What does Financial Heterogeneity Say about the Transmission of Monetary Policy? *

Nishant Vats†

August 3, 2020

Abstract

I study the role of heterogeneity of financial frictions in determining the effect of monetary policy shocks on firm investment. Using staggered enactment of anti-recharacterization legislation across different states in the US as a source of exogenous variation in creditor rights, I find that the investment of unconstrained firms is more sensitive to monetary policy shocks relative to the constrained firms. A one standard deviation expansionary monetary policy shock results in a 0.02 standard deviation higher investment growth among unconstrained firms relative to constrained firms. This effect is most prominent among firms operating in industries with extensive use of special purpose vehicles and greater engagement in secured asset-based borrowing. However, constrained firms are more responsive to monetary policy shocks relative to unconstrained firms during periods of economic downturns and low-interest rate regimes. Lastly, I provide some suggestive evidence that my results are not driven by the Fed information effect, and the effects dominate during periods of high wage and contractual rigidity.

JEL Classification: D22, K20, E22, E43, E52, G31
Keywords: Creditor Rights, Monetary Policy, Financial Frictions, Investment

*I am grateful to my advisors Amir Sufi and Michael Weber. I thank Steven J. Davis, Douglas W. Diamond, Wenxin Du, Lars Peter Hansen, Kilian Huber, Erik Hurst, Elisabeth Kempf, Ralph Koijen, Randall S. Kroszner, Shohini Kundu, Yueran Ma, Prachi Mishra, Stefan Nagel, Ali Ozdagli, Nagpurnanand Prabhala, Raghuram G. Rajan, Joseph Vavra, Lauren Vollon and Thomas Winberry for helpful conversations and valuable feedback. I am grateful to John Rogers for sharing the data on monetary policy surprise measure. I take full responsibility for any errors. I have no conflicts of interest to disclose.

†Nishant Vats is at the University of Chicago Booth School of Business, Chicago, IL. Send correspondence to 5807 S Woodlawn Ave, Chicago, IL 60637, e-mail: nvats@chicagobooth.edu.

1 Introduction

The goal of this paper is to examine the heterogeneous response of firms' investment to monetary policy shocks by financial constraints. This question has been studied extensively since the seminal work of Bernanke, Gertler and Gilchrist (1999), yet we have not fully established how monetary policy affects the economy (Nakamura and Steinsson (2018*a*)), nor the channels of monetary transmission (Crouzet and Mehrotra (2018)). The empirical evidence on the cross-sectional response of firms' investment to monetary policy shocks has not only been mixed, but also devoid of a clean identification strategy as noted by Nakamura and Steinsson (2018*b*). The mixed conclusions put forth in the prior empirical literature can be attributed to various identification problems associated with measuring financial constraints using accounting proxies. Endogeneity in the measurement of financial constraints using firm size, leverage, liquid assets, dividend payments, and other textbook measures greatly hinders the identification of the cross-sectional response of firm investment to monetary policy shocks.[1]

In this study I attempt to address the endogeneity issue. I provide causal identification using a plausibly exogenous natural experiment with variation in a key financial friction, the strength of creditor rights. My strategy to identify financial constraints combined with the high-frequency measurement of monetary policy shocks provides an explicit comparison of the investment response to monetary policy by firms operating under different levels of financial constraint. Therefore, my results improve our understanding of monetary transmission to the real economy, specifically the investment channel of monetary transmission.

I employ staggered enactment of anti-recharacterization legislation across different states in the US as a source of exogenous variation in creditor rights. Li, Whited and Wu (2016) show that these statutes strengthened creditors' ability to acquire collateral in bankruptcy. Firms transfer collateral to a special-purpose vehicle (SPV) while engaging in secured borrowing. Assets transferred to an SPV are protected from Chapter 11 proceedings,

[1]Firm size has often been used as a proxy for financial constraints. While firm size is correlated with financial factors such as informational frictions, poor collateral and low liquidity it is also related to non-financial factors such as big Firms smooth variation in demand by contracting out to small firms, small firms are concentrated in cyclical industries and large firms have a diversified customer base (Crouzet and Mehrotra (2018)). Apart from the omitted variable concern due to non-financial factors, there is also a concern of reverse causality if the firm size determines financial constraint or vice versa.

making it easier for creditors to seize these assets. However, before anti-recharacterization statutes, courts could adjudicate on the legality of this on a case-by-case basis. The enactment of anti-recharacterization legislation provided legitimacy to these bankruptcy-remote transfers and stripped courts of any jurisdiction to rule over this matter. Hence, the legislation facilitated secured creditors' ability to seize assets in event of bankruptcy.

I use a methodology similar to difference-in-differences (DiD) to study the relative effect of anti-recharacterization law and aggregate monetary policy shocks on firm investment using firm-level data from Compustat. Strengthening of creditor rights increases firms' net worth as perceived by its creditors. This increase in net worth increases the borrowing capacity of firms, thereby reducing its financial constraints (Bernanke and Gertler (1989); Holmstrom and Tirole (1997); Kiyotaki and Moore (1997)).[2] Firms incorporated in states where the law was enacted (treated group) are less financially constrained relative to firms incorporated in states where the law was not enacted (control group). The setting allows me to conduct cross-sectional and temporal analyses. In the cross-section, I can compare the monetary policy semi-elasticity of investment for the treated and the control group subject to identical aggregate monetary policy shocks. Furthermore, I can compare a firms' monetary policy semi-elasticity of investment for the treated group across the two periods when the law was active and inactive relative to the control group.

I find that the investment of treated firms is more sensitive to monetary policy shocks relative to the control firms. Treated firms exhibit monetary policy semi-elasticity of investment that is $\approx 1.65\%$ higher than the control group firms during the active law period relative to non-active period. Specifically, a one standard deviation unexpected expansionary monetary policy shock results in a ≈ 0.02 standard deviation higher investment growth among treated firms relative to control firms. These results are both statistically and economically significant. The results are robust to a wide array of firm-specific time-varying controls, alternative measures of investment and monetary policy shocks, controlling for other macroeconomic factors, as well as the entry and exit of firms. Furthermore, these

[2] A valid critique of this assumption is that if firms re-optimize after the law is passed and again go back to operating at the constraint are they really less constrained? Treated firms will re-optimize their debt and assets to operate at the constraint in the steady-state. As long as the steady-state is not reached instantaneously with the passage of the law, treated firms are relatively less constrained for a period of time before they reach their steady state. Additionally, re-optimization by treated firms creates a downward bias in my estimates, in which case one could interpret my estimates as the lower bound.

results are corroborated by a placebo and a falsification test. I explore the factors that drive the baseline estimates. My results are driven by firms in the manufacturing and the mining sector, two sectors that exhibit extensive usage of SPVs (Korgaonkar and Nini (2010)), primarily engage in secured asset-based borrowing, and have relatively higher asset tangibility. Moreover, I provide suggestive evidence that the results are not driven by the Fed information effect but rather by "pure" monetary policy shocks. As a conclusion, my results indicate that unconstrained firms are more responsive to monetary policy shocks relative to constrained firms.

Next, I exploit the staggering of contractual and wage changes as in Olivei and Tenreyro (2007) over calendar time to show that unconstrained firms are more responsive to monetary policy shocks relative to constrained firms during times of greater contractual and wage rigidity. This test is motivated by prior research that shows firms with greater nominal rigidity respond more to the dilution of financial constraints (D'Acunto et al. (2018)) and firms facing greater nominal rigidities are more responsive to monetary policy shocks (Christiano, Eichenbaum and Evans (2005)).

Lastly, I examine the monetary policy responsiveness of constrained and unconstrained firms during the crisis of 2001. Kashyap, Lamont and Stein (1994) argue that the periods of economic downturn are best suited to test for the presence of financial accelerator; during a recession, firms are not only operating under constraints, but these constraints become binding. Hence, constrained firms are expected to respond more to monetary policy shocks during the crisis. I find that while unconstrained firms are more responsive to monetary policy shocks during normal times, constrained firms become more responsive to monetary policy shocks during periods of economic downturns marked by low interest rates.

To explain my findings I construct a static model similar to Hayashi (1982) and Kaplan and Zingales (1997) featuring convex adjustment costs of new investment in the presence of financial frictions. To outline the key mechanism operating from the steepness of the marginal cost (MC) curve I compare the response of (1) firms with financial frictions that face heterogeneity in the level of MC curves but have the same slope and, (2) firms facing heterogeneity in the slope of their MC curve due to financial frictions with a frictionless benchmark where firms face no financing frictions. I show that when the financial frictions result in an MC curve that differs only in level, constrained firms are more responsive to monetary policy shocks. This effect operates via the flattening of the MC curve due to the firm balance sheet effect. However, when financial frictions result in an MC curve that differs in slope, unconstrained firms could be more responsive to monetary policy shocks. While the balance sheet effect still exists in the second case, the ex-ante steepness of the MC curve of constrained firms dampens the effect of monetary policy shocks making them less responsive in certain cases. Notably, constrained firms are more responsive under either shape of the MC curve in my model during periods of low interest rates.

1.1 Related Literature

My work identifies the micro-foundations of the transmission of aggregate shocks to the real economy. My findings are broadly related to four strands of literature.

Firstly, I contribute to the literature studying the transmission of monetary policy when firms face financial frictions. Gertler and Gilchrist (1994) and Kashyap, Lamont and Stein (1994) find that smaller, presumably relatively constrained firms, are more responsive to monetary policy shocks than larger firms, presumably less constrained firms. Jeenas (2018) finds that firms with higher leverage and smaller liquid asset holdings are more responsive to monetary policy shocks. Ippolito, Ozdagli and Perez-Orive (2018) find stock prices, cash holdings, inventory and fixed capital of constrained firms are more sensitive to monetary policy. My findings closely resonate the results in Ottonello and Winberry (2018) who show that unconstrained low-risk firms are more responsive to monetary policy shocks. However, unlike previous studies, I do not rely on endogenous accounting measures to proxy for financial constraints. My empirical methodology is more adept at solving the theoretical and empirical challenges posed in the literature so far.

Secondly, I contribute to the long-standing literature operating at the nexus of financial constraints and investment. Fazzari, Hubbard and Petersen (1988), Hoshi, Kashyap and Scharfstein (1991), Whited (1992), Carpenter, Fazzari and Petersen (1998), Rajan and Zingales (1998), and Denis and Sibilkov (2009) among others show that financial constraints dampen firm investment. My findings extend this literature by showing that investment dampening of financial frictions can be amplified in the presence of aggregate shocks that affect firms' marginal cost and marginal benefit of investment.

Thirdly, my results are related to the literature on creditor rights. Li, Whited and Wu (2016) show that firms increase their leverage following stronger creditor rights. Ponticelli and Alencar (2016), Ersahin (2018) and Mann (2018) show an increase in investment, firm productivity and innovation output following an increase in creditor rights. These studies stand in contrast to the prior literature that associate stronger creditor rights with liquidation bias (Aghion and Bolton (1992)), conservative financing policy (Vig (2013)), conservative investment policy (Acharya, Amihud and Litov (2011)) and lower innovation output (Acharya and Subramanian (2009)). I present evidence of increased aggregate investment by treated firms relative to the control firms following a monetary policy shock. Moreover, I show that the strengthening of creditor rights improves monetary policy transmission, pointing to the existence of a creditor rights channel of monetary transmission. Additionally, I document that financial constraints are relaxed following the strengthening of creditor rights.

Lastly, my work resonates with the literature in asset pricing that identifies the impact of monetary policy shocks on stock market returns. Cook and Hahn (1989) find that the changes in the Federal Funds target rate are associated with interest rate changes in the same direction, with larger effects at the short end of the yield curve. Bernanke and Kuttner (2005) find a 1 percentage increase in the CRSP value-weighted index following a 25 basis point surprise interest rate cut. Gürkaynak, Sack and Swansonc (2005) find similar results for the S&P 500 index. In the cross-section, Gorodnichenko and Weber (2016) show that after monetary policy announcements, the conditional volatility of stock market returns rises more for firms with stickier prices than for firms with more flexible prices. Ozdagli and Weber (2017) argue production networks shape the stock market response to monetary policy shocks. Using the Enron accounting scandal and the following demise of Arthur Andersen, Ozdagli (2017) argues that firms subject to greater information friction have a weaker reaction to monetary policy shocks. While these studies aim to identify the effect of monetary policy shocks on stock market returns, I attempt to identify the real effects of monetary policy shocks, specifically the effect on private investment.

Next, I lay out the road-map of the paper. Section 2 describes the framework through a thought experiment, how it maps with my setting and a simple model. Section 3 presents the institutional details of the anti-recharacterization law. Section 4 describes the data, empirical strategy, and identification at length. Section 5 presents results from my analysis. Section 6 and 7 presents a battery of robustness tests. Section 8 and 9 present the underlying mechanism driving my results, and section 10 concludes.

2 Framework

The response of firms to monetary policy shocks is theoretically ambiguous. Bernanke, Gertler and Gilchrist (1999) argue that the balance sheet effect of monetary policy flattens the marginal cost curve for constrained firms, amplifying their response to monetary policy shocks. In contrast, Ottonello and Winberry (2018) argue that financial frictions result in an upward sloping marginal cost curve, dampening the effect of monetary policy shocks for firms operating on steeper marginal cost curves, i.e., relatively constrained firms.[3] Hence, in theory the response of firms to monetary policy depends on the ex-ante elasticity of the marginal cost curve before the monetary policy shocks, and the shift in the marginal cost, and the marginal benefit curve after a monetary policy shock. The theoretical ambiguity in the relative response of constrained and unconstrained firms to monetary policy shocks makes the response of firm investment to monetary policy an interesting empirical question with consequences for the real economy. A starting point to answer the question at hand is to visualize the ideal thought experiment one would need to identify the impact of monetary policy shocks on constrained firms relative to unconstrained firms. This discussion is also useful in understanding the underlying identifying assumptions and how my empirical design relates to the ideal thought experiment.

The thought experiment to address the problem of identification comprises of a two-firm, three-period economy. Firms choose their investment level defined by the point of intersection of the marginal cost and marginal benefit of investment. Firms face a downward sloping marginal benefit curve. The marginal benefit curve is downward sloping due to the concavity of the production function in capital. Firms also face an upward sloping marginal

[3] In the model of Ottonello and Winberry (2018) steep marginal cost curve dampens investment response of highly constrained firms following monetary policy shock.

cost curve. The marginal cost curve is upward sloping due to the presence of adjustment costs and financial frictions.

Let the two firms be identical at $t = 0$. Hence, the two firms, say A and B, operate at the same investment level. At $t = 1$, I randomly reduce the level of financial constraints for one of the firms, say firm A. As a result, the marginal cost curve for firm A goes down and the slope of the marginal cost curve becomes less steep. This is shown in panel A of figure 1. MC_1^A and MC_1^B shows the marginal cost curves for firm A and B, respectively. The downward movement of MC_1^A relative to MC_1^B at $t = 1$ results in firm A operating at a higher investment level relative to firm B.

At $t = 2$, I introduce an unexpected aggregate expansionary monetary policy shock shown in panel B of figure 1. This causes the marginal benefit curve to shift outwards to MB_2, as now the firm is discounting its future cash-flows from the investment project at a lower discount rate. The marginal cost curve for firm A (B) shifts to MC_2^A (MC_2^B). Suppose, the marginal cost curve shifts downward following an expansionary monetary policy shock as financing is now cheaper. The interaction effect of monetary policy with the level of financial constraint is captured by comparing $I_2^A - I_1^A$ with $I_2^B - I_1^B$. If $(I_2^A - I_1^A) - (I_2^B - I_1^B) < 0$, constrained firms react more, else, unconstrained firms are more responsive. This thought experiment translates one-to-one with my identification strategy where I measure changes in the level of constraint by the enactment of anti-recharacterization laws and combine them with the unexpected monetary policy shocks measured using high-frequency approach employed in Gorodnichenko and Weber (2016).

2.1 Model

To formally outline the underlying theoretical mechanism, I present a static model as in Hayashi (1982) and Kaplan and Zingales (1997) featuring convex adjustment costs of new investment in the presence of financial frictions. To outline the key mechanism operating from the steepness of the marginal cost curve I present three cases: (1) a frictionless benchmark case, (2) heterogeneity in financial frictions affects the level of the MC curve but not the slope, and (3) heterogeneity in financial frictions affects the slope of the MC curve.

2.1.1 Setup

The model has a single period and $i \in I$ firms. Firm i chooses the investment level I_i to maximize the firms' market value. Firms have no internal funds. Each firm has a productivity of α_i, so an investment of I_i results in gross output of $\alpha_i I_i$. Each firm has pledgeable assets with a market value of A_i. Firms face a convex adjustment cost $(\Phi_1(I_i))$ of new investment. Firm borrow I_i at the start of the period and must return $(1+r)I_i$ at the end of the period where r is the risk-free rate. I assume that $r \geq 0$. In the presence of creditor rights frictions, firms face an additional convex adjustment cost $(\Phi_2(I_i))$ of new investment. Firms choose their investment level to maximize the firms' market value.

2.1.2 Case I: Frictionless Benchmark

In a frictionless world firms maximize the equity market value V_i where , $V_i = \alpha_i I_i - (1+r)I_i - \Phi_1(I_i)$. I assume the adjustment cost function to be quadratic in I_i such that $\Phi_1(I_i) = \frac{\phi_i}{2} I_i^2$ where $\phi_i > 0$.

$$V_i = \max_{I_i} \{\alpha_i I_i - I_i - rI_i - \frac{\phi_i}{2} I_i^2\} \tag{1}$$

The function V_i in equation 1 is concave, hence, differentiating V_i with respect to I_i gives the value maximizing level of investment in a frictionless world. The value maximizing level of investment is given by:

$$I_i^* = \frac{\alpha_i - 1 - r}{\phi_i} \equiv I_i^{FB} \tag{2}$$

Equation 2 implies that the first-best level of investment I_i^{FB} is increasing in α_i and decreasing in adjustment cost factor ϕ_i and interest rates r. Specifically $\frac{\partial I_i^{FB}}{\partial r} = -\frac{1}{\phi_i} < 0$. Also, investment takes place only if $\alpha_i > 1 + r$.

2.1.3 Case II: Linear Financing Cost in the Presence of Frictions

In this section, I discuss the interest rate response of firm investment in the presence of frictions. To this end, I elaborate on a special case where firms face heterogeneity in their level of MC curves in the presence of frictions but have the same slope. Specifically, I assume that additional financing cost in the presence of financial frictions is linear. So firms exposed to different level of frictions have different level of MC curves. However, the steepness of the MC curve is the same across all firms. I assume $\Phi_2(.) = \frac{\theta_i}{A_i} I_i$, where $\theta_i \geq 0$ denotes the looseness of the creditor rights standards. Higher values of θ_i imply creditor rights are weaker. The creditors will discount the asset value A_i to A_i/θ_i while deciding the financing cost for the firm i. The additional financing cost in the presence of friction is proportional to I_i and negatively related to the value of assets discounted for the weakness in creditor rights. Under this setup firms maximize the equity value V_i given as follows:

$$V_i = \max_{I_i} \{\alpha_i I_i - I_i - rI_i - \frac{\phi_i}{2} I_i^2 - \frac{\theta_i}{A_i} I_i\} \tag{3}$$

The function V_i in equation 3 is concave, hence, differentiating V_i with respect to I_i gives the value maximizing level of investment:

$$I_i^{*(1)} = \frac{\alpha_i - 1 - r - \frac{\theta_i}{A_i}}{\phi_i} = I_i^{FB} - \frac{\theta_i}{A_i \phi_i} < I_i^{FB} \tag{4}$$

Equation 4 states that the value maximizing level of investment in the presence of friction is lower than the investment in the absence of frictions. $I_i^{*(1)}$ decreases as creditor rights become weaker. I define the elasticity of firm asset value to changes in interest rate as $\epsilon^i_{A,r} \equiv \frac{r}{A_i} \frac{\partial A_i}{\partial r}$. I assume $\epsilon^i_{A,r} < 0$, and $|\epsilon^i_{A,r}| < \infty$. The first assumption implies that asset values decrease when interest rates increase and the second assumption implies that the interest rate elasticity of assets is finite. Next, I evaluate the response of investment to changes in interest rates.

$$\frac{\partial I_i^{*(1)}}{\partial r} = \underbrace{\frac{\partial I_i^{FB}}{\partial r}}_{<0} + \underbrace{\frac{\theta_i}{A_i \phi_i r} \epsilon^i_{A,r}}_{<0} < 0 \tag{5}$$

Changes in interest rates affect $I_i^{*(1)}$ through the balance sheet effect in addition to the changes in the direct financing cost as in the frictionless case. The balance sheet effect of monetary policy flattens the MC curve for constrained firms, amplifying their response to

MP shocks. This results in a clear prediction of $|\frac{\partial I_i^{*(1)}}{\partial r}| > |\frac{\partial I_i^{FB}}{\partial r}|$, implying that constrained firms are more responsive to monetary policy shocks.

2.1.4 Case III: Convex Financing Cost in the Presence of Frictions

In this section, I discuss the response of firm investment to interest rate changes when financial frictions generate heterogeneity in the slope of the MC curve. For illustration I assume $\Phi_2(.) = \frac{\theta_i}{2A_i} I_i^2$. In this case, the financing cost increases rapidly relative to the linear case. This rapid increase reflects that as the firm borrows more it moves closer to its default frontier and the creditors need to be compensated for this additional risk. In this setup keeping the market value of assets fixed, an increase in financial frictions makes the MC curve steeper. Firms maximize the equity value V_i to choose their value maximizing investment ($I_i^{*(2)}$) level.

$$V_i = \max_{I_i}\{\alpha_i I_i - I_i - rI_i - \frac{\phi_i}{2} I_i^2 - \frac{\theta_i}{2A_i} I_i^2\} \tag{6}$$

$$\Rightarrow I_i^{*(2)} = \frac{\alpha_i - 1 - r}{\phi_i + \frac{\theta_i}{A_i}} = \frac{A_i \phi_i}{\theta_i + A_i \phi_i} I_i^{FB} < I_i^{FB} \tag{7}$$

Given the concavity of V_i in equation 6, differentiating V_i with respect to I_i gives the value maximizing investment ($I_i^{*(2)}$) level as in equation 7 which is lower than I_i^{FB} as $\theta_i > 0$. Next, I evaluate the response of $I_i^{*(2)}$ to changes in interest rates.

$$\frac{\partial I_i^{*(2)}}{\partial r} = \underbrace{\frac{A_i \phi_i}{\theta_i + A_i \phi_i}}_{\in (0,1)} \{ \underbrace{\frac{\partial I_i^{FB}}{\partial r}}_{<0} + \underbrace{\frac{\theta_i}{\theta_i + A_i \phi_i} \frac{I_i^{FB}}{r} \epsilon_{A,r}^i}_{<0} \} < 0$$

Monetary policy shocks affect firms in this setup via three forces: (1) the direct effect of changes in financing cost as in the frictionless benchmark, (2) the amplification of monetary policy changes operating via the balance sheet effect, and (3) financial frictions result in an upward sloping MC curve, dampening the effect of monetary shocks for firms operating on steeper MC curves. This results in an ambiguous case where constrained firms could have a lower or higher response to monetary policy shocks. Under a positive interest rate regime, the presence of financial frictions dampens the response of the MC curve to interest rate changes for firms operating on a steeper MC curve and amplifies the sensitivity of the MC curve to interest rate change changes via the balance sheet effect. When interest rates are high the dampening effect dominates making unconstrained firms more responsive to monetary policy shocks. On the other hand, during periods of low interest rates the amplification operating via the balance sheet effect dominates making constrained firms more responsive to monetary policy shocks.

3 Institutional Details

In this section, I describe the anti-recharacterization laws that affect the strength of creditor rights. Li, Whited and Wu (2016) and Ersahin (2018) employ the setting of anti-recharacterization laws to identify the effect of increase in protection of creditor rights on corporate leverage and plant level productivity. Using a structural model, Li, Whited and Wu (2016) show that leverage changes significantly after the implementation of anti-recharacterization laws originating from movements in the position of the collateral constraint. As noted earlier, anti-recharacterization laws operate via the use of SPVs to conduct secured borrowing. Firms transfer their assets intended to be used as collateral against secured borrowing to a SPV. Such use of SPVs is a common practice among firms. Feng, Gramlich and Gupta (2009) show SPVs are extensively used in the US. Using data from 10-K filings between 1994 and 2004, Feng, Gramlich and Gupta (2009) find that 42% of firms are associated with at least one SPV, and 32% with multiple SPVs. SPVs are bankruptcy remote in case of Chapter 11 filings, allowing lenders to easily seize assets without any delay. However, in the pre-law period, this \true sale" transfer of an asset from the firm to SPV was not guaranteed. The bankruptcy courts had the authority to re-characterize these transfers as loans to the SPV instead of a true sale. Re-characterizations are typically justified on the grounds that the assets transferred to the SPV are essential for firms' operation and hence, crucial for the reorganization process. After recharacterization, the lender becomes a secured creditor of the firm instead of the SPV. Hence, following recharacterization, creditors lose the right to seize assets until Chapter 11 proceedings terminate.

The enactment of anti-recharacterization laws removes any possibility of re-characterizing true sales as loans. The anti-recharacterization laws require that collateral transfers to an SPV be treated as a true sale, stripping courts of any authority to rule over this matter. Hence, anti-recharacterization laws strengthen creditors' ability to swiftly seize assets without any delay of Chapter 11 proceedings. Seven states enacted anti-recharacterization laws. Texas and Louisiana passed the anti-recharacterization laws in 1997, followed by Alabama in 2001, Delaware in 2002, South Dakota in 2003, Virginia in 2004, and Nevada in 2005. These laws can be grouped into two categories (Kettering (2010)); while Texas and Louisiana discard the possibility of recharacterization of all sales of receivables, the other states only discard this possibility when sales are explicitly marked as securitization transactions.

The enactment of anti-recharacterization laws improved the pledgeability for firms incorporated in these states. However, the fifth circuit court ruling of ***Reaves v. Sunbelt*** in 2003 came as a huge blow to anti-recharacterization laws.[4] The summary judgement by the fifth court judge re-characterized the firms' sale of assets to an SPV as a lending agreement. Even though the judgement explicitly states that this is not a judgement against the constitutionality of anti-recharacterization laws, it increases the likelihood of challenging anti-recharacterization laws based on federal laws. In fact, this case was cited as a precedent in 62 other bankruptcy cases within seven years of ***Reaves v. Sunbelt*** decision (Li, Whited and Wu (2016)). Thus, the ruling makes the effect of anti-recharacterization laws limited after 2003.

While the timing enactment of anti-recharacterization laws can be argued as being plausibly exogenous, the enactment itself could be influenced by lobbying activities. Kettering (2008) shows that the lobbying efforts related to anti-recharacterization laws were spearheaded by the banking sector, specifically the securitization industry. Janger (2003) argues that the non-financial firms have had little role in the enactment of these laws. In fact, in most cases, non-financial firms argued for bankruptcy courts to re-characterize their sale to SPVs as loans (Li, Whited and Wu (2016)). I address this issue via a falsification test. If indeed the results are driven by state-specific conditions which led to the enactment of the law, I should find significant results even in states that passed anti-recharacterization laws

[4] Reaves Brokerage Company, Inc. v. Sunbelt Fruit & Vegetable Company, Inc. case originally filed by the plaintiff citing violation of a federal law, Perishable Agricultural Commodities Act (PACA) of 1930 by the defendant with no reference to the anti-recharacterization laws.

after 2003. However, the estimates in my falsification test are not statistically significant for the states that passed the law after 2003. Hence, it is difficult to argue that my identification strategy is contaminated by political economy considerations leading to selection bias into the treatment group by non-financial firms.

4 Data and Methodology

4.1 Data

Quarterly firm-level data on key financial variables from 1993 to 2007 is extracted from Compustat. All financial firms (SIC Codes 6000-6999), regulated utilities firms (SIC Codes 4900-4949), and firms incorporated outside the United States are dropped from the sample. I start from 1993 as the banking system across states in the US became mostly integrated by then.[5] I end my sample in December 2007, before the financial crisis, studying the period of conventional monetary policy with a fully integrated banking system across states in the US. The data on macroeconomic factors, effective Fed funds rate, GDP, CPI and unemployment rate (UR) is sourced from the website of the Federal Reserve Bank at St. Louis. The data on the economic policy uncertainty index is obtained from the website of the policy uncertainty project.[6]

4.1.1 Monetary Policy Shocks

In this section, I discuss the methodogy used for constructing monetary policy shocks. Monetary policy shocks are constructed using the high-frequency event study approach pioneered by Cook and Hahn (1989) and more recently exploited in Bernanke and Kuttner (2005). I closely follow the approach used in Gorodnichenko and Weber (2016) to construct the unexpected monetary policy shocks $\Delta\varepsilon_t$. The surprise component $\Delta\varepsilon_t$ is calculated using price changes within the Fed Funds futures in a narrow window around the Federal Open Market

[5] Even though the formal nation-wide banking integration law, Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994 was signed by the then President Bill Clinton on September of 1994, the nation already had an effective inter-state banking system by 1993 as noted by the United States Secretary of the Treasury Lloyd Bentsen (Fed History). My results are however robust to not including 1993.

[6] The data on economic policy uncertainty was accessed from https://www.policyuncertainty.com/us_monthly.html.

Committee (FOMC) meetings.[7] Fed Funds futures have been traded at the Chicago Board of Trade (CBOT) from 1990. Price changes in the Fed Funds futures within a narrow window around FOMC announcements reflect the surprise component in the path of the Fed Funds rates, the main policy instrument of the Fed during my sample period. The unexpected component is calculated as

$$\Delta\varepsilon_t = \frac{D}{D-d}(\nu_{t+\Delta^+} - \nu_{t-\Delta^-}) \tag{8}$$

where t is the time of FOMC announcement on date d. D is the number of days in the month. ν_t is the implied Fed Funds rate from the current-month Fed Funds futures contract at time t. $\nu_{t+\Delta^+}$ and $\nu_{t-\Delta^-}$ reflect the Fed Funds rate implied by the futures contract at time Δ^+ after and Δ^- before the FOMC announcement. The term $\frac{D}{D-d}$ adjusts for the fact that the Fed Funds futures settle on the average effective overnight Fed Funds rate. Next, I aggregate these high-frequency shocks at the quarterly level to merge with the firm-level data. I aggregate the data at the quarterly level by taking an average of all high-frequency shocks in that quarter, $\Delta\varepsilon_t^q$. I find that these quarterly averaged shocks have features very similar to the actual change in Federal Funds rate (see appendix B).

However, these monetary policy shocks may not just reflect pure monetary policy shocks but could also include Feds' private information about the future state of the economy (see Romer and Romer (2000), Nakamura and Steinsson (2018*a*) Jarocinski and Karadi (2018), and Bu, Rogers and Wu (2019)). If the Fed information effect dominates an expansionary shock measured by the sign of monetary policy surprise would actually imply a contractionary shock making the result go in the wrong direction. This implies that if the measured monetary policy shocks are dominated by the Fed information effect my results would imply that constrained firms respond more than unconstrained firms. To address this issue I employ the monetary policy shocks formulated in Jarocinski and Karadi (2018) and Bu, Rogers and Wu (2019) which capture the pure monetary policy effect not contaminated by the Fed information effect. Unlike other measures Jarocinski and Karadi (2018) and Bu, Rogers and Wu (2019) have low correlation with actual change in Federal Funds rate and standard tight

[7] I use the term monetary policy surprise and monetary policy shock interchangeably hereafter.

window high-frequency shocks. (see appendix B) Additionally, I exploit another measure of monetary policy shock as calculated in Nakamura and Steinsson (2018a).[8].

4.1.2 Data Description

Table 1 reports the summary statistics for firm-level and macroeconomic variables employed in the analysis. Panel A (B) report the number of observations, the first, the second and the third quartile values, mean and the standard deviation for firm-level (macroeconomic) variables. All variables are defined in Appendix A. The natural logarithm of capital expenditure has a mean (standard deviation) value of 1.06 (2.40) and its growth rate has a mean value of 0.03 (1.07), showing a great degree of heterogeneity in my sample. 5% of all firm-year observations are treated. These treated firms include firms incorporated in states that passed anti-recharacterization laws before 2003. Table A.1 provides a timeline of states that passed these laws at different points of time. The median firm in the sample has a size of 4.85 measured as the natural logarithm of the book value of assets, a leverage ratio of 16.2%, a sales growth rate of 2.3%, EBITDA to equity ratio of 9.1%, and the cash to assets ratio of 5.7%. The median value of Tobins' Q in the sample is 1.6.[9] The change in the effective Fed Funds rate has a mean value of 0.03 with a standard deviation of 0.31 between 1993 and 2007. The policy surprise shocks have a mean value of -0.01 with a standard deviation of 0.05 over a tight window of 30 minutes around the FOMC announcements. The mean and standard deviation around a wide window of 45 minutes is similar to that of a narrow window of 30 minutes. The standard deviation of policy surprise shocks is, however, small relative to the standard deviation of actual changes in the effective funds rate.

4.2 Empirical Strategy

I closely follow the thought experiment presented in section 2 to construct my estimation strategy. I begin my analysis by showing that unexpected monetary policy shocks affect investment in the expected manner. Then, I show that strengthening of creditor rights

[8] I refer readers to appendix B for a brief discussion on these shocks

[9] The sample runs from 1993 to 2007 which includes the period from 1997 to 2000 when the market valuation relative to the book valuation was at a historical all time high. See FRED.

increases investment and relaxes financial constraints. These two results are crucial assumptions of my thought experiment. After establishing these key results, I study the joint impact of the enactment of the law and aggregate monetary policy shocks. My baseline empirical specification is as follows:

$$\Delta logI_{it} = \beta_0 \mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q + \beta_1 \mathbb{1}(Law_{st} = 1) + \gamma_i + \theta_{jt} + \Gamma Z_{it} + \nu_{it} \tag{9}$$

where i denotes firm incorporated in state s, operating in industry j at time t. Industry is measured by the four digit SIC code. The dependent variable is $\Delta logI_{it}$, measured as the change in log capital expenditure between t and t+1. $\Delta\varepsilon_t^q$ is the contemporaneous monetary policy surprises aggregated at quarterly level, γ_i and θ_{jt} denotes firm and industry-time fixed effects respectively. Z_{it} includes a vector of time-varying firm specific characteristics: natural logarithm of the book value of assets, leverage ratio, real sales growth, average Q, cash to assets ratio and EBITDA to equity ratio. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that takes a value of 1 if the state of incorporation of the firm passed the anti-recharacterization law before 2003, and 0 otherwise. It takes a value of 0 for all the treated firms after 2003. Hence, this strategy is similar to a DiD methodology but follows an on-off approach as in Li, Whited and Wu (2016). As an example, for firms incorporated in Texas the variable $\mathbb{1}(Law_{st} = 1)$ will take a value of 1 (turn on) for all time-periods from 1997 to 2003, and will take a value of 0 (turn-off) otherwise. Standard errors are estimated by double clustering at state and quarter-year level.

4.2.1 Identification

The objective of this paper is to identify the investment response of firms operating on different marginal cost curves to an aggregate unexpected shock. A valid test requires separating firms that operate on different marginal cost curves using variation that is independent of firms' investment opportunities. By comparing across firms within the same industry, I can control for firm's investment opportunities and identify the effect of financial constraints on the sensitivity of investment to monetary policy. I refer to this approach as "within-industry" estimation.[10]

The key identifying assumption is that firms face identical investment opportunities within an industry. This is a reasonable assumption given that firms incorporated in any state are free to engage in investment opportunities elsewhere. This follows from the fact that firms in my sample are listed firms with access to nationwide equity and debt markets, and operate under an open economy system. A weaker version of my identifying assumption is that any friction that prevents otherwise identical firms within an industry located in different states from having access to identical investment opportunities is unrelated to financial frictions associated with creditor rights that these firms face.[11]

For identification, I also require that the unexpected monetary policy shocks are uncorrelated with the idiosyncratic conditions in treatment states after treatment. The objective of the Fed is overall price stability and nationwide employment, hence, by mandate, the Fed is not allowed to react to local economic conditions. Given that the law was active in two states (Texas and Louisiana) from 1997 and 2003, Alabama for a period of three years and Delaware for just a period of one year, it is difficult to argue that the Fed was announcing policy based on conditions in these states, and not aggregate macroeconomic factors. One could argue that idiosyncratic shocks can result in aggregate shocks when firms exhibit a power-law distribution (Gabaix (2011)). However, this would require that the majority of observations in the fat tails (percentage of large firms) to be concentrated in states where the law was passed. The spatial distribution of large firms shows that on average only 11% of large firms were located in law-active states.[12] Though I cannot completely rule out all explanations that can drive the correlation between monetary policy shocks and idiosyncratic conditions in states where the law was enacted, it is reasonable to assume that this correlation is small or insignificant.

[10] Alternatively, one can also interpret β_0 as a within-firm estimator for the treatment group relative to the control group. Under this interpretation the identifying assumption is that industry-time fixed effects fully control for aggregate industry-specific business-cycle fluctuations.

[11] In addition to interpreting the point estimate of the interaction term as a within-industry estimator I also control for the interaction term of average Q and monetary policy surprises to best account for any difference in investment opportunities within an industry.

[12] Large firms are identified as firms with asset size above the 99^{th} percentile of all firms in a quarter-year.

5 Results

5.1 Creditor Rights, Financial Constraints, Investment and Monetary Policy

This section documents the aggregate effect of monetary policy shocks on firm investment and the impact of the strengthening of creditor rights on firm investment and financial constraints. It is important to establish these relationships to validate the underlying assumptions of my thought experiment.

Table 2 reports the results for the regression of the change in log investment on monetary policy surprise. These results imply that investment responds negatively to monetary policy changes, and that this relationship is robust, statistically significant and economically relevant. The point estimate of $\Delta\varepsilon_t^q$ is negative for all specifications in columns (1)-(4). The point estimate is statistically significant at the 1% level. The estimated semi-elasticity of investment is between -0.02 and -0.08 indicating that a one standard deviation expansionary monetary policy shock is associated with a 0.02-0.08 standard deviation increase in investment growth. In columns (5) and (6), the change in log investment is regressed on the change in effective Fed Funds rate during the quarter. Again, the point estimate of Δr_t^q is negative and statistically significant at 1% level. In columns (7) and (8), monetary policy surprise is used as an instrument for the change in the effective Fed Funds rate. The regression R^2 for the regression of the change in the effective fed funds rate on policy surprises is 36%, implying relevance. The 2SLS estimates of Δr_t^q in columns (7) and (8) are negative and statistically significant.

As a next step, I examine the response of firm investment to the strengthening of creditor rights. Prior work of Ersahin (2018) find an increase in productivity and investment among treated firms relative to the controls firms in the manufacturing sector following the enactment of anti-recharacterization laws. Li, Whited and Wu (2016) have documented an increase in the leverage and Chu (2018) find a reduction in corporate leasing among treated firms after the law. Figure 2 plots the cumulative distribution function (CDF) of $Ln(I_t)$ and $I_t/Assets_{t-1}$ in Panels A and B, respectively, for the control (solid blue line) and the treatment (dashed red line) firms. The CDF of the treatment firms' first-order stochastically dominates (FOSD) the CDF of the control firms, signifying an increase in investment following the enactment of anti-recharacterization laws. This rightward shift in the distribution of treated firms is significant at 1% level for the mean, the first, the second and the third quartile values.

Lastly, I evaluate the impact of strengthening of creditor rights on firm financial constraints. The results indicate that firms' financial constraints reduced across all conventional measures of financial constraints following the enactment of the law. An important reason to verify the effect of the change in law on financial constraints is to counter the argument that an increase in leverage as a result of the change in law as documented in Li, Whited and Wu (2016) necessarily implies an increase in financial constraint. Theoretically an increase in leverage implies an increase in financial constraint keeping the optimal leverage constant. The enactment of the law increases the optimal leverage value. Hence, an increase in leverage as a result of this law does not necessarily imply an increase in the level of financial constraint. The impact of the strengthening of creditor rights is evaluated on four measures of financial constraints: (1) firm size, measured as the natural logarithm of the book value of assets,[13] (2) Size-Age (SA) Index of Hadlock and Pierce (2010), (3) synthetic Kaplan-Zingales (KZ) Index presented in Lamont, Polk and Saaá-Requejo (2001) based on estimates of Kaplan and Zingales (1997), and (4) Whited-Wu (WW) Index of Whited and Wu (2006). A larger magnitude of firm size implies lower financial constraint, whereas, a larger magnitude of SA, KZ, and WW Index implies greater financial constraint. Table 3 reports the results of the impact of the law on different measures of financing constraints. The enactment of the law results in a 0.03 standard deviation increase in firm size, and a 0.03 to 0.06 standard deviation decline in different measures of financial constraints. These results are statistically significant and economically relevant to imply that the level of financial constraints decreased among treated firms relative to the control firms following the enactment of the law.

[13] Hennessy and Whited (2007) report that external financing costs decreases sharply as firm grows indicating that financing costs are closely related to firm size.

5.2 Baseline Results

In this section, I discuss the baseline results evaluating the effect of monetary policy shocks on investment for the treated firms relative to the control firms. The baseline results indicate that the investment of treated firms is more responsive to monetary policy shocks relative to the control firms indicating that financially unconstrained firms relative to financially constrained firms are more responsive to monetary policy shocks.

Figure 3 provides suggestive evidence that treated firms are more responsive to monetary policy shocks during the period when the law was active. The point estimates for the three periods are estimated separately regressing the change in natural logarithm of investment on treatment dummy, monetary policy surprise and the interaction of the two. The first period is the pre-law period before 1997. The second period is between 1997 and 2003 when the law was active, and the third period is the period from 2004 to 2007. A firm is marked as treated if it is incorporated in a state where the law was passed and active between 1997 and 2003 and control otherwise.[14] The point estimate for the pre-period and the post-period are small in magnitude and statistically indistinguishable from zero. The point estimate for the active period is negative and statistically different from zero. Additionally, the χ^2 statistic for the joint that that the estimates in the pre and post active period are equal to the active period is 16.83 indicating that the difference in the estimates are statistically significant.

Table 4 reports the results from the estimation of equation 9 with change in the natural logarithm of capital expenditure as the dependent variable. Column (1) presents the results from the estimation of equation 9 with no fixed effects. The estimated coefficient of interest, the interaction term of $\mathbb{1}(Law_{st} = 1)$ and $\Delta\varepsilon_t^q$, is -0.01. The estimate is significant at 1% confidence level and negative. Column (2), (3), (4) and (5) re-estimate equation 9 with time, state of incorporation, industry and firm fixed effects respectively. Finally, in column (6), equation 9 is estimated with the firm and industry-time fixed effects. The point estimate of the interaction term in column (6) can be interpreted as a within industry estimator while controlling for non-time varying firm specific observable and unobservable characteristics. The point estimates reported in column (1) through (6) are all negative and statistically

[14] Bankruptcy proceedings and related cases usually take place in the state of incorporation of the firm making the law of the state of incorporation crucial for such proceedings.

significant at 1% level. Moreover, the point estimate is extremely stable despite the increase in model R^2 from 0.06% to 30.48%. The point estimate suggests that the semi-elasticity of firm investment to monetary policy rate is 0.01-0.02 higher for the treated firms relative to the control firms. To put this in economic terms, a one standard deviation expansionary monetary policy shock results in $\approx$ 0.01-0.02 standard deviation higher investment growth among treated firms relative to the control firms. Since the mean level of change in investment is 2.9% for the sample firms, the estimated differential impact between treated and control firms is economically significant.

Next, I evaluate the asymmetric impact of monetary policy shocks. Consistent with the prior work of Bernanke and Kuttner (2005), Ozdagli and Weber (2017), Neuhierl and Weber (2018), and others that document an asymmetric effect of monetary policy shocks on stock market returns, I document an asymmetric impact of monetary policy shocks on firm investment growth in my setting. Columns (6) and (7) re-estimate equation 9 separately for negative and positive surprises respectively. The results indicate that expansionary surprises result in a greater response by unconstrained firms relative to contractionary monetary policy surprises. The response is statistically and economically insignificant for contractionary monetary policy surprises. I conduct a Wald test to evaluate the statistical difference in the estimated obtained from column (6) and (7). The value of χ^2 test statistic is 8.32, rejecting the null that the two point estimates are the same at the 1% level of significance. The asymmetric effect can be explained by investment being irreversible. Under irreversible investment the impact of contractionary shocks manifests via retardation in announcements of new projects whereas the impact of expansionary shocks propagates via acceleration in announcements of new projects and expansion of existing projects. Moreover minimum depreciation investment expenses could be fundamental to a firms continuing operations. hence, a contractionary shock would not affect the firms decision to invest in fundamental minimum depreciation investment expense, whereas cheap financing might encourage firms to incur more than mandatory minimum depreciation investment expense,

Furthermore, to investigate the dynamics of the differential response of treated and control firms to monetary policy shocks over a long horizon I estimate a Jordà (2005) style local projection:

$$LogI_{i,t+h} - LogI_{i,t-1} = \beta_h^0 \mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q + \beta_h^1 \mathbb{1}(Law_{st} = 1) + \alpha_i + \theta_{jt} + \nu_{it} \quad (10)$$

where $h \geq 1$ indexes quarters in the future. The point estimate β_h^0 measures the cumulative response of investment in quarter $t+h$ to a monetary policy surprise in quarter t for treated firms relative to control firms. Christiano, Eichenbaum and Evans (2005) and Gertler and Karadi (2015) find that the effects of monetary policy shocks on real activity appear slowly over time. More recently, Ottonello and Winberry (2018) find that the heterogeneous response of monetary policy disappear approximately six quarters after the shock and the only statistically significant heterogeneous response is upon impact of the shock. Figure 4 shows the heterogeneous impact of monetary policy surprises on treated firms relative to control firms over time. The β_h^0 is short-lived and disappears completely after 5-6 quarters from the initial policy surprise. The only statistically significant estimates of β_h^0 occur at $h = 0$, $h = 2$ and $h = 3$. The short-lived dynamics of cross-sectional differences are in agreement with the results presented in Ottonello and Winberry (2018). Therefore, I focus on the instantaneous impact hereafter.

6 Testing for Parallel Trends

A necessary condition for identification is the parallel-trends assumption. The counterfactual outcome in the absence of the law change is unobservable, hence, I cannot test for this assumption directly. However, I can evaluate the extent to which the impact of monetary policy on firm investment is parallel among treated and control firms before the change in the law. Under the parallel trends assumption, any divergence between the control and the treated firms after the law change can be attributed to the underlying parameter being captured by the policy change. Hence, the path of the control firms after the law change can be viewed as a valid counterfactual to the trajectory of the treated firms had they not been exposed to the anti-recharacterization laws.

The empirical design is not a pure DiD, but an on-off strategy. Hence, I drop all treatment group states that passed the law after 2001 and consider the sample up to 2003. This sample cut allows me to do a standard pre-trends assessment.

Figure 5 provides a visual presentation of the trend in the impact of monetary policy surprises on firm investment across treated and control firms in the years before and after the enactment of anti-recharacterization laws. Figure 5 plots the estimates of β_0^k and the 95% confidence intervals for the equation:

$$\Delta log(I_{i,t}) = \sum_{k=-4,k\neq-1}^{k=+4} \beta_0^k \mathbb{1}(Treatment_{st} = 1) * \Delta\varepsilon_t^q * Time_t^k + \alpha_i + \theta_{jt} + \nu_{it} \tag{11}$$

where $Time_t^k$ takes a value of 1 if the year is k years before or after the passage of the law for treatment firms and years before or after 1997 for the control group. The omitted category is $Time_t^k = -1$ and I interpret β_0^k as the effect of the interaction term on firm investment at $Time_t^k = k$ relative to $Time_t^k = -1$. Based on the point estimates and the 95% confidence interval, I reject (1) the average effect of monetary policy on the treated and the control group is the same before and after the law change, and, (2) the average effect of monetary policy on the treated and the control group is different before the law change. Hence, I rule out the possibility that my results are driven by any pre-trends.

7 Robustness Checks

In this section I conduct a battery of robustness tests to ensure the stability and the validity of the estimates reported in table 4. Overall, the tests indicate that the baseline results are not driven by firm-specific or other macroeconomic factors. Results are robust to alternative measurements of firm investment and monetary policy shocks, entry and exit of firms. Moreover, the results withstand the benchmarks of a placebo test and a falsification test.

7.1 Omitted Variable Bias

The results in table 4 show that the estimate of interest does not change in a statistically significant sense, even though the R^2 increases by 30% from column (1) through (6). The only drop in estimate is observed between column (5) and (6) where the magnitude of the point estimate drops from 0.0186 in column (5) to 0.0165 in column (6) with an accompanying increase of 8% in the model R^2. Oster (2019) suggests a test for the omitted variable bias based on the methodology proposed in Altonji, Elder and Taber (2005).[15] The test uses the information contained in the change in the magnitude of the estimate and the model R^2 as more controls are added. Here, the Oster (2019) recommended set, [-0.0066, -0.0165] when moving from column (5) to column (6), safely excludes zero, thus rejecting that the effect of monetary policy shock and anti-recharacterization laws on the firm investment is driven by omitted variables. Despite the stability of the point estimate and the rejection of the null under Oster (2019), the point estimate of the interaction term could still be plagued by omitted variable bias via firm-specific or macroeconomic covariates.

Table 5 attempts to address the issue of omission of firm-specific characteristics by controlling for the firm-specific covariates. Firm-specific covariates include firm size measured as the natural logarithm of the book value of assets, book leverage ratio, Tobin's Q, growth in sales, EBITDA-to-Equity ratio and cash to assets ratio. Values of firm-specific characteristics as in the quarter just before the enactment of the law for the treated firms and the values in the fourth quarter of 1996 for the control firms are used instead of contemporaneous time-varying firm characteristics.[16] Specifically, table 5 controls for the interaction term of these static firm covariates with $\Delta\varepsilon_t^q$ and examines the point estimate of the interaction term of $\mathbb{1}(Law_{st} = 1)$ and $\Delta\varepsilon_t^q$. The point estimate of the interaction term of $\mathbb{1}(Law_{st} = 1)$ and $\Delta\varepsilon_t^q$ is consistently negative, statistically significant, stable in magnitude and qualitatively similar to the estimates reported in table 4. The point estimates associated with other firm-specific variables are mostly insignificant. This observation is consistent with Ottonello and Winberry (2018). Moreover, the significance and the sign of the estimate for cash to assets ratio resonates with the results in Jeenas (2018).

Table 6 addresses the issue associated with the omitted variable bias pertaining to macroeconomic variables. High-frequency identification allows measurement of monetary policy surprises, it does not completely rule out the fact that these surprises could still

[15] I provide details of the test in appendix C.

[16] Contemporaneous time-varying firm characteristics may not serve as a perfect control as they might be responsive to the enactment of the law. Hence, employing characteristics just before the enactment are better suited to control for other firm-specific characteristics. Nevertheless, I report estimation results similar to table 5 in appendix table D.1 using contemporaneous time-varying firm characteristics. The estimates in appendix table D.1 are qualitatively similar to the estimated results in table 5.

be reactionary to aggregate macroeconomic conditions.[17] To address this issue, equation 12, where Δz_t^q denotes a vector of macroeconomic variables including the gross domestic product, unemployment rate, consumer price index, and economic policy uncertainty index is estimated as:

$$\Delta log(I_{i,t}) = \beta_0 \mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q + \sum_{z \in Z} \beta_z \mathbb{1}(Law_{st} = 1) * \Delta z_t^q$$
$$+ \beta_1 \mathbb{1}(Law_{st} = 1) + \alpha_i + \theta_{jt} + \nu_{it} \qquad (12)$$

Table 6 reports the estimation results for equation 12. The estimated coefficients for the interaction term of the law change and $\Delta\varepsilon_t^q$ are qualitatively similar in magnitude, sign and statistical significance to the estimates reported in table 4. The interaction terms for most of the macroeconomic variables are insignificant as also observed in Ottonello and Winberry (2018). However, the interaction term of $\mathbb{1}(Law_{st} = 1)$ with the change in the consumer price index (ΔCPI_t^q) in column (4) and the change in economic policy uncertainty (ΔEPU_t^q) in column (5) are statistically significant. Unconstrained firms reduce investment more during inflationary periods relative to constrained firms, whereas unconstrained firms reduce investment less during periods of high policy uncertainty relative to constrained firms. The second finding is consistent with the theory and evidence on uncertainty multiplier effect presented in Alfaro, Bloom and Lin (2018) and Favara, Gao and Giannetti (2018).

7.2 Other Robustness Tests

This section examines the robustness of baseline results reported in table 4 to alternative measures of firm investment and monetary policy shocks, and the entry and exit of firms. First, I validate robustness to alternative measures of firm investment. Alternative measures of firm investment include the ratio of capital expenditure to lagged book value of assets as in Hayashi (1982) and change in the natural logarithm of property, plant and equipment. Additionally to capture changes in intangible assets, change in the natural logarithm of research and development expenditure is used. The estimation results using alternative

[17] Nakamura and Steinsson (2018b) note that the Federal Reserve employs hundreds of PhD economist to mine every possible data about the economy making monetary policy as endogenous as possible.

measures of firm investment reported in appendix table D.2 reflect that the results are qualitatively similar to the baseline estimates.

Second, I employ alternative measures of monetary policy shocks to verify the robustness of baseline results. The alternative measures of monetary policy used are wide window surprise shocks, actual change in effective Fed Funds rate over the quarter and the Nakamura and Steinsson (2018a) monetary policy shocks.[18] Additionally, robustness to alternative aggregation methodologies for shocks during the quarter is also verified. Gorodnichenko and Weber (2016) and Wong (2019) use the addition of all shocks during the quarter to construct quarterly shocks. Ottonello and Winberry (2018) construct quarterly shocks using the moving average of the raw shocks weighted by the number of days in the quarter after the shock occurs. This time aggregation strategy ensures that the shocks are weighted by the amount of time firms have had to react to them. Estimation of baseline equation using alternative measures of monetary policy shocks are qualitatively similar to the results in table 4. Appendix table D.3 reports these results.

Lastly, to verify that the results are not plagued by entry and exit of firms over the sample period, I estimate baseline equation 9 for a balanced panel of firms between 1993 and 2007.[19] The results from a balanced panel estimation of equation 9 reported in table D.4 are qualitatively similar to the baseline results in table 4.

7.3 Placebo test

A concern about the validity of the empirical results is that the point estimate of the interaction term may capture a spurious relationship unrelated to the enactment of anti-recharacterization law. To address this concern, I conduct a placebo test for my baseline specification 9. A year is randomly drawn to mark the enactmentment of anti-recharacterization law for each state from a uniform distribution between 1993 and 2003. The random year thus generated is defined as the $Placebo - Year$, and the coefficient of $Placebo - Year * \Delta\varepsilon_t^q$

[18] I refer the readers to appendix B for a discussion on measurement and other properties of these shocks.

[19] It is plausible that the strengthening of creditor rights reduces financial frictions and makes the entry of firms just below the margin feasible, therefore increasing investment due to the entry of new firms. Alternatively, an increase in protection of creditor rights can increase liquidation bias. This increase in firm liquidation could either decrease or increase investment. It can increase investment if the increased liquidation is efficient as now the freed up resources from the liquidated firms can be allocated to more efficient firms. On the other hand, liquidation bias could result in firms following a conservative financing and investment policy (Vig (2013)).

in baseline equation 9 is estimated. This exercise of generating the point estimate associated with $Placebo - Year * \Delta\varepsilon_t^q$ is repeated 3,500 times. To negate the validity of the previous results, the null hypothesis that the point estimate associated with $Placebo - Year * \Delta\varepsilon_t^q$ is zero must be rejected.

Figure 6 presents a visual assessment of the kernel density of $\beta_{Placebo-Year}$ estimates, estimated using 3,500 simulations. The distribution of $\beta_{Placebo-Year}$ is centered around 0 with a standard deviation of 0.006. I fail to reject the null hypothesis that the average point estimate from the placebo analysis is equal to zero. The red dashed line denotes the location of the coefficient of interaction term from column 6 of table 4. Particularly, 0.23% of estimates of placebo β lie to the left of the red dashed line. The results of the placebo test add confidence to the argument that the baseline results are neither spurious nor unrelated to the enactment of anti-recharacterization law.

7.4 Falsification Test

The identification strategy relies strongly on the quasi-randomness of the enactment of anti-recharacterization laws. As pointed out earlier in section 3, while the timing of these laws could be argued as plausibly exogenous, the enactment itself could be contaminated by state-specific conditions. To asses the validity of this argument, I conduct a falsification test using a group of treated firms that should not show the treatment effect. The ***Reaves v. Sunbelt*** court decision of 2003 came as a huge blow to the relevance of anti-recharacterization laws. However, Virginia and Nevada enacted these laws in 2004 and 2005 respectively. The firms in this treatment group are identified as $\mathbb{1}(Post - 2003_{st} = 1)$. If the setting is truly quasi-random, the firms incorporated in these states are treated but should not exhibit the treatment effect.

Table 7 reports the results for the falsification test. Table 7 compares outcomes within industry-time across firms in a pure control group, treatment group before 2003 and treatment group post-2003. The point estimate of $\mathbb{1}(Post - 2003_{st} = 1) * \Delta\varepsilon_t^q$ is statistically indistinguishable from zero and the magnitude of the point estimate is not negative. Whereas, the point estimate of $\mathbb{1}(Pre - 2003_{st} = 1) * \Delta\varepsilon_t^q$ is still statistically significant and is similar in magnitude to the ones reported in column 6 of table 3. I conduct a joint Wald test to verify $\mathbb{1}(Pre - 2003_{st} = 1) = \mathbb{1}(Post - 2003_{st} = 1)$, and $\mathbb{1}(Pre - 2003_{st} = 1) * \Delta\varepsilon_t^q = \mathbb{1}(Post - 2003_{st} = 1) * \Delta\varepsilon_t^q$. The value of the f-statistic for the Wald test is 3.45 and the two equations are rejected at 5% level of significance.

8 Mechanism

In this section I examine the underlying mechanism that drive the baseline results. First, I show that the results are driven by the pure monetary policy effect and not driven by the Fed information effect. Second, the baseline results appear to be concentrated among firms operating in the mining and the manufacturing sector; two sectors with high fixed assets, greater asset tangibility and greater reliance of secured debt. Lastly, I document that the results seem to be driven in periods when firms face greater contractual and wage rigidity.

8.1 Pure Monetary Policy Effect & Fed Information Effect

Romer and Romer (2004) and Nakamura and Steinsson (2018a) document the importance of the Fed private information effect on the macroeconomy. The Fed private information hypothesis posits that monetary policy surprises capture not only pure monetary policy news effect but also contains signal on the private information of the central bank on the state of the economy. If indeed monetary policy surprises contain substantial Fed information then the effect of these surprises could go in the wrong direction. Hence, a contractionary shock would imply higher future economic growth making these shocks expansionary in effect. Hence, to identify the effect of relaxation in financing cost operating via monetary policy it is important to differentiate between the two effects. To address this issue I employ the monetary shock series constructed in Jarocinski and Karadi (2018) and Bu, Rogers and Wu (2019).[20] These shocks series separate the pure monetary policy effect from monetary policy surprises. Bu, Rogers and Wu (2019) are able to separate the pure monetary policy component from the Fed information component using the methodology of Rigobon and Sack (2003) under the assumption that the variance of the Fed information component

[20] I refer readers to appendix B for details on the construction and properties of these measures.

exhibits homoscedasticity. Jarocinski and Karadi (2018) exploit the negative and positive co-movement between interest rates and stock prices to disentangle the two components.

Table 8 compares the estimate on the interaction term for pure monetary policy effects of Bu, Rogers and Wu (2019) and Jarocinski and Karadi (2018) in columns (2) and (3), respectively, with the baseline monetary policy surprise measure in column (1). The coefficient of the interaction term associated with the Bu, Rogers and Wu (2019) shocks is closer to the coefficient of the interaction term associated with the baseline shocks. The coefficient of the interaction term associated with Jarocinski and Karadi (2018) shocks is smaller but the standard deviation for Jarocinski and Karadi (2018) shocks is almost twice the standard deviation of Bu, Rogers and Wu (2019) shocks. This indicates that an equivalent Jarocinski and Karadi (2018) shock would result in a similar effect. The closeness of the three estimates stems from the particular sample used in the study. Jarocinski and Karadi (2018) argue that, under the pure monetary policy effect, the stock market and interest rates would have a negative co-movement and a positive co-movement under Fed information effect. For the sample between 1993 and 2007 and correlation between the stock returns (measured by S&P 500 Index returns) and interest rates (measured by monetary policy surprises) was -62%. The same correlation for the period between 2008 and 2016 was -25% indicating that the Fed information effect became dominant only after 2007 with the unconventional monetary policy. Additionally, Faust, Swanson and Wright (2004) argue that the Fed information effects are concentrated among intermeeting announcements. As there were barely any intermeeting decisions pre-financial crisis which explains why the information effect doesn't play a major role in the results (Gorodnichenko and Weber (2016)). These results indicate that the baseline estimates reported in table 4 are not plagued by the Fed information effect but mostly capture the effect of pure monetary policy shocks.

8.2 Within-Industry Results

This section discusses the cross-sectional response of firms to monetary policy surprises given the treatment shock within the industry. This analysis fosters a better understanding of the underlying mechanism. I classify firms as constrained or unconstrained depending on whether the firm is incorporated in a state that passed the anti-recharacterization law. The enactment of these laws improved the protection of creditor rights. However, for a change in these rights to affect the level of firm financial constraint, I need two assumptions. First, firms use SPVs, and, second, they engage in secured asset based borrowing. Korgaonkar and Nini (2010) report a wide usage of SPVs in the manufacturing sector. Additionally, sectors such as construction, mining and manufacturing have a great degree of fixed assets on their balance sheets and engage in secured asset based borrowing (Lian and Ma (2019)). Hence, if the results are driven by the change in the level of financial constraints because of the enactment of this law then the baseline results should be driven by these industries.

Figure 7 and appendix table D.4 report the results for industry-specific point estimates of the interaction term of law and monetary policy surprise.[21] Consistent with the conjecture, the results seem to be driven by the manufacturing and the mining sector. A one standard deviation expansionary monetary policy surprise results in a 0.02 standard deviation investment growth in the manufacturing sector and a 0.05 standard deviation investment growth in the mining sector for unconstrained firms relative to constrained firms. The prominence of the result within these two sectors points to the fact that the results are indeed driven by the underlying mechanism of the strengthening of creditor rights.

8.3 Contractual and Wage Rigidity, Financing Constraint & Monetary Transmission

A class of macroeconomic theories exploit contractual rigidities to explain why monetary policy could affect the real output. Olivei and Tenreyro (2007) document a differential response of real output to monetary policy shocks based on the timing of these shocks during the year. They propose that this differential response is driven by the uneven staggering of wage contracts across quarters. Olivei and Tenreyro (2007) show that the response of real output to monetary policy surprises is smaller in periods of lower rigidity. Additionally, they document that firms face higher wage and contractual rigidity in the first and the second quarter of the year relative to the last two calendar quarters of the year.[22] I exploit

[21] The cross-sectional splits for this test are based on the broader 2 digit SIC industry classification. The broader industry classification still allows me to control for narrow 4 digit SIC industry-time fixed effects within each 2 digit SIC industry.

[22] See the discussion in Olivei and Tenreyro (2007) for more details of the anecdotal evidence that points to the fact that firms face higher contractual and wage rigidity during the first half of the year.

the anecdotal evidence on the uneven staggering of contractual rigidity across quarters as in Olivei and Tenreyro (2007) to identify the cross-sectional response to monetary policy shocks among constrained and unconstrained firms during times of greater rigidity relative to times of lower rigidity. This test is motivated by prior research that shows firms with greater nominal rigidity respond more to the dilution of financial constraints (D'Acunto et al. (2018)) and firms facing greater nominal rigidities are more responsive to monetary policy shocks (Christiano, Eichenbaum and Evans (2005)).

If the results of higher investment by unconstrained firms are driven by monetary policy surprises, the results should be more prominent in the first two calendar quarters of the year when firms face lower wage and contractual flexibility (Olivei and Tenreyro (2007)). Figure 8 reports the results from the Jordà (2005) style linear projection for each quarter. Panel 8a reports the response of investment of unconstrained firms relative to constrained firms to monetary policy surprises occurring in the first quarter. The differential impact rises and reaches its peak level four quarters after the shock. The impact appears to be persistent after that. Panel 8b reports the results for shocks in the second quarter. The impact in the second quarter is smaller relative to the impact in the first quarter but is strongly persistent two quarters after the shock. The initial difference between the impact observed in first quarter and the second quarter is relatively small. The results in panel 8c reports that the shocks in the third quarter have a small response that dampen quickly after three quarters, and there is no sizable impact of shocks in the fourth quarter as shown in panel 8d. Even though the effect is significant six quarters after the shock in the fourth quarter it is not persistent.

Figure 8 shows that the heterogeneous response of firm investment to monetary policy surprises in the first and second quarter is in sharp contrast to the response to surprises occurring in the third and the fourth quarter. Economically a one standard deviation expansionary monetary policy shock results in a persistent 0.04 standard deviation increase in investment growth of unconstrained firms relative to constrained firms following a shock in the first and the second quarter of the calendar year and no significant persistent impact for shocks in the third and the fourth quarters.

A related concern is that the different responses to monetary policy surprises in different quarters result from different types of shocks over the year. Uhlig (2005) shows that differences in the type of shocks could produce different impulse responses. I explore this issue by testing for the equality of distribution of surprises across quarters via the Kolmogorov-Smirnov test. In a pairwise comparison of distributions of monetary policy surprises for each quarter, I cannot reject the null hypothesis of identical distributions while comparing any two quarters. This indicates that the differences in the directions of the shocks across quarters are unlikely to provide a counter-explanation for the different impulse responses.

9 Effect during the 2001 Recession

Kashyap, Lamont and Stein (1994) argue that the financial conditions are more binding during recessionary periods. Hence, periods of recession are ideal to test for the presence of a financial accelerator effect. Additionally, the model presented in section 2.1 shows that during periods of low-interest rates, the dampening effect of financial constraints disappears and the amplification effect via the firm balance sheet channel gains dominance. The reversal effects of monetary policy at low interest rates has also been documented in Brunnermeier and Koby (2018) and Wang et al. (2018). Therefore, I exploit the recession of 2001 with binding financial constraints and low interest rates to test for the presence of financial accelerator.

The 2001 recession was an eight months long economic downturn starting in March of 2001 and ending in December of 2001. The stock prices and values of several dot-com businesses declined while many went bankrupt. Simultaneously, the Fed raised the Fed Funds rate three times reaching 6.5% in May of 2000. This economic downturn was further worsened by the 9/11 attacks. Following the downturn, the Fed reduced interest rates drastically during 2001 resulting in a Fed Funds rate of 1.75% by January of 2002. This episode is similar in conditions and context to the historical episodes of Romer and Romer (1990) used in Gertler and Gilchrist (1994) and Kashyap, Lamont and Stein (1994).

Table 9 reports the estimation results. The point estimate of the triple interaction term of the law, monetary policy surprises and the recession is positive and statistically significant at 5% level. The interaction term of the law with monetary policy surprises is still negative and statistically significant as in the baseline results. As expected the interaction term of the law with the recession is positive and statistically significant indicating that constrained firms are more hit by the recession relative to the unconstrained firms. The Wald f-statistic for the null $\mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q * Recession + \mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q + \mathbb{1}(Law_{st} = 1) * Recession + \mathbb{1}(Law_{st} = 1) = 0$ is 18.14, significant at 1% level. The Wald f-statistic for the null $\mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q * Recession + \mathbb{1}(Law_{st} = 1) * Recession = 0$ is 14.13, significant at 1% level. Economically, the results indicate that constrained firms have 0.03 standard deviation lower investment growth than the unconstrained firms in response to a one standard deviation monetary tightening during low interest-rate regimes.

10 Conclusion

In this paper, I show that financial frictions dampen the firms' response to monetary policy surprises. My argument has two components. First, using an exogenous increase in protection of creditor rights to measure the level of financial constraint, I show that firms incorporated in states where creditor rights protection was strengthened (treated) exhibit greater investment growth than the control firms following a monetary policy surprise. Second, I identify the mechanism via which strengthening of creditor rights relax financial constraints and amplifies monetary transmission. Greater investment in treated firms following a monetary policy surprise is concentrated in industries with extensive usage of SPV and fixed assets. Unlike previous research, my results are better identified and hence, improve our understanding of the monetary transmission mechanism.

My results could independently inform the policymakers about the differential impact of monetary policy across firms. A guidance for monetary policymakers is the conventional wisdom that monetary policy affects constrained firms more than the unconstrained firms. My results, however, imply that unconstrained firms respond more relative to constrained firms at least during normal times. However during low interest rate regimes or periods similar to Romer and Romer (1990) episodes constrained firms seem to be more responsive to monetary policy shocks. Moreover, my work speaks to the philosophy of Nakamura and Steinsson (2018*b*) as to how well identified empirical settings could be used to compare competing models.

References

Acharya, Viral V, and Krishnamurthy V Subramanian. 2009. "Bankruptcy codes and innovation." *The Review of Financial Studies*, 22(12): 4949–4988.

Acharya, Viral V, Yakov Amihud, and Lubomir Litov. 2011. "Creditor rights and corporate risk-taking." *Journal of Financial Economics*, 102(1): 150–166.

Aghion, Philippe, and Patrick Bolton. 1992. "An incomplete contracts approach to financial contracting." *The Review of Economic Studies*, 59(3): 473–494.

Alfaro, Ivan, Nicholas Bloom, and Xiaoji Lin. 2018. "The finance uncertainty multiplier." National Bureau of Economic Research.

Altonji, Joseph G, Todd E Elder, and Christopher R Taber. 2005. "Selection on observed and unobserved variables: Assessing the effectiveness of Catholic schools." *Journal of Political Economy*, 113(1): 151–184.

Bernanke, Ben, and Mark Gertler. 1989. "Agency Costs, Net Worth, and Business Fluctuations." *The American Economic Review*, 79(1): 14–31.

Bernanke, Ben S, and Kenneth N Kuttner. 2005. "What explains the stock market's reaction to Federal Reserve policy?" *The Journal of Finance*, 60(3): 1221–1257.

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

Brunnermeier, Markus K, and Yann Koby. 2018. "The reversal interest rate." National Bureau of Economic Research.

Bu, Chunya, John H Rogers, and Wenbin Wu. 2019. "A unified measure of Fed monetary policy shocks."

Carpenter, Robert E, Steven M Fazzari, and Bruce C Petersen. 1998. "Financing constraints and inventory investment: A comparative study with high-frequency panel data." *Review of Economics and Statistics*, 80(4): 513–519.

Christiano, Lawrence J, Martin Eichenbaum, and Charles L Evans. 2005. "Nominal rigidities and the dynamic effects of a shock to monetary policy." *Journal of Political Economy*, 113(1): 1–45.

Chu, Yongqiang. 2018. "Collateral, Ease of Repossession, and Leases: Evidence from Anti-Recharacterization Laws." *SSRN Working Paper*.

Cook, Timothy, and Thomas Hahn. 1989. "The effect of changes in the federal funds rate target on market interest rates in the 1970s." *Journal of Monetary Economics*, 24(3): 331–351.

Crouzet, Nicolas, and Neil Mehrotra. 2018. "Small and large firms over the business cycle." *Unpublished Working Paper*.

Denis, David J, and Valeriy Sibilkov. 2009. "Financial constraints, investment, and the value of cash holdings." *The Review of Financial Studies*, 23(1): 247–269.

D'Acunto, Francesco, Ryan Liu, Carolin Pflueger, and Michael Weber. 2018. "Flexible prices and leverage." *Journal of Financial Economics*, 129(1): 46–68.

Ersahin, Nuri. 2018. "Creditor rights, technology adoption, and productivity: Plant-level evidence." *Unpublished Working Paper*.

Faust, Jon, Eric T Swanson, and Jonathan H Wright. 2004. "Do Federal Reserve policy surprises reveal superior information about the economy?" *Contributions in Macroeconomics*, 4(1).

Favara, Giovanni, Janet Gao, and Mariassunta Giannetti. 2018. "Uncertainty, Access to External Finance, and Firm Precautionary Behavior." *Unpublished Working Paper*.

Fazzari, Steven M, R Glenn Hubbard, and Bruce C Petersen. 1988. "Financing Constraints and Corporate Investment." *Brookings Papers on Economic Activity*, , (1): 141–206.

Feng, Mei, Jeffrey D Gramlich, and Sanjay Gupta. 2009. "Special purpose vehicles: Empirical evidence on determinants and earnings management." *The Accounting Review*, 84(6): 1833–1876.

Gabaix, Xavier. 2011. "The granular origins of aggregate fluctuations." *Econometrica*, 79(3): 733–772.

Gertler, Mark, and Peter Karadi. 2015. "Monetary policy surprises, credit costs, and economic activity." *American Economic Journal: Macroeconomics*, 7(1): 44–76.

Gertler, Mark, and Simon Gilchrist. 1994. "Monetary policy, business cycles, and the behavior of small manufacturing firms." *The Quarterly Journal of Economics*, 109(2): 309–340.

Gorodnichenko, Yuriy, and Michael Weber. 2016. "Are sticky prices costly? Evidence from the stock market." *American Economic Review*, 106(1): 165–99.

Gürkaynak, Refet S, Brian Sack, and Eric T Swansonc. 2005. "Do Actions Speak Louder Than Words? The Response of Asset Prices to Monetary Policy Actions and Statements." *International Journal of Central Banking*.

Gutiérrez, Germán, and Thomas Philippon. 2017. "Declining Competition and Investment in the US." National Bureau of Economic Research.

Hadlock, Charles J, and Joshua R Pierce. 2010. "New evidence on measuring financial constraints: Moving beyond the KZ index." *The Review of Financial Studies*, 23(5): 1909–1940.

Hayashi, Fumio. 1982. "Tobin's marginal q and average q: A neoclassical interpretation." *Econometrica*, 213–224.

Hennessy, Christopher A, and Toni M Whited. 2007. "How costly is external financing? Evidence from a structural estimation." *The Journal of Finance*, 62(4): 1705–1745.

Holmstrom, Bengt, and Jean Tirole. 1997. "Financial intermediation, loanable funds, and the real sector." *The Quarterly Journal of Economics*, 112(3): 663–691.

Hoshi, Takeo, Anil Kashyap, and David Scharfstein. 1991. "Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups." *The Quarterly Journal of Economics*, 106(1): 33–60.

Ippolito, Filippo, Ali K Ozdagli, and Ander Perez-Orive. 2018. "The transmission of monetary policy through bank lending: The floating rate channel." *Journal of Monetary Economics*, 95: 49–71.

Janger, Edward J. 2003. "The death of secured lending." *Cardozo Law Review*, 25: 1759.

Jarocinski, Marek, and Peter Karadi. 2018. "Deconstructing monetary policy surprises: The role of information shocks." *American Economic Journal - Macroeconomics, forthcoming*.

Jeenas, Priit. 2018. "Monetary policy shocks, financial structure, and firm activity: A panel approach." *Unpublished Working Paper*.

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

Kanodia, Chandra, and Haresh Sapra. 2016. "A real effects perspective to accounting measurement and disclosure: Implications and insights for future research." *Journal of Accounting Research*, 54(2): 623–676.

Kaplan, Steven N, and Luigi Zingales. 1997. "Do investment-cash flow sensitivities provide useful measures of financing constraints?" *The Quarterly Journal of Economics*, 112(1): 169–215.

Kashyap, Anil K, Owen A Lamont, and Jeremy C Stein. 1994. "Credit conditions and the cyclical behavior of inventories." *The Quarterly Journal of Economics*, 109(3): 565–592.

Kettering, Kenneth C. 2008. "True sales of receivables: A purpose analysis." *American Bankruptcy Institute Law Review*, 16: 511.

Kettering, Kenneth C. 2010. "Harmonizing Choice of Law in Article 9 with Emerging International Norms." *Gonzaga Law Review*, 46: 235.

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

Korgaonkar, Sanket, and Greg Nini. 2010. "Special purpose vehicles and nonfinancial corporate finance." *Available at SSRN 1639548*.

Lamont, Owen, Christopher Polk, and Jesús Saaá-Requejo. 2001. "Financial constraints and stock returns." *The review of nancial studies*, 14(2): 529–554.

Lian, Chen, and Yueran Ma. 2019. "Anatomy of Corporate Borrowing Constraints."

Li, Shaojin, Toni M Whited, and Yufeng Wu. 2016. "Collateral, taxes, and leverage." *The Review of Financial Studies*, 29(6): 1453–1500.

Mann, William. 2018. "Creditor rights and innovation: Evidence from patent collateral." *Journal of Financial Economics*, 130(1): 25–47.

Nakamura, Emi, and Jón Steinsson. 2008. "Five facts about prices: A reevaluation of menu cost models." *The Quarterly Journal of Economics*, 123(4): 1415–1464.

Nakamura, Emi, and Jón Steinsson. 2018*a*. "High-frequency identification of monetary non-neutrality: the information effect." *The Quarterly Journal of Economics*, 133(3): 1283–1330.

Nakamura, Emi, and Jón Steinsson. 2018*b*. "Identification in macroeconomics." *Journal of Economic Perspectives*, 32(3): 59–86.

Neuhierl, Andreas, and Michael Weber. 2018. "Monetary momentum." National Bureau of Economic Research.

Olivei, Giovanni, and Silvana Tenreyro. 2007. "The timing of monetary policy shocks." *American Economic Review*, 97(3): 636–663.

Oster, Emily. 2019. "Unobservable selection and coefficient stability: Theory and evidence." *Journal of Business & Economic Statistics*, 37(2): 187–204.

Ottonello, Pablo, and Thomas Winberry. 2018. "Financial heterogeneity and the investment channel of monetary policy." National Bureau of Economic Research.

Ozdagli, Ali, and Michael Weber. 2017. "Monetary policy through production networks: Evidence from the stock market." National Bureau of Economic Research.

Ozdagli, Ali K. 2017. "Financial frictions and the stock price reaction to monetary policy." *The Review of Financial Studies*, 31(10): 3895–3936.

Ponticelli, Jacopo, and Leonardo S Alencar. 2016. "Court enforcement, bank loans, and firm investment: evidence from a bankruptcy reform in Brazil." *The Quarterly Journal of Economics*, 131(3): 1365–1413.

Rajan, Raghuram G, and Luigi Zingales. 1998. "Financial dependence and growth." *The American Economic Review*, 88(3): 559–586.

Rigobon, Roberto, and Brian Sack. 2003. "Measuring the reaction of monetary policy to the stock market." *The Quarterly Journal of Economics*, 118(2): 639–669.

Romer, Christina D, and David H Romer. 1990. "New evidence on the monetary transmission mechanism." *Brookings papers on economic activity*, 1990(1): 149–213.

Romer, Christina D, and David H Romer. 2000. "Federal Reserve information and the behavior of interest rates." *American Economic Review*, 90(3): 429–457.

Romer, Christina D, and David H Romer. 2004. "A new measure of monetary shocks: Derivation and implications." *American Economic Review*, 94(4): 1055–1084.

Stein, Jeremy C. 1989. "Efficient capital markets, inefficient firms: A model of myopic corporate behavior." *The Quarterly Journal of Economics*, 104(4): 655–669.

Uhlig, Harald. 2005. "What are the effects of monetary policy on output? Results from an agnostic identification procedure." *Journal of Monetary Economics*, 52(2): 381–419.

Vig, Vikrant. 2013. "Access to collateral and corporate debt structure: Evidence from a natural experiment." *The Journal of Finance*, 68(3): 881–928.

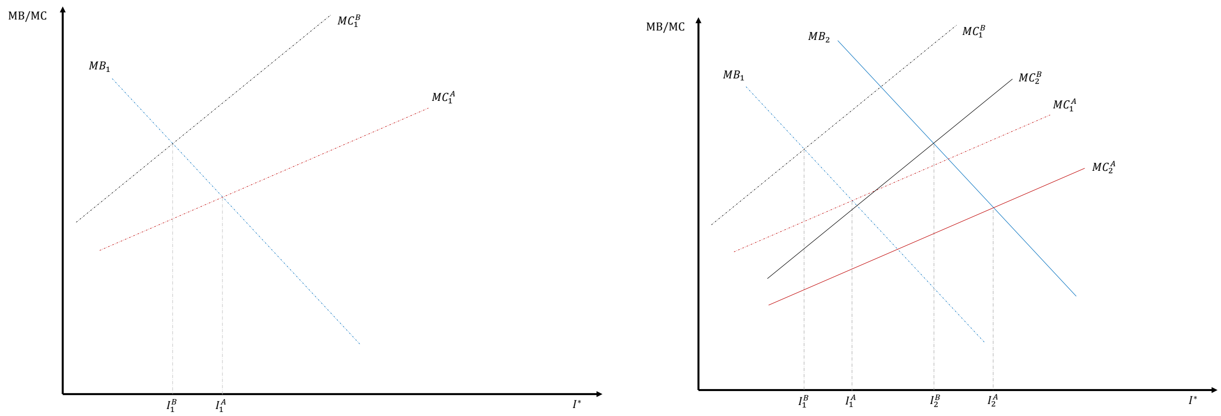
Wang, Yifei, Toni M Whited, Yufeng Wu, and Kairong Xiao. 2018. "Bank market power and monetary policy transmission: Evidence from a structural estimation." *Available at SSRN 3049665*.

Whited, Toni M. 1992. "Debt, liquidity constraints, and corporate investment: Evidence from panel data." *The Journal of Finance*, 47(4): 1425–1460.

Whited, Toni M, and Guojun Wu. 2006. "Financial constraints risk." *The Review of Financial Studies*, 19(2): 531–559.

Wong, Arlene. 2019. "Refinancing and the transmission of monetary policy to consumption." *American Economic Review*.

Figure 1: Thought Experiment



(a) Economy at $t = 1$ (b) Economy at $t = 2$

The figure plots the marginal cost and the marginal benefit for firms as a function of its capital investment. MC and MB denote marginal cost and marginal benefits respectively. There are two firms A and B. Firm A is less financially constrained relative to firm B. The subscript on MC and MB denote the time and the superscript denotes the firm A or B. The following time-line shows the series of events in the thought experiment.

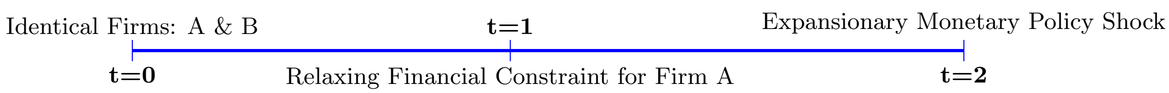
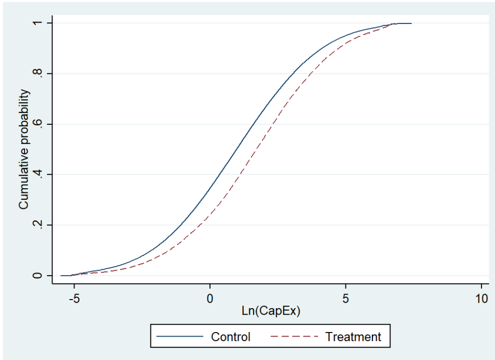
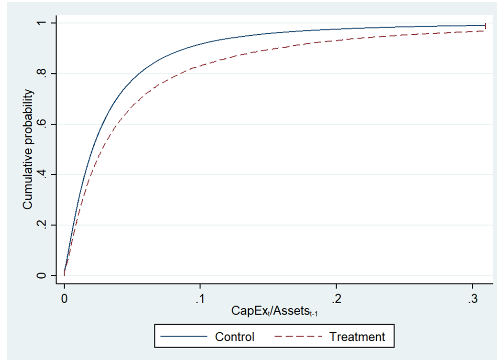


Figure 2: Response of Investment to the Change in Law



(a) $Ln(I_t)$



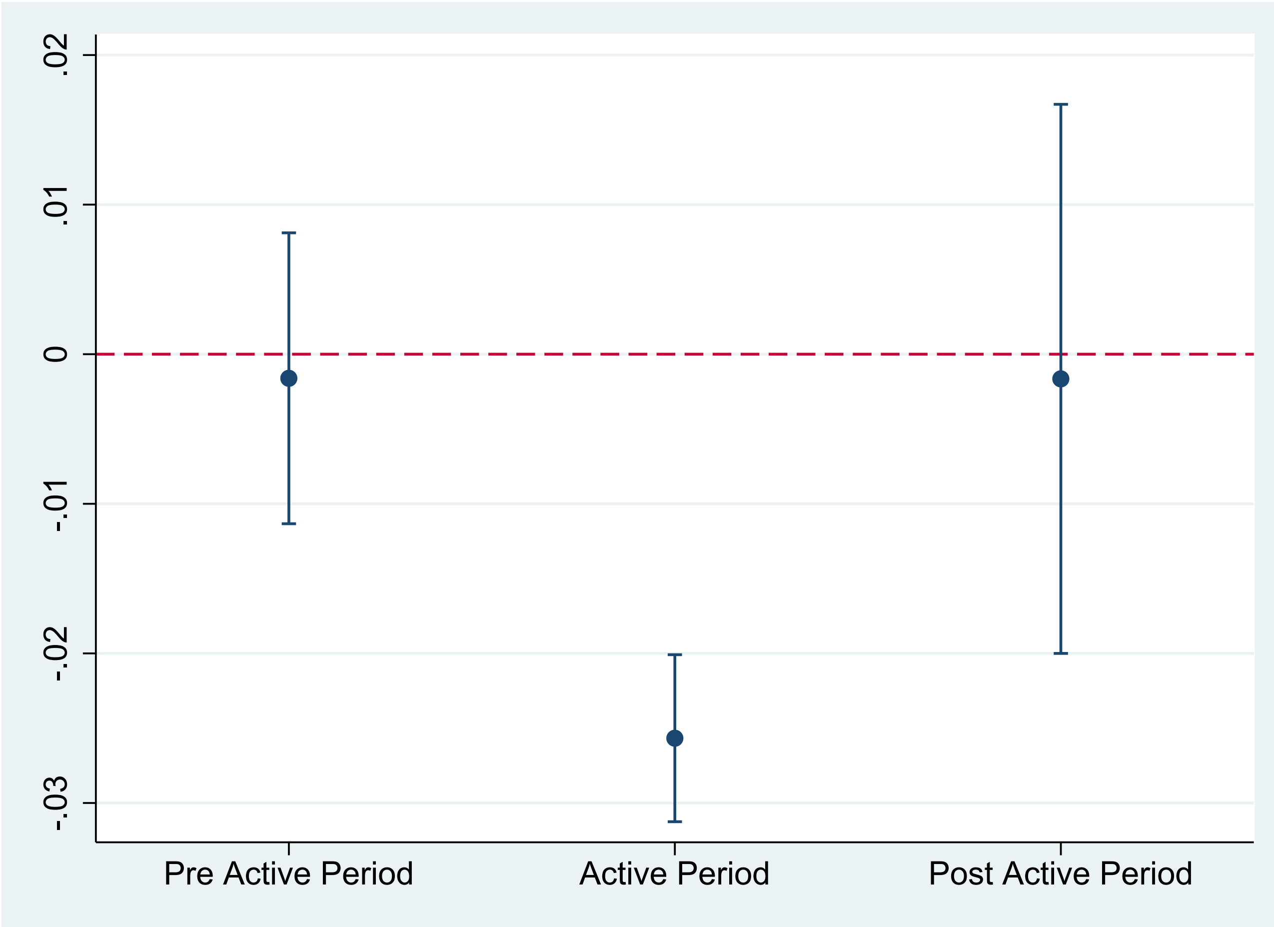
(b) $I_t/Assets_{t-1}$

The figure plots the cumulative density function for the natural logarithm of investment in panel A and capital expenditure to lagged assets ratio in panel B for the control (solid blue line) and the treatment (dashed red line) firms. A firm is allocated to the treatment group if it is located in the state that passed the law and the law was active, otherwise, it is allocated to the control group.

	$Ln(I_t)$			$I_t/Assets_{t-1}$		
	Treatment	Control	Difference	Treatment	Control	Difference
Mean	1.6435	0.9628	0.6807***	0.0566	0.0377	0.0189***
p25	0.0723	-0.6892	0.7615***	0.0108	0.0085	0.0023***
Median	1.7087	0.9700	0.7387***	0.0280	0.0207	0.0073***
p75	3.3178	2.6407	0.6771***	0.0676	0.0455	0.0221***

The above table shows the mean, first, second and third quartile of $Ln(I_t)$ and $I_t/Assets_{t-1}$ for the treatment and the control group. The significance for the difference in the mean is based on a standard t-statistic, whereas the significance level for the first, second and the third quartiles are based on the significance level obtained by a quantile regression of the investment on the variable $\mathbb{1}(Law_{st} = 1)$ for q = 0.25, 0.50 and 0.75.

Figure 3: Baseline OLS Estimate of the Interaction Term for Three Periods

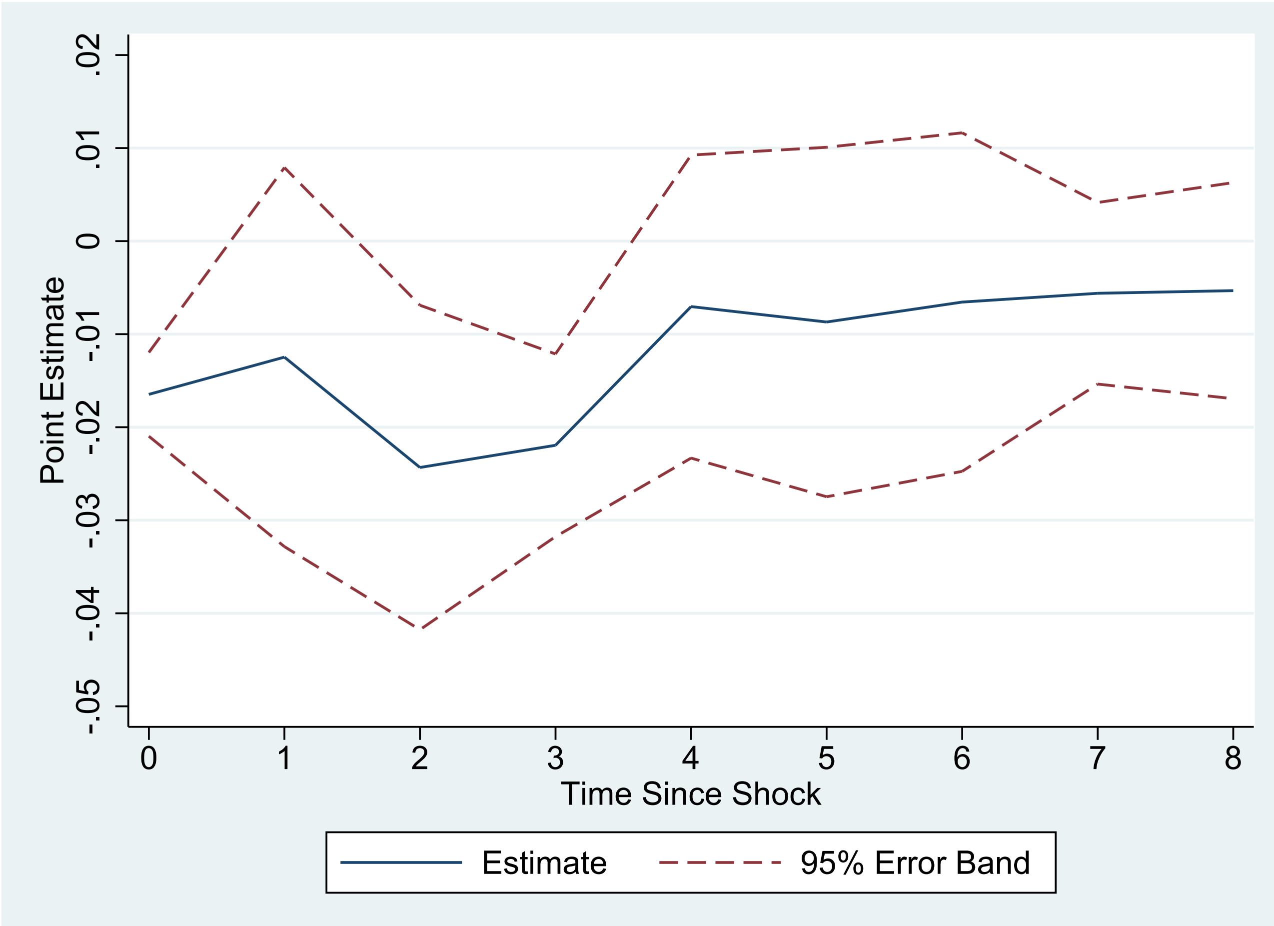


This figure plots the estimates of β_1 obtained from following specification for three different periods.

$$\Delta log I_{it} = \beta_0 + \beta_1 \mathbb{1}(Treated = 1) \quad \Delta\varepsilon_t^q + \beta_2 \mathbb{1}(Treated = 1) + \beta_3 \Delta\varepsilon_t^q + \nu_{it}$$

where i denotes firm, $\mathbb{1}(Treated = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^m$ denotes the monetary shock. The 95% error bands are estimated by clustering the standard errors at the state level. The first period (pre active period) spans from 1993 to 1997. The second period (active) is between 1997 and 2003 when the law was active, and the third period (post active period) is the period from 2004 to 2007.

Figure 4: Dynamics of Differential Response to Monetary Shocks: Jordà (2005) projection

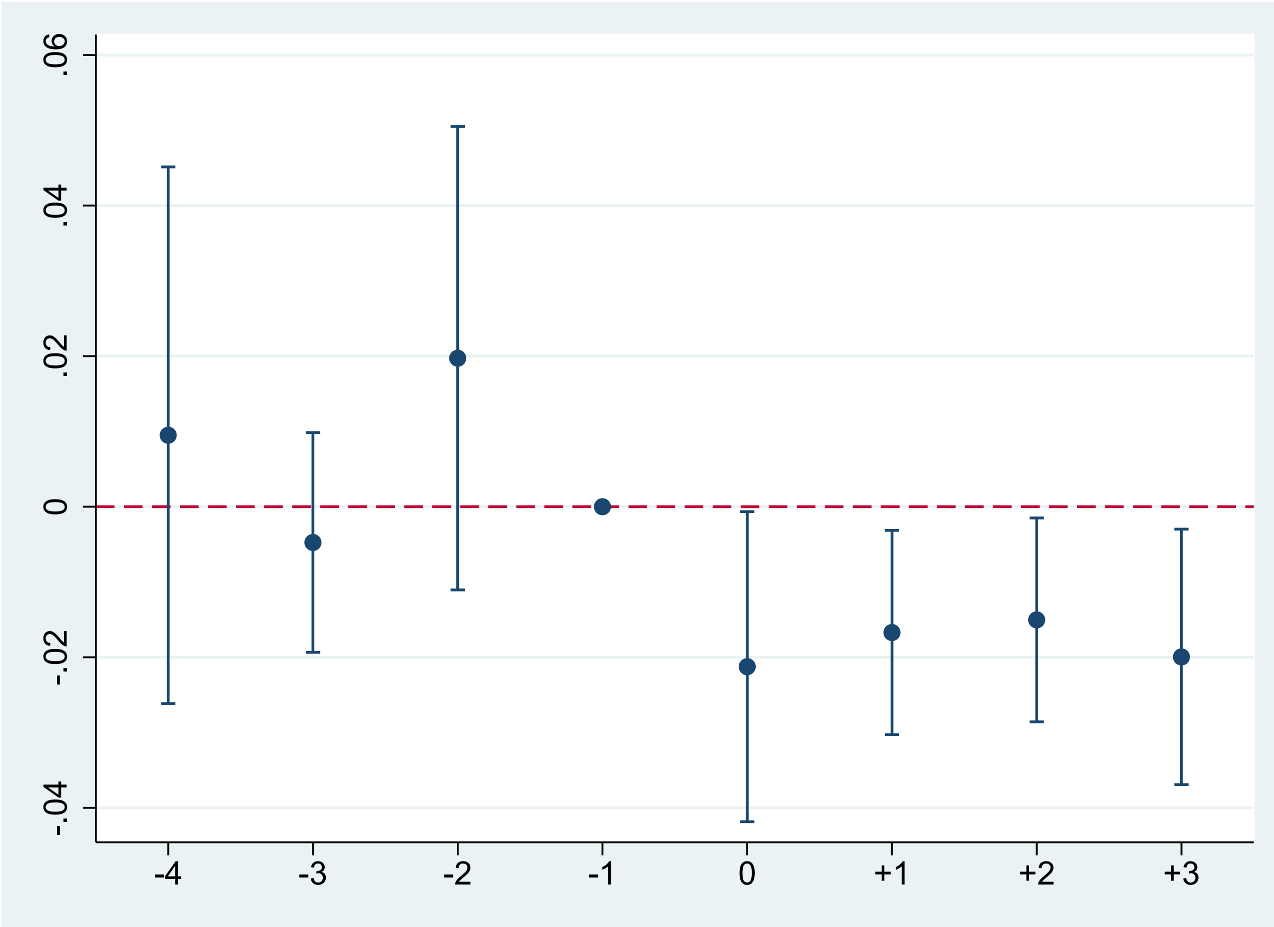


This figure plots the dynamics of the interaction coefficient of anti-recharacterization laws and monetary policy surprise over time. I estimate Jordà (2005) style projection regression until 8 steps. The specification is as follows and h takes an integer value between 1 and 8.

$$log(I_{i,t+h}) \quad log(I_{i,t-1}) = \beta_h^0 \mathbb{1}(Law_{st} = 1) \quad \Delta\varepsilon_t^q + \beta_h^1 \mathbb{1}(Law_{st} = 1) + \alpha_i + \theta_{jt} + \nu_{it}$$

where i denotes firm, j is industry, s is the state of incorporation of the firm i and t is the quarter year. α_i denotes firm fixed effects, θ_t denotes quarter year fixed effects. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^m$ denotes the monetary shock. The 95% error bands are estimated by double clustering of the standard errors at state and quarter-year level.

Figure 5: Parallel Trends Assumption: Assessment of Pre-Trends

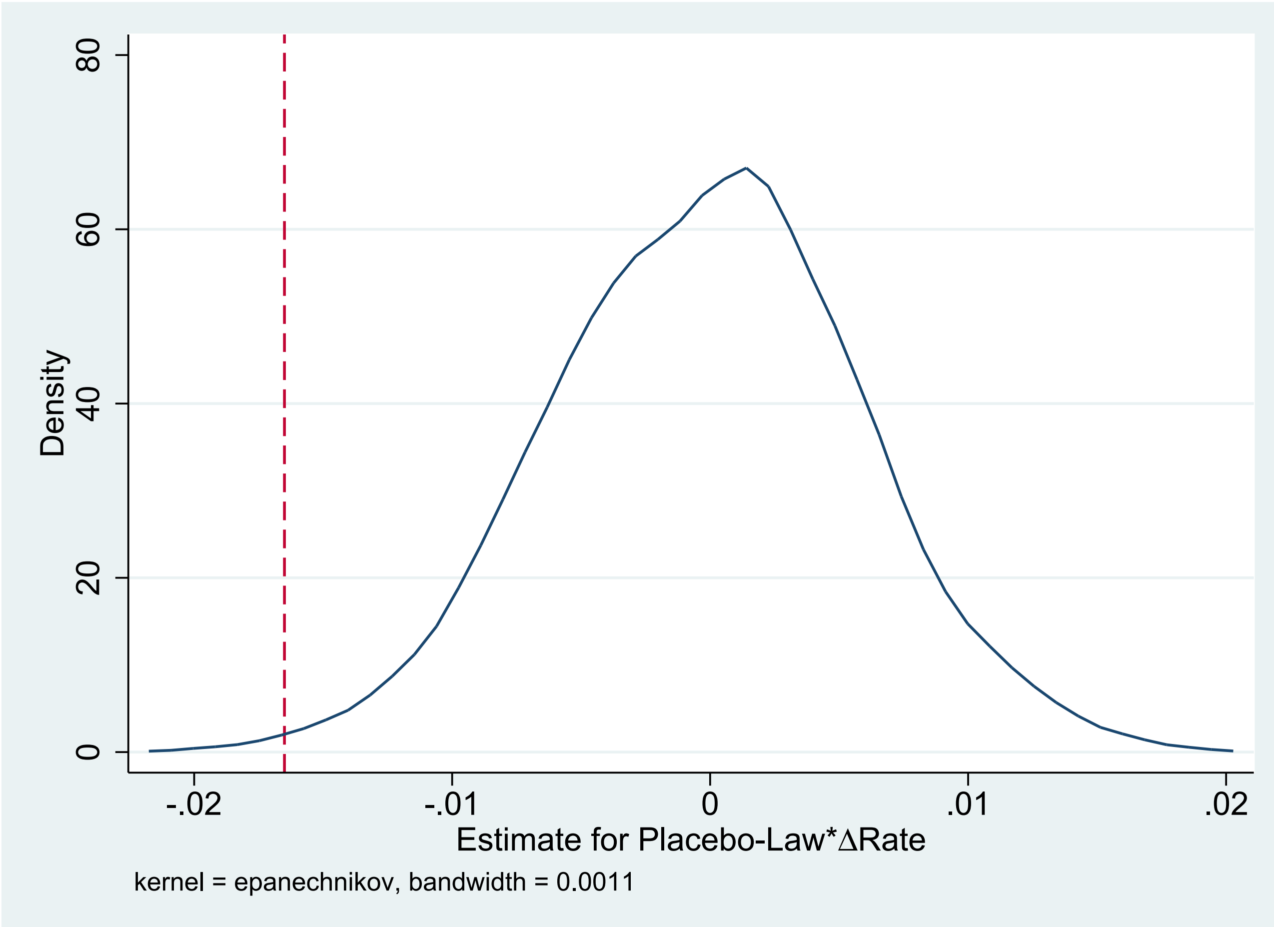


The figure plots the estimates of β_0^k and the 95% confidence intervals from the following regression equation:

$$\Delta log(I_{i,t}) = \sum_{k=-4,k\neq -1}^{k=+3} \beta_0^k \mathbb{1}(Treatment_{st} = 1) \quad \Delta\varepsilon_t^q \quad Time_t^k + \alpha_i + \theta_{jt} + \nu_{it}$$

where i denotes firm, j is industry, s is the state of incorporation of the firm i and t is the quarter year. α_i denotes firm fixed effects, θ_{jt} denotes industry-quarter year fixed effects. $\mathbb{1}(Treatment_{st} = 1)$ is an indicator function that takes a value of 1 if the state of incorporation had passed the creditor protection law and 0 otherwise. $\Delta\varepsilon_t^q$ denotes the monetary surprise. $Time_t^k$ takes a value of 1 if the year is k years before/after the passage of the law for treatment firms and years before or after 1997 for the control group. I drop all treatment group states that passed the law after 2001. The sample comprises of quarterly data on Compustat firms between 1994 and 2003. The 95% error bands are estimated by double clustering of the standard errors at state and quarter-year level.

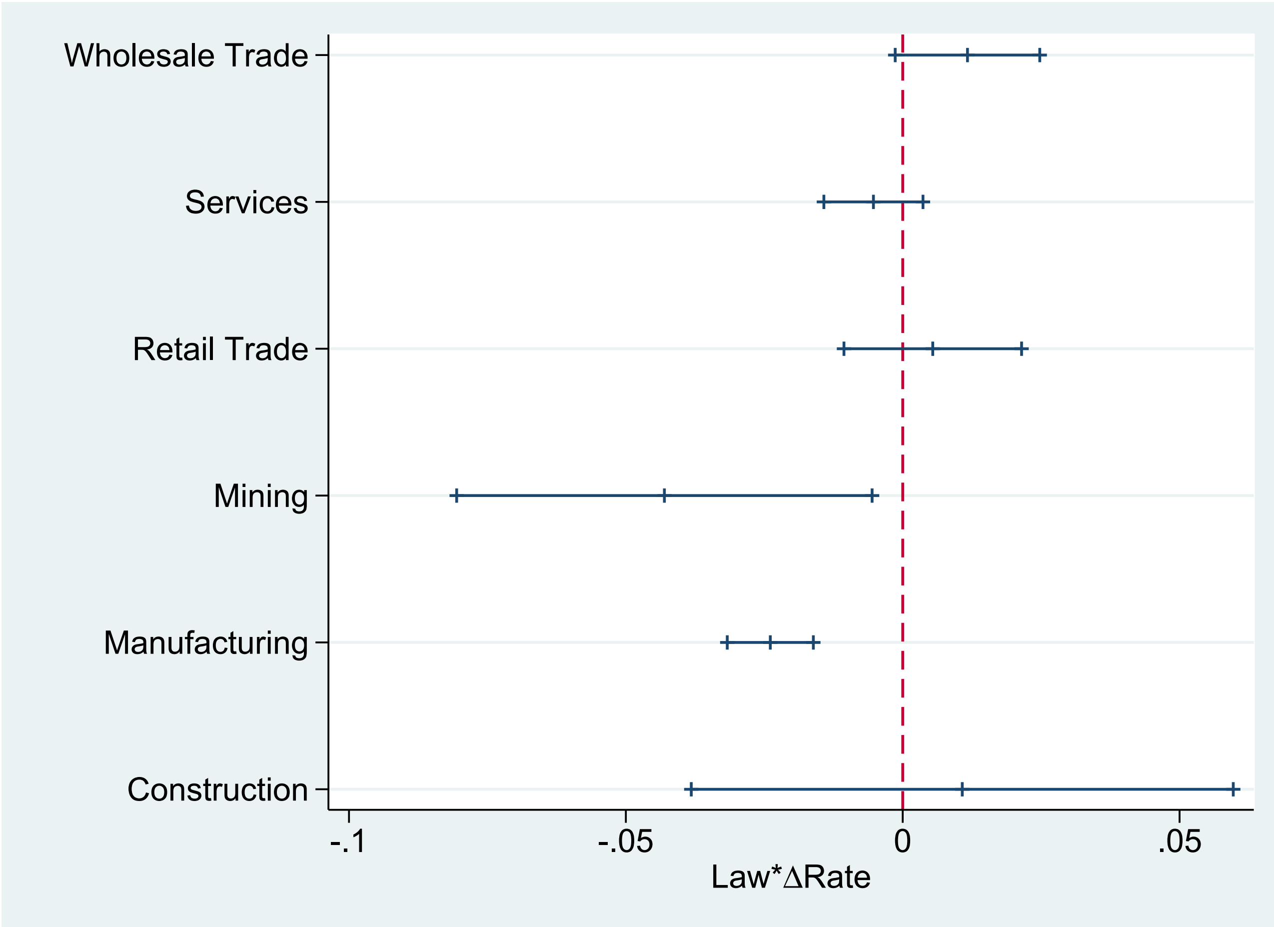
Figure 6: Placebo Test



Min	p1	p5	p25	p50	p75	p95	p99	Max	Mean	St Dev
-0.021	-0.014	-0.010	-0.004	0.000	0.004	0.010	0.014	0.019	0.000	0.006

The figure plots the kernel density of the point estimates of the $\mathbb{1}(Placebo \quad Law_{st} = 1) \quad \Delta\varepsilon_t^q$ obtained from the 3,500 Monte Carlo simulations. A placebo law variable is generated for each state in every simulation by drawing a value from a uniform distribution between 1993 and 2003. $\mathbb{1}(Placebo \quad Law_{st} = 1)$ is an indicator function that takes a value of 1 if the state of incorporation had passed the creditor protection placebo law in a year prior to t and t is before 2003, and 0 otherwise. $\Delta\varepsilon_t^q$ denotes the monetary shock. The red dotted line marks the point estimate of -0.016 on the kernel density. This point estimate is below the 1st percentile value of the estimated distribution.

Figure 7: Industry Specific Point Estimates

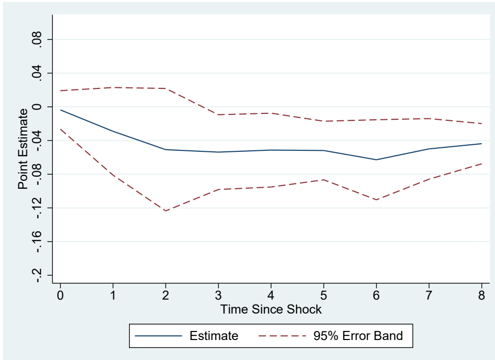


The figure plots the point estimates for the six industries from the following regression.

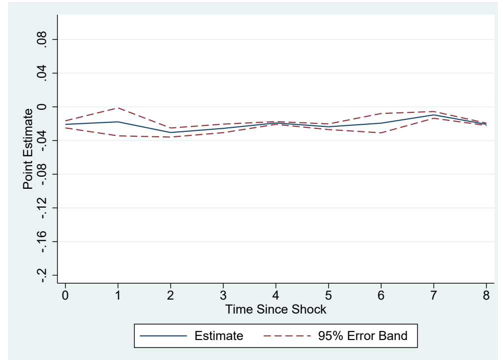
$$\Delta log(I_{i,t}) = \sum_{j\in J} \beta_j Industry_j \quad \mathbb{1}(Law_{st}=1) \quad \Delta\varepsilon_t^q + \beta_1 \mathbb{1}(Law_{st}=1) + \alpha_i + \theta_{jt} + \nu_{it}$$

where i denotes firm, j is industry, s is the state of incorporation of the firm i and t is the quarter year. α_i denotes firm fixed effects, θ_{jt} denotes four digit industry quarter year fixed effects. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^m$ denotes the monetary shock. The variable $Industry_j$ is defined based on the two digit SIC code classification. The 95% error bands are estimated by double clustering of the standard errors at state and quarter-year level.

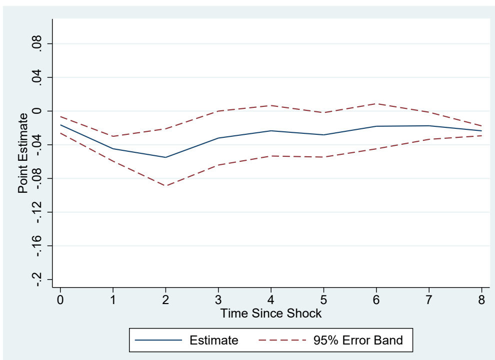
Figure 8: Timing of Monetary Policy Surprises



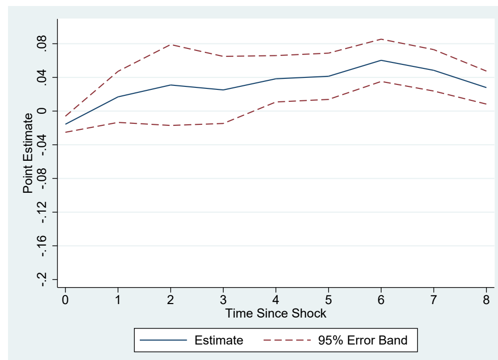
(a) Q1 Shocks



(b) Q2 Shocks



(c) Q3 Shocks



(d) Q4 Shocks

The figure plots the point estimates from a Jordà (2005) style projection regression until 8 steps for each quarter separately. The specification is as follows and h takes an integer value between 1 and 8.

$$log(I_{i,t+h}) \quad log(I_{i,t-1}) = \beta_h^0 \mathbb{1}(Law_{st} = 1) \quad \Delta\varepsilon_t^q + \beta_h^1 \mathbb{1}(Law_{st} = 1) + \alpha_i + \theta_{jt} + \nu_{it}$$

where i denotes firm, j is industry, s is the state of incorporation of the firm i and t is the quarter year. α_i denotes firm fixed effects, $\theta_{j,t}$ denotes industry year fixed effects. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^m$ denotes the monetary shock. The 95% error bands are estimated by double clustering of the standard errors at state and quarter-year level. The table reports the p values for the Kolmogorov-Smirnov test for the equality of the distribution of shocks across quarters.

	Quarter 1	Quarter 2	Quarter 3
Quarter 2	0.3752	-	-
Quarter 3	0.3752	0.6604	-
Quarter 4	0.1813	0.9995	0.6604

Table 1: Summary Statistics

Panel A: Firm Characteristics						
	#Obs	p25	p50	p75	Mean	St Dev
$Log(I_{it})$	233,843	-0.5906	1.0682	2.7288	1.0594	2.4054
$\Delta log(I_{it})$	233,843	-0.0480	0.3407	0.6150	0.0296	1.0685
$\mathbb{1}(Law_{st} = 1)$	233,843	0.0000	0.0000	0.0000	0.0497	0.2172
Ln(Assets)	233,832	3.5919	4.8465	6.3070	4.9985	1.9385
Debt/Asset	225,988	0.0150	0.1620	0.3355	0.2086	0.2094
Average Q	232,245	1.1418	1.5839	2.5093	2.2686	2.1057
g(Sales)	228,633	-0.0714	0.0230	0.1189	0.0223	0.2917
EBITDA/Equity	233,713	0.0221	0.0907	0.3001	0.1978	0.2356
Cash/Assets	231,703	-0.0053	0.0573	0.1084	0.5589	3.9819

Panel B: Macroeconomic Characteristics						
	#Obs	p25	p50	p75	Mean	St Dev
Δr_t^q	60	-0.0450	0.0150	0.2150	0.0287	0.3145
$\Delta \varepsilon_t^q$ (Tight)	60	-0.0231	-0.0029	0.0045	-0.0113	0.0461
$\Delta \varepsilon_t^q$ (Wide)	60	-0.0222	-0.0013	0.0057	-0.0099	0.0469
Δgdp_t^q	60	0.5055	0.7656	1.0727	0.7904	0.4837
ΔUR_t^q	60	-0.1667	-0.0667	0.0500	-0.0406	0.1824
ΔCPI_t^q	60	0.8167	1.2000	1.3833	1.1409	0.6303
ΔEPU_t^q	60	-13.3325	-1.2082	12.1544	-1.2351	25.5066

This table reports the descriptive statistics for the key variables used in the analysis. Panel A reports the summary statistics for firm-level variables, and panel B reports the summary statistics for macroeconomic variables. The data on firm-specific variables comes from Compustat. The data on macroeconomic variables is sourced from the Federal Reserve at St. Louis. The data on economic policy uncertainty index comes from the website of the policy uncertainty project.

Table 2: Monetary Policy Response to Investment

$\Delta logI_{it}$	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) IV-2SLS	(8) IV-2SLS
$\Delta\varepsilon_t^q$	-0.0199***	-0.0676***	-0.0677***	-0.0787***				
	(0.0029)	(0.0023)	(0.0023)	(0.0028)				
Δr_t^q					-0.1104***	-0.1497***	-0.3432***	-0.3459***
					(0.0040)	(0.0049)	(0.0134)	(0.0135)
ΔGDP_t^q				0.1543***		0.1607***		0.1799***
				(0.0053)		(0.0051)		(0.0055)
ΔUR_t^q				0.0568***		0.0120***		-0.0248***
				(0.0035)		(0.0028)		(0.0031)
ΔCPI_t^q				0.0104***		0.0231***		0.0319***
				(0.0021)		(0.0021)		(0.0020)
ΔEPU_t^q				-0.0165***		-0.0253***		-0.0236***
				(0.0030)		(0.0028)		(0.0028)
Firm FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE			Yes	Yes	Yes	Yes	Yes	Yes
# Obs	233,843	233,671	233,668	233,668	233,668	233,668	233.668	233668
R^2	0.0004	0.0233	0.0243	0.0378	0.0250	0.0398		

This table presents the estimates of firm-level impact of monetary policy surprises on change in firm investment. The dependent variable is the change in the natural logarithm of capital expenditure. The main independent variable is $\Delta\varepsilon_t^q$ which denotes the quarterly monetary policy surprise. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of 1. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 3: Anti-Recharacterization Laws and Financial Constraints

	(1) Firm Size	(2) SA-Index	(3) KZ-Index	(4) WW-Index
$\mathbb{1}(Law_{st} = 1)$	0.0303**	-0.0513***	-0.0608*	-0.0340**
	(0.0147)	(0.0142)	(0.0305)	(0.0138)
Firm FE	Yes	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes	Yes
# Obs	252,442	138,598	206,404	199,489
R^2	0.9462	0.9088	0.5922	0.9283

This table presents the estimates of firm-level impact of anti-recharacterization laws on different measures of financial constraints.. The dependent variable in column 1 if the natural logarithm of book value of assets, the Size-Age (SA) index of Hadlock and Pierce (2010) in column (2), the synthetic Kaplan Zingales (KZ) Index presented in Lamont, Polk and Saaá-Requejo (2001) based on regression estimates of Kaplan and Zingales (1997) in column (3), and the Whited-Wu (WW) Index of Whited and Wu (2006) in column (4). The main independent variable is $\mathbb{1}(Law_{st} = 1)$. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003 and zero otherwise. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of 1. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Anti-Recharacterization Laws, Firm Investment and Monetary Policy Surprise: Baseline Results

$\Delta log I_{it}$	(1) All	(2) All	(3) All	(4) All	(5) All	(6) All	(7) Neg	(8) Pos
$1(\text{Law}_{st} = 1) * \Delta\varepsilon_t^q$	-0.0101***	-0.0181***	-0.0182***	-0.0181***	-0.0186***	-0.0165***	-0.0150***	0.0026
	(0.0035)	(0.0059)	(0.0060)	(0.0059)	(0.0057)	(0.0022)	(0.0039)	(0.0124)
$1(\text{Law}_{st} = 1)$	0.0488***	0.0018	-0.0111	-0.0094*	-0.0143	-0.0063	-0.0069	-0.0254
	(0.0047)	(0.0084)	(0.0103)	(0.0055)	(0.0149)	(0.0099)	(0.0233)	(0.0181)
$\Delta\varepsilon_t^q$	-0.0201							
	(0.0554)							
Qtr Year FE		Yes	Yes	Yes	Yes			
State FE			Yes					
Industry FE				Yes				
Firm FE					Yes	Yes	Yes	Yes
Industry-Qtr Year FE						Yes	Yes	Yes
# Obs	233,843	233,843	233,843	233,842	233,687	231,631	78,449	152,199
R^2	0.0006	0.2187	0.2188	0.2192	0.2269	0.3048	0.3121	0.3376

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment. The dependent variable is the change in the natural logarithm of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st} = 1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Controlling for Static Firm Characteristics

$\Delta logI_{it}$	(1) All	(2) All	(3) All	(4) All	(5) All	(6) All	(7) All	(8) Neg	(9) Pos
$\mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q$	-0.0141***	-0.0142***	-0.0144***	-0.0139***	-0.0147**	-0.0140***	-0.0137***	-0.0186***	0.0176
	(0.0046)	(0.0042)	(0.0048)	(0.0045)	(0.0055)	(0.0047)	(0.0041)	(0.0061)	(0.0250)
Ln(Asset)*$\Delta\varepsilon_t^q$	-0.1297						-0.1400	-0.0702	0.1382
	(0.1386)						(0.1531)	(0.0958)	(0.3992)
Debt/Asset*$\Delta\varepsilon_t^q$		0.0086					-0.0197	0.1130	0.3219**
		(0.0699)					(0.1023)	(0.1857)	(0.1436)
Avg Q*$\Delta\varepsilon_t^q$			-0.0348				-0.0414**	0.0993	-0.0310
			(0.0381)				(0.0193)	(0.0711)	(0.0224)
g(Sales)*$\Delta\varepsilon_t^q$				-0.1589			-0.1417	0.0333	-0.1571
				(0.1184)			(0.1139)	(0.1660)	(0.3105)
EBITDA/Equity*$\Delta\varepsilon_t^q$					-0.0684		-0.1216	0.0167	0.2019
					(0.1235)		(0.1795)	(0.2556)	(0.3399)
Cash/Asset*$\Delta\varepsilon_t^q$						0.0117	0.0177*	0.0153	0.0144
						(0.0080)	(0.0090)	(0.0151)	(0.0170)
$\mathbb{1}(Law_{st} = 1)$	-0.0101	-0.0082	-0.0101	-0.0095	-0.0100	-0.0103	-0.0062	-0.0112	-0.0309
	(0.0107)	(0.0097)	(0.0107)	(0.0100)	(0.0108)	(0.0099)	(0.0091)	(0.0221)	(0.0221)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	180,346	175,253	179,593	173,174	180,346	179,456	166,587	58,310	108,238
R^2	0.2982	0.3092	0.2989	0.2988	0.2981	0.3005	0.3153	0.3074	0.3479

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment while controlling for the interaction term of firm-specific characteristics and monetary policy surprises. Firm specific covariates are measured as values in the quarter prior to the enactment of the law for the treated firms and the values as on the fourth quarter of 1996 for the control firms. The dependent variable is the change in the natural logarithm of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st} = 1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Is it Really Monetary Policy or Other Macroeconomic Factors?

$\Delta logI_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	-0.0165***	-0.0163***	-0.0156***	-0.0168***	-0.0158***	-0.0161***	-0.0160***
	(0.0022)	(0.0032)	(0.0030)	(0.0023)	(0.0021)	(0.0026)	(0.0035)
$\mathbb{1}(Law_{st}=1)*\Delta gdp_t^q$		-0.0005				-0.0044	-0.0033
		(0.0049)				(0.0055)	(0.0062)
$\mathbb{1}(Law_{st}=1)*\Delta UR_t^q$			0.0031			-0.0053	-0.0031
			(0.0019)			(0.0037)	(0.0039)
$\mathbb{1}(Law_{st}=1)*\Delta CPI_t^q$				-0.0239***		-0.0319***	-0.0307***
				(0.0064)		(0.0045)	(0.0068)
$\mathbb{1}(Law_{st}=1)*\Delta EPU_t^q$					0.0117**	0.0163***	0.0157***
					(0.0050)	(0.0043)	(0.0050)
$\mathbb{1}(Law_{st}=1)$	-0.0063	-0.0062	-0.0072	-0.0139	-0.0074	-0.0162	-0.0179
	(0.0099)	(0.0102)	(0.0103)	(0.0105)	(0.0095)	(0.0115)	(0.0124)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls							Yes
# Obs	231,631	231,631	231,631	231,631	231,631	231,631	215,547
R^2	0.3048	0.3048	0.3048	0.3048	0.3048	0.3048	0.3201

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment while controlling for the interaction term of other macroeconomic characteristics with $\mathbb{1}(Law_{st}=1)$. The dependent variable is the change in the natural logarithm of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st}=1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. The vector of macroeconomic variables include change in gross domestic product, unemployment rate, consumer price index, and economic policy uncertainty index. Firm controls include firm-specific time varying covariates firm size, book leverage, average Tobin's Q, growth in sales, EBITDA to book equity ratio and cash to assets ratio. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table 7: Falsification Test

$\Delta log(I_{it})$	(1)	(2)
$\mathbb{1}(Pre - 2003_{st} = 1) * \Delta\varepsilon_t^q$	-0.0165***	-0.0167***
	(0.0022)	(0.0040)
$\mathbb{1}(Post - 2003_{st} = 1) * \Delta\varepsilon_t^q$	0.0365	0.0503
	(0.0455)	(0.0710)
$\mathbb{1}(Pre - 2003_{st} = 1)$	-0.0062	-0.0077
	(0.0097)	(0.0103)
$\mathbb{1}(Post - 2003_{st} = 1)$	-0.0064	-0.0077
	(0.0188)	(0.0242)
Firm FE	Yes	Yes
Industry-Qtr Year FE	Yes	Yes
Firm Controls		Yes
# Obs	231,631	215,547
R^2	0.3048	0.3200

This table presents the falsification test estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment. The dependent variable is the change in log of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Pre \quad 2003_{st} = 1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Pre \quad 2003_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\mathbb{1}(Post \quad 2003_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state that passed the law after 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. Firm controls include firm-specific time varying covariates firm size, book leverage, average Tobin's Q, growth in sales, EBITDA to book equity ratio and cash to assets ratio. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Using pure Monetary Policy Shocks

$\Delta log(I_{i,t})$	(1)	(2)	(3)
$\mathbb{1}(Law_{st}=1) * \Delta\varepsilon_t^q$	-0.0165***		
	(0.0022)		
$\mathbb{1}(Law_{st}=1) * BRW_t^q$		-0.0154*	
		(0.0085)	
$\mathbb{1}(Law_{st}=1) * JK_t^q$			-0.0061***
			(0.0008)
$\mathbb{1}(Law_{st}=1)$	-0.0063	0.0008	-0.0022
	(0.0099)	(0.0101)	(0.0104)
Firm FE	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes
# Obs	231,631	220,005	231,631
R^2	0.3048	0.3102	0.3048

This table presents the estimates of firm-level impact of anti-recharacterization laws and pure monetary policy surprises on change in firm investment. The dependent variable is the change in log of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st}=1)$ and the monetary policy shocks. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\eta_t^q$ denotes the quarterly monetary policy surprises. BRW denotes pure monetary policy shocks as calculated in Bu, Rogers and Wu (2019). JK denotes pure monetary policy shocks as in Jarocinski and Karadi (2018). The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of 1. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 9: Effect During the 2001 recession

$\Delta log(I_{it})$	(1)	(2)
$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$*Recession	0.0332**	0.0406**
	(0.0155)	(0.0146)
$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	-0.0128**	-0.0135*
	(0.0058)	(0.0064)
$\mathbb{1}(Law_{st}=1)$*Recession	0.1063***	0.1202***
	(0.0223)	(0.0173)
$\mathbb{1}(Law_{st}=1)$	-0.0090	-0.0104
	(0.0119)	(0.0109)
Firm FE	Yes	Yes
Industry-Qtr Year FE	Yes	Yes
Firm Controls		Yes
# Obs	231,631	215,547
R^2	0.3048	0.3200

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment. The dependent variable is the change in the natural logarithm of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st}=1)$, $\Delta\varepsilon_t^q$ and the recession of 2001. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. Recession takes a value of 1 for the period 2001:Q2 - 2001:Q4 and zero otherwise. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of 1. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Appendix A Empirical Appendix

This appendix describes the sample selection and the firm-level variables used in the empirical analysis of the paper, based on quarterly Compustat data.

A.1 Sample Selection

The sample comprises of all publically listed firms between January 1993 and December 2007. I exclude all firms not incorporated in the United States. The sample excludes all financial firms with SIC codes between 6000 and 6799 and all utilities firms with SIC codes between 4000 and 4999. I drop these firms because they are heavily regulated. I drop all firms with acquisitions larger than 5% of assets.

A.2 Variable Definition

- $Ln(I_{it})$: Investment, defined as the natural logarithm of capital expenditure (capexq)
- $\Delta Ln(I_{it})$: Change in investment, defined as the log differences in capexq between t and $t+1$
- $Ln(A_{it})$: Firm Size is defined as the natural logarithm of the total book value of assets (atq)
- $Debt/Assets$: Leverage, defined as the ratio of total debt (sum of dlcq and dlttq) to total assets (atq)
- Avg Q: Average Q, defined as the ratio of market to the book value of assets. The market value of assets is measured as the book value of assets (atq), plus the market value of common stock, minus the book value of common stock (ceq). The market value of common stock is calculated as the product of stock quarter closing stock price (prccq) and common shares outstanding at the end of the quarter (cshoq). The book value of assets is measured using atq.
- $g(Sales)$: Real sales growth, defined as the difference in the natural logarithm of sales (saleq) deflated using CPI

- $EBITDA/Equity$: Cash flow is measured as the ratio of EBITDA to the book value of equity

- $Cash/Asset$: Liquidity is defined as the ratio of cash and cash equivalents (cheq) to the book value of assets (atq)

- $\frac{I_{it}}{A_{i,t-1}}$: Investment to assets ratio is defined as the period t capital expenditure (capexq) scaled by period $t-1$ book value of assets (atq)

- $\Delta log(R\&D_{it})$: defined as the log difference in the research and development expenditure (xrdq)

- $\Delta log(PP\&E_{it})$ defined as the log difference in the property, plant and equipment (ppegtq)

- KZ Index: KZ Index denotes the synthetic KZ Index employed in Lamont, Polk and Saaá-Requejo (2001) based on estimates from Kaplan and Zingales (1997). It is computed as follows where K is PPE_{t-1}:

$$KZ-Index = -1.001909 * \frac{EBITDA}{K} + 0.2826389 * Q + 3.139193 * \frac{Debt}{K} - 39.3678 * \frac{Div}{K} - 1.314759 * \frac{Cash}{K}$$

- SA Index: SA Index denotes the Size-Age Index of Hadlock and Pierce (2010) and is calculated as follows:

$$SA-Index = -0.737 * Size + 0.043 * Size^2 - 0.040 * Age$$

- WW Index: WW Index denotes the structural index of Whited and Wu (2006) and is calculated as follows:

$$WW-Index = -0.091 * \frac{CF}{A} - 0.062 * DIV + 0.021 * \frac{LTDebt}{Asset} - 0.044 * Size + 0.102 * Ind - g(Sales) - 0.035 * g(Sales)$$

A.3 Timeline of the enactment of the Law

Table A.1: Changes in the Law

State	Year
Texas	1997
Louisiana	1997
Alabama	2001
Delaware	2002
South Dakota	2003
Virginia	2004
Nevada	2005
Reaves v. Sunbelt	2003

Appendix B Measures of Monetary Policy

B.1 Variable Definition

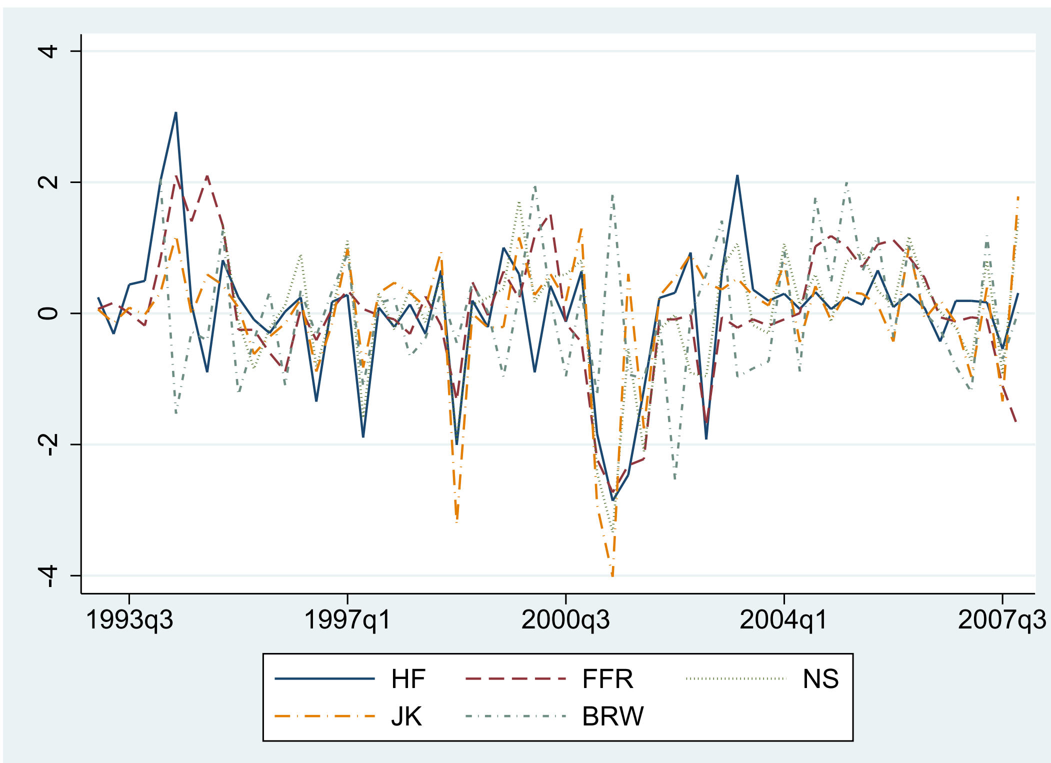
- **Q-o-Q change in FFR (FFR)**: FFR is calculated as the difference in effective Federal Funds rate at the end and the start of the quarter.
- **Bernanke-Kuttner Shock (Tight) (HF-Tight)**: See section 4.1.1.
- **Bernanke-Kuttner Shock (Tight) (HF-Wide)**: See section 4.1.1.
- **Nakamura-Steinsson Shock (NS)**: I directly use the data provided by Nakamura and Steinsson (2018*a*). Here, I describe the construction of policy news shock or the Nakamura-Steinsson Shock (NS). NS is the first principal component of the unanticipated change over the 30-minute window in the following five interest rates: the Fed Funds rate immediately following the FOMC meeting, the expected Fed Funds rate immediately following the next FOMC meeting, and expected three-month Euro-Dollar interest rates at horizons of two, three, and four quarters. Data on Fed Funds futures and Euro-Dollar futures measures changes in market expectations about future interest rates at the time of FOMC announcements. The variable is scaled such that its effect on the one-year nominal Treasury yield is equal to one. I direct the readers to the online appendix A of Nakamura and Steinsson (2018*a*) for details of the construction of this measure.
- **Jarocinski and Karadi Shock (JK)**: Jarocinski and Karadi (2018) exploit the negative and positive co-movement between interest rates and stock prices to dientangle the monetary policy component from the information effect component.
- **Bu, Rogers and Wu Shock (BRW)**: Bu, Rogers and Wu (2019) employ a heteroscedasticity based partial least squares approach combined with Fama-MacBeth regressions to extract pure monetary policy component devoid of Fed information effect from monetary policy shocks. Their approach is based on the identification assumption similar to Rigobon and Sack (2003) that the institutional compnent of monetary shocks (information effect) is homoskedastic.

Table B.1: Correlation between different measures of Monetary Policy Shocks

	HF	FFR	NS	JK	BRW
HF	1.000				
FFR	0.600	1.000			
NS	0.761	0.624	1.000		
JK	0.623	0.492	0.847	1.000	
BRW	0.036	0.220	0.288	0.127	1.000

The table reports the correlation coefficient between the five quarterly measures of monetary policy shocks employed in the study between 1993 and 2007. HF denotes the tight window shocks respectively computed as in Bernanke and Kuttner (2005). FFR denotes quarter on quarter change in Federal Funds rate. NS denotes monetary policy path computed as in Nakamura and Steinsson (2018*a*). JK and BRW denote pure monetary policy shocks after removing fed information effect as in Jarocinski and Karadi (2018) and Bu, Rogers and Wu (2019) respectively.

Figure B.1: Time-series plot of Monetary Policy Shocks



The figure plots the quarterly time-series variation in monetary policy shocks between 1993 and 2007. HF denotes the tight window shocks respectively computed as in Bernanke and Kuttner (2005). FFR denotes quarter on quarter change in Federal Funds rate. NS denotes monetary policy path computed as in Nakamura and Steinsson (2018*a*). JK and BRW denote pure monetary policy shocks after removing fed information effect as in Jarocinski and Karadi (2018) and Bu, Rogers and Wu (2019) respectively.

Appendix C Test for Omitted Variable Bias

In this section I provide details of the Oster (2019) test and the calculation of the identified set. Oster (2019) is a modified version of Altonji, Elder and Taber (2005). Let the true model be given by:

$$Y = \beta X + \gamma W_1 + \delta W_2 + \epsilon, R^2_{max} \tag{C.1}$$

In the above model I am interested in capturing the effect of X on Y. So the parameter of interest is β. W_1 and W_2 denote vector of observable and unobservable covariates respectively. Given that we cannot control for W_2 the estimate of β from the regression of X on Y while controlling for W_1 will be plagued by omitted variable bias if $\mathbb{E}(X, W_2) \neq 0$. Oster (2019) suggestes estimating the following two regressions:

- Model 1: $Y = \bar{\beta}X + \bar{\varepsilon}$, $\bar{R}^2$.
- Model 2: $Y = \tilde{\beta}X + \tilde{\psi}W_1 + \tilde{\varepsilon}$, $\tilde{R}^2$.

$\bar{R}^2$ and $\tilde{R}^2$ denotes the model R^2 for model 1 and 2 respectively. Using the parameters in model 1 and 2 and the R^2 for model 1, 2 and the true model we can estimate a new parameter β^*. Under the assumption that the relative strength of observable is equal to that of unobservables, β^* is given by the following equation and $\beta^* \xrightarrow{p} \beta$.

$$\beta^* = \tilde{\beta} - \left(\bar{\beta} - \tilde{\beta}\right) \frac{R^2_{max} - \tilde{R}^2}{\tilde{R}^2 - \bar{R}^2}$$

Here, R^2_{max} is the maximum R^2 that the true model can have. We have $R_{max} \equiv \min\left\{\theta \tilde{R}^2, 1\right\}$ with $\theta > 1$. Oster (2019) suggests a value of 2.2 for the value of θ. Then we define the identified set $\Omega = [\beta^*, \tilde{\beta}]$, if $0 \notin \Omega$, we reject the null that effect of X on Y is driven by omitted variables.

Appendix D Robustness of Baseline Results

This section reports results for the robustness of baseline results reported in table 3 and 4.

Table D.1: Controlling for Time-Varying Firm Characteristics

$\Delta log I_{i,t}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	-0.0165***	-0.0157***	-0.0166***	-0.0168***	-0.0177***	-0.0157***	-0.0151***	-0.0165***
	(0.0022)	(0.0020)	(0.0028)	(0.0020)	(0.0030)	(0.0025)	(0.0027)	(0.0041)
Ln(Asset)*$\Delta\varepsilon_t^q$		-0.0080						-0.0076
		(0.0061)						(0.0061)
Ln(Asset)		0.0517***						0.0696***
		(0.0104)						(0.0118)
Debt/Asset*$\Delta\varepsilon_t^q$			0.0005					0.0006
			(0.0035)					(0.0041)
Debt/Asset			-0.0438***					-0.0341***
			(0.0046)					(0.0039)
Avg Q*$\Delta\varepsilon_t^q$				-0.0009				-0.0034
				(0.0016)				(0.0025)
Avg Q				0.0469***				0.0398***
				(0.0042)				(0.0044)
g(Sales)*$\Delta\varepsilon_t^q$					0.0051			0.0056
					(0.0034)			(0.0036)
g(Sales)					0.1016***			0.0964***
					(0.0075)			(0.0074)
EBITDA/Equity*$\Delta\varepsilon_t^q$						-0.0008		-0.0026
						(0.0029)		(0.0048)
EBITDA/Equity						0.0679***		0.0529***
						(0.0062)		(0.0043)
Cash/Asset*$\Delta\varepsilon_t^q$							0.0024	0.0042**
							(0.0017)	(0.0016)
Cash/Asset							0.0069***	0.0028*
							(0.0016)	(0.0016)
$\mathbb{1}(Law_{st}=1)$	-0.0063	-0.0067	-0.0063	-0.0060	-0.0079	-0.0072	-0.0052	-0.0078
	(0.0099)	(0.0100)	(0.0106)	(0.0100)	(0.0104)	(0.0099)	(0.0101)	(0.0105)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	231,631	231,620	223,690	230,038	226,389	231,501	229,449	215,547
R^2	0.3048	0.3050	0.3089	0.3057	0.3148	0.3057	0.3052	0.3201

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment while controlling for the interaction term of firm-specific time-varying characteristics and monetary policy surprises. The dependent variable is the change in the natural logarithm of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st}=1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p<0.1$, ** $p<0.05$, *** $p<0.01$.

Table D.2: Alternative Measure of Firm Investment

	(1) $\Delta log I_{it}$	(2) $\frac{I_{i,t}}{A_{i,t-1}}$	(3) $\Delta log(R\&D_{it})$	(4) $\Delta log(PP\&E_{it})$
$\mathbb{1}(Law_{st}=1) * \Delta\varepsilon_t^q$	-0.0167***	-0.0225**	-0.0387***	-0.0144**
	(0.0039)	(0.0095)	(0.0093)	(0.0064)
$\mathbb{1}(Law_{st}=1)$	-0.0077	-0.0125	-0.0176	0.0009
	(0.0104)	(0.0142)	(0.0243)	(0.0064)
Firm FE	Yes	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
# Obs	215,547	220,256	84,132	226,604
R^2	0.3200	0.5181	0.1058	0.2197

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment. The dependent variable is $\Delta log I_{it}$ in column 1, $\frac{I_{i,t}}{A_{i,t-1}}$ in column 2, $\Delta log(R\&D_{it})$ in column 3 and $\Delta log(PP\&E_{it})$ in column 4. The main independent variable is the interaction term of $\mathbb{1}(Law_{st}=1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. Firm controls include firm-specific time varying covariates firm size, book leverage, average Tobin's Q, growth in sales, EBITDA to book equity ratio and cash to assets ratio. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table D.3: Alternative Measures of Monetary Policy Shocks

$\Delta log(I_{i,t})$	(1) OLS	(2) OLS	(3) 2SLS	(4) OLS	(5) OLS	(6) OLS
$\mathbb{1}(Law_{st} = 1)$*Wide	-0.0165***					
	(0.0023)					
$\mathbb{1}(Law_{st} = 1) * \Delta FFR_t^q$		-0.0248***	-0.0271***			
		(0.0036)	(0.0057)			
$\mathbb{1}(Law_{st} = 1)$*NS				-0.0146***		
				(0.0015)		
$\mathbb{1}(Law_{st} = 1)$*Sum					-0.0134***	
					(0.0002)	
$\mathbb{1}(Law_{st} = 1)$*Wt Avg						-0.0115***
						(0.0013)
$\mathbb{1}(Law_{st} = 1)$	-0.0065	-0.0104	-0.0112	-0.0034	-0.0050	-0.0042
	(0.0100)	(0.0110)	(0.0100)	(0.0109)	(0.0102)	(0.0104)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Qtr Year FE	Yes	Yes	Yes	Yes	Yes	Yes
# Obs	231,631	231,631	231,631	203,250	231,631	231,631
R^2	0.3048	0.3048	0.0000	0.3166	0.3048	0.3048

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment for alternative measures of monetary policy shocks. The dependent variable is the change in log of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st} = 1)$ and different measures of monetary policy shock. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. Wide denotes the quarterly average of monetary policy surprise measures in the wide window. ΔFFR_t^q denotes the quarterly change in effective fed funds rate. NS denotes the quarterly monetary policy shocks as calculated in Nakamura and Steinsson (2018a) and are available only since 1995. The shocks used in column (5) are simple sum of all tight window shocks during the quarter, and the shocks used in column (6) are a weighted average of tight window shocks during the quarter. Column 1, 2, 4, 5 and 6 are estimated via OLS. column 3 is estimated via 2SLS. The instrument used for $\mathbb{1}(Law_{st} = 1)$ ΔFFR_t^q in column 3 is the interaction term of the law and the tight window monetary policy surprise $\mathbb{1}(Law_{st} = 1)$ $\Delta \varepsilon_t^q$. The model R^2 between the two is 48% making the instrument relevant. The Kleibergen-Paap rank Wald F statistic for the weak identification test is 38.737. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table D.4: Robustness to Entry and Exit of Firms

$\Delta log(I_{i,t})$	(1)	(2)
$\mathbb{1}(Law_{st} = 1) * \Delta\varepsilon_t^q$	-0.0289***	-0.0367***
	(0.0105)	(0.0103)
$\mathbb{1}(Law_{st} = 1)$	-0.0235	-0.0198
	(0.0247)	(0.0258)
Firm FE	Yes	Yes
Industry-Qtr Year FE	Yes	Yes
Firm Controls		Yes
# Obs	72,028	67,362
R^2	0.3325	0.3502

This table presents the estimates of firm-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment while controlling for the entry and exit of firms. The dependent variable is the change in log of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st} = 1)$ and $\Delta\varepsilon_t^q$. $\mathbb{1}(Law_{st} = 1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. Firm specific controls include natural logarithm of assets, debt to assets ratio, average Q, growth in sales, EBITDA to equity ratio and cash to assets ratio. The unit of observation in each regression is a firm-quarter-year pair. The sample comprises of a balanced panel of firms since 1993. All variables are standardized to mean zero and standard devation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table D.5: Industry Specific Results

$\Delta log(I_{i,t})$	(1)	(2)	(3)
Manufacturing*$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	-0.0210***	-0.0239***	-0.0201***
	(0.0046)	(0.0039)	(0.0048)
Mining*$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	-0.0506**	-0.0430**	-0.0511**
	(0.0192)	(0.0187)	(0.0199)
Construction*$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	0.0060	0.0108	0.0107
	(0.0238)	(0.0244)	(0.0268)
Retail-Trade*$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	0.0039	0.0054	0.0113
	(0.0082)	(0.0080)	(0.0118)
Service*$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	-0.0054	-0.0053	-0.0112
	(0.0045)	(0.0045)	(0.0069)
Wholesale-Trade*$\mathbb{1}(Law_{st}=1)*\Delta\varepsilon_t^q$	0.0069	0.0117*	0.0101*
	(0.0073)	(0.0065)	(0.0057)
Industry-Qtr-Year FE	Yes	Yes	Yes
Firm FE		Yes	Yes
Firm Controls			Yes
# Obs	229,670	229,524	214,066
R^2	0.2188	0.2269	0.2397

This table presents the estimates of industry-level impact of anti-recharacterization laws and monetary policy surprises on change in firm investment. I run the following specification:

$$\Delta log(I_{it}) = \sum_{j\in J}\beta_j Industry_j \quad \mathbb{1}(Law_{st}=1) \quad \Delta\varepsilon_t^q + \beta_1\mathbb{1}(Law_{st}=1) + \alpha_i + \theta_{jt} + \nu_{it}$$

The dependent variable is the change in log of capital expenditure. The main independent variable is the interaction term of $\mathbb{1}(Law_{st}=1)$ and $\Delta\varepsilon_t^q$ with the industry dummies. $\mathbb{1}(Law_{st}=1)$ is an indicator variable that equals one if a firm is incorporated in a treated state between 1997 and 2003. $\Delta\varepsilon_t^q$ denotes the quarterly monetary policy surprise. $Industry_j$ are defined based on 2 digit SIC codes. Firm controls include firm-specific time varying covariates firm size, book leverage, average Tobin's Q, growth in sales, EBITDA to book equity ratio and cash to assets ratio. The unit of observation in each regression is a firm-quarter-year pair. All variables are standardized to mean zero and standard deviation of one. Standard errors reported in parentheses are double clustered at state and quarter-year level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.