Leasing as a Corporate Risk Management Mechanism *

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Abstract

This paper highlights leasing as a key corporate risk management mechanism for hedging capital valuation risks, extending beyond its traditional financing role. Financially constrained firms often face a trade-off between financing and hedging due to collateral competition, a challenge known as the "corporate risk management paradox" (Rampini and Viswanathan, 2010, 2013). Leasing contracts, where the lessor serves as both creditor and insurance provider, offer a more collateral-efficient hedging solution—an aspect previously overlooked in the literature. We develop a dynamic agency-based model to explore leasing's dual role in financing and hedging. Using the staggered implementation of U.S. anti-recharacterization laws as a quasi-natural experiment, our empirical findings show that firms with greater capital value volatility—and thus stronger hedging needs—are more likely to lease, even when financing conditions improve. This evidence strongly supports our theoretical framework.

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"And if a man borrows anything from his neighbor, and it becomes injured or dies, the owner of it not being with it, he shall surely make it good. But if its owner was with it, he shall not make it good; if it was hired, it came for its hire."
– Exodus 22:14–15 (NKJV)

1 Introduction

Lease contracts play a pivotal role in capital markets and are increasingly recognized as a key component of capital structure, as highlighted by seminal studies from Eisfeldt and Rampini (2009), Rauh and Sufi (2012), Rampini and Viswanathan (2013), and others.[1]

While much of the existing literature focuses on the financing advantages of leasing, industry insights suggest a complementary motive: risk management. For instance, a 2019 report by the International Air Transport Association (IATA) notes: *"Airlines choose to lease to avoid the full brunt of asset depreciation, especially in times of economic uncertainty, when the residual value of planes can be unpredictable."* A senior airline executive echoes this rationale, stating: *"Leasing helps us avoid tying up huge capital in assets that might depreciate unpredictably. It gives us the ability to adjust fleet size without bearing the risk of owning depreciating assets."* These examples point to a central insight: leasing allows firms to transfer asset valuation risk to the lessor, functioning as a form of capital risk hedging.

Building on this perspective, our paper highlights the role of leasing as a highly collateralizable risk management mechanism. Traditional instruments like derivatives are often inaccessible or costly for financially constrained firms due to collateral requirements. Leasing, by expanding the contract space available to firms and addressing agency frictions such as limited commitment, offers a compelling alternative. Our findings broaden the understanding of corporate hedging strategies by highlighting the underappreciated role of leasing in risk management, offering a complementary solution to the corporate risk management puzzle discussed by Rampini and Viswanathan (2010, 2013).

Theoretically, we develop a dynamic agency-based model to illustrate the dual benefits

[1] Additional significant contributions include works by Ang and Peterson (1984), Smith Jr and Wakeman (1985), Sharpe and Nguyen (1995), and Graham et al. (1998).

of leasing as both a collateralizable financing option and a hedging instrument. We demonstrate that leasing functions as a combination of collateralized borrowing and a short position in a futures contract that hedges against capital value fluctuations. Our model predicts that firms facing higher capital value volatility are more likely to use leasing as a risk management mechanism.

Our empirical analysis confirms that firms with greater capital value volatility are more likely to lease, particularly when financially constrained. To distinguish between the financing and hedging motives, we exploit the staggered implementation of anti-recharacterization laws across U.S. states as quasi-natural experiments, examining how these laws impact corporate leasing behavior. Our results show that firms with high capital value fluctuations, driven by their hedging motives, are less likely to reduce leasing even when favorable financing conditions arise, aligning with our model predictions.

Firms, due to financial constraints, are inherently risk-averse (Froot et al., 1993). However, empirical studies such as those by Nance et al. (1993), Géczy et al. (1997), and Rampini et al. (2014) have observed that financially constrained firms engage less in hedging through derivative markets, particularly when the need for risk management is strong—a phenomenon known as "the corporate risk management paradox". Rampini and Viswanathan (2010, 2013) offer a theoretical explanation: collateral is required for both financing and risk management through derivative markets, leading financially constrained firms to prioritize operational funding over hedging activities. We propose that financially constrained firms, rather than forgoing risk management altogether, switch to leasing as a means of managing risk. Leasing serves a dual purpose: it not only mitigates financial constraints but also acts as a risk hedge to protect firm value.

A significant part of this risk is tied to capital value, which typically represents a substantial portion of a firm's total assets. Managers frequently adopt strategies to protect the firm from potential losses related to their capital. For instance, firms commonly purchase insurance to safeguard against physical damage to their capital assets, such as losses from natural disasters. Beyond physical threats, capital value is also vulnerable to market fluctuations, which can significantly impact a firm's financial health. As a result, managers are compelled to develop methods to shield the firm from potential losses due to these fluctuations.

However, there appears to be a gap in the literature regarding risk management in terms of capital value[2]. The absence of discussions on hedging capital prices can be partly explained by the lack of derivatives specifically designed for this purpose, as the heterogeneity and asset specificity of capital complicate the development of standardized hedging instruments. In response, firms may turn to indirect hedging strategies using financial derivatives that correlate with their capital assets, but these methods are often costly and imperfect. Furthermore, derivative hedging requires collateral or margin to mitigate counterparty risks, which can be especially burdensome for financially constrained firms.

Leasing offers an alternative approach to hedging against capital price fluctuations. In the structure of a typical operating lease contract, the asset's owner (the lessor) grants the right to use the capital exclusively to a borrower (the lessee) for a specified period in exchange for periodic payments. Crucially, the ownership of the capital remains with the lessor throughout the contract, meaning it is the lessor who bears the risk of any fluctuations in the capital's value during the lease term. This arrangement leads to our central insight: the leasing contract essentially provides a hedge for the lessee against capital price risks.

From a risk management standpoint, the lessee is essentially paying a premium to secure a futures contract (in a short position) from the lessor. This contract allows the lessee to return the capital at its current price when the lease expires, thereby achieving full protection against capital price risks. Furthermore, since capital value often correlates with a firm's input costs, productivity, and inventory prices, leasing also serves as an indirect hedge against variations in profit margins.

A notable advantage of leasing is that it doesn't require firms to post additional collateral, making it a more cost-effective option for financially constrained firms. The core reason behind this is leasing's inherent repossession advantage – ownership of the

[2]The literature on corporate risk management is extensive, predominantly focusing on commodities, interest rates, and foreign exchange rates. An incomplete list of studies in this field includes Allayannis and Weston (2001), Allayannis et al. (2001), Guay and Kothari (2003), Gleason et al. (2005), Carter et al. (2006), Jin and Jorion (2006), Clark and Judge (2009), Chod et al. (2010), Allayannis et al. (2012), Choi et al. (2013), and Almeida et al. (2017).

asset remains with the lessor, addressing the limited commitment issue. From a broader perspective, the lessor acts as both a financier and an insurance provider, which eliminates the need for double collateral and enhances efficiency. Additionally, leasing helps overcome the asset-specific valuation challenges that complicate derivative markets, providing a direct hedge against capital value risks.

This paper underscores the significance of the hedging motive in the lease versus buy decision. We present a dynamic agency-based model in which firms choose between purchasing and leasing assets, and firms can also borrow and hedging with collateral constraints. We demonstrate that leasing is equivalent to a purchased capital with collateralized borrowing plus a short position in a future contract that hedges against capital value fluctuation. In our model, we conduct counterfactual analysis and comparative statics to isolate each channel—financing and hedging—to highlight their individual importance. Notably, leasing's hedging function becomes increasingly crucial as firms face financial constraints and derivative hedging turns costly. This shifts the firm's risk management strategy from derivatives to leasing, allowing for significant risk mitigation even under constraints. Our findings complement the current literature by highlighting the often-overlooked hedging role of leasing, which contrasts with the prevailing view that financially constrained firms do not engage in hedging. This perspective offers a more nuanced understanding of how firms manage risk, particularly when traditional hedging methods like derivatives are less accessible or too costly.

Our model predicts that firms facing higher capital value volatility are more likely to use leasing. We test this hypothesis by analyzing firms across various industries and find that those in high-volatility sectors indeed have a higher leased capital ratio. To further distinguish the hedging motive from the financing motive, we exploit the staggered implementation of anti-recharacterization laws across U.S. states as a quasi-natural experiment. These laws enhance collateral pledgeability, making collateralized borrowing more attractive, which primarily influences the financing motive while leaving the hedging motive largely unaffected. Using a standard staggered difference-in-differences (DID) approach, we show that firms in high-volatility industries maintain their reliance on leasing even when favorable financing conditions arise. This behavior highlights the strong hedging needs of these firms, reinforcing leasing as a preferred strategy for managing capital risk. In order to mitigate potential bias in estimates due to the staggered nature of policy shocks, we follow the recent development by De Chaisemartin and d'Haultfoeuille (2020, 2023, 2024), and conduct a heterogeneity-robust staggered difference-in-differences (DID) approach to confirm our results are robust.

Related Literature

Our paper is closely related to the literature on financial constraints and corporate risk management. The classical theory articulated by Froot et al. (1993) predicts that financially distressed firms have a heightened incentive to hedge due to their inherent risk aversion. This theoretical proposition has been the cornerstone of subsequent empirical investigations into corporate risk management behavior. However, empirical studies such as those by Nance et al. (1993) and Géczy et al. (1997) have observed a counter-intuitive pattern: larger firms, which are presumably less financially constrained, engage more in derivative hedging than smaller ones.

Holmström and Tirole (2000) and Mello and Parsons (2000) lay the initial groundwork by suggesting that financial constraints may lead firms to opt out of full insurance against risks, indicating that incomplete risk management can be a rational choice. Advancing this line of thought, Rampini and Viswanathan (2010, 2013) provide a theoretical framework that sheds light on the opportunity costs associated with hedging under financial constraints. Their theory suggests that when financing and risk management compete for the same scarce collateral, financially constrained firms hedge less, as the opportunity cost of hedging is higher for them. This theory has been substantiated by Rampini et al. (2014), in which they provide empirical evidence within the specific context of fuel price hedging by U.S. airlines, thereby enriching our understanding of hedging behaviors in financially constrained environments.

Our research complements the work of Rampini and Viswanathan (2010, 2013) by exploring the role of leasing as a hedge to capital value risk. We posit that leasing, with its lesser collateral demands compared to derivatives, offers a more accessible form of hedging for firms with limited financial resource. Our empirical analysis supports this, showing that firms tend to rely more on leasing when facing higher capital value volatility and reduce their use of leasing to a lesser extent when other financing options become more attractive. This evidence suggests that the incentive to hedge against capital value fluctuations is a key factor influencing leasing decisions. From the empirical side, Fairhurst and Nam (2023) leverage anti-recharacterization laws to directly test the trade-off theory between financing and hedging proposed by Rampini and Viswanathan (2010, 2013). They find that an exogenous increase in collateral value mitigates this trade-off, leading firms to increase their use of derivative hedging, including commodity, foreign exchange, and interest rate hedging. Our paper differs from theirs in several key ways. While their focus is on traditional derivative hedging, our theory advocates for a broader definition of corporate risk management—one that includes leasing as a hedging tool beyond derivatives. Additionally, our empirical focus is on disentangling the financing and hedging motives behind leasing, providing direct evidence of leasing's role as a hedging instrument. By doing so, our paper significantly expands the interpretation and understanding of the traditional risk management paradox.

Additionally, our research contributes to the corporate finance literature that emphasizes the importance of asset collateralizability for firms' capital structure decisions. Albuquerque and Hopenhayn (2004) explore the dynamics of financing under limited commitment. Nikolov et al. (2021) study the implications of various financial frictions, including collateral constraints, on firms' financing choices. Furthermore, Falato et al. (2022) provide empirical evidence linking asset collateralizability with leverage, both in aggregate time series and across different sectors. While prior research focuses primarily on collateralized financing, our paper highlights the collateral advantages of leasing, positioning it as both a financing and hedging tool.

Our study also aligns closely with theories on corporate decisions to lease, particularly drawing upon the foundational work of Eisfeldt and Rampini (2009) and Rampini and Viswanathan (2010, 2013). These studies lay the groundwork for understanding the impact of collateral constraints on a firm's dynamic decision to lease or buy. Additionally, Hu et al. (2020) examine the broader implications of the lease versus buy decision on capital misallocation and the real economy. Li and Tsou (2019) argue that leasing is a risk-sharing mechanism and provide empirical evidence to support the risk premium channel from the cross-section of stock returns. Finally, Binfare et al. (2020) investigate how firms determine discount rates for valuing leased assets. Unlike previous studies that focus on leasing's financing role, our paper diverges by investigating its implications on corporate risk management, thus contributing a unique perspective to this field of study.

The remainder of the paper is structured as follows. Section 2 presents a dynamic agency-based model, decomposing leasing into its financing and hedging components. Section 3 conducts counterfactual analysis and comparative statics to demonstrate the significance of risk management incentives in determining leasing decisions. Section 4 provides empirical evidence supporting the model's predictions. Section 5 concludes.

2 Model Setup

We use this section to provide a dynamic agency-based model to understand the vital role that leased capital plays with respect to firms' risk management. We study an environment in which firms choose between purchasing and renting assets, and firms can also borrow and hedging with collateral constraints. We explicitly decompose the benefit of leasing into cheap financing and hedging. We show that leasing act as a substitute for hedging in derivative market, and the hedging benefit is an important determinant of the firm's lease vs. buy decision.

2.1 Firm's Problem

In our model, we consider a risk neutral firm which is subject to limited liability and maximizes its discounted dividends stream at rate $\beta \in (0, 1)$. We write the firm's infinite horizon problem recursively. The firm starts period t with net worth w_t and chooses dividends, d_t, purchase of capital, $k_{o,t}$, leasing, $k_{l,t}$, financing, b_t, and hedging, h_t, to maximize its firm value:

$$V_t = \max_{d_t, k_t, k_{l,t}, b_t, h_t} d_t + \beta E_t \left(V_{t+1} \right). \tag{1}$$

The firm is endowed with a standard neoclassical production function with decreasing returns to scale. An amount of invested capital k_t will generate a stochastic cash flow of $f_{t+1}(k_t) = A_{t+1}k_t^{\alpha}$ next period, in which A_{t+1} is the total productivity factor and α is the capital share.

The firm can either purchase or lease capital. Purchased capital and leased capital are denoted by $k_{o,t}$ and $k_{l,t}$, respectively. These are perfect substitutes, so total capital is represented as $k_t = k_{o,t} + k_{l,t}$. To capture uncertainty in capital value, we introduce a capital "quality shock," which reflects risks to the firm's future capital stock and motivates the need for hedging. If the firm chooses to purchase capital, it must pay a capital price of one in the current period and will receive the resale value, $(1-\delta)\xi_{t+1}$, in the next period, where δ is the depreciation rate and ξ_{t+1} represents a mean-one capital "quality shock" that randomly transforms one unit of capital at time t into ξ_{t+1} units at time $t+1$. There are no adjustment costs. If the firm chooses to lease, it must pay a leasing fee $\vartheta_{l,t}$ per unit of capital in the current period and a monitoring cost m in the next period. The purchase of capital can be partially financed through collateralized borrowing in a state non-contingent manner. If the firm borrows b_t, it must repay Rb_t in the next period, where R is the gross interest rate.

There is also a futures market for quality shocks. Let h_t represent the number of short positions the firm takes in futures contracts. A short position in one futures contract does not generate any cash inflow or outflow in the current period but will yield $(1-\delta)(1-\xi_{t+1})$ as a payoff in the next period. Since the resale value of capital at time $t+1$ is $(1-\delta)\xi_{t+1}$, one short position in the futures market hedges the capital value risk of one unit of purchased capital. Hedging in the futures market incurs no direct cost, as both the cash flow at time t and the expected cash flow at time $t+1$ are zero. Importantly, futures contracts require firms to post collateral, a factor that we will discuss in detail as part of the firm's collateral constraint.

The firm's budget constraint at time t and the evolution of its net worth are as follows:

$$w_t + b_t \geq d_t + k_{o,t} + \vartheta_{l,t}k_{l,t}, \tag{2}$$

$$f_{t+1}(k_t) + (1-\delta)\xi_{t+1}k_{o,t} - mk_{l,t} + h_t(1-\delta)\left(1-\xi_{t+1}\right) \geq w_{t+1} + Rb_t. \tag{3}$$

Equation (2) represents the firm's budget constraint at time t, where the firm's available resources, including net worth w_t and borrowing b_t, must be sufficient to cover dividends d_t, the cost of purchasing capital $k_{o,t}$, and the leasing expense $\vartheta_{l,t}k_{l,t}$. Equation (3) describes the evolution of the firm's net worth. It accounts for the cash flow generated by production, $f_{t+1}(k_t)$, the resale value of owned capital, $(1-\delta)\xi_{t+1}k_{o,t}$, the monitoring cost of leased capital, $mk_{l,t}$, and the payoff from hedging, $h_t(1-\delta)(1-\xi_{t+1})$. These must collectively cover the firm's debt repayment Rb_t in the next period, with any remaining funds contributing to net worth w_{t+1}.

The Collateral Constraint. The central friction in this economy arises from the collateral constraint faced by firms. Firms can borrow subject to the well-known Kiyotaki and Moore (1997) collateral constraints. Additionally, derivative markets impose significant collateral requirements due to counterparty risk, consistent with Rampini and Viswanathan (2013) and the standard practice of margin requirement of derivative hedging. Firms engaged in hedging through futures or other derivatives must post margin or collateral to protect counterparties from potential default, ensuring that obligations are met. In the real economy, financially constrained firms often face a trade-off: they must choose whether to use their collateral to secure borrowing for new investments or to allocate it for hedging activities.

To capture this dynamic, we model the firm's collateral constraint as follows[3]:

$$\underbrace{b_t \leq \theta_b R^{-1}(1-\delta)k_{t,o}}_{\text{Standard Borrowing Constraint}} \quad \underbrace{-\theta_h R^{-1}(1-\delta)h_t.}_{\text{Collateral Requirement for Hedging}} \tag{4}$$

The first part of Equation (4) represents a standard borrowing constraint, where the firm can issue one-period debt up to a fraction $\theta_b \in (0,1)$ of the expected resale value of its owned capital. The second term highlights that hedging via derivatives also consumes collateral, consistent with Rampini and Viswanathan (2013). Specifically, θ_h governs the collateral requirement for derivative hedging: firms must deposit $\theta_h R^{-1}(1-\delta)$ in a risk-free account (i.e., negative b_t) to engage in one unit of futures hedging, which reduces their

[3]Since firms in equilibrium do not speculate on capital prices (i.e., they do not take long positions in futures contracts), we assume without loss of generality that $h_t \geq 0$.

available liquidity. Moreover, Equation (4) shows that borrowing and hedging compete for collateral: if the firm chooses to use owned capital as collateral, it must post θ_b/θ_h units of its owned capital for each unit of futures hedging, effectively reducing its borrowing capacity by $\theta_h R^{-1}(1-\delta)$. As a result, hedging with futures contracts ties up collateral that could otherwise be used for financing investments, making it a costly option for financially constrained firms.

2.2 Lessor's Problem

A competitive lessor maximizes profits taking the equilibrium leasing fee $\vartheta_{l,t}$ as given. To provide an amount of capital $k_{l,t}$ to the lessee, the lessor needs to purchase that amount of capital at unit price at time t. Since there is no deadweight cost when the lessor repossesses the capital, we can assume that all leased capital is repossessed, and the lessor will be able to sell $(1-\delta)\xi_{t+1}k_{l,t}$ amount of capital at time $t+1$. We further assume that the lessor must pay a monitoring cost m at time $t+1$ to make sure the lessee takes good care of leased capital. This is consistent with the agency problem due to the separation of ownership and control rights, which can be traced back to Alchian and Demsetz (1972), and is highlighted in Eisfeldt and Rampini (2009) and Rampini and Viswanathan (2013). In equilibrium, this cost is covered by the lessee.

The lessor discounts cash flows at a rate R, and faces an optimization problem characterized as follows:

$$\max_{\{k_{l,j}\}_{j=t}^{\infty}} E_t \sum_{j=t}^{\infty} R^{j-t} \left[\vartheta_{l,t}k_{l,t} - k_{l,t} + R^{-1}(1-\delta)\xi_{t+1}k_{l,t}\right] \tag{5}$$

The first-order condition implies that $\vartheta_{l,t} = R^{-1}(R-1+\delta)$ and the lessor makes zero profits in equilibrium.

It is important to note that, because lessors are assumed not subject to financial constraints in our model, they are effectively risk-neutral and possess a greater risk-bearing capacity than lessees, who are endogenously risk-averse due to their financial constraints. Li and Tsou (2019) provide supporting evidence that lessors are generally capital-rich and less financially constrained, which reinforces our modeling assumptions in this context.

2.3 Decomposing Leasing

As highlighted in Rampini and Viswanathan (2013), leasing can be viewed as a more collateralizable way of financing. Our paper show that, in addition to the advantage of cheap financing, leasing also serve as a more collateralizable way of hedging, which is a very important risk management tool for financially constrained firms. The key intuition behind this lies in the repossession advantage of leasing, which resolves both agency problems and asset-specificity concerns. Since the lessor retains ownership of the asset, the risk of capital value fluctuations is effectively transferred to the lessor. This reduces the need for collateral from the lessee, as the lessor, acting as both financier and insurer, ensures that the asset can be redeployed if necessary. As a result, leasing provides a direct hedge against capital price risks while requiring less collateral than traditional financing and derivative hedging combined.

Specifically, we show that the cash flows of leasing one unit of capital are equivalent to (1) purchasing one unit of capital with price, (2) borrowing $R^{-1}(1-\delta)$ amount of non-contingent debt, (3) hedging with a short position in one future contract, and (4) paying m amount of monitoring cost next period. This decomposition is summarized in Table 1, which illustrates the equivalence between leasing and this combination of activities.

[Place Table 1 here]

Let $B_t = b_t + R^{-1}(1-\delta)k_{l,t}$ represent total borrowing, which includes both direct debt issuance and indirect borrowing through leasing. The firm's budget and collateral constraints can then be rewritten as follows:

$$w_t + B_t \geq d_t + k_t, \tag{6}$$

$$f_{t+1}(k_t) + (1-\delta)\xi_{t+1}k_t - mk_{l,t} + (h_t + k_{l,t})(1-\delta)(1-\xi_{t+1}) \geq w_{t+1} + RB_t, \tag{7}$$

$$B_t \leq \theta_b R^{-1}(1-\delta)k_{t,o} - \theta_h R^{-1}(1-\delta)h_t + \theta_l R^{-1}(1-\delta)k_{l,t}, \tag{8}$$

where $\theta_l = 1$.

These equations highlight the dual role of leased capital in both production and risk management. In terms of production, total capital is given by $k_t = k_{o,t} + k_{l,t}$ in Equation (6), indicating that leased capital $k_{l,t}$ functions as a direct substitute for owned capital $k_{o,t}$ in production. Beyond its production role, leasing also acts as a hedge against capital price risk. As shown in Equation (7), the term $(h_t + k_{l,t})(1 - \delta)(1 - \xi_{t+1})$ highlights that both futures hedging h_t and leased capital $k_{l,t}$ mitigate capital price fluctuations. Specifically, leased capital transfers the risk of capital value fluctuations to the lessor, as the lessor bears the resale value risk $(1 - \delta)\xi_{t+1}$. This is a direct consequence of the repossession advantage: since the lessor retains ownership, the lessee is shielded from capital price volatility.

Leasing also enhances collateral efficiency, as reflected in Equation (8). Leased capital $k_{l,t}$ has a collateral efficiency of $\theta_l = 1$, which is higher than the combined collateral efficiency of owned capital and hedging $(\theta_b - \theta_h)$. This is because the lessor, acting as both financier and insurer, eliminates the need for double collateral—once for financing and again for hedging. However, leasing comes with a monitoring cost, represented by $-mk_{l,t}$ in Equation (7), which arises due to agency frictions from the separation of ownership and control. The trade-off between collateral efficiency and monitoring cost plays a key role in firms' lease-versus-buy decisions. We explore this trade-off in detail in Section 2.4.

2.4 Determinants of Leasing

In this section, we explore the factors influencing the decision to lease, purchase, or hedge using derivatives.

2.4.1 The Frictionless User Cost vs. Down Payment

We adopt Jorgenson (1963)'s framework, using μ to represent the frictionless user cost of capital and φ for the down payment, the minimum internal funds required per unit of capital.

The user costs for purchased capital (o), derivative hedging (h), and leased capital (l)

are calculated as the expected total cost, discounted by the risk-free rate:

$$\mu_o = 1 - R^{-1}(1-\delta) \tag{9}$$

$$\mu_h = 0 \tag{10}$$

$$\mu_l = 1 - R^{-1}(1-\delta) + R^{-1}m \tag{11}$$

Notably, derivative hedging incurs no direct cost since both the cash flow at t and the expected cash flow at $t+1$ are zero. The user cost of leasing exceeds that of purchasing and hedging combined ($\mu_l > \mu_o + \mu_h$), with the difference being the monitoring cost.

To assess how much internal net worth each investment type occupies, we combine the time t budget and collateral constraints, substituting out borrowing B_t:

$$\varphi_o k_{o,t} + \varphi_h h_t + \varphi_l k_{l,t} + d_t \leq w_t \tag{12}$$

The coefficients on purchased capital, derivative hedging, and leased capital represent the amount of internal net worth required per unit of investment, corresponding to the down payments. These coefficients are expressed as:

$$\varphi_o = 1 - \theta_b(1-\delta)R^{-1} \tag{13}$$

$$\varphi_h = \theta_h(1-\delta)R^{-1} \tag{14}$$

$$\varphi_l = 1 - \theta_l(1-\delta)R^{-1} \quad \text{with} \quad \theta_l = 1 \tag{15}$$

The down payment for leasing is lower than that of purchasing and hedging combined ($\varphi_l < \varphi_o + \varphi_h$), reflecting that leasing is a more collateralizable form of financing and hedging.

To summarize, leasing incurs a higher user cost ($\mu_l > \mu_o + \mu_h$) due to monitoring expenses but offers a lower down payment requirement ($\varphi_l < \varphi_o + \varphi_h$), making it a more collateral-efficient alternative to purchasing and hedging.

2.4.2 Trade-off: Financing vs. Risk Management

We derive the first-order conditions for the firm's optimization problem in Appendix A. Integrating definitions of user cost and down payment, the Euler equation for purchased capital (k_o) is:

$$\underbrace{\mu_o + \varphi_o \tilde{\lambda}_t}_{\text{MC purchased capital}} = \underbrace{R^{-1} E_t \left[f'_{t+1}\left(k_t\right) \right]}_{\text{MPK}} + \underbrace{R^{-1} Cov_t \left[\frac{\mu_{t+1}}{E_t(\mu_{t+1})}, f'_{t+1}\left(k_t\right) + (1-\delta)\xi_{t+1} \right]}_{\text{Negative, discounts for productivity risk and capital risk}} + \tilde{\nu}_{o,t}, \tag{16}$$

where $\tilde{\lambda} t$ measures the tightness of the collateral constraint, μ_t and μ_{t+1} represent the marginal value of net worth at times t and $t+1$, and $\tilde{\nu}_{o,t}$ is the Lagrange multiplier for the non-negative constraint on purchased capital. The left side of Equation (16) shows the marginal cost of deploying a unit of purchased capital, including both the user cost and the down payment adjusted for the financial constraint $\tilde{\lambda}_t$. When $\tilde{\lambda}_t = 0$ (financially unconstrained), firms only consider the frictionless user cost. As financial constraints tighten and $\tilde{\lambda}_t$ increases, the down payment becomes more significant. The right side reflects the marginal benefit, including the marginal productivity of capital (MPK) and a discount for risks related to productivity and capital value.

The analysis extends to derivative hedging (h) with its Euler equation:

$$\underbrace{\mu_h + \varphi_h \tilde{\lambda}_t}_{\text{MC derivative hedging}} = \underbrace{R^{-1} Cov_t \left[\frac{\mu_{t+1}}{E_t(\mu_{t+1})}, (1-\delta)(1-\xi_{t+1}) \right]}_{\text{Positive, hedging for capital risk}} + \tilde{\nu}_{h,t}, \tag{17}$$

where $\tilde{\nu}_{h,t}$ is the Lagrange multiplier for the non-negative constraint on hedging. The marginal cost of derivative hedging is similar to that of purchased capital. Since the frictionless user cost of derivative hedging is zero ($\mu_h = 0$), it is cost-free for financially unconstrained firms. However, since hedging requires collateral and occupies net worth ($\varphi_h > 0$), it becomes costly for constrained firms. The right side reflects the marginal benefit of hedging, represented by the covariance between the firm's marginal value of net worth and the payoff from hedging.

In the absence of leasing, as discussed in Rampini and Viswanathan (2010), we encounter the trade-off between financing and risk management. When the financial constraint is relaxed, the firm can allocate resources towards hedging. However, as financial constraints tighten, the firm's capacity to invest in capital diminishes. Due to decreasing returns to scale, the marginal productivity of capital, $R^{-1}E_t\left[f'_{t+1}\left(k_t\right)\right]$, on the right-hand side of Equation (16) grows significantly as k approaches zero. This increase in turn amplifies the Lagrangian multiplier of the financial constraint, λ_t. As shown on the left-hand side of Equation (17), this makes derivative hedging exceedingly costly. Consequently, in scenarios of deep financial constraints, firms are less likely to engage in derivative hedging.

2.4.3 Trade-off: Leasing vs. Combined Purchasing and Hedging

To compare leasing with purchasing and hedging, we examine the firm's Euler equation for leased capital (k_l), which quantifies the marginal costs and benefits of leasing relative to its alternatives:

$$\underbrace{\mu_l + \varphi_l \tilde{\lambda}_t}_{\text{MC leased capital}} = \underbrace{R^{-1}E_t\left[f'_{t+1}\left(k_t\right)\right] + R^{-1}Cov_t\left[\frac{\mu_{t+1}}{E_t(\mu_{t+1})}, f'_{t+1}\left(k_t\right) + (1-\delta)\xi_{t+1}\right]}_{\text{MB purchased capital}} \tag{18}$$
$$+ \underbrace{R^{-1}Cov_t\left[\frac{\mu_{t+1}}{E_t(\mu_{t+1})}, (1-\delta)(1-\xi_{t+1})\right]}_{\text{MB derivative hedging}} + \tilde{\nu}_{l,t},$$

where $\tilde{\nu}_{l,t}$ is the Lagrange multiplier for the non-negative constraint on leased capital. In Equation (18), the marginal benefit of leased capital is equivalent to the sum of the marginal benefit from purchased capital and one derivative contract. The decision to lease or to purchase with hedging thus hinges on a comparison of their respective marginal costs ($\mu_l + \varphi_l \tilde{\lambda}_t$ vs. $(\mu_o + \mu_h) + (\varphi_o + \varphi_h)\tilde{\lambda}_t$).

While the user cost of leasing is higher than purchasing and hedging combined, due to monitoring costs ($\mu_l > \mu_o + \mu_h$), the down payment for leasing is lower than the combined down payment for purchasing and hedging ($\varphi_l < \varphi_o + \varphi_h$). Financial constraints play a key role in this decision. When collateral constraints are loose ($\tilde{\lambda}_t$ is small), firms favor collateralized borrowing and futures hedging due to lower user costs. On the other hand, when constraints tighten ($\tilde{\lambda}_t$ is large), leasing becomes more appealing due to its lower down payment, making it a better option for financing and hedging.

3 Numerical Exercise

In this section, we conduct a numerical exercise to analyze the impact of financing and hedging on leasing decisions through counterfactual analysis. We also perform comparative statics to demonstrate how factors such as collateral requirements for derivatives, capital volatility, and the correlation between capital prices and productivity influence the choice of leasing.

3.1 Financing and Hedging Aspects in Leasing

Our model offers a distinct approach to separately examine the financing and hedging aspects of leasing. In this section, we first outline the firm's decision-making that incorporates both financing and hedging benefits. Then, we explore how each of these channels affects the firm's leasing choices.

We begin with the benchmark case illustrated in Figure 1, where each panel plots the firm's policy as a function of its net worth. Panels A and B report the level of leasing ($k_{l,t}$) and the leasing ratio ($k_{l,t}/k_t$), respectively; Panels C and D show the level of futures hedging (h_t) and the hedging ratio (h_t/k_t), respectively; and Panels E and F focus on constraint tightness and marginal costs of leasing versus purchasing and hedging, as per equations (16)–(18). High net worth firms are financially unconstrained; as net worth declines, firms become increasingly constrained. This tightening is evident in Panel E, where constraint tightness $\tilde{\lambda}_t$ rises sharply as net worth decreases.

The patterns in Panel A–C mirrors the findings of Rampini and Viswanathan (2013): financially unconstrained firms purchase capital (Panel A), use it as collateral for financing, and hedge capital price risk through derivatives (Panel C). However, as financial constraints tighten, firms gradually reduce their use of futures for hedging. Once a critical threshold is reached, firms transition from purchasing to leasing capital (Panel B).

[Place Figure 1 here]

Panel D illustrates the importance of including leasing as a risk management tool. When risk management is narrowly defined (focusing solely on derivative hedging), the hedging ratio decreases monotonically as firm net worth declines. Firms reduce their use of derivatives precisely when their need for risk management is greatest, leading to a risk management paradox. However, with a broader definition that includes leasing, the total hedging ratio actually increases when firms face financial constraints. This is because firms use leasing to hedge a significant portion of their risk, reducing their reliance on derivatives.

As discussed in Section 2.4, the key tradeoff between leasing, purchasing, and derivative hedging depends on comparing their respective marginal costs: $\mu_l + \varphi_l \tilde{\lambda}_t$ versus $(\mu_o + \mu_h) + (\varphi_o + \varphi_h)\tilde{\lambda}_t$. Panel F compares the marginal costs. Since leasing has a higher user cost (μ) but requires a lower down payment, financially unconstrained firms face higher marginal costs for leasing. This leads them to choose purchasing and hedging with derivatives rather than leasing. As constraints tighten, the marginal cost of leasing becomes equal to that of purchasing and derivative hedging. Firms begin to replace purchasing and derivative hedging with leasing. When financial constraints are severe, firms exclusively rely on leasing. This highlights the collateral advantage of leasing, serving as a combined contract for purchasing and hedging.

The financing Channel. To examine the financing channel, we shut down the hedging role of leasing by assuming that lessees, rather than lessors, absorb capital value fluctuations. This assumption modifies the net worth evolution formula as follows:

$$w_{t+1} = f_{t+1}(k_t) + (1-\delta)\xi_{t+1}k_t - mk_{l,t} + h_t(1-\delta)\left(1-\xi_{t+1}\right) - RB_t. \tag{19}$$

In this case, firms choose leasing solely because it provides a more collateralizable form of production. Figure 2 Panels A–D show the firm's decisions regarding capital investment, leasing, and derivative hedging.

[Place Figure 2 here]

Without leasing as a risk management tool, firms rely entirely on derivatives to hedge capital risk. Notably, compared to the benchmark case, Panel D shows that firms use significantly more derivatives for hedging, even when financial constraints are relatively tight. For instance, in the region where firms switch from buying to leasing capital, derivative hedging actually increases rather than decreases. This is because leasing alleviates financial constraints, freeing up more resources for derivative hedging. Eventually, as constraints become extremely tight, firms sharply reduce hedging, prioritizing resources for operations, which aligns with the intuition established by Rampini and Viswanathan (2013). Additionally, compared to the benchmark case, Panel A indicates that firms use less capital for production, as the need to allocate collateral for hedging crowds out capital investments.

When leasing does not have a hedging role, the decision reduces to a comparison between its marginal cost, $\mu_l + \varphi_l \tilde{\lambda}_t$, and that of purchased capital, $\mu_o + \varphi_o \tilde{\lambda}_t$. Panel F illustrates this tradeoff. Leasing incurs higher marginal costs when firms are financially unconstrained due to additional monitoring costs, but it becomes more cost-efficient as financial constraints tighten, owing to its lower down payment requirements.

The Hedging Channel. Next, we examine the hedging role of leasing by excluding its productive capacity. Specifically, we subtract the costs and benefits of purchased capital from leasing. The budget and collateral constraints are revised as follows:

$$w_t + B_t \geq d_t + k_{o,t}, \tag{20}$$

$$f_{t+1}(k_{o,t}) + (1-\delta)\xi_{t+1}k_{o,t} - mk_{l,t} + (h_t + k_{l,t})(1-\delta)(1-\xi_{t+1}) \geq w_{t+1} + RB_t, \tag{21}$$

$$B_t \leq \theta_b R^{-1}(1-\delta)k_{t,o} - \theta_h R^{-1}(1-\delta)h_t, \tag{22}$$

In this case, leasing serves as a hedging tool that does not require collateral but requires a monitoring cost of m in period $t+1$. Figure 3 shows the firm's choices. Compared to the previous scenario, Panel D shows a significant reduction in firms' reliance on futures for hedging, with the derivative hedging ratio declining monotonically as financial constraints tighten. However, including leasing as an alternative hedging tool reveals a stable total hedging ratio in the constrained region. Panel A shows that capital investment levels are notably lower, as firms no longer have the option to finance through leasing and must invest solely by purchasing capital.

[Place Figure 3 here]

The tradeoff between derivative hedging and lease hedging becomes clear when comparing their marginal costs. The marginal cost of derivative hedging is $\varphi_l \tilde{\lambda}$, while the marginal cost of lease hedging is $R^{-1}m$. From this comparison, we can see that derivative hedging requires no direct cost but demands collateral, whereas lease hedging incurs the direct cost $R^{-1}m$, is collateral-free, and does not consume net worth in the current period. Panel F plots these two costs. When financial constraints are slack, the cost of futures hedging is lower, leading firms to prefer hedging with futures. As financial constraints tighten and exceed the discounted monitoring cost, firms switch to leasing for hedging.

3.2 Heterogeneity Across Firms and Industries

In this section, we conduct comparative static analyses to highlight how firms' leasing decisions—and the role of leasing as a hedging mechanism—vary across different firm characteristics and industry conditions. We begin with the challenge of hedging capital price risk through derivatives, emphasizing how higher collateral requirements for futures increase the relative appeal of leasing. We then illustrate how leasing indirectly hedges operating profits through the correlation between productivity and capital value. Finally, we explore how heightened capital price volatility influences the reliance on leasing, linking these results to our subsequent empirical analysis.

Collateral Requirements for Futures. As noted in the introduction, hedging capital price risk with derivatives presents significant practical challenges: capital is highly heterogeneous and asset-specific, rendering standardized derivatives less effective; and financially constrained firms often find collateral or margin requirements burdensome. To capture these challenges, we consider scenarios with different collateral requirements for futures. Specifically, we vary θ_h—the fraction of the contract size that must be posted as collateral.

Figure 4 summarizes our findings. When $\theta_h = 0$, derivative hedging is effectively cost-free, so firms hedge extensively through futures and achieve a total hedging ratio of one, fully insulating themselves from capital price risk. However, as the collateral requirement rises (i.e., larger values of θ_h), firms increasingly rely on leasing to hedge.

In other words, leasing serves as a substitute for derivative-based risk management when margin requirements are prohibitively high or otherwise difficult for firms to meet. Given these practical challenges and costs, we concentrate on scenarios without derivative hedging in the subsequent analysis.

[Place Figure 4 here]

Correlation Between Productivity and Capital Value. Leasing also provides an indirect hedge against operating risks, such as adverse productivity shocks, when these correlate with capital price fluctuations. If the capital's resale value tends to move in the same direction as the firm's productivity (e.g., positive correlation), then the lessee not only hedges against capital price risk but also stabilizes operating profits.

Figure 5 illustrates this mechanism. A stronger positive correlation between productivity and capital value leads firms to make greater use of leasing, as it hedges both capital prices and the underlying profitability of their operations. In contrast, a negative correlation reduces the incentive to lease, since the capital's value may rise when productivity falls (and vice versa), diminishing leasing's effectiveness in hedging overall profitability.

[Place Figure 5 here]

Capital Price Volatility and the Empirical Motivation. Finally, we examine how different levels of capital price volatility affect leasing choices. This exercise directly links to the empirical section of the paper, where we focus on volatility as a key driver of firms' leasing decisions. Figure 6 shows that under high volatility, firms have stronger incentives to hedge capital value risk and thus lease a larger fraction of their capital. In unconstrained regions, financially healthy firms increase leasing primarily for risk management. To illustrate how the hedging role shapes leasing decisions, we compare this to a hypothetical scenario in which leasing provides no hedge (i.e., it functions purely as a financing tool): in that case, firms would only resort to leasing under severe borrowing constraints.

[Place Figure 6 here]

Overall, these comparative statics demonstrate that leasing becomes especially valuable for firms facing high collateral requirements in futures markets, those whose capital values are strongly positively correlated with productivity, and those operating in volatile capital environments. Because the lessor retains ownership of the asset, leasing avoids substantial collateral obligations and serves as an alternative to costly or imperfect derivatives. In the following section, we focus on the last prediction—volatility—to provide empirical evidence that tests the hedging motive behind firms' leasing decisions.

4 Empirical Evidence

In this section, we provide empirical evidence supporting the hedging motive behind firms' use of leased capital.

First, we test the predictions of our theoretical model, which suggests that firms in industries with high capital price volatility are more likely to use leasing as a risk management tool. As we show in the theoretical part, leasing offers an embedded futures hedging against the capital price risk, making it an attractive option for financially constrained firms facing uncertainty in asset prices. To investigate this, we analyze the relationship between capital price volatility, financial constraints, and the proportion of capital leased. We expect financially constrained firms in high-volatility industries to exhibit a higher leased capital ratio compared to those in low-volatility industries, as they use leasing to hedge against price fluctuations and manage financial constraints more effectively.

Second, we use the anti-recharacterization laws as a quasi-natural experiment to distinguish between the hedging and financing motives behind leasing. These laws strengthen secured lenders' ability to repossess assets in bankruptcy, expanding borrowers' debt capacity and influencing financing decisions. As documented in the literature (Li et al., 2016; Chu, 2020), these laws affect firms' choice between leasing and secured lending, especially for financially constrained firms.

This legal change provides an exogenous shock, allowing us to assess whether firms lease for risk management beyond easing financing constraints. Our findings show that high-volatility firms reduce leasing less significantly following the enactment of these laws, indicating that risk management, not just financing concerns, drives their leasing decisions. Even firms with lower financial constraints continue to show leasing behavior aligned with hedging motives, supporting our theoretical model.

Our results strongly support the view that leasing plays a critical role in risk management, particularly for firms exposed to high capital price risk. This highlights the need to broaden our understanding of corporate risk management, incorporating not only derivative hedging but also leasing as an essential hedging tool.

4.1 Leased Capital and Capital Price Volatility

In this subsection, we describe the data and variables, and analyze how capital price volatility and financial constraints relate to leased capital ratio. The analysis reveals a general pattern where firms facing higher capital price volatility and greater financial constraints tend to lease a larger proportion of their capital.

4.1.1 Sample and Variables

Sample construction: Our firm-level data are sourced from Compustat, which includes all publicly listed firms in the United States. We restrict our sample period to the years between 1995 and 2010.[4]

Capital price volatility: We employ industry-level stock market return volatility to serve as a proxy for firm capital volatility, consistent with capital market practices. This approach captures the systematic risk that affects all firms within a given industry, rather than focusing solely on firm-specific volatility. By using an industry measure, we also account for broader economic and sectoral factors influencing volatility, which is not directly affected by individual firms' characteristics, for instance, financial constraint.

Our analysis focuses on two-digit SIC industries, and we calculate industry-level

[4]The anti-recharacterization laws first went into effect in 1997, beginning with Texas, so we include two years prior (1995–1996) in our difference-in-difference analysis. We exclude data beyond 2010 because, during that time, state-level anti-recharacterization laws were partially invalidated by several federal bankruptcy cases. These cases invoked federal law standards to override state-level regulations, effectively diminishing the relevance of these laws and making secured lending less attractive compared to leasing. By focusing on this restricted timeframe, our analysis remains centered on the period when the state-level anti-recharacterization laws were most impactful.

volatility in three steps. First, we compute the industry average daily return using the formula:

$$R_{j,d,y} = \sum_i w_{i,y} \times R_{i,j,d},$$

where $w_{i,y}$ represents the market capitalization of firm i in year y, relative to the total market capitalization of all firms in industry j for that year[5]. The market capitalization for each firm is calculated as the product of firm i's annual average stock price and its outstanding shares. $R_{i,j,d}$ is the daily return of firm i in industry j on day d, and $R_{j,d,y}$ is the weighted average daily return for industry j on day d in year y.

Second, annual industry volatility ($Vol_{j,y}$) is calculated as the standard deviation of $R_{j,d,y}$. Finally, we compute the mean volatility over the five years prior to each policy event to avoid bias. For example, for the 1997 policy change, we average industry volatility from 1992 to 1996. Industries are then classified into high- and low-volatility groups based on the median five-year average, as shown in Appendix Tables A2 and A3.

Leased capital ratio: We measure leased capital as the present value of both current and future lease commitments. Following established literature (Rampini and Viswanathan, 2013;Li et al., 2016; Chu, 2020), we simplify this calculation by estimating future commitments as eight times the current rent expense ($8 \times XRENT$). This provides a reasonable approximation without the complexity of discounting future payments. We then express this measure as a fraction of total assets (Compustat item AT). Robustness checks confirm that the results are consistent when alternative measures of lease commitments (Hu et al., 2020) are applied.

Financial constraints: We use two proxies to measure financial constraints. First, we classify firms as financially constrained or unconstrained using the size-age (SA) index (Hadlock and Pierce, 2010). Firms with an annual SA index above the industry median are considered constrained, while those below the median are classified as unconstrained[6]. Additionally, we use the Whited-Wu (WW) index (Whited and Wu, 2006), categorizing firms with a WW index above the median as constrained and those below as unconstrained.

[5] As a robustness check, we also compute industry average volatility using firms' annual sales as weights.

[6] We do not use ex-ante classification prior to the anti-recharacterization laws, as many firms established after the cutoff lack SA index data for earlier periods. For robustness, we apply the ex-ante classification and find consistent results.

The detailed calculation of SA and WW indices are described in Appendix B.

Other Variables: We include several control variables in our analysis, such as log assets, leverage, Tobin's Q, dividends, profitability, cash holdings, tangibility, and tax rates. Detailed definitions of these variables can be found in our Data Appendix.

Our final sample comprises Compustat-listed firms from 1995 to 2010, excluding those in the financial and utilities sectors (SIC codes 4900-4949 and 6000-6999) due to their unique regulatory and accounting frameworks. We also exclude firms not incorporated or headquartered in the U.S. and those with missing or negative values for key variables like rent expenses, book assets, sales, employee count, operating income, and net property, plant, and equipment.

4.1.2 Leased Capital Ratio in Different Volatility Groups

Figure 7 illustrates the correlations between the leased capital ratio, volatility, and financial constraints. To construct this figure, we first divide firms into high and low volatility groups based on our industry-level volatility measure. Within each volatility group, firms are further sorted into 50 equally sized bins according to their financial constraint measures—the SA index or the WW index. For each bin, we calculate the mean leased capital ratio and plot them against the financial constraint measures.

Within each volatility group, we also include fitted lines representing the OLS estimation of the relationship between the leased capital ratio and financial constraints. The specification for this estimation is:

$$LCR_i = \alpha + \beta \times SA(WW)_i + \varepsilon_i, \tag{23}$$

where LCR_i is the leased capital ratio, and $SA(WW)_i$ represents the financial constraint measure.

[Place Figure 7 here]

The figure highlights several key observations. First, financially constrained firms tend to use more leased capital, consistent with prior research (Rampini and Viswanathan, 2013;Li et al., 2016; Chu, 2020). This pattern reflects the collateral efficiency of leasing due to its repossession advantage, allowing financially constrained firms to access capital more effectively. Second, high-volatility firms consistently use more leased capital even when controlling for financial constraints, indicating a strong risk management incentive, which aligns with the predictions of our model. Lastly, the reliance on leased capital among high-volatility firms is less sensitive to financial constraints, as indicated by the flatter slopes in the fitted lines compared to low-volatility firms. This shows that for high-volatility firms, an additional important consideration in using leased capital is risk management, making their leasing decisions less affected by changes in financial constraints.

Table 2 compares leased capital ratios, financial constraints, and other characteristics between high- and low-volatility groups. High-volatility firms tend to have smaller assets, higher Tobin's Q, lower tangibility, lower tax rates, higher cash holdings, lower leverage, and are younger by about 2.9 years, while profitability differences are not significant.

[Place Table 2 here]

The high-volatility group tends to face tighter financial constraints, evidenced by higher WW and SA index values and lower dividend payouts. Their leased capital ratio is approximately 10 percentage points higher than that of the low-volatility group, due to both the financing and risk management motive combined. To further explore whether firms' reliance on leasing is driven by hedging capital price volatility or by alleviating financial constraints, we first develop a conceptual framework in Section 4.2, and then test its empirical implications using regression analysis in Section 4.3.

4.2 Disentangling Financing and Risk Management Motives: A Conceptual Framework

This subsection develops a conceptual framework to illustrate why the empirical patterns shown in Figure 7 are insufficient to separately identify financing and risk management motives in firms' leasing decisions. We use our model to clarify this distinction and argue that shocks to financial constraints—such as those induced by anti-recharacterization laws—can help disentangle these two channels. We also explain why we do not rely on shocks to derivative hedging (e.g., the Safe Harbor Reform studied in Giambona and Wang, 2020) as a source of identification.

4.2.1 Baseline vs. Financing-Only Model

Our baseline model assumes that managers consider both the financing and risk management roles of leasing when making capital allocation decisions. By combining the Euler equations for purchased and leased capital (16) and (18), we derive the firm's optimal leased capital ratio:

$$m(l) = \underbrace{(\theta_l - \theta_b)\,(1-\delta)\,\tilde{\lambda}_t}_{\text{Financing Motive}} + \underbrace{\mathrm{Cov}_t\left[\frac{\mu_{t+1}}{\mathbb{E}_t(\mu_{t+1})}, (1-\delta)(1-\xi_{t+1})\right]}_{\text{Risk Management Motive}}. \tag{24}$$

We assume that the firm is not at a corner solution and that the monitoring cost, $m(l)$, is a linear and increasing function of the leased capital ratio l, i.e., $m(l) = a + bl$. This formulation captures the dual role of leasing: (i) alleviating financial constraints and (ii) serving as a hedge against capital risk.

In contrast, an alternative specification assumes that managers ignore the hedging benefit of leasing, so the leased capital ratio is determined solely by financing considerations:

$$m(l) = \underbrace{(\theta_l - \theta_b)\,(1-\delta)\,\tilde{\lambda}_t}_{\text{Financing Motive}}. \tag{25}$$

This alternative reflects the traditional view in the literature that leasing is used to mitigate financial frictions. Our empirical objective is to test whether firms follow the baseline model, which incorporates both financing and risk management motives, or the financing-only model, which considers only financing constraints.

4.2.2 The Empirical Challenge: Hedging vs. Financing Motives

Disentangling the hedging motive from the financing motive in firms' leasing decisions is empirically challenging. Figure 7 documents a positive correlation between the leased capital ratio and capital price volatility, consistent with the notion that leasing serves as a risk-hedging tool. However, a key concern is that capital price volatility may capture additional information about financial constraints, beyond what is reflected in the SA and WW indices. In particular, Table 2 shows that firms in the high-volatility group tend to be more financially constrained. Thus, the higher leased capital ratio observed in these firms may simply reflect a need to alleviate financial constraints.

This ambiguity makes it difficult to determine whether observed patterns reflect a hedging motive or are merely driven by tighter financial constraints. Let H and L denote firms in high- and low-volatility environments, respectively. The empirical pattern in Figure 7 is consistent with both of the following hypotheses:

- $\mathbf{H_0}$ **(Financing-Only Model):** Managers do not consider hedging benefits when making leasing decisions. Even after controlling for SA and WW indices, high-volatility firms face tighter financial constraints ($\tilde{\lambda}_t^H > \tilde{\lambda}_t^L$).
- $\mathbf{H_1}$ **(Baseline Model):** Managers do consider hedging benefits. In this case, firms in high-volatility environments are not significantly more financially constrained ($\tilde{\lambda}_t^H \approx \tilde{\lambda}_t^L$), but face greater capital risk ($\text{Cov}_t^H > \text{Cov}_t^L$).

The observed pattern does not by itself rule out the financing-only model in $\mathbf{H_0}$. If volatility also reflects tighter financial constraints, then even managers respond only to financing motive—we may observe a similar positive relationship between volatility and leasing. In that case, high-volatility firms lease more not because of hedging benefits, but because they face more binding financial constraints.

In the next section, we address this challenge by introducing a difference-in-differences strategy based on shocks to capital pledgability. This approach allows us to assess whether firms' leasing behavior reflects hedging incentives beyond what can be explained by financing needs alone.

4.2.3 Difference-in-Differences Identification of Hedging Motives

To credibly identify whether managers view leasing as a hedging device, we adopt a difference-in-differences (DiD) strategy. A key assumption throughout is that derivative hedging is unavailable, making leasing the firm's only means of insuring against capital risk.

Suppose an exogenous policy shock increases the pledgeability of purchased capital, i.e., $\theta_b \to \theta_b + \Delta\theta_b$. This relaxes the firm's financial constraint, $\tilde{\lambda}_t \to \tilde{\lambda}_t - \Delta\tilde{\lambda}_t$, and reduces its leased capital ratio, $l \to l - \Delta l$. Let H and L denote firms in high- and low-volatility environments, respectively.

Under $\mathbf{H_0}$ (Financing-Only Model): Volatility proxies for the tightness of financial constraints, and managers do not consider hedging benefits. Taking the difference between post-shock and pre-shock values:

$$-b\Delta l^H = -\Delta\theta_b(1-\delta)\tilde{\lambda}_t^H - (\theta_l - \theta_b)(1-\delta)\Delta\tilde{\lambda}_t^H,$$
$$-b\Delta l^L = -\Delta\theta_b(1-\delta)\tilde{\lambda}_t^L - (\theta_l - \theta_b)(1-\delta)\Delta\tilde{\lambda}_t^L,$$

implying:

$$b(\Delta l^H - \Delta l^L) = \Delta\theta_b(1-\delta)(\tilde{\lambda}_t^H - \tilde{\lambda}_t^L) + (\theta_l - \theta_b)(1-\delta)(\Delta\tilde{\lambda}_t^H - \Delta\tilde{\lambda}_t^L).$$

Since $\tilde{\lambda}_t^H > \tilde{\lambda}_t^L$ and $\Delta\tilde{\lambda}_t^H > \Delta\tilde{\lambda}_t^L$, it follows that $\Delta l^H > \Delta l^L$. Intuitively, because high-volatility firms are more financially constrained, an improvement in capital pledgeability relaxes their constraints more, leading to a larger reduction in leasing.

Under $\mathbf{H_1}$ (Baseline Model): Volatility reflects exposure to capital risk, and managers value leasing for its hedging benefit. Taking differences:

$$-b\Delta l^H = -\Delta\theta_b(1-\delta)\tilde{\lambda}_t^H - (\theta_l - \theta_b)(1-\delta)\Delta\tilde{\lambda}_t^H + \Delta\text{Cov}_t^H,$$
$$-b\Delta l^L = -\Delta\theta_b(1-\delta)\tilde{\lambda}_t^L - (\theta_l - \theta_b)(1-\delta)\Delta\tilde{\lambda}_t^L + \Delta\text{Cov}_t^L,$$

where ΔCov_t measures the increase in marginal hedging value as leasing declines. Assuming $\tilde{\lambda}_t^H \approx \tilde{\lambda}_t^L$ and $\Delta\tilde{\lambda}_t^H \approx \Delta\tilde{\lambda}_t^L$, we obtain:

$$b(\Delta l^H - \Delta l^L) = \Delta\text{Cov}_t^L - \Delta\text{Cov}_t^H.$$

Since high-volatility firms experience a larger increase in capital risk from the same reduction in the leased capital ratio, it follows that:

$$\Delta\text{Cov}_t^H > \Delta\text{Cov}_t^L \quad \Rightarrow \quad \Delta l^H < \Delta l^L.$$

Intuitively, for high-volatility firms, leasing is a more valuable hedge. Thus, in response to a pledgeability shock, they reduce leasing by less than low-volatility firms.

Empirical Implication. This leads to a testable prediction:

$$\begin{aligned} &\Delta l^H < \Delta l^L \quad \text{(Rejects } \mathbf{H_0}\text{; hedging motive dominates)} \\ \text{vs.} \quad &\Delta l^H > \Delta l^L \quad \text{(Rejects } \mathbf{H_1}\text{; financing motive dominates).} \end{aligned}$$

In Section 4.3, we show empirical evidence supporting $\Delta l^H < \Delta l^L$, consistent with the view that managers incorporate risk management motives into leasing decisions.

For expositional clarity, we assume in $\mathbf{H_1}$ that the SA and WW indices adequately control for financial constraints, such that $\tilde{\lambda}_t^H \approx \tilde{\lambda}_t^L$. In reality, volatility may capture both constraint tightness and capital risk. However, if $\tilde{\lambda}_t^H > \tilde{\lambda}_t^L$, this would bias against finding $\Delta l^H < \Delta l^L$, as more financially constrained firms are expected to reduce leasing by more. Thus, observing $\Delta l^H < \Delta l^L$ despite this bias offers strong evidence that risk management considerations play a dominant role in the leasing decisions of high-volatility firms.

4.2.4 Limitations of Derivative Hedging as an Identification Strategy

We exclude derivative hedging from our empirical design for both practical and conceptual reasons.

Practical constraint. The primary concern is institutional: there is no liquid derivatives market directly linked to capital goods or capital asset prices. Existing financial derivatives are generally weakly correlated with capital price fluctuations at the firm level. Attempting to hedge capital risk indirectly through such instruments may introduce significant basis risk or expose firms to unintended financial volatility. Consequently, leasing remains the most viable and relevant channel for hedging capital risk in practice.

Modeling constraint. Even if a hypothetical market for capital price derivatives existed, incorporating derivative hedging into the model would not facilitate identification. Crucially, the Euler equation for derivative hedging (equation 17) directly links financial constraints ($\tilde{\lambda}_t$) to hedging motives. This tight coupling eliminates the variation necessary to empirically separate the two channels.

Consider a shock that reduces the collateral requirement for derivative hedging, φ_h. This would lead to greater use of derivative hedging (higher h), which simultaneously relaxes the financial constraint ($\tilde{\lambda}_t$) and lowers the marginal hedging incentive. Because such a shock affects both financing and hedging motives simultaneously, it becomes impossible to disentangle whether leasing decisions are driven by risk management considerations (baseline model) or by financing needs alone (financing-only model). A decline in leasing could reflect either substitution toward derivatives or a reduction in financial frictions.

The availability of derivative hedging also undermines our identification strategy by introducing substitutability between leasing and financial hedging. In our difference-in-differences framework, leasing is the only available means of hedging capital risk. As such, the marginal hedging benefit is directly tied to the leased capital share l. When financial constraints are relaxed, firms reduce leasing because they are less financially constrained—but high-volatility firms, which derive greater hedging value from leasing, reduce it by less. This asymmetry drives our identification. However, if firms can substitute between leasing and derivatives, leasing becomes decoupled from hedging motives, undermining the core mechanism of our DiD design.

In this sense, the absence of viable substitutes for leasing is not only a realistic feature of the institutional environment but also a necessary condition for identifying the role of risk management in leasing decisions.

4.3 Anti-Recharacterization Laws as a Natural Experiment

We now turn to our empirical strategy, which leverages the staggered implementation of anti-recharacterization laws across U.S. states as a natural experiment. These laws, by improving the pledgeability of capital and facilitating secured lending, offer a unique opportunity to isolate the effect of financing shocks on firms' leasing behavior. Crucially, this setting allows us to test whether firms' leasing decisions are driven primarily by financing constraints or also reflect hedging considerations related to capital price risk.

4.3.1 Institutional Background: Anti-Recharacterization Laws

Anti-recharacterization laws were introduced to strengthen the pledgeability of collateral assets, making secured lending more appealing. These laws require that collateral transfers to special-purpose vehicles (SPVs) be treated as true sales, thereby limiting the automatic stay's applicability. This provides greater security and certainty for creditors during bankruptcy proceedings. Prior to these laws, whether secured lending via SPVs was subject to the automatic stay was often at the discretion of bankruptcy judges, who could recharacterize the transfer as a financing transaction rather than a true sale, creating uncertainty for creditors.

When comparing leases and secured loans, one significant advantage of leases is that, in bankruptcy, firms must either assume the lease or default and return the asset. Secured loans, by contrast, are subject to the automatic stay, preventing creditors from reclaiming collateral. Although leasing fees are often higher, leases hold an edge as repossessing leased assets is quicker and typically requires no collateral, making them attractive for financially constrained firms.

The introduction of anti-recharacterization laws shifts this dynamic by making secured lending through SPVs more competitive with leasing. By mitigating the risks of collateral entanglement in bankruptcy proceedings and allowing firms to bypass the automatic stay, these laws enhance the attractiveness of secured loans and influence firms' financing choices.

The adoption of anti-recharacterization laws has varied by state, with Texas and Louisiana being the first to implement them in 1997, followed by Alabama (2001), Delaware (2002), South Dakota (2003), Virginia (2004), and Nevada (2005).

Following the methodologies of Li et al. (2016) and Chu (2020), we define the treatment status. A firm is classified as treated if it is incorporated in Texas, Louisiana, Alabama, or Delaware—states that enacted anti-recharacterization laws prior to 2003—and if its fiscal year occurs after the enactment of these laws but before 2004. We focus on laws passed before 2003, as subsequent federal legislation preempted these state-level laws. Our final sample consists of 44,994 observations, including 29,510 treated observations. Appendix Table A4 presents the differences in key characteristics between the treated and control groups.

The treated group of firms differs from the control group in several key financial and operational characteristics. Specifically, firms in the treated group have larger assets, higher leverage, and a greater Tobin's Q, while showing slightly lower profitability, tangibility, and tax rates. Furthermore, the treated group is younger and experiences tighter financial constraints, as indicated by the Whited-Wu (WW) index, despite maintaining a lower average leasing capital ratio compared to the control group. These differences highlight the distinct financial profiles and constraints that influence the firms' leasing and financing decisions.

Thus, controlling for these factors in our regression analysis is crucial to evaluate how increased volatility affects leased capital usage while accounting for these characteristics.

4.3.2 Main Specification

Our baseline specification is as follows:

$$LCR_{ijst} = \alpha_i + \alpha_t + \beta_0 Law_{st} + \beta_1 Law_{st} \times I_j^{HighVol} + \gamma X_{ijst-1} + \varepsilon_{ijst} \tag{26}$$

where i denotes a firm, j an industry, s the incorporated state, and t the year. The dependent variable LCR_{ijst} represents the leased capital ratio. The treatment status is captured by the dummy variable Law_{st}, which equals 1 if firm i is incorporated in a state s that had adopted anti-recharacterization laws by year t.

Specifically, We define treatment status using an 'on-off' approach, determined by each state's passage of antirecharacterization laws and the 2003 federal court ruling. For firms incorporated in Texas or Louisiana, the "on" period is 1997-2003, with all other years classified as "off." For Alabama-incorporated firms, the "on" period is 2001-2003, and for Delaware, it is 2002-2003. All other years are considered "off" for these states. For firms in states that never passed anti-recharacterization laws or did so after the 2003 ruling, the treatment variable is always set to 0. The terms α_i and α_t represent firm and year fixed effects, respectively. The vector X_{ijst-1} includes other firm characteristics one year prior to the enactment of the laws.

The coefficient β_0 represents the change in the leased capital ratio for low-volatility firms following the passage of anti-recharacterization laws, while β_1 captures the incremental sensitivity of high-volatility firms to this legislative change. According to our theoretical framework, low-volatility firms—characterized by weaker hedging motives—are more likely to substitute leasing with traditional financial debt when financing conditions improve, leading us to expect $\beta_0 < 0$. This is consistent with prior empirical findings (Li et al., 2016; Chu, 2020).

In contrast, high-volatility firms face greater capital price risk and therefore derive stronger risk management benefits from leasing. If firms do incorporate hedging motives into their leasing decisions, we expect these firms to exhibit a smaller reduction in leased capital in response to the laws—implying a positive β_1. Crucially, β_1 is the key parameter of interest: a significantly positive β_1 provides evidence that firms value leasing as a hedge, thereby rejecting the financing-only model ($\mathbf{H_0}$) and offering strong support for our baseline model that incorporates both financing and risk management motives.

Prior studies suggest that antirecharacterization laws more negatively impact leasing for financially constrained firms, which value the increased debt capacity and flexibility in financing. We examine the responses of constrained and unconstrained firms to these exogenous shocks.

For financially constrained firms, we expect $\beta_0 < 0$, consistent with findings that the laws reduce leasing among low-volatility constrained firms. We also anticipate $\beta_1 > 0$, which indicates that constrained firms in high-volatility sectors—driven by hedging needs—experience a smaller leasing reduction post-law change, supporting the hedging channel. Thus, high-volatility constrained firms are less sensitive to the law's leasing impact.

For financially unconstrained firms, we expect β_0 and β_1 to be statistically insignificant, as these firms are less likely to benefit from the increased appeal of secured lending via special purpose vehicles (SPVs) introduced by the laws. Consequently, financially unconstrained firms, regardless of volatility, should be largely unaffected by this legal change.

4.3.3 Empirical Results

We first estimate our main specification in equation (26), with results in Table 3 showing the impact of anti-recharacterization laws on the leased capital ratio (LCR) across different firm groups—overall, financially constrained, and financially unconstrained. The key variables of interest are the binary treatment indicator Law and the interaction term $Law \times HighVolatility$, which captures differential effects on high-volatility firms.

[Place Table 3 here]

In the overall sample (Column 1), the coefficient on Law is -1.229 and statistically significant at the 1% level, suggesting that firms reduce their reliance on leased capital by 1.229 percentage points after the enactment of anti-recharacterization laws. This effect is economically meaningful: given that the mean LCR for low-volatility firms is 19.45% (as shown in Column 1 of Table 2), this reduction represents approximately 6.3% of the average LCR[7]. The positive coefficient on $Law \times HighVolatility$ (1.134, significant at the 1% level) indicates that high-volatility firms experience a smaller reduction in leasing, reflecting their stronger need for hedging.

[7]This aligns with Chu (2020), which documents a 5% decrease in leased capital for the overall sample.

For financially constrained firms (Column 2), the law's impact is more pronounced, with the coefficient on Law at -1.764, larger in magnitude than in the overall sample and statistically significant at the 1% level. This suggests that financially constrained firms are more sensitive to the law's impact due to their reliance on external financing. Additionally, the significant positive coefficient on $Law \times HighVolatility$ (1.674) implies that high-volatility constrained firms reduce leased capital usage by about 0.09%, indicating that hedging motives mitigate the law's effect in this group.

In contrast, financially unconstrained firms (Column 3) exhibit a smaller response to the law change. Consistent with our model, the coefficients on Law and $Law \times High\,Volatility$ remain in the same direction as those for constrained firms, but are notably smaller in magnitude and statistically weaker. This suggests that unconstrained firms are less responsive to improvements in capital pledgeability.

In summary, anti-recharacterization laws have a more substantial negative effect on leasing for financially constrained firms, particularly those in low-volatility industries. High-volatility constrained firms experience smaller reductions in leasing, reinforcing the importance of hedging motives. Financially unconstrained firms are less affected overall. These findings highlight financial constraints and volatility as key determinants in how firms adjust financing in response to leasing regulation changes.

To assess whether the findings in Table 3 are influenced by pre-trends, we generate event study graphs to evaluate if leased capital usage between treated and non-treated firms would have followed similar trajectories in the absence of the treatment. The parallel trend assumption implies that the effect of the laws on leased capital usage should only appear after their adoption.

We construct indicator variables for each time period relative to the enactment of the anti-recharacterization laws, covering three years pre-enactment and extending across multiple post-enactment periods. These indicators are then interacted with treated states, using the same control variables as in Table 3.

Panel (a) of Figure 8 presents the event study graph, illustrating the average effects on the leased capital ratio and the annual impact of being in a treated state, both before and after the reform. Here, year 0 is normalized to represent the year immediately preceding the reform. The results indicate no significant effects for treated firms prior to the law's enactment, suggesting no differential pre-trends. In fact, the effect of the laws becomes statistically significant only in the year following the enactment and remains significantly negative in all subsequent years.

To further support our identification strategy, we plot event study graphs separately for high- and low-volatility firms, as shown in Figure 8, panel (b). Two observations are noteworthy. First, the laws did not have a strong differential effect on leased capital usage for high-volatility firms before enactment, providing visual evidence that pre-trends are unlikely to drive the results. Second, consistent with our previous estimates, the enactment of the anti-recharacterization laws significantly reduces leased capital usage among low-volatility firms, whereas high-volatility firms show less change in their leased capital usage following the law's enactment.

[Place Figure 8 here]

A potential concern arises from recent literature showing that difference-in-differences (DID) estimates from staggered treatments—where different units are treated at different times—can be biased. In our context, the anti-recharacterization laws were enacted at varying times across states, creating a staggered treatment effect for firms. The standard two-way fixed effects (TWFE) model calculates the overall treatment effect as a weighted average of the treatment effects for each individual switcher. However, this approach can sometimes produce misleading results. For instance, even if each switcher has a positive treatment effect, the average effect could appear negative due to negative weights. These negative weights can arise when comparing early adopters to always-takers, late adopters to always-takers, or late adopters to early adopters. In our case, this bias may occur when comparing firms in Alabama, Delaware, or South Dakota (treated in 2002 or 2003) to those in Texas or Louisiana (where the laws were enacted in 1997).

To address this issue, we apply the heterogeneity-robust staggered DID (het-robust DID) method developed by De Chaisemartin and d'Haultfoeuille (2020, 2023, 2024). This method corrects the "bad comparisons" inherent in traditional TWFE models by facilitating "good comparisons" similar to a simple two-by-two DID framework, ensuring more accurate treatment effect estimates. [8]

Table 4 presents estimates from our main model, showing both the average treatment effect (ATE) and dynamic effects from two years before to two years after the enactment of anti-recharacterization laws. Following the law's passage, firms' leased capital ratios declined on average by approximately 0.915 percentage points, with low-volatility firms experiencing a larger reduction of 1.025 percentage points. Given a mean leased capital ratio of 19.45%, this reduction equates to about 5%, consistent with findings in existing literature. As expected, the impact is less significant for high-volatility firms, which may continue using leased capital due to a stronger hedging motive.

[Place Table 4 here]

The results in columns (4) through (7) illustrate the impact of the anti-recharacterization laws on leasing behavior across various firm types. Consistent with the results from our TWFE model estimation, financially constrained firms in low-volatility industries exhibit the strongest response to the anti-recharacterization laws, with significant reductions in leasing post-implementation. Financially unconstrained firms in low-volatility industries also show significant reductions, albeit to a lesser degree. In contrast, high-volatility firms—regardless of financial constraints—demonstrate less consistent changes in leasing behavior, suggesting they may be less affected by the laws. These findings imply that the volatility measure captures firms' risk management strategies, with high-volatility firms potentially using leasing as a hedge.

Finally, the dynamic results in Table 4 confirm that our specification meets the parallel trends assumption. Pre-treatment coefficients are not statistically significant for the overall sample or the high- and low-volatility subsamples, indicating that, in the absence of the anti-recharacterization laws, treated and control states would likely have followed similar trends. The consistency between the heterogeneity-robust DID and the regular TWFE model reassures us that our results are robust against potential negative weighting bias. This indicates that the bias may not be significant in our context, allowing us to proceed

[8] The results are estimated using the Stata command "did_multiplegt_dyn" contributed by De Chaisemartin and d'Haultfoeuille (2024). Estimators and Variance Estimators Computed by the did_multiplegt_dyn Command.

with the regular DID for our subsequent robustness analysis.

4.3.4 Robustness

We further examine the robustness of our main findings by exploring potential influences from other factors that might challenge our identifying assumptions. Additionally, we test the robustness of our results across alternative model specifications and variable measurements.

Endogeneity of Law Passage. A potential concern is that our estimates may be biased due to sample selection issues arising from the endogeneity of the laws' passage or firms' strategic location choices. If anti-recharacterization laws were enacted in response to economic or industry-specific conditions that also influence firms' leasing decisions, our results could be confounded. For example, states with industries heavily reliant on leasing might be more inclined to adopt these laws, introducing endogeneity of the passage of the laws if leasing patterns in such industries differ systematically. As noted by Kettering (2007), the financial sector played a significant role in lobbying to limit recharacterization. To mitigate this concern, we exclude financial firms, where lobbying efforts were most concentrated, and focus on non-financial firms.

Our dynamic effects analysis (Figure 8 and Table 4) provides further reassurance. If economic conditions had motivated firms to advocate for these laws, we would expect to observe anticipatory effects prior to their enactment. However, our findings indicate no evidence of such effects.

State Incorporation Changes and Attrition Bias. We also exclude firms that change their state of incorporation during the sample period. These changes may reflect relocations to states with more favorable business environments, potentially introducing omitted variable bias if such relocations are correlated with firms' financing options. A related concern is "compositional change bias", which occurs when the composition of treated and control groups changes over time in a way systematically related to the treatment or outcome. This bias can distort causal estimates, as observed differences in outcomes may capture shifts in group characteristics rather than the treatment effect itself.

To address these concerns, we replace the outcome variable in our baseline regression with indicators for firm entry and exit. If the laws had no effect on attrition, compositional changes should not bias our results. We define firm entry based on the year of incorporation and use the last year in the dataset as a proxy for firm exit. Additionally, we restrict the sample to firms observed throughout the sample period to ensure a stable panel. Table 5 presents the results, showing little evidence that the laws influenced firm entry or exit.

[Place Table 5 here]

Controlling for Time-Varying State-Level Shocks. Other state-level policies, economic shocks, or firm-specific factors that vary over time could also influence leasing behavior and potentially confound the effects attributed to the anti-recharacterization laws. While including firm and time fixed effects partially controls for this issue, it may not fully address all unobserved heterogeneity. Therefore, to further mitigate potential bias from other time-varying shocks, we augment our baseline specification with state-by-year fixed effects to capture various unobserved, time-varying shocks at the state level. Our point estimates remain quantitatively similar, supporting the robustness of our results.

[Place Table 6 here]

Placebo test Using Neighboring States. Additionally, we address concerns that the smaller reduction in leased capital usage among high-volatility firms compared to low-volatility firms could be driven by unobservable shocks that affect treated and control firms differently, undermining causal inference. To examine this, we conduct a falsification test by assuming that states bordering Texas, Louisiana, and Alabama enacted anti-recharacterization laws, treating these neighboring states as a pseudo-treatment group. We then replicate our baseline regressions. The estimated coefficients in Table 7 are statistically indistinguishable from zero, indicating that our main results are not artifacts of regional or political shocks affecting these areas.

[Place Table 7 here]

Alternative Measures of Leasing and Volatility. Finally, we test the robustness of our results to alternative definitions of the leased capital ratio. Following Hu et al. (2020), we define the ratio as eight times the current lease payment (XRENT) divided by the sum of eight times XRENT and property, plant, and equipment (PPENT). Columns (1) to (3) in Table 8 show that the passage of anti-recharacterization laws significantly reduces the leased capital ratio, particularly for financially constrained firms. Further, the interaction between the law and high volatility remains positive and statistically significant, indicating that high-volatility firms are less likely to reduce leasing activity after the law change. Columns (4) to (6) use an alternative classification for high- and low-volatility firms, based on the top and bottom 30% of industry volatility rather than the median. The results confirm that our conclusions regarding the differential responses of high- and low-volatility firms are robust.

Overall, these findings are consistent with the baseline results in Table 3, demonstrating that our conclusions are robust to variations in both the leased capital ratio measurement and the classification of volatility groups.

[Place Table 8 here]

5 Conclusion

Our study offers a novel perspective on the strategic use of leasing in corporate finance. We propose that leasing is not merely an alternative form of financing but also an effective, collateral-efficient method for managing risk. This view complements with the traditional understanding of hedging behavior among financially constrained firms, suggesting that these firms often use leasing to hedge against capital value risk.

Through our dynamic agency-based model, we illustrate how leasing can integrate the benefits of collateralized borrowing with hedging strategies, addressing both financing and risk management needs. Empirically, we find that firms experiencing higher capital value volatility, regardless of their financial constraints, are more inclined to lease. We also find that following an exogenous shock to financial constraints, high-volatility firms reduce their leased capital usage less than low-volatility firms. This evidence highlights the significant role of leasing as a hedging mechanism, particularly when traditional methods like derivatives are impractical or too costly.

Our findings contribute to a deeper understanding of corporate decision-making, underscoring the strategic importance of leasing as a viable tool for risk management in the context of financial constraints.

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Tables and Figures

Table 1: **Decomposition of Leasing Cash Flows**

Panel A: Cash Flow of Leasing		
	Time t	Time $t+1$
Leasing	$-R^{-1}(R-1+\delta)$	$f'_{t+1}(k_t)-m$
Panel B: Cash Flow of Compositions of Leasing		
	Time t	Time $t+1$
Purchase of Capital	-1	$f'_{t+1}(k_t)+(1-\delta)\xi_{t+1}$
Non-contingent Debt	$R^{-1}(1-\delta)$	$-(1-\delta)$
Short Position in Futures	0	$(1-\delta)\,(1-\xi_{t+1})$
Monitoring Cost	0	$-m$
Sum	$-R^{-1}(R-1+\delta)$	$f'_{t+1}(k_t)-m$

This table provides a detailed decomposition of leasing cash flows. Panel A outlines the cash flow associated with deploying a single unit of leased capital at times t and t+1. Panel B breaks down the leasing cash flow into its constituent elements: capital purchase, non-contingent borrowing, futures contract hedging, and monitoring costs.

Table 2: Differences According to Volatility

Variables	(1) Overall	(2) Low Volatility	(3) High Volatility	(4) Difference
lcr	24.021	19.446	29.301	-9.854***
logat	5.807	5.952	5.639	0.312***
tobinQ	1.916	1.775	2.079	-0.304***
dividend	0.378	0.446	0.300	0.146***
proabi	0.141	0.141	0.141	0.000
tanabi	0.270	0.293	0.242	0.051***
taxrate	0.246	0.259	0.230	0.030***
WW	-0.226	-0.236	-0.215	-0.021***
SA	-3.256	-3.335	-3.166	-0.169***
age	14.513	15.864	12.954	2.909***

We classify two-digit SIC industries into high- and low-volatility groups based on their ex-ante volatility. This table presents the mean values of key variables for the full sample, the low-volatility group, and the high-volatility group, along with the differences between these groups. The last column reports the p-values of t-tests comparing the low- and high-volatility groups, with *** denoting statistical significance at the 1% level.

Table 3: Volatility and Leased Capital Ratio: Baseline Results

VARIABLES	(1) Overall	(2) Financially Constrained	(3) Financially Unconstrained
law	-1.229***	-1.764***	-0.731*
	(0.440)	(0.609)	(0.390)
$law \times HighVolatility$	1.134***	1.674***	0.134
	(0.121)	(0.222)	(0.190)
Observations	41,063	20,259	20,501
R-squared	0.910	0.917	0.918
Control Variables	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	YES	YES

This table presents the results of the firm-level impact of anti-recharacterization laws on the leased capital ratio (LCR). The key variables of interest are Law and $Law \times I_{Highvol}$. Law is a binary indicator set to 1 for firms incorporated in Texas, Louisiana, Alabama, and Delaware after the enactment of anti-recharacterization laws in these states and before 2003. The interaction term $Law \times I_{Highvol}$ captures the differential sensitivity of high-volatility firms to the law change. A firm is classified as high volatility if its industry volatility is above the industry median, as defined in the Data section. The unit of observation is a firm-year pair. Control variables include leverage, Tobin's Q, dividends, profitability, cash holdings, tangibility, and tax rates (see Table A1 for variable definitions). Standard errors (in parentheses) are clustered at the state of incorporation. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 4: Volatility and Leased Capital Ratio: Baseline Results by Heterogeneity-robust DID

				Financially Constrained		Financially Unconstrained	
VARIABLES	Overall Sample	High Volatility	Low Volatility	High Volatility	Low Volatility	High Volatility	Low Volatility
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ATE	-0.915***	-0.746	-1.025***	-0.727	-1.523***	-0.462	-0.873***
	(0.307)	(0.706)	(0.219)	(0.444)	(0.370)	(0.703)	(0.216)
$law(-2)$	0.387	0.923	-0.0262	1.431*	-0.737	0.0628	0.503
	(0.648)	(0.867)	(0.677)	(0.840)	(1.460)	(1.165)	(0.462)
$law(-1)$	0.399	0.543	0.279	-0.385	0.516*	0.996	0.414**
	(0.368)	(0.710)	(0.185)	(1.464)	(0.304)	(0.879)	(0.209)
$law(+1)$	-0.685	-0.460	-0.840***	0.0290	-1.262***	-0.602	-0.755***
	(0.488)	(1.092)	(0.211)	(0.983)	(0.396)	(0.613)	(0.227)
$law(+2)$	-1.173***	-1.068*	-1.234***	-1.673*	-1.843***	-0.313	-1.002***
	(0.269)	(0.579)	(0.303)	(0.909)	(0.471)	(0.851)	(0.299)
Observations	11,517	4,240	6,327	2,125	2,023	1,927	3,570
Controls	YES	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES

This table presents the baseline results for the overall sample, high- and low-volatility firms, and financially constrained and non-constrained subsamples. The dependent variable is the lease capital ratio. The independent variables are dummy variables indicating the year distance to the passing of the anti-recharacterization laws, interacted with the treatment indicator for treated states. All regressions include year and firm fixed effects. Robust standard errors clustered at the state level are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Robustness Check: Compositional Change

VARIABLES	(1)	Number of Exits (2)	(3)	Number of Entrants (4)	(5)
law	-1.040***	0.154	-21.80	0.132	-23.42
	(0.350)	(0.109)	(23.69)	(0.108)	(24.51)
$law \times HighVolatility$	0.462**	0.0550		0.0996*	
	(0.197)	(0.0529)		(0.0592)	
Observations	19,653	18,328	752	18,328	752
R-squared	0.921	0.128	0.456	0.157	0.291
Year FE	YES	YES	YES	YES	YES
Firm FE	YES				
4-digit Industry FE		YES		YES	
State FE			YES		YES

Column (1) estimates the effect of the Anti-recharacterization Law on the leasing capital ratio using a sample of firms observed within a $[t-2, t+2]$ window around the law's implementation, with no attrition. Columns (2) through (5) analyze the law's impact on firm exit and entry using Compustat data. In columns (2) and (4), the analysis is conducted at the 4-digit industry-year-volatility category level, while in columns (3) and (5), the unit of observation is a state-year cell. A firm is classified as exiting in a given year if it is no longer observed in the data for that year and does not re-enter in subsequent years. Conversely, a firm is classified as entering in a given year if it is incorporated during that year. Standard errors (reported in parentheses) are clustered at the state-of-incorporation level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: Robustness Check: Time-varying Shocks

VARIABLES	(1) Overall	(2) Financially Constrained	(3) Financially Unconstrained
law	-1.040***	-1.360***	-0.683
	(0.378)	(0.430)	(0.496)
$law \times HighVolatility$	1.021***	1.311**	0.00436
	(0.178)	(0.544)	(0.204)
Observations	41,063	20,259	20,501
R-squared	0.910	0.917	0.918
Control	YES	YES	YES
Firm FE	YES	YES	YES
State by Year FE	YES	YES	YES

This table shows the impact of anti-recharacterization laws on the leased capital ratio (LCR) at the firm level. The key variables are Law and $Law \times I_{HighVol}$, with the interaction term capturing the differential effect on high-volatility firms. A firm is considered high-volatility if its industry volatility exceeds the median (see Data section). The analysis is at the firm-year level. Control variables include leverage, Tobin's Q, dividends, profitability, cash holdings, tangibility, and tax rates (see Table A1 for definitions). Financial constraints are defined by the firm's Size-age (SA) index relative to the industry median. $HighVolatility$ equals 1 if the firm belongs to an industry whose volatility is higher than the median of industrial volatility, otherwise equals 0. State by Year fixed effect is constructed in terms of headquarter located states. Standard errors (in parentheses) are clustered at the state level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7: Robustness Check: Placebo Test

VARIABLES	(1) Overall	(2) Financially Constrained	(3) Financially Unconstrained
law	-0.00254	-0.668	0.935
	(0.934)	(0.409)	(1.719)
$law \times HighVolatility$	-1.032	-0.232	-2.200
	(1.531)	(1.917)	(1.846)
Observations	41,063	20,259	20,501
R-squared	0.910	0.917	0.918
Control	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	YES	YES

This table presents the results of the firm-level impact of anti-recharacterization laws on the leased capital ratio (LCR). The key variables of interest are Law and $Law \times I_{Highvol}$. We used the bordering states of TX, LA and AL as falsely treated group. For cohorts treated in 1997, we use New Mexico, Oklahoma, Arkansas and Mississippi as treated group; for cohorts treated in 2001, we use Tennessee, Georgia and Florida as treated group. The interaction term $Law \times I_{Highvol}$ captures the differential sensitivity of high-volatility firms to the law change. A firm is classified as high volatility if its industry volatility is above the industry median, as defined in the Data section. The unit of observation is a firm-year pair. Control variables include leverage, Tobin's Q, dividends, profitability, cash holdings, tangibility, and tax rates (see Table A1 for variable definitions). Standard errors (in parentheses) are clustered at the state of incorporation. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 8: Robustness Check: Alternative Leased Capital Ratio and Volatility Cutoffs

VARIABLES	Alternative Leased Capital Ratio			Alternative Volatility Cutoffs		
	Overall	Financially Constrained	Financially Unconstrained	Overall	Financially Constrained	Financially Unconstrained
	(1)	(2)	(3)	(4)	(5)	(6)
law	-0.447*	-0.575**	-0.380	-1.723***	-2.781***	-0.634
	(0.232)	(0.275)	(0.279)	(0.487)	(0.857)	(0.507)
$law \times HighVolatility$	1.092***	1.480***	0.326***	0.772**	1.866**	-0.363
	(0.139)	(0.147)	(0.120)	(0.383)	(0.807)	(0.231)
Observations	41,063	20,259	20,501	41,063	20,259	20,501
R-squared	0.910	0.917	0.918	0.910	0.917	0.918
Control	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

This table shows the impact of anti-recharacterization laws on the leased capital ratio (LCR) at the firm level. The key variables are Law and $Law \times I_{HighVol}$, with the interaction term capturing the differential effect on high-volatility firms. A firm is considered high-volatility if its industry volatility exceeds the median (see Data section). The analysis is at the firm-year level. Control variables include leverage, Tobin's Q, dividends, profitability, cash holdings, tangibility, and tax rates (see Table A1 for definitions). In columns (1) to (3), the leased capital ratio is calculated as eight times XRENT scaled by the sum of eight times XRENT and PPENT. The high-volatility classification follows the baseline: $HighVolatility = 1$ if industry volatility exceeds the median. In columns (4) to (6), $HighVolatility = 1$ if industry volatility is above the 70th percentile and 0 if below the 30th percentile. The leased capital ratio is calculated as eight times XRENT scaled by total assets. Financial constraints are defined by the firm's Whited-Wu (WW) index relative to the industry median. Standard errors (in parentheses) are clustered at the state level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Figure 1: **Leasing vs. Combined Purchasing and Hedging**

This figure illustrates the firm's policy as a function of its net worth. Panels A and B depict the level of leasing ($k_{l,t}$) and the leasing ratio ($\frac{k_{l,t}}{k_t}$). Panels C and D present the level of futures hedging (h_t) and the futures hedging ratio ($\frac{h_t}{k_t}$). Panels E and F focus on the constraint tightness and marginal costs of leasing vs. combined purchasing and hedging, as outlined in equation (16)–(18). The parameters used in this analysis include a discount rate $\beta = 0.985$, gross interest rate $R = 1.01$, depreciation rate $\delta = 0.025$, monitoring cost $m = 0.0025$, collateral requirements $\theta_b = 0.8$ for borrowing and $\theta_h = 0.2$ for futures, and capital share $\alpha = 0.333$. The productivity shock (A) and capital value shock (ξ) follow truncated normal distributions with a mean of 1, truncated at 3 standard deviations. They have volatilities $\sigma_A = 0.2$ and $\sigma_\xi = 0.2$, with zero correlation ($corr(A, \xi) = 0$).

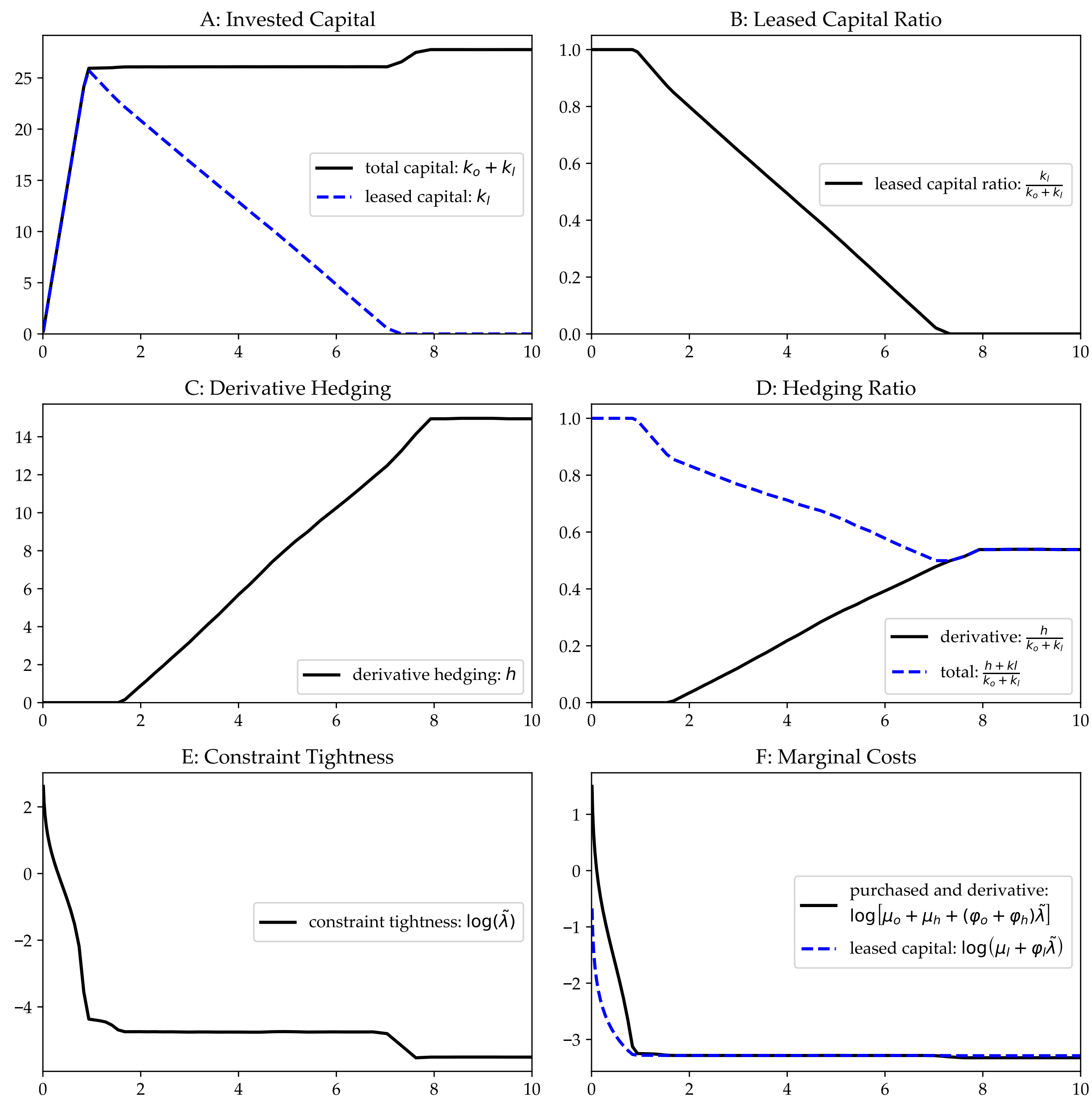


Figure 2: **Leasing: the Financing Channel**

This figure illustrates the firm's policy as a function of its net worth, with an emphasis on its financing role by excluding the hedging role of leasing. Panels A and B depict the level of leasing ($k_{l,t}$) and the leasing ratio ($\frac{k_{l,t}}{k_t}$). Panels C and D present the level of futures hedging (h_t) and the futures hedging ratio ($\frac{h_t}{k_t}$). Panels E and F focus on the constraint tightness and marginal costs of leasing vs. purchasing. In this setup, capital value risk is borne by lessees rather than lessors. The remaining parameters match those used in Figure 1.

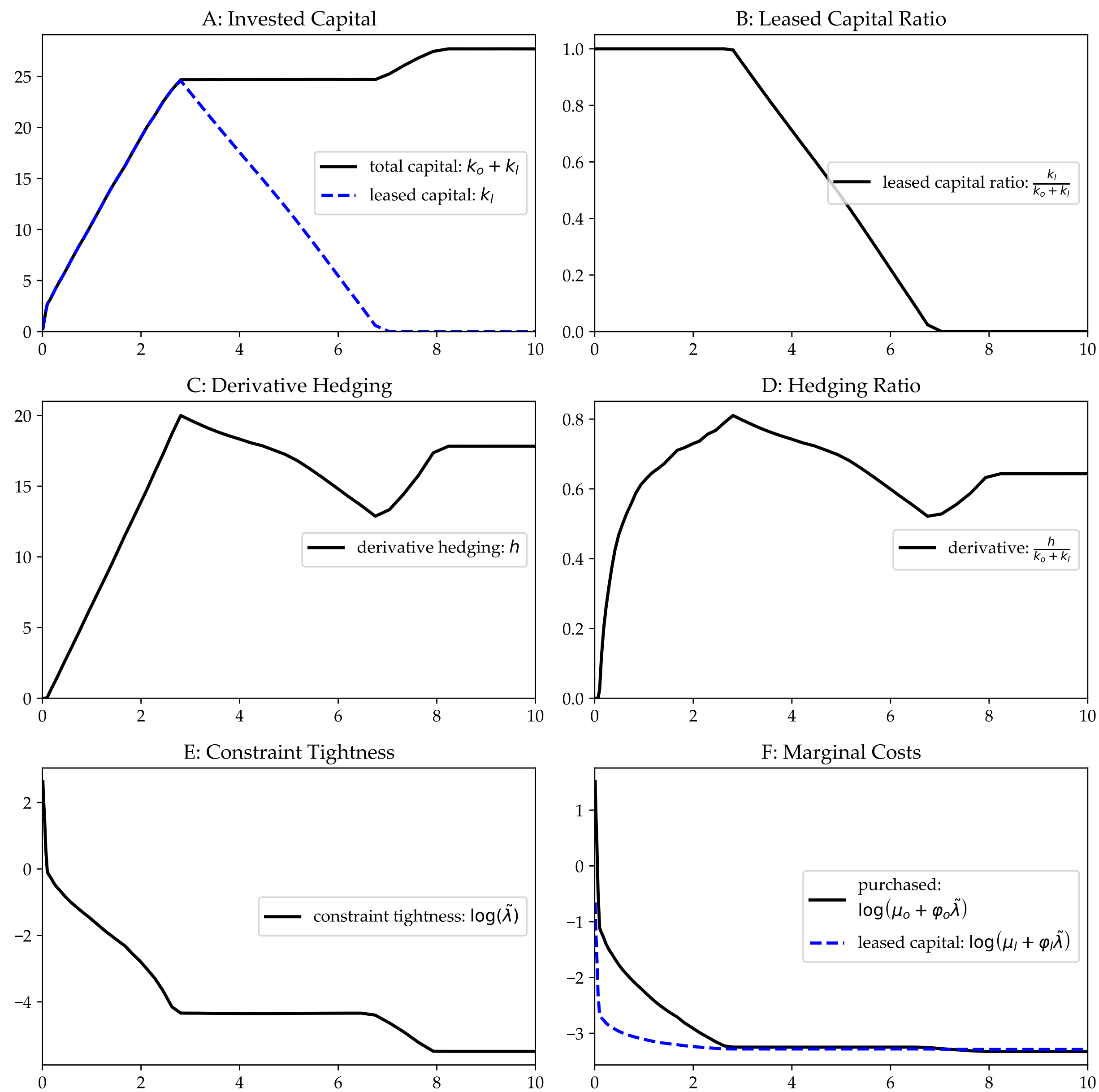


Figure 3: **Leasing: the Hedging Channel**

This figure illustrates the firm's policy as a function of its net worth, particularly highlighting its hedging role while setting aside the financing aspect of leasing. Panels A and B depict the level of leasing ($k_{l,t}$) and the leasing ratio ($\frac{k_{l,t}}{k_t}$). Panel C presents the level of futures hedging (h_t) and total hedging ($h_t + k_{l,t}$), while Panel D shows the futures hedging ratio ($\frac{h_t}{k_t}$) and total hedging ratio ($\frac{h_t+k_{l,t}}{k_t}$). Panels E and F focus on the constraint tightness and marginal costs of leasing vs. derivative hedging. In this setup, leasing serves purely as a hedging tool and does not contribute to production. The remaining parameters are consistent with those used in Figure 1.

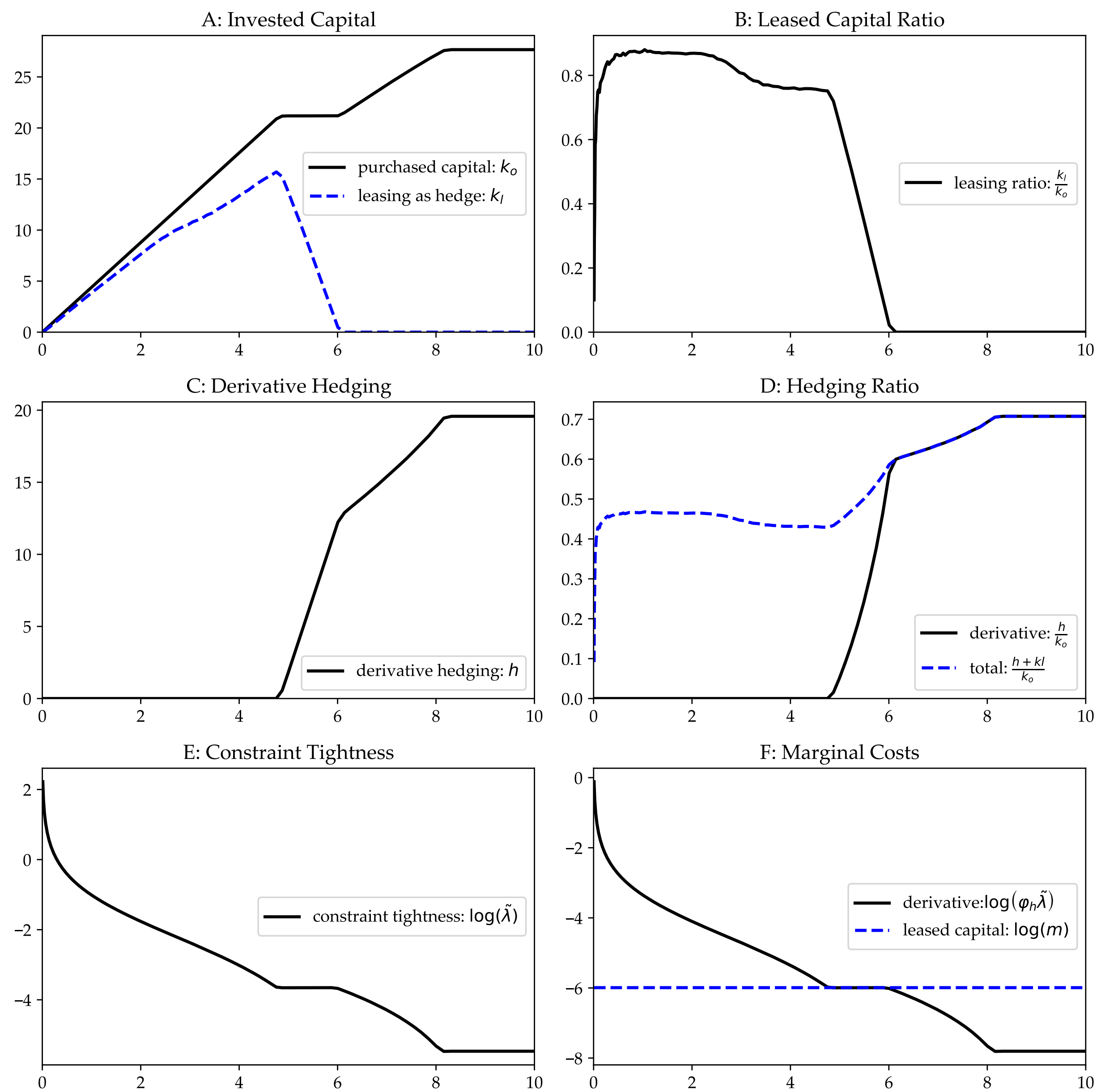


Figure 4: **Different Collateral Requirements for Derivative Hedging**

This figure presents comparative statics analyses under different collateral requirements for futures. It examines three scenarios: the blue line represents a high collateral requirement with $\theta_h \to +\infty$, the black line shows a medium collateral requirement with $\theta_h = 0.2$, and the red line indicates no collateral requirement with $\theta_h = 0$. Panels A and B illustrate the level of leasing ($k_{l,t}$) and the leasing ratio ($\frac{k_{l,t}}{k_t}$), respectively. Panels C and D show the derivative hedging ratio ($\frac{h_t}{k_t}$) and the total hedging ratio ($\frac{h_t+k_{l,t}}{k_t}$). The parameters for these analyses are consistent with those used in Figure 1.

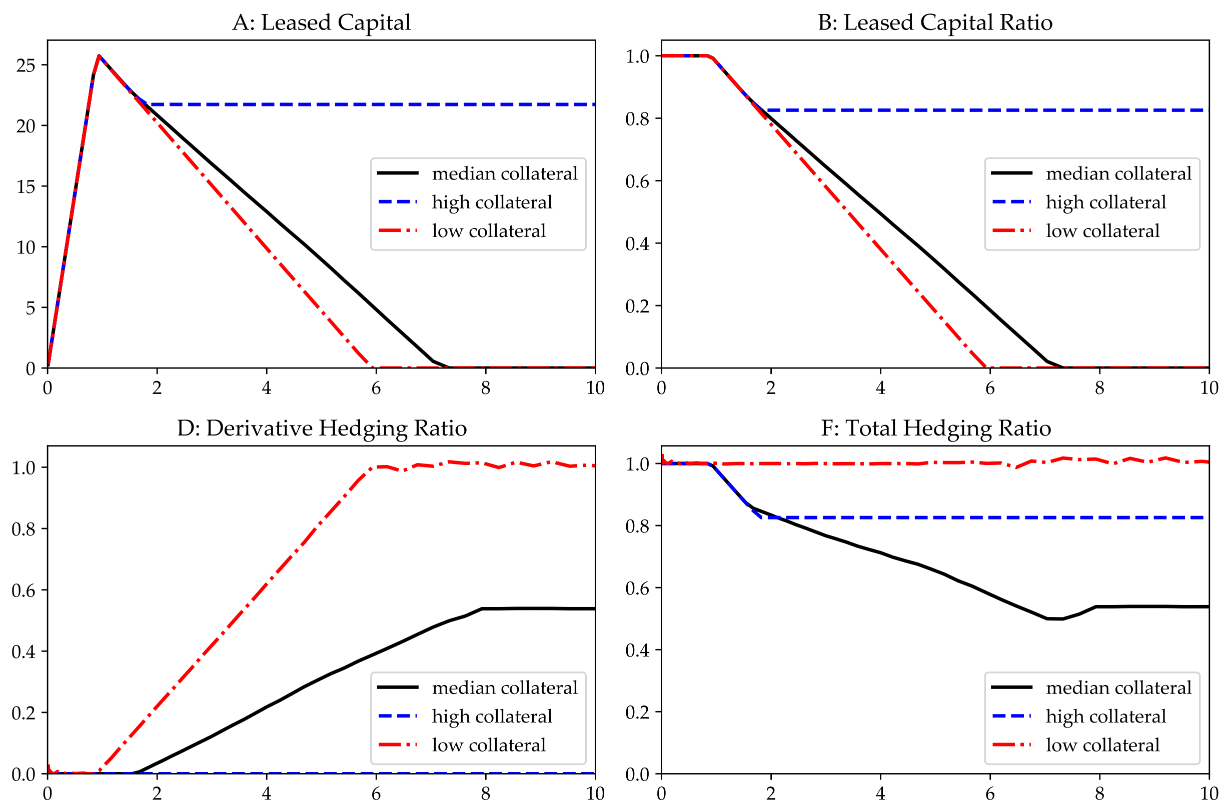


Figure 5: **Correlated Shocks**

This figure conducts comparative statics analyses examining the impact of varying correlations between capital quality and productivity shocks ($corr(A, \xi)$). Three scenarios are depicted: the black line represents positive correlation case with $corr(A, \xi) = 1$, the black line illustrates zero correlation case with $corr(A, \xi) = 0$, and the red line shows negative correlation case with $corr(A, \xi) = -1$. In all three scenarios, the futures market is excluded from consideration. Panels A and B showcase the level of leasing ($k_{l,t}$) and the leasing ratio ($\frac{k_{l,t}}{k_t}$), respectively. The parameters for these analyses are consistent with those used in Figure 1.

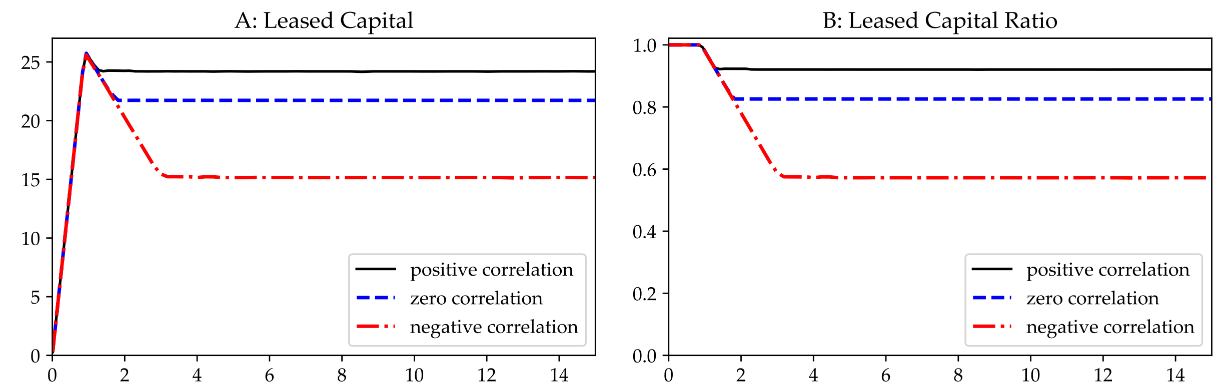


Figure 6: **Different Volatility of Capital Values**

This figure presents comparative statics analyses under varying capital value volatility. It features three scenarios: the black line represents a high volatility case with $\sigma_\xi = 0.2$, the blue line illustrates a low volatility case with $\sigma_\xi = 0.1$, and the red line shows a high volatility case with $\sigma_\xi = 0.2$ where the hedging role of leasing is shut down. In all three scenarios, the futures market is excluded from consideration. Panels A and B showcase the level of leasing ($k_{l,t}$) and the leasing ratio ($\frac{k_{l,t}}{k_t}$), respectively. The parameters for these analyses are consistent with those used in Figure 1.

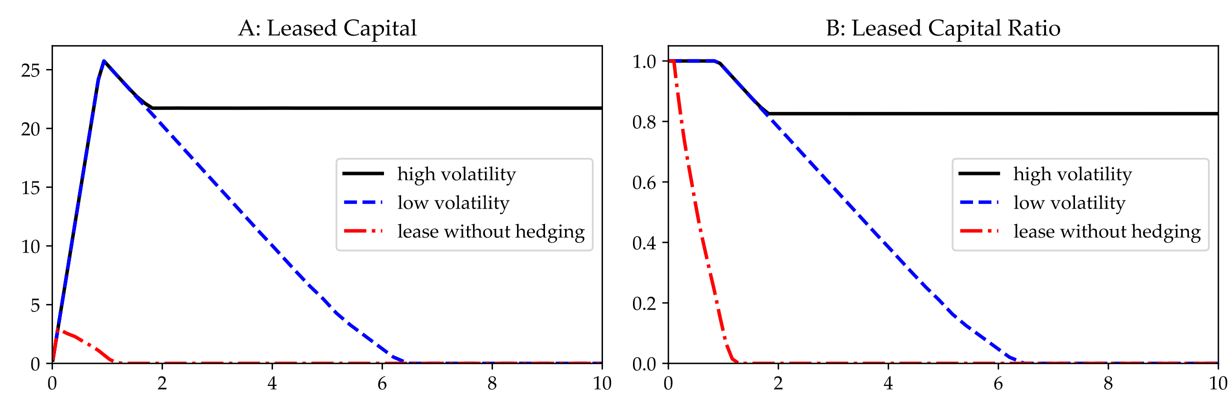


Figure 7: **Leasing Capital Ratio, Volatility, and Financial Constraints**

The dots are characterized by dividing SA (WW) index into 50 equally sized bins based on quantile cutoff points and then plotting mean values of leasing capital ratio (defined by eight times current lease payments XRENT scaled by total assets) and SA (WW) within these bins. The fitted lines represent the OLS estimation of specification $LCR_i = \alpha + \beta \times SA_i + \varepsilon_i$, where LCR is leasing capital ratio, SA index is calculated according to Hadlock and Pierce (2010), WW index is calculated based on Whited and Wu (2006), and i represents the i_{th} observation. Preliminarily, $\beta_{\text{low volatility}} > \beta_{\text{high volatility}}$ reflects the stylized fact that high-volatility group is less sensitive to the change of financial constraints.

(a) SA Index

(b) WW index

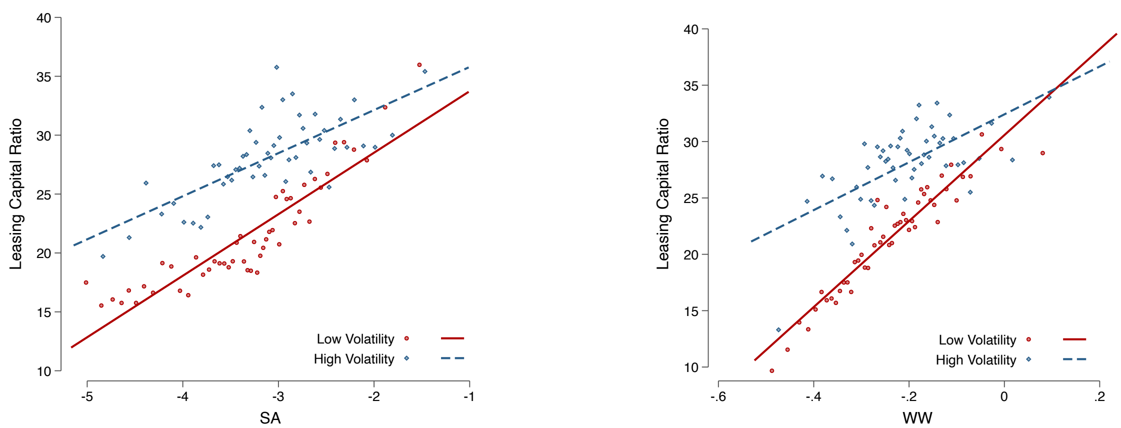
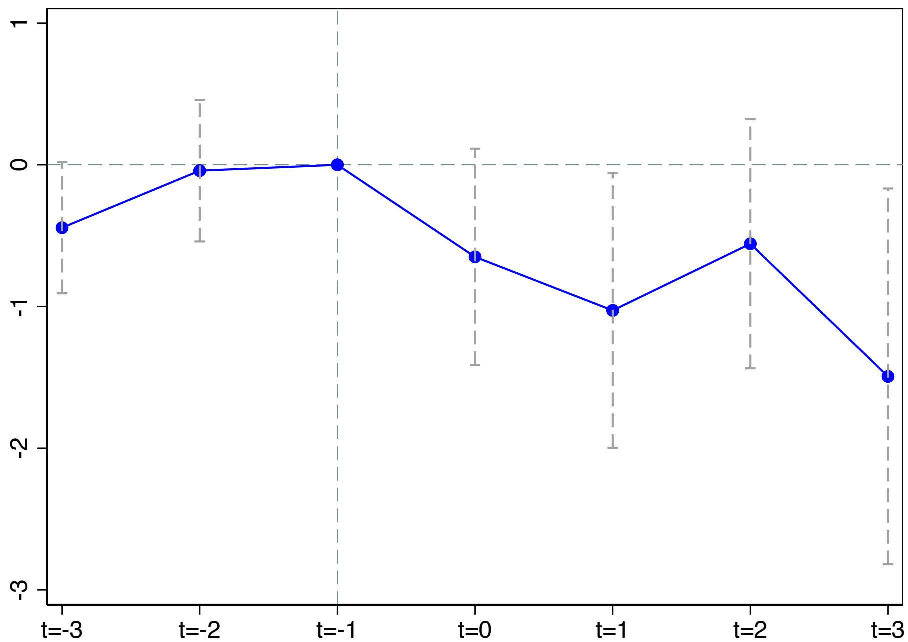


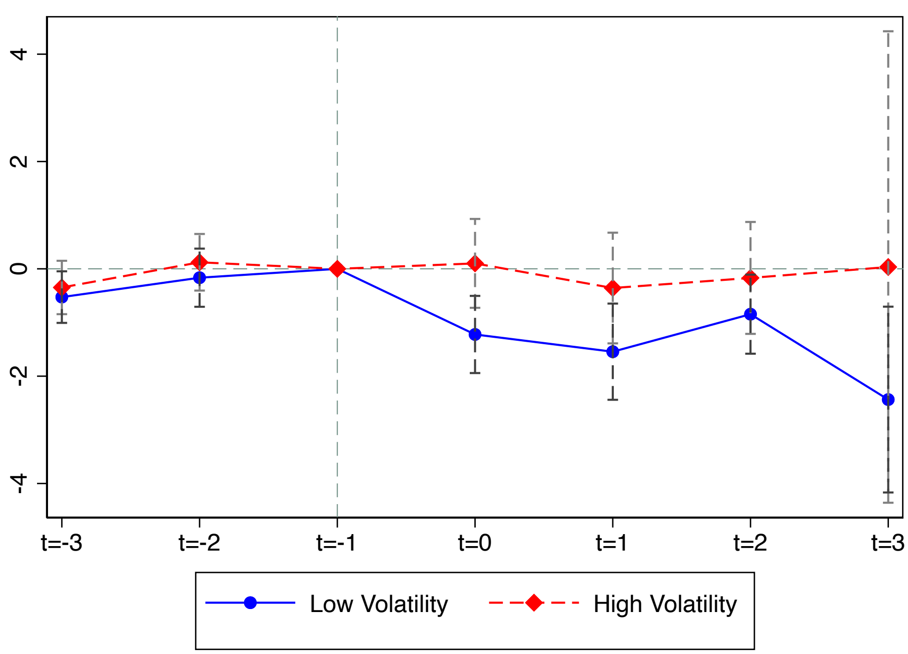
Figure 8: **Lease Surrounding Antirecharacterization Laws**

Event study graph for the average effect of the antirecharacterization laws on leased capital for the overall sample as well as high (low) volatility firms. We assign firms to the high-vol (low-vol) group categorized based on industry volatility proxies measured at the fiscal year ending before the laws' implementation. The dependent variable is defined as the lease capital ratio (i.e., eight times XRENT scaled by total assets). The benchmark period is the last period before the passage of the antirecharacterization laws. Each dot represents the coefficient on the interaction between being observed t years after the laws and being incorporated in a treated state. The confidence interval is at the 95% level.

(a) Overall Sample



(b) Low & High Volatility Sample



A Firm's Optimization Problem

The firm's optimization problem is summarized as follows:

$$V_t = \max_{d_t, k_{o,t}, k_{l,t}, B_t, h_t} d_t + \beta E_t \left(V_{t+1} \right). \tag{A.1}$$

subject to:

$$w_t + B_t \geq d_t + k_t, \tag{A.2}$$

$$f_{t+1}(k_t) + (1-\delta)\xi_{t+1} k_t - m k_{l,t} + \left(h_t + k_{l,t} \right)(1-\delta)\left(1 - \xi_{t+1}\right) \geq w_{t+1} + R B_t, \tag{A.3}$$

$$B_t \leq \theta_b R^{-1}(1-\delta) k_{t,o} - \theta_h R^{-1}(1-\delta) h_t + \theta_l R^{-1}(1-\delta) k_{l,t}, \tag{A.4}$$

$$k_{o,t} \geq 0 \tag{A.5}$$

$$k_{l,t} \geq 0 \tag{A.6}$$

$$d_t \geq 0 \tag{A.7}$$

$$h_t \geq 0 \tag{A.8}$$

Let the Lagrange multipliers for the budget constraints at time t and $t+1$, and the collateral constraint, be denoted as μ_t, μ_{t+1}, and λ_t, respectively. The multipliers for the non-negativity constraints on purchased capital, leased capital, dividends, and hedging are denoted as $\nu_{o,t}$, $\nu_{l,t}$, $\nu_{d,t}$, and $\nu_{h,t}$. The first-order conditions with respect to d_t, $k_{o,t}$, $k_{l,t}$, B_t, and h_t are as follows:

$$\mu_t = 1 + \nu_{d,t}, \tag{A.9}$$

$$\mu_t = \beta E_t \left\{ \mu_{t+1} \left[f'_{t+1}(k_t) + (1-\delta)\xi_{t+1} \right] \right\} + \theta_b R^{-1}(1-\delta)\lambda_t + \nu_{o,t}, \tag{A.10}$$

$$\mu_t = \beta E_t \left\{ \mu_{t+1} \left[f'_{t+1}(k_t) + (1-\delta) - m \right] \right\} + \theta_l R^{-1}(1-\delta)\lambda_t + \nu_{l,t}, \tag{A.11}$$

$$\mu_t = \beta R E_t \left(\mu_{t+1} \right) + \lambda_t, \tag{A.12}$$

$$\beta(1-\delta) E_t \mu_{t+1} \left(1 - \xi_{t+1}\right) - \theta_h R^{-1}(1-\delta)\lambda_t + \nu_{h,t} = 0. \tag{A.13}$$

To simplify notation and facilitate analysis, we define $\tilde{\lambda}_t = \frac{\lambda_t}{\beta R E_t(\mu_{t+1})}$ and $\tilde{\nu}_t = \frac{\nu_t}{\beta R E_t(\mu_{t+1})}$.

B Variable Definitions

This paper employs two measures of financial constraints:

1. **Whited-Wu Index**

   Following Whited and Wu (2006), the financial constraint index is constructed as:

$$
\begin{aligned}
-0.091 \times \frac{IB + DP}{AT} - 0.062 \times \mathbf{1}\{DVC + DVP > 0\} + 0.021 \times \frac{DLTT}{AT} - 0.044 \times \log(AT) \\
+0.102 \times (\text{Average Industry Sales Growth}) - 0.035 \times (\text{Sales Growth})
\end{aligned}
$$

   where variables in italics are the corresponding Compustat codes. Firms with values above the median are classified as financially constrained, while those below the median are classified as unconstrained.

2. **Size-Age Index**

   Following Hadlock and Pierce (2010), the financial constraint index is defined as:

$$
-0.737 \times \text{Size} + 0.043 \times \text{Size}^2 - 0.040 \times \text{Age},
$$

   where **Size** is the natural logarithm of total assets (*AT*), adjusted to 2004 dollars, and capped at the natural logarithm of $4.5 billion. **Age** is the number of years since the firm was first listed with a non-missing stock price on Compustat, capped at 37.

Table A1: Variable Definition

Variable	**Definition**
Leasing Capital Ratio	eight times current rental payment(XRENT) scaled by total assets(AT)
Alternative Leasing Capital Ratio	eight times current rental payment(XRENT) scaled by the sum of eight times current rental payment(XRENT) and total property, plant and equipment(PPENT)
Size	the log of total assets(AT)
Tobin Q	market value of total assets(AT+PRCC_F*CSHO-TXDB-CEQ) to total assets
Dividend	equals 1 if the firm pays out a dividend(DVP+DVC¿0)
Profitability	operating income(OIBDP) divided by total assets
Tangibility	total property, plant and equipment(PPENT) divided by total assets
Tax Rate	tax payment(TXT) to pretax income(PI)
WW index	calculated according to Whited and Wu (2006)
SA index	calculated according to Hadlock and Pierce (2010)
Redeployability	calculated according to Kim and Kung (2017)

This table presents the definitions for the variables used throughout the paper.

C Classification of High vs. Low Volatlity Industries

Table A2: High Volatility Industries

SIC	Industry Name	Obs
01	Agricultural Production - Crops	93
02	Agricultural Production - Livestock	16
07	Agricultural Services	22
10	Metal Mining	71
12	Bituminous Coal and Lignite Mining	105
14	Mining and Quarrying of Nonmetallic Minerals, except Fuels	114
15	Building Construction General Contractors and Operative Builders	274
16	Heavy Construction other than Building Construction Contractors	211
17	Construction Special Trade Contractors	144
21	Tobacco Products	54
24	Lumber and Wood Products, except Furniture	255
31	Leather and Leather Products	220
35	Industrial and Commercial Machinery and Computer Equipment	3069
36	Electronic and other Electrical Equipment and Components, except Computer Equipment	3941
41	Local and Suburban Transit and Interurban Highway Passenger Transportation	54
44	Water Transportation	165
45	Transportation by Air	423
46	Pipelines, except Natural Gas	48
47	Transportation Services	168
52	Building Materials, Hardware, Garden Supply, and Mobile Home Dealers	116
53	General Merchandise Stores	417
55	Automotive Dealers and Gasoline Service Stations	328
56	Apparel and Accessory Stores	759
57	Home Furniture, Furnishings, and Equipment Stores	252
58	Eating and Drinking Places	1095
73	Business Services	6212
75	Automotive Repair, Services, and Parking	161
76	Miscellaneous Repair Services	11
78	Motion Pictures	299
79	Amusement and Recreation Services	510
80	Health Services	1191
83	Social Services	92

We classify two-digit SIC industries into high or low volatility groups according to their ex-ante volatility. This table shows the details of high volatility group.

Table A3: Low Volatility Industries

SIC	Industry Name	Obs
13	Oil and Gas Extraction	1679
20	Food and Kindred Products	1279
22	Textile Mill Products	299
23	Apparel and other Finished Products Made from Fabrics and Similar Materials	642
25	Furniture and Fixtures	358
26	Paper and Allied Products	509
27	Printing, Publishing, and Allied Industries	665
28	Chemicals and Allied Products	2769
29	Petroleum Refining and Related Industries	282
30	Rubber and Miscellaneous Plastics Products	640
32	Stone, Clay, Glass, and Concrete Products	319
33	Primary Metal Industries	566
34	Fabricated Metal Products, except Machinery and Transportation Equipment	832
37	Transportation Equipment	1173
38	Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks	3024
39	Miscellaneous Manufacturing Industries	577
40	Railroad Transportation	138
42	Motor Freight Transportation and Warehousing	296
48	Communications	1608
49	Electric, Gas and Sanitary Services	379
50	Wholesale Trade-Durable Goods	1461
51	Wholesale Trade-Nondurable Goods	797
54	Food Stores	381
59	Miscellaneous Retail	1239
70	Hotels, Rooming Houses, Camps, and other Lodging Places	242
72	Personal Services	237
82	Educational Services	283
87	Engineering, Accounting, Research, Management, and Related Services	1076
99	Nonclassifiable Establishments	354

We classify two-digit SIC industries into high or low volatility groups according to their ex-ante volatility. This table shows the details of low volatility group.

Table A4: Summary Statistics of Key Variables

	Control			Treated		
	Mean	SD	p50	Mean	SD	p50
lcr	24.856	32.801	13.420	23.584	32.705	12.171
logat	5.486	1.910	5.364	5.975	1.861	5.900
tobinQ	1.847	1.275	1.436	1.953	1.398	1.491
dividend	0.432	0.495	0.000	0.349	0.477	0.000
proabi	0.143	0.081	0.132	0.139	0.081	0.128
tanabi	0.272	0.214	0.212	0.268	0.225	0.198
taxrate	0.261	0.361	0.349	0.238	0.408	0.342
WW	-0.215	0.117	-0.213	-0.232	0.113	-0.231
SA	-3.256	0.829	-3.210	-3.256	0.728	-3.196
age	16.602	12.753	13.000	13.417	12.164	10.000
Observations	15484			29510		

This table reports averages, standard deviation and median of leasing capital ratio and other firm characteristics. We use firms in Compustat between 1995 and 2010. We exclude firms that engaged in financial and utilities industries (four-digit standard industrial classification codes 4900-4949 and 6000-6999). We also exclude firms not incorporated or not located in the United States. We then exclude firms with missing or negative value of rent expenditure, book assets, sales, number of employee, operating income and net value of property, plant and equipment. lcr is leasing capital ratio, which is eight times current rental payment scaled by total assets. $logat$, which is the log of total assets(AT). $tobinQ$, which is the market value of total assets($AT + PRCC\_F * CSHO - TXDB - CEQ$) to total assets. $dividend$, which equals 1 if the firm pays out a dividend($DVP + DVC > 0$). $proabi$, which is operating income(OIBDP) divided by total assets. $tanabi$, which is the total property, plant and equipment(PPENT) divided by total assets. $taxrate$, which is tax payment(TXT) to pretax income(PI). WW index is calculated according to Whited and Wu (2006). SA index is calculated according to Hadlock and Pierce (2010). All variables above are winsorized 1%. age, is calculated by regarding the first year that the firm showed up in Compustat as the birth year.