The Effect of the Tax Cuts and Jobs Act of 2017 on Leasing

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This Version: June 18, 2024

Abstract

This paper examines the effect of the Tax Cuts and Jobs Act (TCJA) of 2017 on firms' choice of leasing in their financing mix and the substitutability between operating leases and debt financing. Firms may use operating leases to sidestep TCJA's limitations on tax deductions of debt interest. TCJA's new provisions on bonus depreciation for equipment and the treatment of net operating losses (NOLs) are also likely to affect firms' leasing incentives. Our results show that firms affected by the TCJA's limitations on interest deductions experienced a positive impact of TCJA on their use of operating leases and have a greater tendency to shift from non-lease debt financing to lease financing. Our results also indicate that firms affected by the bonus depreciation provision of the TCJA reduced their operating leases as a fraction of total assets. Additionally, we find that firms affected by the TCJA's limitations on net operating loss (NOL) carrybacks and carryforwards experienced a positive impact of TCJA on their use of operating leases relative to asset purchases. Overall, these findings support the view that the TCJA had significant effects on firms' financing decisions about operating leases.

Keywords: TCJA, Lease Financing, Operating Leases, Debt Financing, Taxes.

JEL Classification Codes: G30, G32, H32.

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1. Introduction

The Tax Cuts and Jobs Act of 2017 (TCJA or the Act) was the largest overhaul of the tax code in the U.S. in three decades. The Act created a single corporate tax rate of 21% and eliminated the corporate alternative minimum tax. Because excessive leverage poses increased risks and costs of financial distress and bankruptcy (especially in economic downturns) to firms, one intention of the TCJA was to reduce the corporate tax advantage of debt over equity. However, in doing so the legislators might have created a tax preference for leases over debt for some corporations.[1] Notably, 72% of the U.S. firms use leases as a type of financing, with operating leases comprising around 36% of their total debt and up to 12% of their total assets (Wang, 2023). Given the substantial weight of leases in firms' capital structure and the significant tax revisions, the effect of TCJA on leases is an important research question. While there is some evidence that firms reduced their leverage in response to TCJA (Carrizosa, Gaertner, and Lynch, 2023; Zhang, Chiasson, Li, and Lawrence; 2023), there is no direct empirical evidence on the effects of the Act on leases. For example, in the recently revised new version of their corporate finance textbook, Brealey, Myers, Allen, and Edmans (Principles of Corporate Finance, 14th edition, 2023) added one more "sensible reason for leasing" in their chapter on leasing (Chapter 26) without citing empirical evidence:

> "*Lessees May Sidestep the Limitation on Debt Interest: The 2017 Tax Cuts and Jobs Act limited the tax deductibility of interest payments to 30% of earnings before interest and depreciation (EBITDA). Companies that are up against this limit may find it convenient to lease new equipment rather than to borrow in order to buy it. The rental payments on the*

[1] In the tax law literature, Yu (2020) argues that limiting the amount of interest expense that corporations can deduct while allowing the entire lease expense or cost of goods sold to be deducted would be inconsistent with the tax law policy principles of horizontal equity and economic neutrality.

lease are fixed obligations like debt interest, but there is no restriction on the company's ability to deduct them when calculating its tax liability."

Thus, corporations affected by this TCJA limitation on the tax deductibility of debt interest to a greater extent may desire to lease more frequently as a replacement to debt financing since lease rents are not limited as to deductibility while interest expense is. This paper examines the effects of three key provisions of the Tax Cuts and Jobs Act of 2017 on firms' use of operating leases in their financing mix. The three key TCJA provisions that concern our study are the new limits on deduction for business interest expenses, the bonus depreciation provision (temporary 100 percent expensing for certain business assets), and limitations on net operating loss (NOL) carrybacks and carryforwards.

The TCJA included an interest deductibility limit provision which limits the amount of interest expense that certain corporations can deduct in a given tax year. Prior to the passage of TCJA, firms were generally allowed to deduct all their interest expenses in the year they were incurred. For tax years beginning after December 31, 2017, the TCJA limits the business interest expense to the sum of i) business interest income, ii) 30% of the taxpayer's "adjusted taxable income" (ATI),[2] and iii) the firm's floor plan financing interest expense for the year.[3] Firms with interest expenses greater than this limit must include the excess in their taxable income for that year. Hence, the TCJA substantially reduces the tax advantages of debt financing, which might lead to decreases in leverage. Firms may opt for leasing more often as a substitute for debt

[2] ATI is a business's taxable income, excluding interest income, interest expense, any net operating losses (NOLs), and certain other deductions related to depreciation, amortization, or depletion (EBITDA) until 2021 and equal to earnings before interest and taxes (EBIT) for taxable years beginning after 2021. The 30% ATI limitation was increased to 50% of ATI for the 2019 and 2020 tax years by the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136), then reverted to the 30% limitation for the 2021 tax year.

[3] The floor plan financing interest expense is interest paid to finance the acquisition of motor vehicles held for sale or lease (Sanati, 2023). This is relevant only for motor vehicle dealers, which are excluded from our sample.

financing because rent payments for operating leases are not subject to deduction limitations, unlike interest expenses. Therefore, certain companies might replace debt with operating leases.

Another important provision of the TCJA is its bonus depreciation provision, which seeks to incentivize greater capital investments in real assets by corporations. The key features of the bonus depreciation under the TCJA include: i) increased deduction percentage from 50% to 100% for qualified property acquired and placed in service after September 27, 2017, and before January 1, 2023,[4] ii) the qualified property are tangible property with a recovery period of 20 years or less, computer software, and certain qualified improvement property[5], and iii) no cap on the amount of bonus depreciation that can be taken in the first year for qualified property (IRS, 2018). The implication of this bonus depreciation provision of TCJA is that firms affected by it to a greater extent, i.e., firms with greater capital intensity, may have an incentive to purchase assets (financed with debt) instead of leasing them after the TCJA, especially if they have the capacity to use the tax shields associated with the bonus depreciation.

The TCJA also brought about some adjustments in how corporations can carry over their NOLs and use them to offset taxable income.[6] A tax-loss position is created when a company's allowable deductions, which can encompass items such as depreciation and interest expenses, surpass its taxable income, resulting in a NOL. The TCJA imposed a cap on the capacity to offset taxable income with NOLs at a maximum of 80%. Additionally, it discontinued the longstanding practice of carrying NOLs back to prior tax years, although there was an exception carved out for

[4] Starting from January 1, 2023, the bonus depreciation deduction percentage is scheduled to be phased down gradually over several years. The phase-down schedule is as follows:
80% for qualified property placed in service after December 31, 2022, and before January 1, 2024.
60% for qualified property placed in service after December 31, 2023, and before January 1, 2025.
40% for qualified property placed in service after December 31, 2024, and before January 1, 2026.
20% for qualified property placed in service after December 31, 2025, and before January 1, 2027.

[5] The TCJA also expanded bonus depreciation to include used property, provided the property was not previously used by the taxpayer.

[6] See https://www.irs.gov/newsroom/tax-cuts-and-jobs-act-a-comparison-for-businesses

specific farming businesses. Before the TCJA, businesses typically had the flexibility to carry NOLs backward to preceding tax years, allowing them to receive refunds for taxes paid during those years, or they could choose to carry NOLs forward for a period of up to 20 years to offset future income. However, with the TCJA in effect, NOLs generated in tax years commencing after December 31, 2017, were no longer eligible for carrybacks to prior tax years. Instead, businesses were permitted to carry these NOLs forward indefinitely. Moreover, the TCJA introduced a constraint on the extent of NOL deduction possible within a single tax year. For NOLs arising in tax years that began after December 31, 2017, businesses faced a general limitation, restricting them to deducting no more than 80% of their taxable income for that particular year. This limitation was designed to prevent businesses from fully offsetting their entire income with NOLs.

The above TCJA changes regarding NOLs may result in the delayed utilization of NOLs, as businesses are now generally limited to deducting no more than 80% of their taxable income in each current fiscal year and may need to carry forward NOLs for an extended period to fully utilize them. The additional depreciation expenses that result from debt-financed asset purchases can result in the company reporting operating losses for tax purposes, leading to the generation of new NOLs. Given these considerations and the TCJA's new limitations on the tax deductibility of debt interest, firms with limited ability to use tax shields (due to the high levels of existing NOLs) may choose to limit the generation of new NOLs and additional interest expenses by opting for leasing rather than buying new assets with debt financing. Leasing can provide them more predictable expenses without large depreciation deductions that create or add to a tax-loss position.[7]

[7] One caveat to these considerations is that, in 2020, the CARES Act temporarily – and retroactively – provided for a special 5-year carryback for taxable years beginning in 2018, 2019 and 2020. However, firms may have already changed their long-term plans and choices between debt and lease financing in the years 2018 and 2019.

Leasing is one of the most important external financing sources of U.S. corporations (Eisfeldt and Rampini, 2009; Rauh and Sufi, 2012; Rampini and Viswanathan, 2013; Li, Whited, and Wu 2016; Wang, 2023). There are two types of leases used by corporations in their financing mix: capital leases and operating leases. Under the Statement of Financial Accounting Standards (SFAS) No. 13 titled "Accounting for Leases," the criteria for a lease to be categorized as a capital lease are: i) the lease transfers ownership of the asset to the lessee at the end of the lease term, ii) the lease contains a bargain purchase option, iii) the lease term is equal to or greater than 75% of the estimated economic life of the leased asset, iv) the present value of minimum lease payments (excluding executory costs) is equal to or exceeds 90% of the fair value of the leased asset. Any lease that does not meet the above criteria is categorized as an operating lease. In an operating lease, there is no transfer of ownership of the asset to the lessee. A capital lease is treated as debt wherein the leased asset and lease liability are recorded on the lessee's balance sheet. However, under SFAS No. 13, operating leases used to be treated as off-balance sheet sources of financing. The leased assets and lease liabilities were not recognized on the lessee's balance sheet.[8]

While accounting rules distinguish between operating leases and capital leases, the tax law distinguishes between true leases and conditional sales contracts. In this study, we focus on operating leases, which are likely to be classified as *true* tax-advantaged leases by the IRS (Graham, Lemmon, Schallheim, 1998; Eisfeldt and Rampini, 2009). In a true lease, the lessor retains effective ownership of the asset and tax benefits such as accelerated depreciation and bonus depreciation are retained by the lessor and may not be taken by the lessee. The lessee is permitted

[8] Accounting Standards Codification Topic 842 (ASC 842), issued by the Financial Accounting Standards Board (FASB) in February 2016, states that operating leases are required to be recognized on the balance sheet. ASC 842 became effective for public companies for fiscal years beginning after December 15, 2018. Lessees are required to recognize a right-of-use (ROU) asset and a corresponding lease liability for all leases with terms longer than 12 months.

to deduct the entire amount of the rental payments under the lease. Moreover, no portion of the lease payment is characterized as interest, so the TCJA limitation on interest deductions does not apply to operating leases. On the other hand, capital leases are often considered conditional sales contracts for tax purposes, in which the ownership of the underlying asset is transferred from the lessor to the lessee. In such conditional sales contracts, capital leases are treated as debt by the IRS.[9] Thus, the lessee of a capital lease is entitled to various tax benefits, including depreciation deductions, on the leased asset. After tax law changes in 2017, these benefits include 100% expensing of a wide variety of non-real estate assets, including used assets. In addition, the interest portion of capital lease payments are deductible as interest, which are subject to the TCJA's limitation on tax deductions for interest.[10]

In this study, we first explore the impact of the interest deduction limitations introduced by the TCJA on corporations' financing choices between debt and lease financing. We hypothesize that some corporations may opt for the use of operating leases as an alternative to debt financing because, unlike interest expenses, payments made for rent under operating leases are not restricted in terms of deductibility. Hence, our conjecture is that companies subject to the TCJA's interest limitation to a greater extent would incline towards favoring operating leases over debt financing. Specifically, corporations with substantial pre-TCJA leverage should display an elevated preference for operating leases in the post-TCJA period. Furthermore, corporations whose interest expenses surpass 30 percent of their adjusted taxable income (ATI) in addition to interest income

[9] Eisfeldt and Rampini (2009) note that capital leases are often considered conditional sales contracts for tax purposes with two important caveats. First, a lease with a term exceeding 75% of the asset's economic life but not exceeding 80% will be a capital lease for accounting purposes but a true lease for tax purposes. Second, by making different assumptions about economic life, residual value, and so on for accounting and tax purposes, a lessee has some additional leeway to have a capital lease treated as a true lease for tax purposes. Similarly, Graham et al. (1998) note that capital leases are likely a mixture of true leases and nontrue leases.

[10] Wang (2023) documents that, in U.S. firms, operating leases account for 11.8% of total assets between 1981 and 2020, whereas capital leases account for less than 1% of total assets on average.

prior to the TCJA should demonstrate an increased propensity for operating leases compared to debt financing following the TCJA.

Second, the bonus depreciation provision of the TCJA may have induced some firms toward a shift in favor of asset acquisitions funded by debt at the expense of the use of operating leases after the TCJA. When a firm purchases a new asset with debt financing, it gains access to several tax advantages associated with that asset, including accelerated depreciation, bonus depreciation, and the ability to expense certain costs. However, in an operating lease, the asset's ownership remains with the lessor, who deducts the depreciation expense of the leased asset from taxable income. This essentially transfers the tax benefits from the lessee to the lessor. Consequently, the bonus depreciation provision of the TCJA might have prompted certain firms with the ability to use tax shields to decrease their reliance on operating leases for equipment financing and instead opt for asset purchases (financed by debt) to benefit from greater depreciation tax shields caused by the new TCJA provision. Therefore, we predict that firms which are more capital-intensive prior to the TCJA should exhibit a decreased dependence on operating leases for equipment financing relative to asset purchases financed by debt after the TCJA.

Third, we conjecture that the NOL provision of TCJA may have tilted the preferences of some firms with limited capacity to use tax shields toward operating leases in equipment financing in lieu of debt-financed asset purchases. When a firm purchases new assets using debt financing, it incurs additional depreciation and interest expenses, which create tax shields. However, if the firm has significant NOL carryovers from previous years, it will not be able to fully utilize these tax shields. Conversely, in an operating lease, the lessor retains ownership of the asset, assuming the responsibility for depreciation expenses which effectively transfers the tax advantages from the lessee to the lessor. Consequently, operating leases enable firms with significant NOL

carryovers from previous years to mitigate the negative impact of the NOL limitations imposed by the TCJA. As a result, the NOL limitations introduced by the TCJA may have prompted certain firms, particularly those with significant pre-existing NOL positions, to increase their reliance on operating leases instead of debt-financed asset purchases. Therefore, we predict that firms with larger existing NOLs before the TCJA should exhibit an increased dependence on operating leases compared to asset purchases financed by debt after the TCJA.

We use two main measures of operating leases in our empirical analysis. The first measure captures total operating lease commitments while the second measure captures new operating lease commitments. With a panel dataset of U.S. firms covering a sample period from 2015 to 2021, we utilize a difference-in-differences methodology to test our hypotheses. Firms are categorized into a treatment group and a control group based on potential effects of the TCJA's provisions.

Our findings demonstrate a significant positive effect of TCJA on both total and new operating lease commitments for treatment firms (relative to total debt) categorized by their pre-TCJA leverage levels. This means that companies with higher leverage prior to the TCJA experienced a considerable upturn in their reliance on operating leases following the enactment of the TCJA relative to the sample of control firms. Additionally, we observe a significant positive effect of TCJA on total and new operating lease commitments for treatment firms categorized by their pre-TCJA levels of interest expenses. This suggests that treatment firms with interest expenses exceeding 30 percent of EBITDA plus interest income before the TCJA witnessed a greater positive impact of TCJA on their utilization of total operating leases (relative to total debt) after the TCJA came into effect. These findings are consistent with the hypothesis that firms particularly influenced by the TCJA's interest deductibility limit experience a greater positive impact of TCJA on their reliance on operating leases (relative to total debt).

We further document a significant negative impact of TCJA on both total and new operating lease commitments (as a fraction of total assets) among treatment firms categorized by their pre-TCJA capital expenditure levels. Thus, firms with higher capital expenditures before the TCJA had a significant decrease in their reliance on operating leases following the enactment of the TCJA. Similarly, we identify a significant post-TCJA decrease in total and new operating lease commitments for treatment firms categorized by their pre-TCJA capital expenditure combined with rental expense levels. These outcomes are in line with the hypothesis that firms particularly affected by the bonus depreciation provision of the TCJA would exhibit a significantly greater decrease in their use of operating leases after the TCJA enactment.

Finally, our findings demonstrate a significant positive effect of TCJA on both total and new operating lease commitments (as a fraction of total assets) among treatment firms categorized by their pre-TCJA levels of NOLs. This means that companies with higher NOLs before the TCJA significantly increased (or maintained) their reliance on operating leases following the enactment of the TCJA relative to the control sample of firms with lower pre-TCJA levels of NOLs. These results are in line with the hypothesis that firms particularly affected by the NOL provision of the TCJA, i.e., treatment firms with a limited capacity to use depreciation and interest tax shields due to high levels of existing NOLs, would experience a positive effect of TCJA on their use of operating leases relative to debt-financed asset purchases.

Our study makes significant contributions to three main areas of existing literature. First, we add to the body of knowledge concerning the tax advantages associated with debt. Prior research has established that the use of debt financing is linked to tax benefits, particularly interest deductibility. Our paper introduces a novel finding, demonstrating that when these tax advantages are curtailed, firms transition from debt financing to lease financing. Second, our research extends

the discourse on the lease versus buy decision. While the extensive literature has predominantly examined whether debt and lease financing are substitutes or complements, our study delves deeper. We provide evidence that the choice between leasing and buying is intricately influenced by the prevailing tax policies and incentives. Lastly, our work contributes to the realm of research surrounding the Tax Cuts and Jobs Act (TCJA). Existing literature highlights the TCJA's adverse effects on leverage. Our contribution to this literature is in unveiling that firms, instead of solely reducing leverage, adopt a two-fold strategy: decreasing leverage while concurrently shifting towards operating leases as an alternative response.

The remainder of this paper is organized as follows. In the next section, we review the related literatures on debt financing, lease financing and the TCJA. Section 3 develops our hypotheses. Section 4 explains the sample selection process, the data used, and the design of our empirical tests. Section 5 presents the results, and Section 6 discusses robustness tests. Section 7 concludes.

2. Related Literature

The focus of an extensive theoretical literature is the tax incentives for leasing in an otherwise frictionless Modigliani-Miller (1958) type framework (see, e.g., Miller and Upton, 1976; and Lewellen, Long, and McConnell, 1976), where firms are indifferent between leasing and buying, except when facing different tax rates. Myers, Dill, and Bautista (1976) present a model of lease versus buy (borrow) decision, in which leasing can be advantageous to the lessee and the lessor if the tax rates between both parties differ. They show that differences in the tax rates across firms makes leasing beneficial, as true leases allow for the transfer of tax shields from firms with low marginal tax rates that cannot fully utilize them (lessees) to firms with high marginal tax rates

that can (lessors). If the depreciation tax shields are more valuable to the lessor than to the asset's user, it may make sense for the lessor to own the equipment and pass on some of the tax benefits to the lessee in the form of low lease payments. Graham, Lemmon, and Schallheim (1998) provide empirical evidence supporting the hypothesis that low-tax-rate firms lease more and that high-tax-rate firms borrow more. They also find that firms with lower Altman Z-scores, negative book value of common equity, and higher earnings variability lease more.

There is also a large corporate finance literature examining whether leases and debt are substitutes or complements. The model of Myers et al. (1976) implies that debt and leases are substitutes, albeit imperfectly due to the sharing of tax benefits between lessees and lessors. Bowman (1980) finds a positive relationship between debt levels and leases. They find that operating leases increase firm risk. Ang and Peterson (1984) empirically show that leases and debt are complements even after controlling for differences in debt capacity: While the theory of Myers et al. (1976) suggests that debt and leases are substitutes, they find a positive relationship between the ratio of lease to book value of equity and the ratio of debt to book value of equity ratio. They call this the leasing puzzle. To provide a resolution to this puzzle, Lewis and Schallheim (1992) argue that debt and leases can be complements to each other in an environment where leasing is motivated by tax considerations. Leasing allows the transfer of tax shields, which increases the benefits of debt financing for the lessee. They show a theoretical possibility that leases do not displace any debt at all such that the firm's debt capacity expands by more than the amount of leasing.

Eisfeldt and Rampini (2009) present another theoretical model of increased debt capacity due to leasing, in which debt and leases are complements. Their model is based on the asset repossession advantage of leasing to lessors relative to secured lending in the event of a

bankruptcy. This advantage allows a lessor to implicitly extend more credit than a lender whose claim is secured by the same asset, which makes leasing valuable to financially constrained firms. However, leasing involves agency costs due to the separation of ownership and control of the leased assets (see also Smith and Wakeman, 1985). The net advantage of leasing allows lessors to offer leases to more financially constrained firms which choose to lease more of their capital than less constrained firms. Evidence consistent with the prediction that more financially constrained firms lease more is first provided by Sharpe and Nguyen (1995). They find that firms facing high financial contracting costs (lower-rated, non-dividend paying, and cash-poor firms) have a greater propensity to use operating leases, suggesting that financially constrained firms use operating leases to expand their debt capacity.[11]

Other empirical papers find evidence supporting the theory that leases and debt are substitutes. Marston and Harris (1988) study the changes (instead of levels) in debt and leases using comprehensive measures of leasing (capitalized plus noncapitalized) and debt (short- and long-term) and find that they are substitutes. They find that $1 of leasing displaces approximately $0.60 of non-leasing debt. Krishnan and Moyer (1994) find that firms with lower retained earnings, higher growth rates, lower coverage ratios, higher debt ratios, higher operating risk, and lower Altman Z-scores (i.e., higher bankruptcy potential) are more likely to have capital leases.[12] They also provide evidence suggesting that leases and debt are substitutes. Using UK data, Beattie, Goodacre and Thomson (2000) find that leases and debt are partial substitutes. Controlling for

[11] More recently, Eisfeldt and Rampini (2009), Rauh and Sufi (2012), Cornaggia et al. (2013), and Schallheim, Wells, and Whitby (2013) also document a positive relation between the use of debt and operating leases. Chu (2020) studies how the ease of repossessing collateral in bankruptcy affects corporate leasing policy. He finds that state anti-recharacterization laws, which make collateral repossession easier for secured lending, reduce corporate leasing, especially in financially constrained firms.

[12] Using only capital leases, Adedeji and Stapleton (1996) find that £1 of capital lease displaced about £0.55 of debt, on average, during 1990-1992. Lease and debt ratios are scaled by total assets instead of book value of equity as in Ang and Peterson (1984).

endogeneity (simultaneity) and firm fixed effects, Yan (2006) finds that leases and debt are substitutes and rejects the hypothesis that debt and leases are complements.[13]

The seminal work of Modigliani and Miller (1958, 1963) and Miller (1977) ushered in extensive research on the effect of taxes to a firm's capital structure. Modigliani and Miller (1963) show that due to the tax deductibility of interest expense, incentive to use debt financing increases with a firm's marginal tax rate. This implies not only a positive relation between the use of debt financing and corporate marginal tax rate but also a positive relation between the tax deductibility of interest and leverage. The consequence of this is, when the marginal benefit of debt falls, as in the case of restrictions on the deductibility of interest, so does the optimal level of debt. Graham (2003) presents empirical evidence showing a positive association between the tax deductibility of interest and leverage. Heider and Ljungqvist (2015) investigate whether the presence of tax shields promotes the use of debt financing. Examining state tax rate changes, they find that firms lack incentives to decrease leverage following reductions in the tax benefits of debt due to firms facing asymmetric incentives with respect to changes in the tax benefits of debt.[14]

Carrizosa, Gaertner and Lynch (2023) find that 257 U.S. firms are affected by the interest deductibility limit of the TCJA. The affected firms decrease their financial leverage by 7.6 percent of assets, corresponding to $330 million per firm and $84.8 billion for their treatment sample. Sanati (2023) also shows that firms losing the tax benefits of debt reduce their debt ratios. Zhang, Chiasson, Li, and Lawrence (2023) find that long-term debt ratio is significantly negatively related to the implementation of the TCJA. Albertus, Glover, and Levine (2023) find that the TCJA

[13] Yan (2006) further finds that firms with more asymmetric information (non-dividend payers), firms that have higher agency costs from underinvestment (more investment opportunities), and firms to which transferring tax shields is less valuable (higher marginal tax rates) have a greater degree of substitutability.

[14] Admati, DeMarzo, Hellwig, and Pfleiderer (2018) develop a dynamic model in which they show that increasing leverage is always preferred by shareholders to fully exhaust the tax benefit of debt and but the same doesn't apply to reducing leverage, even when it may increase firm value. Shareholders prefer to avoid leverage reductions because the benefits accrue to debtholders at the shareholders' expense.

unlocked as much as $1.7 trillion of U.S. multinationals' foreign cash. They examine the real and financial response to this liquidity shock and find that firms did not increase capital expenditures, employment, R&D, or M&A, regardless of financial constraints. They also find that firms paid out only about one-third of the new liquidity to shareholders and retained half as cash.

In the tax law literature, Yu (2020) contends that if leasing provides favorable tax treatment because the entire lease expense is deductible while the interest expense on debt is subject to a deductibility limitation, corporations would rationally choose to lease instead of purchase with borrowed funds, despite there being limited substantive economic difference (for acquiring capital assets such as equipment) between the two options for the corporation.

3. Hypothesis Development

From the interest deductibility limit perspective, this paper seeks to examine whether the interest limitation of the TCJA causes firms to shift from one form of financing to the other. Specifically, this paper investigates the effect of tax incentives on corporations' choice between leases and debt. If corporations use capital lease financing, only the interest portion of the lease payments are deductible as interest. Furthermore, the limit on overall tax deductions for interest still applies for capital leases. In an operating lease, the lessee can treat the full rental payment as an expense on its income statement (rather than only the imputed interest portion). These observations and considerations motivate us to formulate and put forward the hypothesis that firms which are affected by the interest deduction limitation provision of the TCJA to a greater extent may want to lease more frequently as a replacement for debt financing since rent (operating lease) payments are not limited to deductibility while interest expense is.

H1: TCJA has a positive impact on the use of operating leases relative to debt for firms subject to the TCJA interest limitation.

H1A: Firms with high leverage pre-TCJA increase operating leases relative to debt after the TCJA.

H1B: Firms with interest expense exceeding 30 percent of adjusted taxable income (ATI) plus interest income pre-TCJA increase operating leases relative to debt after the TCJA.

Regarding the bonus depreciation provision of TCJA, we predict an increase in asset purchases financed with debt after TCJA versus operating leases for firms which are affected by this new provision to a greater extent. The firms most affected by this provision would be capital intensive firms, those heavily reliant on purchasing or investing in tangible assets. These firms rely on depreciation deductions to reduce taxable income, and the TCJA's bonus depreciation provision offers them accelerated depreciation benefits, further incentivizing investment in capital assets. In an asset purchase financed with debt, the asset user is entitled to various tax benefits such as accelerated and bonus depreciation expenses. However, in an operating lease, the lessor remains the owner of the asset and thus incurs the depreciation expenses, so that the tax benefits are transferred from the lessee to the lessor. Therefore, the bonus depreciation provision of the TCJA may have incentivized some affected firms to reduce their use of operating leases in favor of asset purchases (financed with debt).

H2: TCJA has a negative impact on the uses of operating leases relative to total assets financed with debt for more capital-intensive firms.

H2A: Firms with higher capital expenditure pre-TCJA decrease operating leases relative to total assets financed with debt after the TCJA.

H2B: Firms with higher capital expenditure plus rental expense pre-TCJA decrease operating leases relative to total assets financed with debt after the TCJA.

Considering the delayed and limited utilization of NOLs to offset taxable income after the Act, we predict an increase in the use of operating leases (instead of asset purchases financed with debt) post-TCJA for firms which are affected by this new provision to a greater extent. In an asset purchase financed with debt, the asset user is entitled to various tax benefits such as depreciation and amortization expenses, which can trigger a tax-loss position that cannot be carried back or fully written-off in the current year. However, in operating leases (which are all true leases), the lessor remains the owner of the asset and thus incurs the depreciation expenses and interest expenses associated with the capital asset. Therefore, the tax benefits are transferred from the lessee to the lessor. In exchange, the lessor may pass on some of these tax benefits to the lessee in the form of lower lease payments. Therefore, the NOL provision of the TCJA may have incentivized some affected firms (with a limited capacity to use tax shields) to increase (or maintain) their use of operating leases as opposed to asset purchases (financed with debt).

H3: Firms more likely to be negatively affected by the NOL provisions of the TCJA increase operating leases relative to total assets financed with debt.

H3A: Firms with higher NOL pre-TCJA increase operating leases relative to total assets financed with debt after the TCJA.

4. Data and Methodology

4.1. Data Sources

We begin our sample construction with the Compustat database from 2015 to 2021. We include only U.S. firms listed on the Amex, Nasdaq, and NYSE (Compustat variable *exchg* with

values equal to 11, 12, or 14). For the entire sample, we exclude utilities (Standard Industrial Classification (SIC) codes 4900–4999) and financials (SIC codes 6000–6999). We use historical SIC codes (Compustat variable *sich*) and supplement with the current code (Compustat variable *sic*) when the historical SIC code is missing (Bena and Li, 2014). Additionally, for hypothesis H1, following Sanati (2023), we further exclude firms that are exempt from the TCJA's limitation on interest deductions, these include the real estate (SIC codes 6500-6599), and agriculture (SIC codes 0100- 0999) sectors. We also drop motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) to eliminate the effect of floor plan financing on interest deductibility limitation. We further exclude firms with negative EBITDA and firms with 3-year average sales below $25 million for the years 2015–2017, because they are not subject to the interest limitation (Carrizosa et al, 2023). For hypothesis H2 and H3, we exclude firm-years with sales revenue less than $100 million (Ma and Thomas, 2023). For hypothesis 3, we exclude the agriculture (SIC codes 0100- 0999) sector as there are some exceptions to certain farming losses.

4.2. Methodology

To investigate the effect of the TCJA on operating leases, we employ a difference-in-differences methodology. Specifically, we estimate the model:

$$\text{OpLease}_{it} = \alpha_0 + \alpha_1 \text{Treatment}_{it} \times Post_{it} + \alpha_2 Controls_{it} + \text{Firm FEs} + \text{Year FEs} + \varepsilon_{it} \quad (1),$$

where *OpLease* is a measure of a firm's operating lease activity. Firms are classified into a treatment group (*Treatment* = 1) and a control group (*Treatment* = 0) based on the potential impact of the TCJA on operating leases. *Post* is an indicator variable for the post-TCJA period and equals one for observations with fiscal year end on or after June 30, 2018, and zero otherwise (Kalcheva,

Plečnik, Tran, and Turkiela, 2020). The coefficient associated with the interaction term *Treatment*×*Post*, α_1, represents the change in operating leases for the treatment firms in the post- versus pre-period relative to the change for control firms. Appendix A provides detailed variable construction and definition.

For hypothesis H1A, *Treatment* is replaced with *Treatment_Lev* which is set to 1 for firms with average leverage pre-TCJA (2015-2017) greater than the median level of leverage of all firms over the same period. Firms with average *Leverage* below the median are included in the control group. *Leverage* is defined as total liabilities scaled by total assets. More levered firms pre-TCJA have a greater incentive to shift from debt financing to operating leases for tax savings reasons compared to less levered firms pre-TCJA. For hypothesis H1B, *Treatment* is replaced with *Treatment_IntLimit* which is set to 1 for firms with interest expense greater than 30 percent of EBITDA plus interest income in 2017. Firms with interest expense less than 30 percent of EBITDA plus interest income are the control group. The potential impact of the TCJA's interest deductibility limit on a firm's operating lease activity should directly relate to its level of interest expense pre-TCJA. For hypotheses H1A and H1B, we predict that treatment firms, relative to control firms, increase operating leases after the TCJA. That is, we expect a positive coefficient on the interaction term, i.e., $\alpha_1 > 0$.

For hypothesis H2A, *Treatment* replaced with *Treatment_Capex* which is set to 1 for firms with average capital expenditures pre-TCJA (2015-2017) greater than the median level of capital expenditures of all firms over the same period. Firms with average capital expenditures below the median are the control group (*Treatment_Capex = 0*). For hypothesis H2B, *Treatment* replaced with *Treatment_CapexRent* is set to 1 for firms with average capital expenditures plus rental expense pre-TCJA (2015-2017) greater than the median level of capital expenditures plus rental

expense of all firms over the same period. Firms with average capital expenditures below the median are the control group (*Treatment_CapexRent = 0*). The effect of TCJA on operating leases through the bonus depreciation provision channel should be greater for more-capital intensive firms than it is for less capital-intensive firms. For hypotheses H2A and H2B, we predict that treatment firms, relative to control firms, decrease operating leases after the TCJA. That is, we expect a negative coefficient on the interaction term, i.e., $\alpha_1 < 0$.

For hypothesis H3A, *Treatment* is replaced with *Treatment_NOL* is set to 1 for firms with NOL in 2017 greater than the median level of NOLs of all firms over the same period. Firms with 2017 NOL below the median are the control group (*Treatment_NOL* = 0). The effect of TCJA on operating leases through the NOL channel should be greater for more tax-loss firms than it is for less tax-loss firms. For hypotheses H3A, we predict that treatment firms, relative to control firms, increase operating leases after the TCJA. That is, we expect a positive coefficient on the interaction term, *i.e.*, $\alpha_1>0$.

Controls is a vector of firm-specific control variables that are known from prior studies to explain variations in leasing behavior (Eisfeldt and Rampini, 2009; Beatty, Liao, and Weber, 2010; Ma and Thomas, 2023). Firms with more financial constraints lease more, and thus highly levered, small sized firms, and firms with low performance lease more (Eisfeldt and Rampini,2 009; Beatty, Liao, and Weber, 2010).

The regression specification in equation (1) also includes firm fixed effects, hence we do not include *Treatment* as a main effect in the model. The standard errors are clustered at the firm level. Appendix A provides details about the construction and data sources of all the variables used in our study. We winsorize all continuous accounting variables at the 1% and 99% levels to reduce the effects of extreme outliers.

4.3. Variables

4.3.1 Measures of Lease Financing

To capture the operating lease activity of a firm, we utilize two measures, *TotalOpLease* and *NewOpLease*. *TotalOpLease* is total operating lease commitments at the end of the year scaled by lagged total debt.[15] *NewOpLease* is new operating lease commitments, calculated as total operating lease commitment at the end of the year less operating lease commitment carried over from the prior year scaled by lagged total debt. For hypotheses H2A and H2B, *TotalOpLease* and *NewOpLease* are scaled by lagged adjusted total assets.[16] Adjusted total assets is total assets plus present value of operating lease commitments if the year is prior to 2016 and total assets if the year is 2016 and beyond.[17] In our robustness section we consider four alternative measures to proxy for operating leases which require discounting the future operating lease commitments (*Alt OpLease1*, *Alt OpLease2*, *Alt OpLease3 byd5*, and *Alt OpLease4 byd5*). *Alt OpLease1* and *Alt OpLease2* are the current rental expenses plus the present value of future lease commitments up to year 5 discounted at the Baa bond yield and discounted by 10%, respectively. *Alt OpLease3 byd5*, and *Alt OpLease4 byd5* are the current rental expenses plus the present value of future lease commitments up to year 5 and beyond year 5 discounted at the Baa bond yield and discounted by 10%, respectively. All variables are explained in Appendix A.

[15] We scale operating leases by total debt because we are considering the substitution between operating leases and total debt when testing hypotheses H1A and H1B.

[16] When testing hypotheses H2A and H2B, we scale operating leases by total assets because we are analyzing the effect of TCJA's bonus depreciation provision on firms' choice between operating leases and asset purchases (capital expenditures) for using capital equipment (the firm's lease versus buy decision).

[17] We adjust total assets because ASU 2016-02 changed the definition of reported assets.

4.3.2. Control Variables

The model in equation (1) includes a list of control variables known to explain the variation in leasing behavior (Ma and Thomas, 2023). The control variables are *Leverage*, *Size*, *Net income*, operating cash flows (*OCF*), volatility of operating cash flows (*stdOCF*), *Cash*, *Current ratio*, *Sales growth*, *GDP growth*, and the change in bank prime loan interest rate in the fiscal year (*Change in interest*). Appendix A provides detailed definition and construction of all variables.

4.4. Summary Statistics and Correlations

Table 1 reports summary statistics for the sample used in our regression analysis when the treatment variable is leverage. Thus, in this table all proxies for operating lease are scaled by lagged total debt. The mean (median) firm has a *TotalOpLease* scaled by lagged total debt of 1.159 (0.153) and *NewOpLease* scaled by lagged total debt of 0.223 (0.029). The median amount of total operating lease commitments for the firms in our sample is 15.3 percent (scaled by the firm's total debt). The median amount of new operating lease commitments that a firm makes every year accounts for about 2.9 percent of the firm's total debt. Regarding the control variables, the summary statistics are in line with prior studies (Ma and Thomas, 2023).

Table 2 shows the correlation between the variables reported in Table 1. All operating lease measures are scaled by lagged total debt and are positively correlated. *Post* is negatively correlated with all measures of operating leases.

Table 3 provides the mean and standard deviation of total and new operating lease commitments for the treatment sample versus the control sample across different treatment assignments in panels A-E.

5. Empirical Results

In this section, we report and discuss the results of empirical tests analyzing the various potential channels through which the TCJA had an impact on the use of operating leases by corporations.

5.1. The Effect of the TCJA on the Substitutability between Operating Leases and Debt Financing through the Interest Deductibility Limit Channel

We begin our analysis by examining the effect of the TCJA on operating leases versus debt financing through the interest deductibility limit channel by using the regression model in equation (1). Hypotheses H1A and H1B predict that firms which are affected by the interest deduction limitation provision of the TCJA to a greater extent may want to lease more frequently as a replacement for debt financing since rent (operating lease) payments are not limited to deductibility while interest expense is. The first two columns of Table 4 include *TotalOpLease* as the dependent variable while the last two columns include *NewOpLease* as the dependent variable. In columns 1 and 3, we include only *Treatment_Lev×Post*, firm and year fixed effects in the model. In columns 2 and 4, we add control variables.

The coefficients on *Treatment_Lev×Post* are positive in all columns (1.458, 1.080, 0.302 and 0.232, respectively), all of which are significant at the 1 percent level (two-tailed). This implies that total and new operating lease commitments by treatment firms (firms with greater financial leverage prior to TCJA) have significantly increased after the TCJA as a fraction of the firm's total debt relative to the control group (firms with lower financial leverage prior to TCJA). The effect is also significant in terms of economic magnitude. Following the economic magnitude interpretation approach in Ma and Thomas (2023) p.11, the increase in total operating lease usage for the treatment group is approximately 2.7 times (1.080/0.4201= 2.7) its mean (Table 3, Panel

A1) and half (1.080/2.0158 = 0.54) of its standard deviation (Table 3, Panel A1). The increase in new operating lease usage for the treatment group is approximately 3 times (0.232/0.0753=3.08) its mean (Table 3, Panel A2) and 0.73 (0.232/0.3189=0.73) times its standard deviation (Table 3, Panel A2). Overall, the results are consistent with hypothesis H1A. Firms with higher leverage prior to the TCJA had a significant increase in operating leases as a proportion of total debt financing after the enactment of the Act relative to the control firms. One should note that firms with greater financial leverage prior to TCJA are likely to have greater interest expenses. Therefore, these firms are more likely to be affected by the new limitations of TCJA on the deductibility of interest expenses. This implies that companies with greater financial leverage are more likely to be up against this new limit and may hence find it convenient to lease new equipment rather than to borrow to purchase it.

To further examine the interest deductibility limit channel of the effect of the TCJA on the use of operating leases versus debt financing, we estimate the regression model in equation (1) using the new interest deduction limit (interest expense required to be less than 30 percent of EBITDA) to define our treatment variable. The first two columns of Table 5 include *TotalOpLease* as the dependent variable while the last 2 columns include *NewOpLease* as the dependent variable. In columns 1 and 3, we include only *Treatment_IntLimit×Post*, firm and year fixed effects in the model. In columns 2 and 4, we add control variables.

The coefficients on *Treatment_IntLimit×Post* are significantly positive in all columns (0.771, 0.694, 0.180 and 0.172, respectively). This implies that total operating lease commitments by treatment firms (scaled by the amount of total debt financing), i.e., affected firms with interest expenses greater than 30 percent of EBITDA, have significantly increased after the TCJA. The effect is also significant in terms of economic magnitude. The increase in total operating lease

usage for the treatment group is approximately 2.5 (0.694/0.2833=2.45) times its mean (Table 3, Panel B1) and 1.5 (0.694/0.4660=1.49) times its standard deviation (Table 3, Panel B1). The increase in new operating lease usage for the treatment group is approximately 3.74 (0.172/0.0460=3.74) times its mean (Table 3, Panel B2) and 1.8 (0.172/0.0961=1.79) times its standard deviation (Table 3, Panel B2). Overall, the results are consistent with hypothesis H1B. Firms with interest expense greater than 30 percent of EBITDA plus interest income prior to the TCJA had a significant increase in total operating leases as a fraction of total debt after the enactment of the Act.

5.2. The Effect of the TCJA on Firms' Buy versus Lease Decisions through the Bonus Depreciation Channel

Next, we examine the effect of the TCJA on firms' use of operating leases through the bonus depreciation channel using the regression model in equation (1). Hypotheses H2A and H2B predict that the bonus depreciation provision of the TCJA may have incentivized some affected firms (i.e., firms with greater capital intensity) to reduce their use of operating leases in favor of asset purchases (financed with debt). The first two columns of Table 6 include *TotalOpLease* as the dependent variable while the last two columns include *NewOpLease* as the dependent variable. In columns 1 and 3, we include only *Treatment_Capex×Post*, firm and year fixed effects in the model. In columns 2 and 4, we add control variables.

The coefficients on *Treatment_Capex×Post* are negative in all columns (-0.0139, -0.0138, -0.00617 and -0.00651, respectively), all of which are significant at the 1 percent level (two-tailed). This implies that total and new operating lease commitments by treatment firms have significantly decreased after the TCJA. The effect is also significant in terms of economic magnitude. The

decrease in total operating lease usage for the treatment group is approximately 9 percent (-0.0138/0.1467=-0.094) of its mean (Table 3, Panel C1) and 6 percent (-0.0138/0.2258=-0.061) of its standard deviation (Table 3, Panel C1). The decrease in new operating lease usage for the treatment group is approximately 24 percent (-0.00651/0.0267=-0.244) of its mean (Table 3, Panel C2) and 14 percent (-0.00651/0.0461=-01412) of its standard deviation (Table 3, Panel C2). Overall, the results are consistent with Hypothesis 2A. More capital-intensive firms with greater capital expenditures (scaled by total assets) prior to the TCJA had a significant decrease in operating leases as a percentage of total assets after the enactment of the Act. This implies that the bonus depreciation provision of the TCJA made new asset purchases more attractive for capital-intensive corporations relative to leasing new assets. This is because 100 percent immediate expensing of newly purchased equipment creates greater depreciation tax shields for the affected firms post TCJA.

Next, we examine the effect of the TCJA on operating leases through the bonus depreciation channel using the pre-TCJA level of capital expenditures plus rental expense as the treatment variable. The first two columns of Table 7 include *TotalOpLease* as dependent variable while the last two columns include *NewOpLease* as dependent variable. In columns 1 and 3, we include only $Treatment\_CapexRent \times Post$, firm and year fixed effects in the model. In columns 2 and 4, we add control variables.

The coefficients on $Treatment\_CapexRent \times Post$ are negative in all columns (-0.0220, -0.0223, -0.00813 and -0.00844, respectively), all of which are significant at the 1 percent level (two-tailed). This implies that total and new operating lease commitments by treatment firms have significantly decreased after the TCJA. The effect is also significant in terms of economic magnitude. The decrease in total operating lease usage for the treatment group is approximately

13 percent (-0.0223/0.1661=-0.1343) of its mean (Table 3, Panel D1) and 10 percent (-0.0223/0.2289=-0.097) of its standard deviation (Table 3, Panel D1). The decrease in new operating lease usage for the treatment group is approximately 28 percent (-0.00844/0.0305=-0.277) of its mean (Table 3, Panel D2) and 18 percent (-0.00844/0.0478=-0.177) of its standard deviation (Table 3, Panel D2). Overall, the results are consistent with Hypothesis 2B. Firms with greater capital expenditures plus rental expense prior to the TCJA had a significant decrease in operating leases as a percentage of total assets after the enactment of the Act.

5.3. The Effect of the TCJA on Firms' Buy versus Lease Decisions through the NOL Channel

Next, we examine the effect of the TCJA on firms' use of operating leases through the NOL channel using the regression model in equation (1). Hypotheses H3A predicts that the NOL provision of the TCJA may have incentivized some affected firms (i.e., firms with greater NOL) to increase their use of operating leases in favor of asset purchases (financed with debt). The first two columns of Table 8 include *TotalOpLease* as the dependent variable while the last two columns include *NewOpLease* as the dependent variable. In columns 1 and 3, we include only *Treatment_NOL*×*Post*, firm and year fixed effects in the model. In columns 2 and 4, we add control variables.

The coefficients on *Treatment_NOL*×*Post* are positive in all columns (0.0114, 0.0125, 0.00436 and 0.00496, respectively), all of which are significant at the 5 percent level (two-tailed). This implies that total and new operating lease commitments by treatment firms have significantly increased after the TCJA. The effect is also significant in terms of economic magnitude. The increase in total operating lease usage for the treatment group is approximately 16 percent (0.0125/0.0769=0.1625) of its mean (Table 3, Panel E1) and 11 percent (0.0125/0.1130=0.1106)

of its standard deviation (Table 3, Panel E1). The increase in new operating lease usage for the treatment group is approximately 32 percent (0.00496/0.0154=0.322) of its mean (Table 3, Panel E2) and 17 percent (0.00496/0.0295-0.1681) of its standard deviation (Table 3, Panel E2). Overall, the results are consistent with Hypothesis 3A. More tax-loss firms with greater NOLs prior to the TCJA had a significant increase in operating leases as a percentage of total assets after the enactment of the Act. This indicates that the TCJA's NOL provision rendered leasing new assets a more appealing option for corporations with tax losses when compared to acquiring new assets. The restrictions on NOL carryback and complete write-off under the TCJA have amplified the attractiveness of leasing for these affected firms in the post-TCJA period.

6. Robustness Tests

6.1. Trends before and after TCJA

Parallel trends are a critical assumption underlying our causal inference framework. This assumption posits that, in the absence of treatment, the trends of the outcome variable(s) would have been parallel between the treatment and control groups. To assess the validity of this assumption, we conduct a formal statistical test for parallel trends using interaction terms in our regression models. To investigate the parallel trend assumption, we augment our equation (1) by adding lead and lag terms:

$$\text{OpLease}_{it} = \alpha_0 + \sum_{Year=2015}^{2021} \alpha_1 \text{Treatment}_{it} \times Year_t + \sum_{Year=2015}^{2021} \alpha_2 Year_t + \alpha_3 Controls_{it} + \text{Firm FEs} + \varepsilon_{it}\text{ , (2)}$$

where *Year* takes on different values depending on the year of observation. The year 2017 is excluded and is the reference year. Thus, the coefficient α_1 captures the average difference in the dependent variable between treatment and control firms in each year relative to the average

difference in the year 2017. The regression results are presented in Table IA.1 and depicted in Figure 1. In Table IA.1, Panel A, B and C present results for hypothesis 1, 2 and 3, respectively. Figure 1 plots the estimates of α_1 from equation (2) when the dependent variable is *TotalOpLease* with the treatment group defined by *Treatment_Lev*, *Treatment_IntLimit*, *Treatment_Capex*, *Treatment_CapexRent*, and *Treatment_NOL*, respectively.

Our results in Figure provide evidence that any differential changes in the outcome variable(s) post-treatment are likely attributable to the treatment itself rather than pre-existing differences between the treatment and control groups.

6.2. Alternative Measures for Operating Leases

We use four alternative measures of operating leases which require discounting the operating lease commitments. *Alt OpLease1* and *Alt OpLease2* are computed as the present value of current and future lease commitments scaled by lagged total debt.[18] The former uses Baa bond yield as discount rate and the latter uses 10% as discount rate. To compute the present value of future lease commitments, we follow Li et al. (2016) and Chu (2020), and discount lease commitments due in years one to five (MRC1-MRC5) at the Baa bond yield for *Alt OpLease1*. To compute the present value of future lease commitments, we follow Yan (2006) and Beattie, Goodacre, and Thomson (2000), and discount lease commitments due in years one to five (MRC1-MRC5) at 10% for *Alt OpLease2*. The present value is the sum of the current lease commitment (XRENT) and the discounted future lease commitments. *Alt OpLease3 byd5* and *Alt OpLease4 byd5* are defined similarly as *Alt OpLease1* and *Alt OpLease1* but include the present value of lease commitments beyond year five.

[18] To test hypotheses H2A, H2B and H3, these measures are scaled by lagged adjusted total assets.

As shown in Tables 9 to 13, the robustness of our results is confirmed using these alternative measures of lease financing, which are described in detail in Appendix A. Consistent with hypothesis H1, the findings consistently demonstrate a noteworthy increase in all measures of the present value of operating leases (relative to the value of total debt) post-TCJA for treatment firms, stratified based on their pre-TCJA leverage levels. Similarly, there's a significant increase in the present value of operating leases (relative to the value of total debt) post-TCJA for firms whose interest expenses exceeded 30 percent of EBITDA plus interest income prior to the TCJA. This underscores that firms heavily affected by the TCJA's interest deductibility limit show a substantial rise in reliance on operating leases relative to total debt post-TCJA enactment, even when considering operating leases as defined by the present value of future commitments. Furthermore, our results reveal a significant reduction in all measures of the present value of operating leases post-TCJA for firms identified to be more capital-intensive pre-TCJA. These findings align with our hypothesis H2, suggesting that firms significantly affected by the bonus depreciation provision of the TCJA experienced a marked decrease in their reliance on operating leases for capital equipment financing following the TCJA enactment. Moreover, our findings indicate a substantial rise in all measures of the present value of operating leases after the TCJA for companies that were previously identified as having higher tax losses before the TCJA. These results are consistent with our hypothesis H3, which suggests that firms that were notably impacted by the NOL provision in the TCJA witnessed a notable surge in their utilization of operating leases as a means of financing capital equipment following the TCJA's implementation.

7. Conclusion

For the first time in the literature, this paper examined the effect of the 2017 Tax Cuts and Jobs Act (TCJA) on firms' choice of lease financing in their financing mix and the substitutability between operating leases and debt financing. The results of our difference-in-differences analysis showed that the TCJA had a positive effect on operating leases for firms affected by the limit on interest deductibility provision of TCJA, where the affected firms are more likely to substitute debt financing with lease financing to sidestep the TCJA's limitation on debt interest which reduces interest tax shields of debt.

Furthermore, this paper documented a negative effect of the TCJA on operating leases as a percentage of total assets for firms affected by the bonus depreciation provision, where the affected firms are more likely to substitute operating leases with asset purchases financed with debt financing so that they can realize larger depreciation tax shields.

Third, this paper documented a positive effect of the TCJA on operating leases as a percentage of total assets for firms affected by the NOL provision, where the affected firms are more likely to substitute asset purchases financed with debt financing with operating leases. This helps affected companies avoid larger tax-loss positions that have smaller tax savings benefits after the TCJA.

Overall, these findings support the view that the TCJA had heterogeneous effects on firms' choice between debt financing and lease financing depending on firms' financing policies and real asset characteristics prevailing prior to the TCJA.

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Appendix A

Sample Construction and Variable Definitions

Variable	Definition	Source
Dependent Variables:[19]		
TotalOpLease	Total operating lease commitment at the end of the year. See also footnote 19. *mrct+mrcta*	Compustat
NewOpLease	New operating lease commitment: total operating lease commitment at the end of the year less operating lease commitment carried over from the prior year. See also footnote 19. *(mrct+mrcta)-lag(mrct+mrcta-mrc1)*	Compustat
Alt OpLease1	Current rental expense plus the present value of future lease commitments up to year 5 (discounted at the Baa bond yield). See also footnote 19. *xrent+PV(mrc1, mrc2, mrc3, mrc4, mrc5)*	Compustat & FRED
Alt OpLease2	Current rental expense plus the present value of future lease commitments up to year 5 (discounted by 10%). See also footnote 19. *xrent+PV(mrc1, mrc2, mrc3, mrc4, mrc5)*	Compustat
Alt OpLease3 byd5	Current rental expense plus the present value of future lease commitments up to year 5 and after year 5 (discounted by the Baa bond yield). See also footnote 19. *xrent+PV(mrc1, mrc2, mrc3, mrc4, mrc5, mrcta[20])*	Compustat & FRED
Alt OpLease4 byd5	Current rental expense plus the present value of future lease commitments up to year 5 and after year 5 (discounted by 10%). See also footnote 19. *xrent+PV(mrc1, mrc2, mrc3, mrc4, mrc5, mrcta[21])*	Compustat
Control Variables:		
Leverage	Total liabilities scaled by total assets *lt*/*at*	Compustat
Size	Natural logarithm of market value of equity ln(csho*prcc_f)	Compustat
Net income	Net income before extraordinary items scaled by	Compustat

[19] Scaled by lagged total debt for H1A and H1B. Scaled by lagged adjusted total assets for H2A, H2B and H3.
[20] Assuming mcta are evenly distributed from year six to ten.
[21] Assuming mcta are evenly distributed from year six to ten.

	lagged total sales. *ib/lag(sale)*	
OCF	Operating cash flows, calculated as cash flows from operations scaled by lagged total sales. *oancf/lag(sale)*	Compustat
stdOCF	Three-year standard deviation of OCF	Compustat
Cash	Cash holding: cash scaled by lagged total sales *ch/lag(sale)*	Compustat
Current ratio	Current ratio at the beginning of the year: current assets by current liabilities from the prior year. *act/lag(lct)*	Compustat
Sales growth	Sales growth rate: annual growth rate of sales. ((sale-lag(sale))/lag(sale))	Compustat
GDP growth	Average quarterly GDP growth percentage over the last four quarters prior to the end of the fiscal year.	Bureau of Economic Analysis
Change in Interest	Change in Bank Prime Loan Interest Rate during the fiscal year.	FRED
Sample Partitioning Variables		
Treatment_Lev	Indicator for treatment firms, which is set to 1 for all the observations of a firm if the firm's average *Leverage* pre-TCJA (2015 -2017) is greater than the median level of leverage of all firms over the same period.	Compustat
Treatment_IntLimit	Indicator for treatment firms, which is set to 1 for all the observations of a firm if the firm's interest expense is greater than 30 percent of EBITDA plus interest income in 2017. xint>(0.30*(ebitda)+idit)	Compustat
Treatment_Capex	Indicator for treatment firms, which is set to 1 for all the observations of a firm if the firm's average capital expenditure scaled by total assets pre-TCJA (2015 -2017) is greater than the median level of capital expenditure scaled by total assets of all firms over the same period.	Compustat
Treatment_CapexRent	Indicator for treatment firms, which is set to 1 for all the observations of a firm if the firm's average capital expenditure plus rental expense scaled by total assets pre-TCJA (2015 -2017) is greater than the median level of capital expenditure plus rental expense scaled by total assets of all firms over the same period.	Compustat
Treatment_NOL	Indicator for treatment firms, which is set to 1 for all the observations of a firm if the firm's NOL (Compustat item TLCF scaled by total assets (Compustat item AT)) in 2017 is greater	Compustat

	than the median level of NOL of all firms over the same period.	
Post	Indicator for the post TCJA period, which is set to 1 for observations with fiscal year end after June 30, 2018, and 0 otherwise	Compustat

Table 1. Summary Statistics

The sample includes all Compustat firm-year observations from 2015 to 2021 with non-negative EBITDA and with 3-year average sales below $25 million for the years 2015–2017 for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999), real estate (SIC codes 6500-6599), agriculture sector (SIC codes 0100- 0999) and motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) are excluded from the sample. This table presents the summary statistics for our sample. The sample is restricted to observations with nonmissing variables of interest, yielding a panel of 6,855 observations. All continuous accounting variables are winsorized at 1% and 99%. Variable definitions are provided in the Appendix.

Variable	Obs.	Mean	Std. Dev.	P25	Median	P75	Min	Max
TotalOpLease	6855	1.159	5.07	0.069	0.153	0.438	0.007	43.451
NewOpLease	6855	0.223	0.963	0.009	0.029	0.087	-0.146	8.202
Alt OpLease1	6776	1.038	4.737	0.067	0.142	0.369	0.009	41.127
Alt OpLease2	6776	0.945	4.296	0.062	0.13	0.337	0.008	37.167
Alt OpLease3 byd5	6776	1.265	5.557	0.082	0.177	0.477	0.011	47.851
Alt OpLease4 byd5	6776	1.101	4.873	0.071	0.153	0.408	0.009	41.969
Leverage	6855	0.616	0.227	0.469	0.595	0.733	0.157	1.483
Size	6855	7.896	1.89	6.669	7.855	9.15	3.337	12.368
Net income	6855	0.061	0.114	0.011	0.05	0.102	-0.336	0.487
OCF	6855	0.147	0.131	0.063	0.113	0.194	-0.059	0.726
stdOCF	6855	0.04	0.053	0.013	0.024	0.045	0.002	0.366
Cash	6855	0.141	0.176	0.031	0.08	0.18	0	1.016
Current ratio	6855	2.255	1.526	1.297	1.863	2.701	0.411	9.553
Sales growth	6855	0.069	0.199	-0.025	0.046	0.13	-0.415	0.962
GDP growth	6855	2.411	1.999	1.65	2.275	3.15	-7.275	13.125
Change in Interest	6855	0.009	0.817	-0.6	0.12	0.75	-2.25	1

Table 2. Correlations

The sample includes all Compustat firm-year observations from 2015 to 2021 with non-negative EBITDA and with 3-year average sales below $25 million for the years 2015–2017 for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999), real estate (SIC codes 6500-6599), agriculture sector (SIC codes 0100- 0999) and motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) are excluded from the sample. This table presents the summary statistics for our sample. The sample is restricted to observations with nonmissing variables of interest, yielding a panel of 6,855 observations. All continuous accounting variables are winsorized at 1% and 99%. Variable definitions are provided in the Appendix.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.TotalOpLease	1.000																	
2.NewOpLease	0.896	1.000																
3.Alt OpLease1	0.985	0.881	1.000															
4.Alt OpLease2	0.984	0.880	1.000	1.000														
5.Alt OpLease3 byd5	0.996	0.895	0.995	0.995	1.000													
6.Alt OpLease4 byd5	0.994	0.892	0.997	0.997	1.000	1.000												
7.InterestLimit	-0.163	-0.171	-0.161	-0.162	-0.164	-0.164	1.000											
8.Post	-0.100	-0.103	-0.093	-0.093	-0.097	-0.096	0.003	1.000										
9.Leverage	-0.193	-0.200	-0.191	-0.192	-0.195	-0.195	0.648	0.041	1.000									
10.Size	-0.104	-0.105	-0.114	-0.115	-0.112	-0.112	0.106	0.044	0.080	1.000								
11.Net income	-0.001	0.008	-0.006	-0.007	-0.004	-0.004	-0.031	0.046	-0.102	0.414	1.000							
12.OCF	-0.046	-0.044	-0.054	-0.055	-0.050	-0.051	-0.057	0.053	-0.071	0.411	0.510	1.000						
13.stdOCF	-0.003	-0.009	-0.001	-0.002	-0.003	-0.003	-0.061	0.033	-0.059	0.007	0.050	0.420	1.000					
14.Cash	0.033	0.026	0.035	0.035	0.034	0.034	-0.133	0.024	-0.134	0.155	0.167	0.374	0.290	1.000				
15.Current ratio	0.090	0.095	0.091	0.090	0.091	0.091	-0.320	-0.039	-0.374	-0.072	0.141	0.124	0.125	0.489	1.000			
16.Sales growth	-0.009	0.029	-0.016	-0.016	-0.013	-0.014	-0.045	0.044	-0.055	0.093	0.244	0.339	0.194	0.179	0.197	1.000		
17.GDP growth	-0.012	-0.013	-0.013	-0.013	-0.012	-0.013	0.007	0.146	-0.008	0.036	0.107	0.041	0.030	0.007	-0.001	0.211	1.000	
18.Change in Interest	0.103	0.099	0.099	0.099	0.101	0.101	0.002	-0.414	-0.049	-0.020	0.063	-0.014	-0.005	-0.071	0.010	0.172	0.366	1.000

Table 3. Summary Statistics for Treatment and Control Groups

The table shows the descriptive statistics (mean and standard deviation) of total operating lease commitments (TotalOpLease) on the left panel and new operating lease commitments (NewOpLease) on the right panel by year for the subsample of treatment firms and the subsample of control firms. In a panels A and B, TotalOpLease and NewOpLease are scaled by lagged total debt, while in panels C-E, TotalOpLease and NewOpLease are scaled by lagged adjusted total assets

Panel A: Leverage as Treatment Variable

Panel A.1: TotalOpLease				Panel A.2: NewOpLease			
Treatment Sample		Control Sample		Treatment Sample		Control Sample	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
0.4201	2.0158	2.0845	7.1593	0.0753	0.3189	0.4072	1.3786

Panel B: Interest Limit as Treatment Variable

Panel B.1: TotalOpLease				Panel B.2: NewOpLease			
Treatment Sample		Control Sample		Treatment Sample		Control Sample	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
0.2833	0.4660	1.0610	4.6640	0.0460	0.0961	0.2066	0.8946

Panel C: Capital Expenditure as Treatment Variable

Panel C.1: TotalOpLease				Panel C.2: NewOpLease			
Treatment Sample		Control Sample		Treatment Sample		Control Sample	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
0.1467	0.2258	0.0609	0.0747	0.0267	0.0461	0.0137	0.0222

Panel D: Capital Expenditure plus Rental Expense as Treatment Variable

Panel D.1: TotalOpLease				Panel D.2: NewOpLease			
Treatment Sample		Control Sample		Treatment Sample		Control Sample	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
0.1661	0.2289	0.0448	0.0479	0.0305	0.0478	0.0104	0.0172

Panel E: NOL as Treatment Variable

Panel E.1: TotalOpLease				Panel E.2: NewOpLease			
Treatment Sample		Control Sample		Treatment Sample		Control Sample	
Mean	SD	Mean	SD	Mean	SD	Mean	SD
0.0769	0.1130	0.1253	0.2037	0.0154	0.0295	0.0246	0.0424

Table 4. The Effect of the TCJA on Operating Leases: Leverage as Treatment Variable

The dependent variable in columns 1 and 2 (3 and 4) is a firm's total operating lease commitments at year t scaled by total debt (is a firm's new operating lease commitments at year t scaled by total debt). Post is an indicator for the post TCJA period. Treatment_Lev is an indicator for firms with above-median leverage in the pre-TCJA period (2015 -2017). The sample includes all Compustat firm-year observations from 2015 to 2021 with non-negative EBITDA and with 3-year average sales below $25 million for the years 2015–2017 for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999), real estate (SIC codes 6500-6599), agriculture sector (SIC codes 0100- 0999) and motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	TotalOpLease	TotalOpLease	NewOpLease	NewOpLease
Treatment_Lev×Post	1.458***	1.080***	0.302***	0.232***
	(4.906)	(4.016)	(5.490)	(4.531)
Leverage		-6.247***		-1.171***
		(-4.964)		(-5.469)
Size		-0.442**		-0.0638**
		(-2.335)		(-2.059)
Net income		0.119		0.105
		(0.178)		(0.712)
OCF		1.661		0.237
		(1.640)		(1.142)
stdOCF		1.266		0.435
		(0.531)		(0.924)
Cash		-1.212		-0.280**
		(-1.559)		(-2.019)
Current ratio		0.181*		0.0493**
		(1.834)		(2.376)
Sales growth		-0.506*		0.0935
		(-1.685)		(1.126)
GDP growth		-0.0613***		-0.0103***
		(-3.703)		(-3.100)
Change in Interest		0.611***		0.104***
		(3.689)		(3.041)
Constant	0.716***	7.799***	0.131***	1.262***
	(7.798)	(4.105)	(7.718)	(4.295)
Observations	6,923	6,855	6,921	6,855
R-squared	0.559	0.571	0.506	0.515
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 5. The Effect of the TCJA on Operating Leases: Interest Limit as Treatment Variable

The dependent variable in columns 1 and 2 (3 and 4) is a firm's total operating lease commitments at year t scaled by total debt (is a firm's new operating lease commitments at year t scaled by total debt). Post is an indicator for the post TCJA period. Treatment_IntLimit is an indicator for firms with interest expense greater than 30 percent of EBITDA plus interest income in 2017. The sample includes all Compustat firm-year observations from 2015 to 2021 with non-negative EBITDA and with 3-year average sales below $25 million for the years 2015–2017 for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999), real estate (SIC codes 6500-6599), agriculture sector (SIC codes 0100- 0999) and motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	TotalOpLease	TotalOpLease	NewOpLease	NewOpLease
Treatment_IntLimit×Post	0.771***	0.694***	0.180***	0.172***
	(5.601)	(4.273)	(6.805)	(5.222)
Leverage		-6.100***		-1.160***
		(-4.756)		(-5.383)
Size		-0.454**		-0.0675**
		(-2.383)		(-2.160)
Net income		-0.323		0.0696
		(-0.547)		(0.479)
OCF		1.093		0.169
		(1.125)		(0.827)
stdOCF		1.922		0.497
		(0.780)		(1.023)
Cash		-0.852		-0.225*
		(-1.143)		(-1.674)
Current ratio		0.164		0.0484**
		(1.622)		(2.261)
Sales growth		-0.382		0.0990
		(-1.336)		(1.195)
GDP growth		-0.0446***		-0.00894***
		(-3.036)		(-2.780)
Change in Interest		0.511***		0.0927***
		(3.191)		(2.727)
Constant	0.986***	8.023***	0.191***	1.332***
	(189.6)	(4.138)	(191.0)	(4.510)
Observations	6,728	6,662	6,726	6,662
R-squared	0.545	0.557	0.494	0.504
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 6. The Effect of the TCJA on Operating Leases: Capital Expenditure as Treatment Variable

The dependent variable in columns 1 and 2 (3 and 4) is a firm's total operating lease commitments at year t scaled by adjusted total assets (is a firm's new operating lease commitments at year t scaled by adjusted total assets). Post is an indicator for the post TCJA period. Treatment_Capex is an indicator for firms with above-median capital expenditure scaled by total assets in the pre-TCJA period (2015 -2017). The sample includes all Compustat firm-year observations from 2015 to 2021 with sales revenue greater than $100million for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999) and utilities (SIC codes 4900-4999) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	TotalOpLease	TotalOpLease	NewOpLease	NewOpLease
Treatment_Capex×Post	-0.0139***	-0.0138***	-0.00617***	-0.00651***
	(-3.728)	(-3.799)	(-4.226)	(-4.665)
Leverage		-0.0425***		-0.0116**
		(-2.745)		(-2.343)
Size		-0.00622**		0.000154
		(-2.417)		(0.163)
Net income		-0.0250***		-0.00300
		(-3.125)		(-1.004)
OCF		-0.0184		-0.0145***
		(-1.523)		(-2.860)
stdOCF		0.0105		6.08e-05
		(0.491)		(0.00754)
Cash		-0.0281***		-0.0188***
		(-3.030)		(-5.004)
Current ratio		-0.00178*		0.00171***
		(-1.945)		(3.963)
Sales growth		0.0124***		0.0185***
		(2.905)		(7.952)
GDP growth		-0.000549**		-0.000251
		(-2.513)		(-1.286)
Change in Interest		0.00640***		0.000222
		(3.641)		(0.215)
Constant	0.108***	0.195***	0.0221***	0.0284***
	(102.9)	(8.348)	(53.68)	(3.383)
Observations	7,957	7,854	7,947	7,854
R-squared	0.911	0.914	0.564	0.574
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 7. The Effect of the TCJA on Operating Leases: Capital Expenditure plus Rental Expense as Treatment Variable

The dependent variable in columns 1 and 2 (3 and 4) is a firm's total operating lease commitments at year t scaled by adjusted total assets (is a firm's new operating lease commitments at year t scaled by adjusted total assets). Post is an indicator for the post TCJA period. Treatment_CapexRent is an indicator for firms with above-median capital expenditure plus rental expense scaled by total assets in the pre-TCJA period (2015 -2017). The sample includes all Compustat firm-year observations from 2015 to 2021 with sales revenue greater than $100million for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999) and utilities (SIC codes 4900-4999) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	TotalOpLease	TotalOpLease	NewOpLease	NewOpLease
Treatment_CapexRent×Post	-0.0220***	-0.0223***	-0.00813***	-0.00844***
	(-5.876)	(-6.168)	(-5.521)	(-6.028)
Leverage		-0.0395***		-0.0113**
		(-2.601)		(-2.294)
Size		-0.00682***		-3.62e-06
		(-2.660)		(-0.00383)
Net income		-0.0236***		-0.00295
		(-2.949)		(-0.973)
OCF		-0.0182		-0.0143***
		(-1.491)		(-2.779)
stdOCF		0.0128		3.27e-06
		(0.599)		(0.000400)
Cash		-0.0279***		-0.0187***
		(-3.028)		(-4.983)
Current ratio		-0.00163*		0.00176***
		(-1.796)		(4.089)
Sales growth		0.0124***		0.0188***
		(2.896)		(8.006)
GDP growth		-0.000622***		-0.000225
		(-2.739)		(-1.148)
Change in Interest		0.00695***		0.000250
		(3.738)		(0.241)
Constant	0.112***	0.201***	0.0229***	0.0299***
	(107.2)	(8.645)	(55.85)	(3.572)
Observations	7,898	7,795	7,888	7,795
R-squared	0.912	0.915	0.568	0.578
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 8. The Effect of the TCJA on Operating Leases: NOL as Treatment Variable

The dependent variable in columns 1 and 2 (3 and 4) is a firm's total operating lease commitments at year t scaled by adjusted total assets (is a firm's new operating lease commitments at year t scaled by adjusted total assets). Post is an indicator for the post TCJA period. Treatment_NOL is an indicator for firms with above-median NOL in 2017. The sample includes all Compustat firm-year observations from 2015 to 2021 with sales revenue greater than $100million for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999) and the agriculture (SIC codes 0100- 0999) sector are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	TotalOpLease	TotalOpLease	NewOpLease	NewOpLease
Treatment_NOL×Post	0.0114***	0.0125***	0.00436***	0.00496***
	(2.675)	(2.843)	(2.683)	(3.063)
Leverage		-0.0306*		-0.0107**
		(-1.892)		(-2.067)
Size		-0.00349		0.000501
		(-1.203)		(0.475)
Net income		-0.0272***		-0.00504
		(-3.166)		(-1.565)
OCF		-0.0194		-0.0161***
		(-1.444)		(-2.920)
stdOCF		0.0175		-0.00136
		(0.750)		(-0.154)
Cash		-0.0224**		-0.0166***
		(-2.261)		(-4.032)
Current ratio		-0.00191**		0.00157***
		(-1.965)		(3.427)
Sales growth		0.0110**		0.0178***
		(2.396)		(6.950)
GDP growth		-0.000435*		-0.000184
		(-1.816)		(-0.819)
Change in Interest		0.00553***		-6.90e-05
		(3.557)		(-0.0600)
Constant	0.0978***	0.154***	0.0189***	0.0219**
	(81.56)	(5.921)	(41.10)	(2.332)
Observations	6,629	6,536	6,619	6,536
R-squared	0.901	0.904	0.547	0.556
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 9. The Effect of the TCJA on Alternative Measures of Operating Leases: Leverage as Treatment Variable

The dependent variables in columns 1 and 2 are Alt OpLease1, Alt OpLease2, which are the present value of operating lease commitments up to year 5 discounted at the Baa yield, 10% scaled by total debt. The dependent variables on columns 3 and 4 are Alt OpLease3 byd5, Alt OpLease4 byd5, which are the present value of operating lease commitments up to and after year 5 discounted at the Baa yield, 10% scaled by total debt. Post is an indicator for the post TCJA period. Treatment_Lev is an indicator for firms with above-median leverage in the pre-TCJA period (2015 -2017). The sample includes all Compustat firm-year observations from 2015 to 2021 with non-negative EBITDA and with 3-year average sales below $25 million for the years 2015–2017 for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999), real estate (SIC codes 6500-6599), agriculture sector (SIC codes 0100- 0999) and motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	Alt OpLease1	Alt OpLease2	Alt OpLease3 byd5	Alt OpLease4 byd5
Treatment_Lev×Post	0.921***	0.834***	1.152***	0.998***
	(3.598)	(3.595)	(3.865)	(3.809)
Leverage	-5.779***	-5.260***	-7.003***	-6.111***
	(-4.684)	(-4.701)	(-4.877)	(-4.844)
Size	-0.486***	-0.444***	-0.540**	-0.484**
	(-2.594)	(-2.591)	(-2.501)	(-2.526)
Net income	0.208	0.197	0.243	0.225
	(0.315)	(0.327)	(0.320)	(0.336)
OCF	1.533	1.379	1.856*	1.614
	(1.583)	(1.570)	(1.649)	(1.631)
stdOCF	0.664	0.559	0.770	0.645
	(0.281)	(0.261)	(0.281)	(0.268)
Cash	-0.853	-0.773	-1.170	-0.998
	(-1.225)	(-1.230)	(-1.392)	(-1.366)
Current ratio	0.151*	0.136*	0.185*	0.161*
	(1.754)	(1.750)	(1.742)	(1.755)
Sales growth	-0.534*	-0.481*	-0.612*	-0.538*
	(-1.920)	(-1.909)	(-1.860)	(-1.868)
GDP growth	-0.0644***	-0.0586***	-0.0723***	-0.0643***
	(-4.183)	(-4.197)	(-4.051)	(-4.095)
Change in Interest	0.643***	0.585***	0.721***	0.641***
	(3.892)	(3.901)	(3.813)	(3.837)
Constant	7.849***	7.169***	9.130***	8.061***
	(4.179)	(4.187)	(4.207)	(4.207)
Observations	6,775	6,775	6,775	6,775
R-squared	0.564	0.564	0.567	0.566
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 10. The Effect of the TCJA on Alternative Measures of Operating Leases: Interest Limit as Treatment Variable

The dependent variables in columns 1 and 2 are Alt OpLease1, Alt OpLease2, which are the present value of operating lease commitments up to year 5 discounted at the Baa yield, 10% scaled by total debt. The dependent variables on columns 3 and 4 are Alt OpLease3 byd5, Alt OpLease4 byd5, which are the present value of operating lease commitments up to and after year 5 discounted at the Baa yield, 10% scaled by total debt. Post is an indicator for the post TCJA period. Treatment_IntLimit is an indicator for firms with interest expense greater than 30 percent of EBITDA plus interest income in 2017. The sample includes all Compustat firm-year observations from 2015 to 2021 with non-negative EBITDA and with 3-year average sales below $25 million for the years 2015–2017 for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999), real estate (SIC codes 6500-6599), agriculture sector (SIC codes 0100-0999) and motor vehicle dealers (SIC codes 5511-5521 and 5551-5599) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	Alt OpLease1	Alt OpLease2	Alt OpLease3 byd5	Alt OpLease4 byd5
Treatment_IntLimit×Post	0.552***	0.500***	0.702***	0.605***
	(3.739)	(3.732)	(3.973)	(3.921)
Leverage	-5.475***	-4.981***	-6.729***	-5.851***
	(-4.365)	(-4.379)	(-4.600)	(-4.556)
Size	-0.486**	-0.444**	-0.549**	-0.490**
	(-2.578)	(-2.574)	(-2.528)	(-2.543)
Net income	-0.184	-0.158	-0.236	-0.191
	(-0.314)	(-0.294)	(-0.352)	(-0.321)
OCF	1.057	0.957	1.273	1.113
	(1.151)	(1.149)	(1.185)	(1.181)
stdOCF	1.288	1.114	1.505	1.280
	(0.526)	(0.502)	(0.529)	(0.511)
Cash	-0.506	-0.459	-0.771	-0.647
	(-0.769)	(-0.774)	(-0.962)	(-0.932)
Current ratio	0.128	0.116	0.164	0.143
	(1.473)	(1.472)	(1.517)	(1.519)
Sales growth	-0.420	-0.380	-0.476	-0.420
	(-1.605)	(-1.604)	(-1.526)	(-1.544)
GDP growth	-0.0481***	-0.0439***	-0.0540***	-0.0481***
	(-3.558)	(-3.577)	(-3.446)	(-3.491)
Change in Interest	0.531***	0.484***	0.602***	0.533***
	(3.331)	(3.339)	(3.282)	(3.298)
Constant	7.841***	7.157***	9.258***	8.145***
	(4.089)	(4.095)	(4.181)	(4.166)
Observations	6,582	6,582	6,582	6,582
R-squared	0.546	0.546	0.551	0.549
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 11. The Effect of the TCJA on Alternative Measures of Operating Leases: Capital Expenditure as Treatment Variable

The dependent variables in columns 1 and 2 are Alt OpLease1, Alt OpLease2, which are the present value of operating lease commitments up to year 5 discounted at the Baa yield, 10% scaled by total debt. The dependent variables on columns 3 and 4 are Alt OpLease3 byd5, Alt OpLease4 byd5, which are the present value of operating lease commitments up to and after year 5 discounted at the Baa yield, 10% scaled by total debt. Post is an indicator for the post TCJA period. Treatment_Capex is an indicator for firms with above-median capital expenditure scaled by total assets in the pre-TCJA period (2015 -2017). The sample includes all Compustat firm-year observations from 2015 to 2021 with sales revenue greater than $100million for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999) and utilities (SIC codes 4900-4999) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	Alt OpLease1	Alt OpLease2	Alt OpLease3 byd5	Alt OpLease4 byd5
Treatment_Capex×Post	-0.00676***	-0.00671***	-0.00722**	-0.00798***
	(-3.274)	(-3.527)	(-2.432)	(-3.217)
Leverage	-0.0177*	-0.0182**	-0.0246*	-0.0260**
	(-1.768)	(-1.977)	(-1.786)	(-2.212)
Size	-0.00871***	-0.00796***	-0.00958***	-0.00843***
	(-5.372)	(-5.381)	(-4.305)	(-4.480)
Net income	-0.0111**	-0.0100**	-0.0201***	-0.0163***
	(-2.212)	(-2.187)	(-2.782)	(-2.727)
OCF	-0.00482	-0.00429	-0.0146	-0.0105
	(-0.666)	(-0.653)	(-1.374)	(-1.188)
stdOCF	-0.0154	-0.0135	3.56e-05	-0.00414
	(-1.279)	(-1.247)	(0.00192)	(-0.277)
Cash	-0.0209***	-0.0198***	-0.0232***	-0.0229***
	(-4.276)	(-4.459)	(-2.843)	(-3.594)
Current ratio	-0.00144***	-0.00124***	-0.00229***	-0.00178***
	(-2.862)	(-2.723)	(-2.973)	(-2.832)
Sales growth	0.00262	0.00268	0.00655*	0.00573*
	(1.020)	(1.142)	(1.805)	(1.883)
GDP growth	-0.000261*	-0.000277**	-0.000305	-0.000348**
	(-1.822)	(-2.136)	(-1.545)	(-2.093)
Change in Interest	0.00375***	0.00345***	0.00495***	0.00445***
	(3.489)	(3.588)	(3.126)	(3.264)
Constant	0.173***	0.159***	0.213***	0.188***
	(11.03)	(11.11)	(10.47)	(10.71)
Observations	7,785	7,785	7,785	7,785
R-squared	0.933	0.934	0.919	0.924
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Table 12. The Effect of the TCJA on Alternative Measures of Operating Leases: Capital Expenditure plus Rental Expense as Treatment Variable

The dependent variables in columns 1 and 2 are Alt OpLease1, Alt OpLease2, which are the present value of operating lease commitments up to year 5 discounted at the Baa yield, 10% scaled by total debt. The dependent variables on columns 3 and 4 are Alt OpLease3 byd5, Alt OpLease4 byd5, which are the present value of operating lease commitments up to and after year 5 discounted at the Baa yield, 10% scaled by total debt. Post is an indicator for the post TCJA period. Treatment_CapexRent is an indicator for firms with above-median capital expenditure plus rental expense scaled by total assets in the pre-TCJA period (2015 -2017). The sample includes all Compustat firm-year observations from 2015 to 2021 with sales revenue greater than $100million for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999) and utilities (SIC codes 4900-4999) are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	Alt OpLease1	Alt OpLease2	Alt OpLease3 byd5	Alt OpLease4 byd5
Treatment_CapexRent×Post	-0.0123***	-0.0120***	-0.0140***	-0.0144***
	(-5.991)	(-6.379)	(-4.770)	(-5.838)
Leverage	-0.0162	-0.0168*	-0.0232*	-0.0248**
	(-1.644)	(-1.859)	(-1.708)	(-2.143)
Size	-0.00908***	-0.00829***	-0.0101***	-0.00888***
	(-5.606)	(-5.624)	(-4.541)	(-4.727)
Net income	-0.0103**	-0.00935**	-0.0190***	-0.0154**
	(-2.073)	(-2.049)	(-2.632)	(-2.578)
OCF	-0.00442	-0.00384	-0.0142	-0.00992
	(-0.612)	(-0.588)	(-1.333)	(-1.126)
stdOCF	-0.0140	-0.0122	0.00162	-0.00274
	(-1.171)	(-1.133)	(0.0875)	(-0.184)
Cash	-0.0210***	-0.0199***	-0.0233***	-0.0230***
	(-4.326)	(-4.511)	(-2.863)	(-3.626)
Current ratio	-0.00135***	-0.00117**	-0.00215***	-0.00167***
	(-2.689)	(-2.562)	(-2.798)	(-2.664)
Sales growth	0.00271	0.00280	0.00672*	0.00589*
	(1.053)	(1.195)	(1.848)	(1.935)
GDP growth	-0.000278*	-0.000287**	-0.000351*	-0.000377**
	(-1.887)	(-2.166)	(-1.685)	(-2.171)
Change in Interest	0.00394***	0.00361***	0.00543***	0.00480***
	(3.567)	(3.656)	(3.238)	(3.362)
Constant	0.177***	0.163***	0.219***	0.193***
	(11.31)	(11.41)	(10.74)	(11.01)
Observations	7,759	7,759	7,759	7,759
R-squared	0.934	0.936	0.920	0.926
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

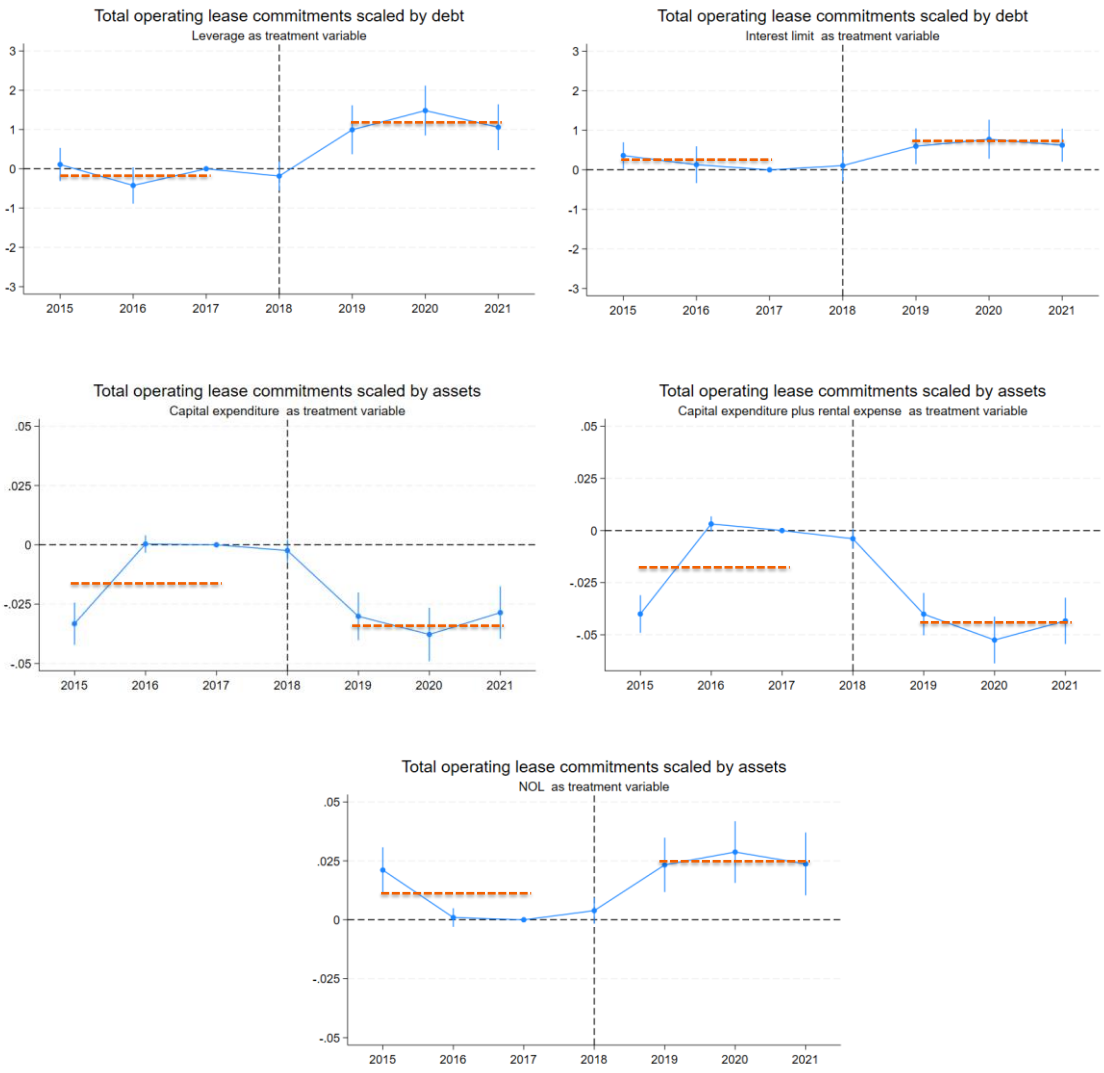
Table 13. The Effect of the TCJA on Alternative Measures of Operating Leases: NOL as Treatment Variable

The dependent variables in columns 1 and 2 are Alt OpLease1, Alt OpLease2, which are the present value of operating lease commitments up to year 5 discounted at the Baa yield, 10% scaled by total debt. The dependent variables on columns 3 and 4 are Alt OpLease3 byd5, Alt OpLease4 byd5, which are the present value of operating lease commitments up to and after year 5 discounted at the Baa yield, 10% scaled by total debt. Post is an indicator for the post TCJA period. Treatment_NOL is an indicator for firms with above-median NOL in 2017. The sample includes all Compustat firm-year observations from 2015 to 2021 with sales revenue greater than $100million for U.S. firms traded on the Amex, Nasdaq, and NYSE (exchg 11, 12 & 14). Financial firms (SIC code 6000-6999), utilities (SIC codes 4900-4999) and the agriculture (SIC codes 0100- 0999) sector are excluded from the sample. All columns control for firm and year fixed effects. Appendix A describes all variables. All continuous accounting variables are winsorized at the 1% and 99% levels. Below the regression coefficient estimates, their t-statistics are given in parentheses; they are heteroskedasticity-robust and clustered by firm. ***, **, or * indicate that the coefficient estimate is significant at the 1%, 5%, or 10% level, respectively.

	1	2	3	4
Independent Variables	Alt OpLease1	Alt OpLease2	Alt OpLease3 byd5	Alt OpLease4 byd5
Treatment_NOL×Post	0.00657***	0.00647***	0.00879**	0.00834***
	(2.825)	(3.024)	(2.519)	(2.901)
Leverage	-0.0117	-0.0126	-0.0164	-0.0187
	(-1.174)	(-1.384)	(-1.151)	(-1.564)
Size	-0.00677***	-0.00618***	-0.00742***	-0.00643***
	(-4.224)	(-4.246)	(-3.121)	(-3.266)
Net income	-0.0107**	-0.00988**	-0.0205***	-0.0168***
	(-2.167)	(-2.183)	(-2.704)	(-2.724)
OCF	-0.00367	-0.00319	-0.0151	-0.0103
	(-0.464)	(-0.446)	(-1.271)	(-1.055)
stdOCF	-0.00844	-0.00744	0.00970	0.00329
	(-0.684)	(-0.670)	(0.489)	(0.208)
Cash	-0.0166***	-0.0156***	-0.0178**	-0.0178***
	(-3.350)	(-3.499)	(-2.059)	(-2.677)
Current ratio	-0.00162***	-0.00143***	-0.00234***	-0.00187***
	(-3.115)	(-3.036)	(-2.871)	(-2.848)
Sales growth	0.00185	0.00187	0.00662*	0.00516
	(0.682)	(0.758)	(1.684)	(1.586)
GDP growth	-0.000204	-0.000209	-0.000235	-0.000273
	(-1.394)	(-1.602)	(-1.108)	(-1.571)
Change in Interest	0.00297***	0.00269***	0.00416***	0.00361***
	(3.149)	(3.203)	(2.892)	(3.098)
Constant	0.147***	0.135***	0.181***	0.158***
	(9.693)	(9.827)	(8.512)	(8.884)
Observations	6,471	6,471	6,471	6,471
R-squared	0.929	0.931	0.914	0.920
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Figure 1. Test of Parallel-Trends Assumption -Operating Lease Commitments before and after the TCJA

This figure plots coefficient estimates from equation (2). The dependent variable is total operating lease commitments. The x-axis corresponds to the years 2015 to 2021. The year 2017 is omitted from equation (2) and thus the reference year. The dots represent coefficient estimates, and the vertical bars represent 95% confidence intervals.



Internet Appendix for

"The Effect of the Tax Cuts and Jobs Act of 2017 on Leasing"

Table IA.1

This table presents the coefficient estimates from equation (2). The year 2017 is omitted from equation (2) and thus the reference year. Panel A, B and C present results for hypothesis 1, 2 and 3, respectively.

Panel A

	1	2	3	4
Independent Variables	TotalOpLease	NewOpLease	TotalOpLease	NewOpLease
	Leverage as Treatment		InterestLimit as Treatment	
Treatment×2015	0.149	-0.00716	0.219	-0.0104
	(0.495)	(-0.108)	(1.039)	(-0.249)
Treatment×2016	-0.487	-0.119*	-0.152	-0.0730**
	(-1.622)	(-1.728)	(-0.862)	(-2.009)
Treatment×2018	-0.248	-0.0409	-0.00650	0.0216
	(-0.985)	(-0.729)	(-0.0474)	(0.639)
Treatment×2019	1.215***	0.224***	0.849***	0.162***
	(3.219)	(3.046)	(4.288)	(3.972)
Treatment×2020	1.779***	0.342***	1.088***	0.217***
	(4.517)	(4.646)	(5.039)	(5.065)
Treatment×2021	1.330***	0.282***	0.987***	0.189***
	(3.695)	(3.997)	(4.467)	(4.342)
Controls	Yes	Yes	Yes	Yes
Constant	7.782***	1.253***	7.989***	1.303***
	(4.076)	(4.370)	(4.103)	(4.488)
Observations	6,855	6,855	6662	6,662
R-squared	0.574	0.518	0.558	0.505
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Panel B

	1	2	3	4
Independent Variables	TotalOpLease	NewOpLease	TotalOpLease	NewOpLease
	CAPEX as Treatment		CAPEX+Rent as Treatment	
Treatment×2015	-0.0333***	0.00135	-0.0400***	0.00138
	(-7.319)	(0.678)	(-8.717)	(0.685)
Treatment×2016	0.000375	0.00533***	0.00315*	0.00617***
	(0.202)	(2.653)	(1.699)	(3.058)
Treatment×2018	-0.00239	-0.00327	-0.00393	-0.00197
	(-1.004)	(-1.525)	(-1.629)	(-0.905)
Treatment×2019	-0.0301***	-0.00210	-0.0401***	-0.00408*
	(-5.876)	(-0.871)	(-7.756)	(-1.673)
Treatment×2020	-0.0378***	-0.00505**	-0.0525***	-0.00963***
	(-6.587)	(-2.354)	(-9.194)	(-4.463)
Treatment×2021	-0.0286***	-0.00762***	-0.0433***	-0.00916***
	(-5.075)	(-3.600)	(-7.658)	(-4.145)
Controls	Yes	Yes	Yes	Yes
Constant	0.194***	0.0278***	0.194***	0.0286***
	(8.380)	(3.321)	(8.474)	(3.424)
Observations	7,854	7,854	7,795	7,795
R-squared	0.915	0.575	0.918	0.580
Fixed Effects	Firm, Year	Firm, Year	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm	Firm	Firm

Panel C

	1	2
Independent Variables	TotalOpLease	NewOpLease
	NOL as Treatment	
Treatment×2015	0.0213***	0.00102
	(4.342)	(0.461)
Treatment×2016	0.00113	-0.000988
	(0.564)	(-0.438)
Treatment×2018	0.00377	0.00656***
	(1.343)	(2.698)
Treatment×2019	0.0232***	0.00327
	(3.957)	(1.181)
Treatment×2020	0.0287***	0.00510**
	(4.312)	(2.103)
Treatment×2021	0.0237***	0.00484*
	(3.501)	(1.915)
Controls	Yes	Yes
Constant	0.167***	0.0248***
	(6.573)	(2.649)
Observations	6,536	6,536
R-squared	0.905	0.557
Fixed Effects	Firm, Year	Firm, Year
Clustered Standard Errors	Firm	Firm