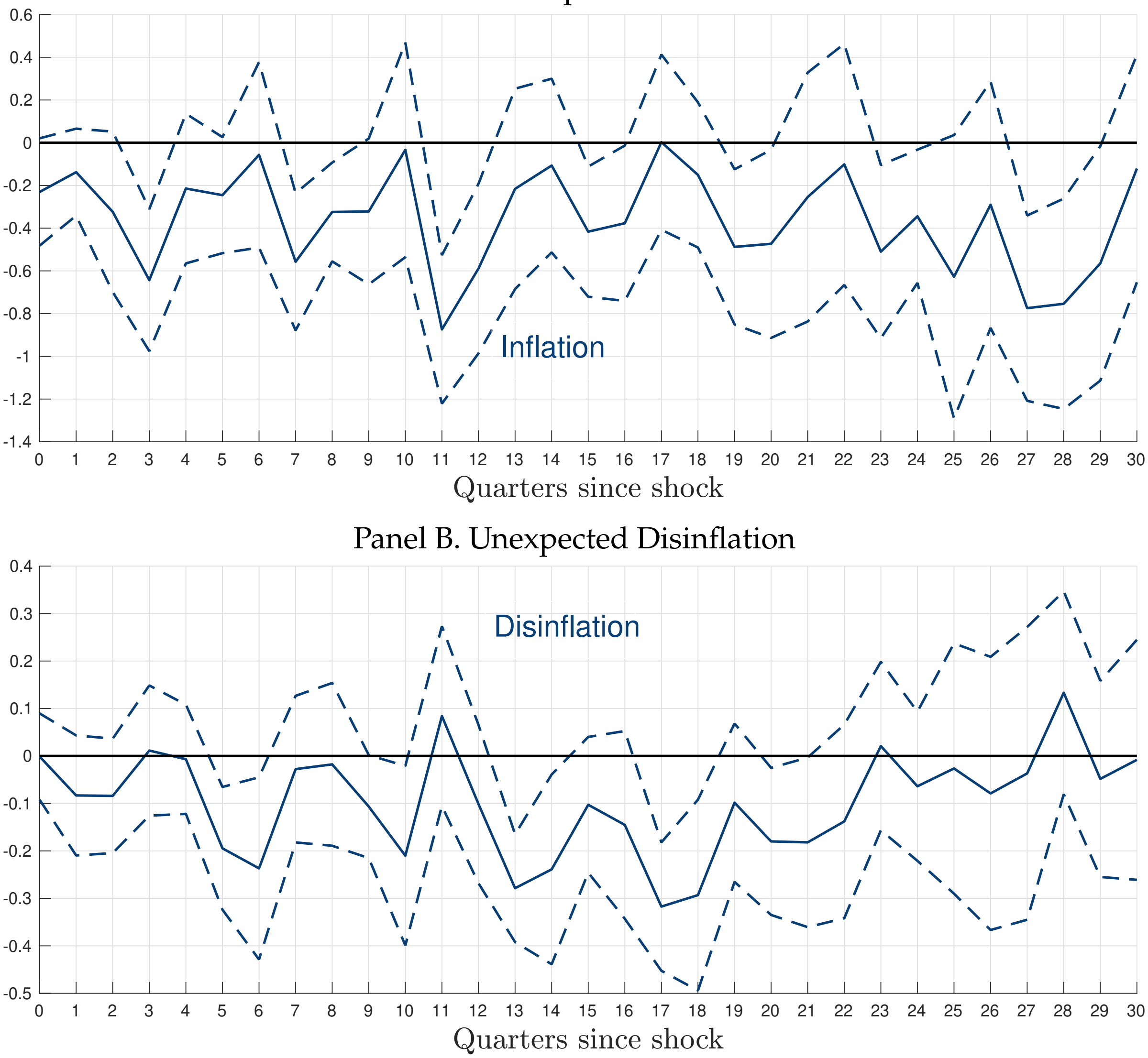
Figure B.2: Heterogeneous Responses of Worker Earnings Growth to Firm-Headquarters State Disinflation



Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (8), showing the heterogeneous responses of workers' earnings growth to unexpected state-level disinflation shocks in firms' headquarters states, conditional on firm leverage.

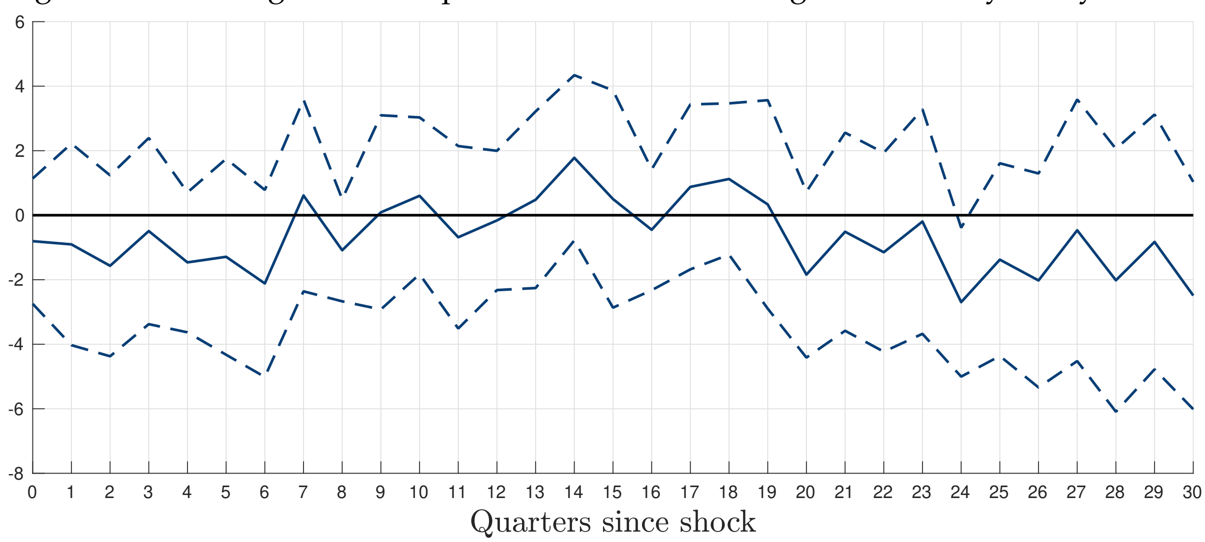
Figure B.3: Heterogeneous Responses of Worker Earnings to Inflation and Disinflation

Panel A. Unexpected Inflation



Note: The figure plots the estimated coefficients with their corresponding 90% confidence intervals from equation (8), allowing asymmetric responses to unexpected inflation and disinflation shocks: $lev_{jt-5} \cdot (-\epsilon^{\pi}_{jt-1}) \cdot (\beta^1_h \mathbb{1}\{\epsilon^{\pi}_{jt-1} \geq 0\} + \beta^2_h \mathbb{1}\{\epsilon^{\pi}_{jt-1} < 0\})$. Panel A shows the heterogeneous responses of workers' earnings growth to unexpected inflation shocks (β^1_h), and Panel B shows the resposnes to disinflation shocks (β^2_h), conditional on firm leverage.

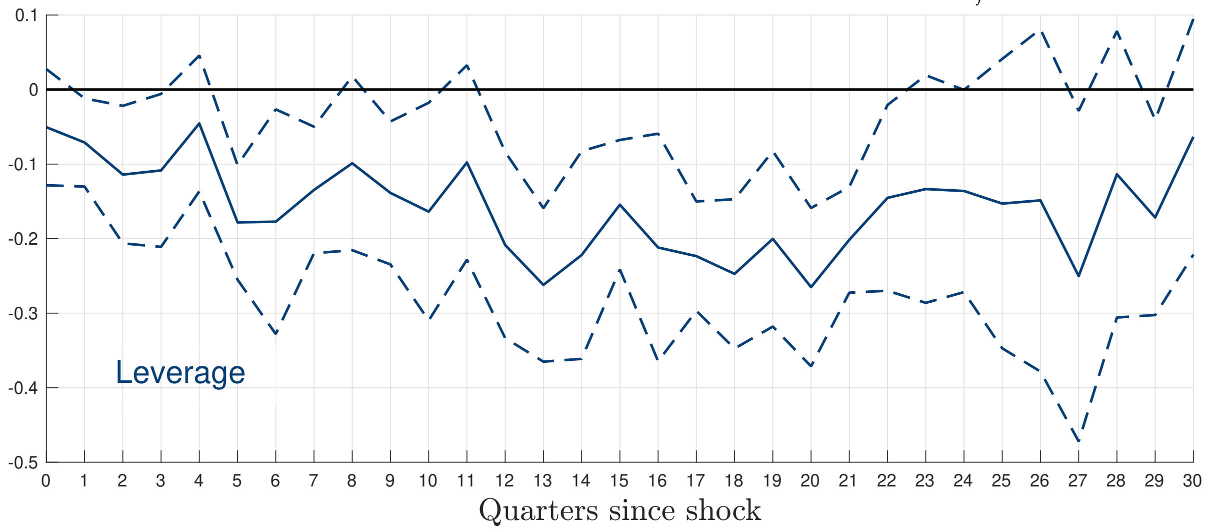
Figure B.4: Heterogeneous Responses of Worker Earnings to Monetary Policy Shocks



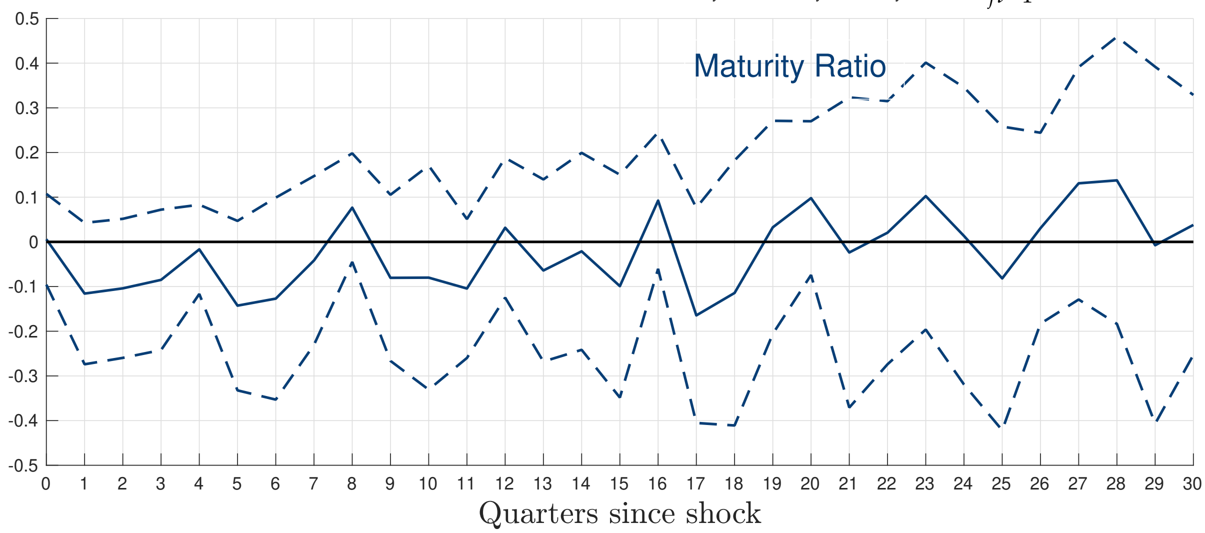
Note: The figure plots the estimated coefficients and 90% confidence intervals of the interaction between lagged leverage and lagged monetary policy shocks from equation (8), showing the heterogeneous responses of workers' earnings growth to monetary policy shocks, conditional on firm leverage.

Figure B.5: Heterogeneous Responses of Worker Earnings to Unexpected Disinflation Conditional on Debt Maturity

Panel A. Estimated Coefficients of $(lev_{jt-5} - \mathbb{E}_j[lev_{jt}])(-\epsilon^{\pi}_{jt-1})$

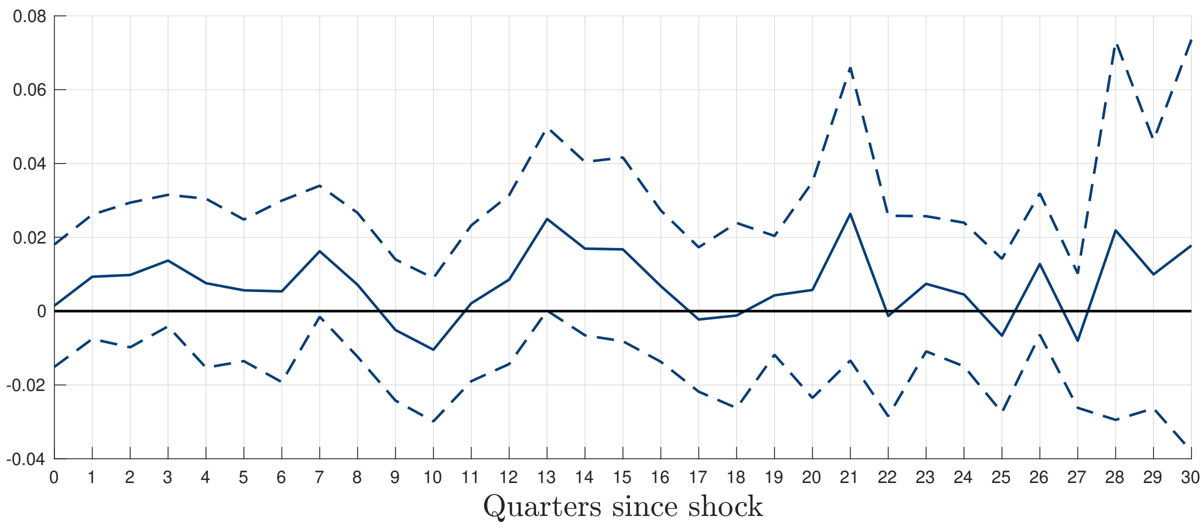


Panel B. Estimated Coefficients of $(mty_{jt-5} - \mathbb{E}_j[mty_{jt}])(-\epsilon^{\pi}_{jt-1})$



Note: The blue lines plot the estimated coefficients (β_h) and their corresponding 90% confidence intervals from equation (8), illustrating the heterogeneous responses of workers' earnings growth to unexpected disinflation shocks, conditional on firm leverage and debt maturity. Panel A reports the estimated coefficients for the interaction between lagged, demeaned leverage and unexpected disinflation shocks. Panel B reports the estimated coefficients for the interaction between the lagged, demeaned maturity ratio and unexpected disinflation shocks. The maturity ratio, mty, is defined as long-term debt ($dlttq$) divided by total debt ($dlcq + dlttq$).

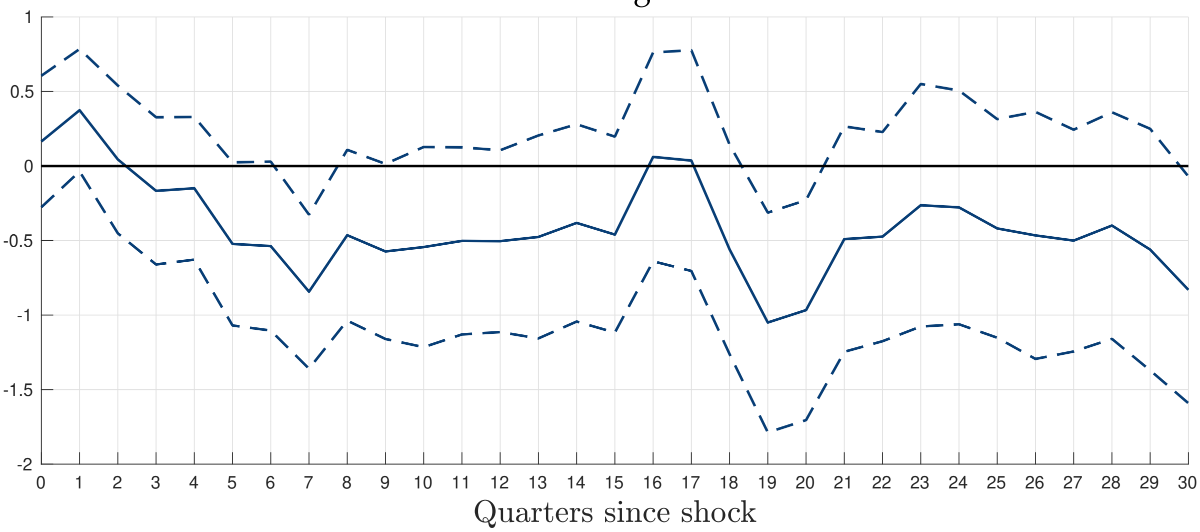
Figure B.6: Heterogeneous Responses of Worker Layoffs



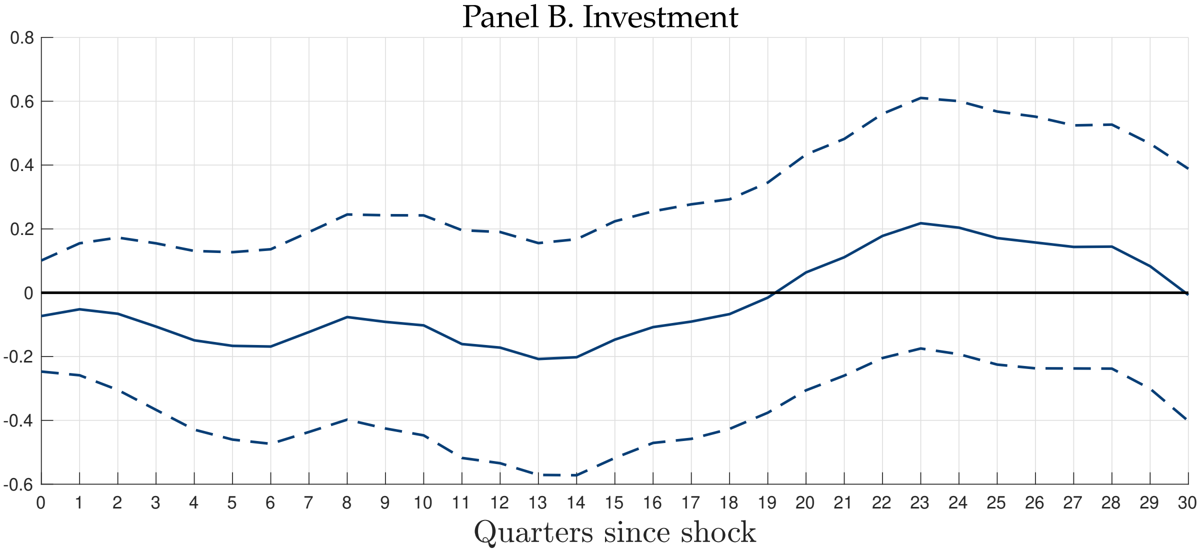
Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (8), replacing the dependent variable with the layoff indicator $\mathbb{1}^{\text{lay}}_{ijt+h}$. It shows the heterogeneous responses of workers' layoff probability to unexpecteddisinflation shocks, conditional on firm leverage.

Figure B.7: Heterogeneous Responses of Firms to Unexpected Disinflation

Panel A. Hiring Growth



Panel B. Investment



Note: The figure plots the estimated coefficients (β_h) with their corresponding 90% confidence intervals from equation (9), using hiring growth as the dependent variable in Panel A and capital growth in Panel B. Panel A shows the heterogeneous responses of firms' hiring growth to unexpected disinflation shocks, conditional on firm leverage. Panel B shows the heterogeneous responses of firms' investment.

C Computation Algorithm

C.1 Benchmark Model

Firm's problem (treat π' as parameter when solving the stationary equilibrium):

$$V(S,z,x) = \max_{l',b'} x + q(S,z,l',b')b' + \beta(1-\delta)\sum_{z'}\pi(z'|z)\Big[\int^{\kappa'^*(S',z',l',b')} V(S',z',x')\phi(\kappa')d\kappa'\Big] \quad (18)$$

$$\text{s.t. } x + q(S,z,l',b')b' \geq 0 \quad (19)$$

$$b' \geq 0 \quad (20)$$

$$x' = z'l'^{\alpha} - \frac{w'(l')}{\pi'}l' - \frac{b'}{\pi'} - \kappa' \quad (21)$$

$$w'(l') = l'^{\frac{1}{\eta}}\bar{w}' \quad (22)$$

$$\kappa'^*(S',z',l',b') = z'l'^{\alpha} - \frac{w'(l')}{\pi'}l' - \frac{b'}{\pi'} + M(S',z') \quad (23)$$

$$q(S,z,l',b') = \frac{1}{1+r}\sum_{z'}\pi(z'|z)\Phi(\kappa'^*)\frac{1}{\pi'}. \quad (24)$$

We first derive the first-order conditions. Let $\gamma(S,z,x)$ and $\eta(S,z,x)$ denote the multipliers on the non-negative equity payout constraint and the borrowing constraint. Define $G(S,z,l',b') = \sum_{z'}\pi(z'|z)\int^{\kappa'^*} V(S',z',x')\phi(\kappa')d\kappa'$. Then the first-order conditions are:

$$[1+\gamma(S,z,x)+\eta(S,z,x)]\frac{\partial[q(S,z,l',b')b']}{\partial l'} + \beta(1-\delta)\frac{\partial G(S,z,l',b')}{\partial l'} = 0, \quad (25)$$

$$[1+\gamma(S,z,x)+\eta(S,z,x)]\frac{\partial[q(S,z,l',b')b']}{\partial b'} + \beta(1-\delta)\frac{\partial G(S,z,l',b')}{\partial b'} = 0, \quad (26)$$

where

$$\frac{\partial[q(S,z,l',b')b']}{\partial l'} = \frac{1}{1+r}b'\sum_{z'}\pi(z'|z)\Big[\phi(k'^*(S',z',l',b'))(\alpha z'l'^{\alpha-1} - \frac{\eta+1}{\eta}\frac{w'(l')}{\pi'})\Big]\frac{1}{\pi'} \quad (27)$$

$$\frac{\partial[q(S,z,l',b')b']}{\partial b'} = q(S,z,l',b') - \frac{1}{1+r}b'\sum_{z'}\pi(z'|z)\Big[\phi(k'^*(S',z',l',b'))\Big]\frac{1}{\pi'^2} \quad (28)$$

$$\frac{\partial G(S,z,l',b')}{\partial l'} = \sum_{z'} \pi(z'|z)(\alpha z' l'^{\alpha-1} - \frac{\eta+1}{\eta}\frac{w'(l')}{\pi'})\Big[\int^{\kappa'^*}(1+\gamma'(S',z',x'))\phi(\kappa')d\kappa' + V(S',z',x'^*(\kappa'^*))\phi(k'^*)\Big] \tag{29}$$

$$\frac{\partial G(S,z,l',b')}{\partial b'} = -\frac{1}{\pi'}\sum_{z'} \pi(z'|z)\Big[\int^{\kappa'^*}(1+\gamma'(S',z',x'))\phi(\kappa')d\kappa' + V(S',z',x'^*(\kappa'^*))\phi(k'^*)\Big] \tag{30}$$

Computational algorithm:

1. Setup grids for z using Tauchen method.
2. Set up the grids for l' and b'.
3. Iterate to find the borrowing limit and bond price schedule.
   (a) Make an initial guess of the maximum borrowing $M^{\{0\}}(S,z)$.
   (b) Update new bond price
   $$q^{\{n\}}(S,z,l',b') = \frac{1}{1+r}\sum_{z'} \pi_z(z'|z)\Phi(\kappa'^*)\frac{1}{\pi'}, \tag{31}$$
   where $\kappa'^* = z'l'^\alpha - \frac{w'(l')}{\pi'}l' - \frac{b'}{\pi'} + M^{\{n\}}(S',z')$.
   (c) Update the maximum borrowing
   $$M^{\{n+1\}}(S,z) = \max_{l',b'} q^{\{n\}}(S,z,l',b')b'$$
   (d) Continue (b)-(c) until the maximum borrowing and the bond price converge.
4. Guess the grids for cash on hand, the multiplier on the non-negative equity payout constraint $\gamma^{\{0\}}(S,z,x)$, and the value function $V^{\{0\}}(S,z,x)$.
5. Solve the relaxed problem without the two inequality constraints:
   $$\hat{V}(S,z) = \max_{l',b'} q(S,z,l',b')b' + \beta(1-\delta)G^{\{n\}}(S,z,l',b').$$
   We solve the following first-order conditions to find the optimal policies to the relaxed problem $\{\hat{l}'(S,z), \hat{b}'(S,z)\}$:
   $$\frac{\partial[q(S,z,l',b')b']}{\partial l'} + \beta(1-\delta)\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial l'} = 0. \tag{32}$$

$$\frac{\partial[q(S,z,l',b')b']}{\partial b'} + \beta(1-\delta)\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial b'} = 0. \tag{33}$$

6. If $\hat{b}'(S,z)$ does not satisfy the borrowing constraint, replace the solutions with $\hat{b}'(S,z) = 0$ and solve $\hat{l}'(S,z)$ using the following condition:

$$\frac{\partial[q(S,z,l',b')b']}{\partial l'}\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial b'} - \frac{\partial[q(S,z,l',b')b']}{\partial b'}\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial l'} = 0, \tag{34}$$

where $b' = 0$.

7. Update cash-on-hand grids $x \in [x_{min}^{\{n+1\}}(S,z), x_{max}^{\{n+1\}}(S,z)]$:

$$x_{min}^{\{n+1\}}(S,z) = -M(S,z),$$

$$x_{max}^{\{n+1\}}(S,z) = \hat{x}(z) \equiv -q(S,z,\hat{l}'(S,z),\hat{b}'(S,z))\hat{b}'(S,z).$$

When $x \leq \hat{x}(z)$, the non-negative equity payout condition binds, and the borrowing constraint automatically holds. For any $x \geq \hat{x}(z)$, the optimal policies are $\hat{l}'(S,z)$ and $\hat{b}'(S,z)$, independent of x.

8. Solve the constrained problem for $x \in [x_{min}^{\{n+1\}}(S,z), x_{max}^{\{n+1\}}(S,z)]$:

$$x + q(S,z,l',b')b' = 0,$$

$$\frac{\partial[q(S,z,l',b')b']}{\partial l'}\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial b'} - \frac{\partial[q(S,z,l',b')b']}{\partial b'}\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial l'} = 0,$$

9. We use the optimal polices are $l'(S,z,x)$ and $b'(S,z,x)$ to update the multiplier:

$$\gamma^{\{n+1\}} = -\beta(1-\delta)\frac{\frac{\partial G^{\{n\}}(S,z,l',b')}{\partial b'}}{\frac{\partial[q(S,z,l',b')b']}{\partial b'}} - 1. \tag{35}$$

Also update the value function:

$$V^{\{n+1\}}(S,z,x) = x + q(S,z,l'b')b' + \beta(1-\delta)\sum_{z'}\pi(z'|z)\int^{\kappa'^*(S',z',l',b')} V^{\{n\}}(S',z',x')\phi(\kappa')d\kappa' \tag{36}$$

10. Iterate 5-9 until γ and V converge.

The household's first-order condition for labor supply is

$$w_{jt} = \chi N_t^{\frac{1}{\nu}} N_t^{-\frac{1}{\eta}} \ell_{it}^{\frac{1}{\eta}}.$$

Thus,

$$w(\ell) = \ell^{\frac{1}{\eta}} \left[\chi N^{\frac{1}{\nu}-\frac{1}{\eta}}\right] = \ell^{\frac{1}{\eta}} \bar{W},$$

where $\bar{W} \equiv \chi N^{\frac{1}{\nu}-\frac{1}{\eta}}$. We can then calibrate χ as

$$\chi = \bar{W} N^{-\frac{1}{\nu}+\frac{1}{\eta}}.$$

C.2 Model without Labor Market Power

Firm's problem (treat π' as parameter when solving the stationary equilibrium):

$$V(S,z,x) = \max_{l',b'} x + q(S,z,l',b')b' + \beta(1-\delta) \sum_{z'} \pi(z'|z) \Big[\int^{\kappa'^*(S',z',l',b')} V(S',z',x')\phi(\kappa')d\kappa' \Big] \tag{37}$$

$$\text{s.t. } x + q(S,z,l',b')b' \geq 0 \tag{38}$$

$$b' \geq 0 \tag{39}$$

$$x' = z'l'^{\alpha} - \frac{w'}{\pi'}l' - \frac{b'}{\pi'} - \kappa' \tag{40}$$

$$\kappa'^*(S',z',l',b') = z'l'^{\alpha} - \frac{w'}{\pi'}l' - \frac{b'}{\pi'} + M(S',z') \tag{41}$$

$$q(S,z,l',b') = \frac{1}{1+r} \sum_{z'} \pi(z'|z)\Phi(\kappa'^*)\frac{1}{\pi'}. \tag{42}$$

We first derive the first-order conditions. Let $\gamma(S,z,x)$ and $\eta(S,z,x)$ denote the multipliers on the non-negative equity payout constraint and the borrowing constraint. Define $G(S,z,l',b') = \sum_{z'} \pi(z'|z) \int^{\kappa'^*} V(S',z',x')\phi(\kappa')d\kappa'$. Then the first-order conditions are:

$$[1+\gamma(S,z,x)+\eta(S,z,x)]\frac{\partial[q(S,z,l',b')b']}{\partial l'} + \beta(1-\delta)\frac{\partial G(S,z,l',b')}{\partial l'} = 0, \tag{43}$$

$$[1+\gamma(S,z,x)+\eta(S,z,x)]\frac{\partial[q(S,z,l',b')b']}{\partial b'} + \beta(1-\delta)\frac{\partial G(S,z,l',b')}{\partial b'} = 0, \tag{44}$$

where

$$\frac{\partial[q(S,z,l',b')b']}{\partial l'} = \frac{1}{1+r}b' \sum_{z'} \pi(z'|z)\Big[\phi(k'^*(S',z',l',b'))(\alpha z' l'^{\alpha-1} - \frac{w'}{\pi'})\Big]\frac{1}{\pi'} \tag{45}$$

$$\frac{\partial[q(S,z,l',b')b']}{\partial b'} = q(S,z,l',b') - \frac{1}{1+r}b'\sum_{z'}\pi(z'|z)\Big[\phi(k'^{*}(S',z',l',b'))\Big]\frac{1}{\pi'^{2}} \tag{46}$$

$$\frac{\partial G(S,z,l',b')}{\partial l'} = \sum_{z'}\pi(z'|z)(\alpha z' l'^{\alpha-1} - \frac{w'}{\pi'})\Big[\int^{\kappa'^{*}}(1+\gamma'(S',z',x'))\phi(\kappa')d\kappa' + V(S',z',x'^{*}(\kappa'^{*}))\phi(k'^{*})\Big] \tag{47}$$

$$\frac{\partial G(S,z,l',b')}{\partial b'} = -\frac{1}{\pi'}\sum_{z'}\pi(z'|z)\Big[\int^{\kappa'^{*}}(1+\gamma'(S',z',x'))\phi(\kappa')d\kappa' + V(S',z',x'^{*}(\kappa'^{*}))\phi(k'^{*})\Big] \tag{48}$$

The computational algorithm is the same as in Section C.1, except that in the outer loop we update w using the Broyden method until it converges to $w = \chi N^{1/\nu}$.