The pass-through of corporate tax cuts to consumer loans: Evidence from the TCJA*

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January 30, 2025

Abstract

Using data from TransUnion, a large U.S. credit bureau, we analyze whether and how cuts in bank income taxation are passed through to the interest rates and size of consumer loans. Exploiting the change in bank corporate income taxation from the Tax Cuts and Jobs Act and utilizing tax-exempt credit unions as a control group, we find that corporate tax cuts lead to lower interest rates for consumers obtaining auto loans from banks. We also find greater pass-through for individuals with higher credit quality. We develop a parsimonious model to identify the economic mechanisms influencing the pass-through of corporate tax cuts to interest rates. Our empirical tests reveal that pass-through declines with banks' market power and leverage, while we find only a limited role for selection in consumer credit markets.

Keywords: *Consumer Loans; Tax Cuts and Jobs Act; Tax Incidence*

*TransUnion (the data provider) has the right to review the research before dissemination to ensure it accurately describes TransUnion data, does not disclose confidential information, and does not contain material it deems to be misleading or false regarding TransUnion, TransUnion's partners, affiliates or customer base, or the consumer lending industry. We thank Phil Berger, Anna Costello, Becky Lester, Doug Skinner, Nastia Zakolyukina, and workshop participants at Chicago Booth for helpful comments on our paper. Granja gratefully acknowledges support of the Jane and Basil Vasiliou Research Fund at the University of Chicago Booth School of Business. Weinrich gratefully acknowledges support of the Deutsche Forschungsgemeinschaft (Project ID 403041268, TRR 266 Accounting for Transparency). Any errors or omissions are the responsibility of the authors.

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1 Introduction

The Tax Cuts and Jobs Act ("TCJA") of 2017 was the largest business tax cut in U.S. history, with projected corporate tax revenue reductions of $100–$150 billion annually. It also sparked a polarizing debate. Supporters credited the tax reform with boosting domestic investment and U.S. competitiveness. Its critics, however, argued that the TCJA exacerbated inequality by raising profits for affluent business owners at the expense of the lower-middle class. Notwithstanding all the rhetoric and vitriol surrounding the politicized debate about the fairness of corporate tax cuts, the arguments almost always overlook the possibility that the corporate tax cuts might have a broad economic incidence if subsequently passed through to workers or U.S. households via higher wages or lower product prices (Harberger, 1962; Auerbach, 2006). This paper contributes new evidence to this ongoing debate about the broader distributional impacts of corporate tax cuts.

Most studies examining the broader distributional effects of corporate tax cuts have focused on their impact on labor. Using local variation in corporate tax rates, Suárez Serrato and Zidar (2016) and Fuest et al. (2018) show that a portion of the incidence falls on labor. Moreover, Kennedy et al. (2022) and Risch (2024) exploit changes in business tax rates at the federal level and find that top-income workers benefit the most from corporate tax cuts. However, focusing solely on labor incidence might provide an incomplete picture of the broader effects on inequality, and particularly on consumption inequality, if corporate tax cuts also affect the prices of goods and services.

This paper contributes to the debate on the distributional effects of corporate tax cuts by examining the impact of the TCJA on consumer credit prices. In particular, we use granular information from the consumer credit market to study the pass-through of corporate tax rate cuts to interest rates paid by U.S. households on auto loans. With U.S. household debt recently exceeding $17.8 trillion, and auto loans comprising nearly 10% of this balance, the scale of this

market is substantial.[1] Moreover, according to the Survey of Consumer Finances, over 35% of U.S. households, spanning low- to high-income groups, hold at least one auto loan. Thus, understanding the pass-through in this market could offer valuable insights into the welfare implications of corporate tax policies across a broad and diverse segment of the population.

We exploit a distinctive institutional feature of U.S. consumer credit markets and granular data on auto loan characteristics to estimate the pass-through of corporate tax cuts to consumer prices. Specifically, we compare changes in interest rates and loan sizes for auto loans originated by commercial banks before and after the TCJA with those of credit unions, which are tax-exempt not-for-profit cooperatives that operate in the same markets and compete with commercial banks for the same loans but are not directly affected by changes in corporate tax rates. In other words, we use an event study design that employs credit unions as an adequate control group – something often difficult to find in analyses of sweeping tax reforms that affect all companies in an economy at once.

We utilize information from the TransUnion consumer credit panel available at Chicago Booth. The panel covers a random 10% sample of U.S. consumers with credit histories and includes granular loan details such as amount, scheduled payments, and maturity, along with borrower risk profiles, geographic information, and loan performance over time. We leverage this detailed information to apply a battery of fixed effects that help isolate differences in how commercial banks and credit unions adjusted loan interest rates and sizes around the passage of the TCJA, while controlling for systematic differences in the composition of loans between the two types of institutions. In particular, we include lender $\times$ maturity $\times$ ZIP code fixed effects to capture time-invariant differences in lender market power or cost structures in each ZIP code across various loan maturities, as well as credit score bucket $\times$ month $\times$ maturity $\times$ ZIP code fixed effects to account for local shocks affecting

[1] E.g., see newyorkfed.org/microeconomics/hhdc.

interest rates and loan sizes for individuals with similar credit scores. Thus, our identification strategy compares the rates received by similar borrowers located in similar local markets obtaining loans with similar characteristics but whose lenders were differently affected by the business tax cuts in the TCJA.

Our summary statistics suggest that credit unions can serve as a suitable control group for studying the pass-through of tax cuts to interest rates and loan sizes in the auto lending market. Credit unions hold a significant share of this market, providing a large sample unaffected by the TCJA's corporate tax cut.[2] Specifically, we show that credit unions account for more than half of all auto loans in our sample. The average interest rate on loans from credit unions is similar to that of commercial banks but the average loan originated by a credit union goes to borrowers with lower credit score suggesting that risk-adjusted interest rates practiced by credit unions are lower than those of banks. This difference likely reflects the credit unions' cost advantage from their preferential tax treatment.

We use a difference-in-differences design to estimate the pass-through of the TCJA's business tax cuts to auto loan interest rates. Our results show that commercial banks reduced rates by 10.4% relative to unaffected credit unions. Taking into consideration that, prior to the TCJA, the average auto loan interest rate offered by banks was 4.21%, our estimates correspond to a 44bps decrease for the average loan, implying a net-of-tax-rate elasticity of -0.49. We also examine the effect of the corporate tax cut on loan sizes but, if anything, we find only a small increase in 2019. Taken together, these results suggests that the TCJA's corporate tax cut is (partly) passed-through to borrowers in consumer credit markets.

Our back-of-the-envelope computations suggest that these effects could lower U.S. households' interest payments by approximately $2.1 billion. By comparison, we estimate that the TCJA

[2]See for example this Industry Report by the Credit Union Times stating that "Credit Unions Gain Top Share of Auto Lending" in 2022, here.

increased banks' profits by about $25.5 billion. These are sizable effects especially when we consider that auto loans represent a fraction of banks' loan portfolios. Our estimated net-of-tax rate elasticity falls on the higher end of the range of comparable estimates. For example, it exceeds the 0.24 found by Baker et al. (2020) for the effect of corporate taxes on retail prices in the U.S., but is closer to the 0.4 found in Fuest et al. (2018) for the impact of corporate taxes on wages. In syndicated loan markets, Kang et al. (2021) do not find an interest rate response to state level corporate income tax cuts. However, many of these elasticity estimates are derived from relatively small changes in local corporate tax rates within open economies. Therefore, they may not be directly generalizable to a major reduction in the U.S. federal corporate income tax, such as the one enacted by the TCJA (e.g., Auerbach, 2018).

Next, we examine the timing of the pass-through of the TCJA's business tax cuts to interest rates. This analysis helps us understand the speed of the interest rate adjustment in response to the tax cuts and whether the estimated coefficients could be driven by ongoing trends toward lower interest rates at commercial banks relative to credit unions. We find no evidence of an ongoing trend in the estimated monthly coefficients before the TCJA's adoption, thus supporting the parallel trends assumption. Interestingly, in the post-TCJA period, the adjustment of interest rates to the tax cuts was not immediate. The estimated coefficients remain flat, or slightly rise, in early 2018 and only begin to decline in the latter half of the year, with the decline continuing through mid-2019. This slow rate of adjustment is consistent with evidence in Benzarti et al. (2020) suggesting that companies do not symmetrically pass-through increases and decreases in value-added taxes to product prices and with evidence suggesting that banks are slower to pass on increases in the Fed Funds rate to depositors than reductions (e.g., Hannan and Berger, 1991; Neumark and Sharpe, 1992). Banks themselves acknowledged in conference calls that pass-through to interest rates would be gradual. For instance, US Bancorp executives noted in a Q1 2018 earnings call that "there is going to be

some bleed that will take place because of competitive pricing, but I also expect that that's going to take place over a time."

Our findings above suggest that the tax cuts were partly passed through to credit consumers, which suggests that the average household was able to share into the benefits of the corporate tax cuts through lower product prices. It is possible, however, that not all consumers benefited equally from the resulting interest rate reductions. Using the granularity of the TransUnion dataset, we analyze the heterogeneity of pass-through across borrowers of different credit quality. Specifically, we examine if the pass through of tax cuts varies for borrowers with credit scores above or below 660. We find that pass-through occurs across the credit score spectrum but is more pronounced among higher-quality borrowers. Lower credit quality borrowers see interest rate reductions of about 7.4% until 2019, while higher credit quality borrowers benefit from a reduction of approximately 12%. Given that Albanesi et al. (2022) show that credit scores correlate with income, this finding implies that while low-income individuals benefited from lower auto loan rates, pass-through was relatively smaller than that for higher-income individuals during our sample period.

In the second part of our paper, we attempt to better understand the economic mechanisms that explain variation in the pass-through of the TCJA's corporate tax cut to interest rates in the consumer credit market. To this effect, we employ a price-theoretic framework that adapts the models of Weyl and Fabinger (2013), Mahoney and Weyl (2017), and Cabral et al. (2018) to the analysis of the incidence of corporate tax cuts in consumer credit markets. Our conceptual framework implies that the degree of pass-through depends on banks' market power, on the degree of adverse or advantageous selection in credit markets, and on banks' capital structure. If there is adverse (advantageous) selection, pass-through is higher (lower) because lower interest rates will change banks' cost structures by attracting better (worse) borrowers. If banks are more reliant on tax-deductible deposits and debt in their capital structure, the model predicts lower pass-through

due to the tax deductibility of interest payments. Finally, while the model does not offer clear directional predictions for the relation between local market power and the rates of pass-through, we find that under a linear parametrization of loan demand, banks with greater market power do not pass-through as much of the tax cuts to interest rates.

We empirically test the predictions of our conceptual framework. We estimate a pass-through of 8.4% in counties with the highest bank market power, compared to 12.6% in counties with the lowest. These findings align with what our model predicts under certain functional form assumptions for loan demand. They are also consistent with statements from several executives attributing their ability to raise profits after the tax cuts to competitive dynamics in the marketplace.[3] We find limited evidence that selection in credit markets significantly affects the pass-through rate to consumers. Specifically, two-year ahead auto loan delinquencies at commercial banks did not change significantly for loans originated post-TCJA, relative to delinquencies at credit unions. We interpret these findings as suggestive that commercial banks' cost structures are not much affected by adverse or advantageous selection, though we note that the results could be confounded by the onset of the Covid-19 pandemic and subsequent policy measures targeted at relieving financial distress (Dettling and Lambie-Hanson, 2021). Lastly, we find evidence that banks' capital structure affects tax pass-through as predicted by the conceptual framework. Specifically, we find lower pass-through for banks with weak capital ratios and vice-versa.

Our paper adds several novel insights to the research on the TCJA, which we review in detail in Section 2.[4] The research on the TCJA has had a large focus on the impact of its many provisions

[3]For instance, in a Q4 2017 earnings call, the Chief Financial Officer of Fifth Third Bancorp stated that: "We are optimistic that we will retain most of the run rate benefits of lower taxes, but this will depend on the competitive dynamics". Similarly, Terence Dolan of US Bancorp stated: "Obviously, we operate in a pretty competitive environment. So ultimately, how much gets competed away will be dependent upon that competition".

[4]For a comprehensive review of the literature see the TJCA Effects Tracker by Jeff Hoopes at https://tax.kenaninstitute.unc.edu/what-do-we-know-about-the-effects-of-the-tax-cuts-and-jobs-act/ and the recent review by Lester and Olbert (2024) on firms' responses to taxation more generally.

on companies' investment policies (e.g., Gale et al., 2024; Chodorow-Reich et al., 2024). With the exception of Kennedy et al. (2022), which studies the impact of the TCJA's tax cuts on wages across the distribution of wage earners, much less is known about the distributional effects of the TCJA. To the best of our knowledge, this study is the first to document that consumers benefited from lower prices following the largest corporate tax cut in U.S. history. Moreover, we find that pass-through is present across the credit score distribution even though it is more more pronounced in individuals with higher credit scores. Our findings suggest that a broader segment of the population, rather than just affluent business owners, shared in the benefits of reduced corporate tax rates. These insights are a novel addition to evaluations of the TCJA (e.g., see Donohoe et al., 2024; Chodorow-Reich et al., 2024; Dobridge and Hsu, 2019) and can guide legislators in finding a successor tax reform to the TCJA when many of its provisions expire by the end of 2025.[5]

The paper also contributes to a growing literature examining tax incidence on consumer prices (e.g., see Baker et al., 2020; Dedola et al., 2022; Jacob et al., 2023). These studies have mostly used relatively small changes in state or local corporate tax rates to investigate the incidence of changes in corporate tax rates on consumer prices. Compared to these studies, our estimates of the tax-rate elasticity of consumer prices fall on the upper end of the range of estimates found in this literature. Some of these papers have also found asymmetric price responses to tax cuts and tax hikes (e.g., see Kang et al., 2021; Doyle and Samphantharak, 2008). We believe estimates from studies of changes in local tax rates might have limited generalizability in the context of a large corporate tax cut whose impact on tax revenue was orders of magnitude larger than those of these other settings (e.g., Auerbach, 2018).

Finally, our work is also related to the literature examining the transmission of bank supply shocks to the real economy. A large literature has documented a bank lending channel of monetary

[5]E.g., see taxfoundation.org/research/all/federal/2025-tax-reform-options-tax-cuts-and-jobs-act/.

policy transmission whereby changes in the policy rate affect banks' cost of funding and, in turn, their supply of credit (e.g., Bernanke and Blinder, 1988; Kashyap and Stein, 2000; Drechsler et al., 2017). A related literature (e.g., Jiménez et al., 2012) has further documented a bank-balance sheet channel suggesting that the strength of the transmission of monetary policy to lending depends on the strength of a bank's balance sheet. Our work documents the existence of transmission of expansionary fiscal policy to the supply of lending and examines the cross-sectional differences across banks and local markets that explain the intensity of this transmission.

2 Prior Literature - Tax Incidence

Tax incidence analysis is characterized as "estimating the effects of tax policy changes on different groups of individuals via the effects on prices and returns to labor and capital" (Auerbach, 2018) with (empirical) research typically building on and expanding beyond the seminal work by Harberger (1962) (for an overview, see Auerbach (2006)).

Under the assumptions of Harberger's closed economy model, capital would bear the full incidence of the tax. With the introduction of open economy models and international capital flows, however, tax incidence can (also) fall on labor (for discussions, see Risch (2023), Auerbach (2018) and Gravelle (2013)), leading to extensive yet inconclusive empirical analyses of eventual tax incidence on labor. Within-country (e.g., Fuest et al. (2018) in Germany and Liu and Altshuler (2013) in the U.S.) and cross-country (e.g., Arulampalam et al. (2012), Clausing (2013), and Hassett and Mathur (2015)) findings suggest that workers bear anything between none and about one half of the tax. Further expanding labor market effects through location choices to other stakeholders, Suárez Serrato and Zidar (2016) show that not only capital and labor but also landowners bear tax incidence. Kennedy et al. (2022) highlight an "efficiency-equity" trade off from the TCJA's tax cut: they find substantial

efficiency gains from cutting corporate taxes but also find that corporate tax cuts disproportionately benefit those with high incomes.

Recent work also considers tax incidence on consumer prices. Baker et al. (2020) argue that state corporate income taxes levied on producers do impact the final retail sales prices of their products; consistent with Poterba (1996) finding that state and local sales taxes are passed-through to consumers.

The findings on a competition channel are nuanced. Hanlon et al. (2023) analyze an airline setting and find that profitable firms use the cash tax savings from corporate income tax cuts to gain market share from their financially constrained, loss-making competitors. Dedola et al. (2022) find that a one percentage point increase in the local business tax rate in Germany results in a 0.4% increase in the retail prices of goods—but find little variation by market shares. Baker et al. (2020) suggest that tax pass through is higher in less competitive markets. Jacob et al. (2023) analyze gas prices and local business tax variation in Germany and find that corporate taxes increase consumer prices, particularly when demand is less elastic.

Analyzing tax incidence in credit markets, Kang et al. (2021) show that syndicated loan spread increases in bank income taxes of corporate borrowers' home states with incidence increasing in local loan market concentration. Interestingly, they document an asymmetric response without spread reductions for tax cuts. Other settings outside of credit markets also find asymmetric responses: for example, Benzarti et al. (2020) for value added tax changes and Doyle and Samphantharak (2008) for a sales tax suspension and reinstatement on retail prices of gasoline.

Recent papers study the effects of the TCJA in credit markets. However, they differ in focus, methodology, and results. Donohoe et al. (2024) study the transmission of aggregate share buybacks to bank lending activity. Dobridge and Hsu (2019) analyze how *personal* income tax provisions of the TCJA affect consumer credit. Fox and Pyle (2022) analyze banks and credit unions at the

lender level but conclude that treated lenders' borrowers did not receive a share of the tax cut—with differing results possibly due to less granular data. Mohrmann and Riepe (2024) analyze bank deposits and identify deposit withdrawals due to mechanical revaluations of banks' deferred tax assets.

For an overview of the broad literature on the effects of the TCJA we refer to Clausing (2024). For a review on trickle-down effects of tax cuts see Risch (2023).

3 Institutional Details

3.1 (Tax Status of) Credit Unions

A *federal credit union* is a cooperative association organized for the purpose of promoting savings among its members and creating a source of credit.[6] Additionally, *state credit unions* and *state-chartered credit unions* are organized and operated according to state laws, which "provide for the organization of credit unions similar in principle and objectives to federal credit union."[7] Credit unions, thus, are characterized by a cooperative structure and mutual purpose.

Historically, this characteristic served as a motivation for a key institutional feature of credit unions that remains intensely debated today. Both federal and state credit unions are federally tax-exempt. Explicitly stated for federal credit unions, "[...] their property, their franchises, capital, reserves, surpluses, and other funds, and their income shall be exempt from all taxation now or hereafter imposed by the United States or by any State, Territorial, or local taxing authority; except that any real property and any tangible personal property [...]."[8] Federal credit unions, thus, are

[6] 12 U.S.C. §1752(1).
[7] 12 U.S.C. §1752(6).
[8] 12 U.S.C. §1768 and 26 U.S.C. §501(c)(1) for federal credit unions; see 26 U.S.C. §501(c)(14)(A) for the federal tax exemption of state credit unions.

exempt from *federal* and *state* corporate income taxation. While state credit unions are exempt from federal corporate income taxation accordingly,[9] states can impose state corporate income taxes on state credit unions. Most state regulations, however, also exempt state credit unions from state level taxes (e.g., see York (2021) and Tatom (2005)).[10] Consequently, a credit union's loan income, including that from auto loans, is always tax-exempt at the federal level and could also be exempt from state corporate income taxation.

Although credit unions are exempt from corporate income tax, they compete directly with commercial banks in consumer credit markets (Van Rijn et al., 2023). While credit unions have membership requirements that limit their potential clientele recent regulatory rulings have blurred the traditional distinctions between credit unions and banks. Notably, a series of rulings by the National Credit Union Administration (NCUA) have relaxed the restrictions on credit union membership Goddard et al. (2023). Perhaps as a result of these blurred membership restrictions, Shahidinejad (2024) finds that the borrower pool at credit unions closely resembles that of commercial banks, indicating they compete for the same customers. This direct competition between credit unions and commercial banks justifies our choice to use credit unions as a control group in our empirical analysis. In the auto loan market, where credit unions hold significant market share, Feinberg (2001) finds that credit unions limit banks' market power, further supporting their role as direct competitors.[11]

3.2 The Tax Cuts and Jobs Act

Corporate lenders that are not credit unions are generally subject to federal and state income taxation. Profits from auto loans are generally taxable at the federal and state levels. Income

[9] 26 U.S.C. §501(c)(14)(A).

[10] Many states incorporate the federal Internal Revenue Code by reference, including the provisions for tax exemptions (e.g., see North Dakota (answerconnect.cch.com) and Illinois (answerconnect.cch.com)). A notable exception is Indiana's financial institutions tax (answerconnect.cch.com).

[11] See footnote 2 and our consistent summary statistics in Table 1.

is allocated to the residence state of the borrower (for unsecured loans) or to the location of the asset (for secured loans).[12] In the case of auto loans, the location of the borrower and the asset usually coincide, allowing us to identify the loans in our sample. Thus, income from auto loans by commercial banks is taxed at the applicable federal and state statutory rates

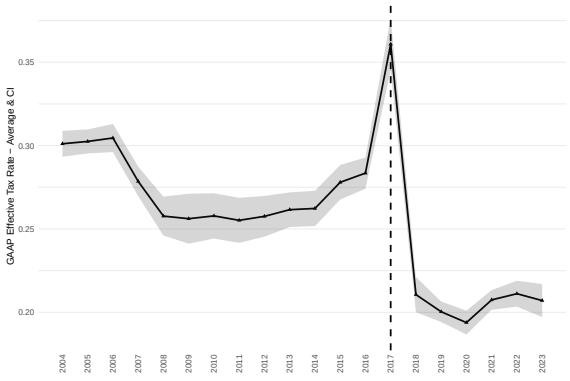
The federal statutory corporate income tax (CIT) rate saw a major overhaul with the passing of Tax Cuts and Jobs Act (TCJA)[13] in December 2017, which introduced a flat tax rate of 21%, cutting down the previous top bracket rate of 35%. The TCJA's CIT rate change became applicable for taxable years starting after December/31/2017, indicating that for fiscal years that included January/01/2018 a blended tax rate was applicable.[14] While the TCJA introduced multiple new mechanisms to the U.S. tax system (for an overview see Clausing, 2024), it had only a marginal impact on credit unions. For instance, the National Association of Federally-Insured Credit Unions indicated that "this monumental piece of legislation keeps the credit union tax exemption fully intact" (NAFCU, n.d.). Therefore, we consider credit unions as the untreated control group in the subsequent analyses.

Commercial banks experienced a significant impact on their tax reporting as a result of the TCJA's tax rate cut. We plot GAAP effective tax rates (ETR) and the development of deferred tax assets of large public banks in the CRSP-Compustat merged bank data in Figure 1. Figure 1a shows that banks' effective tax rates substantially decreased in the fiscal years following the TCJA, indicating that banks indeed experienced a significant tax cut from the TCJA. In Figure 1b, we display distributions of banks' GAAP ETRs in two-year intervals around the TCJA (excluding 2017) and observe meaningful changes in ETRs across the entire distribution of banks. Following the reduction of the CIT rate to 21%, GAAP accounting rules required revaluations of deferred tax

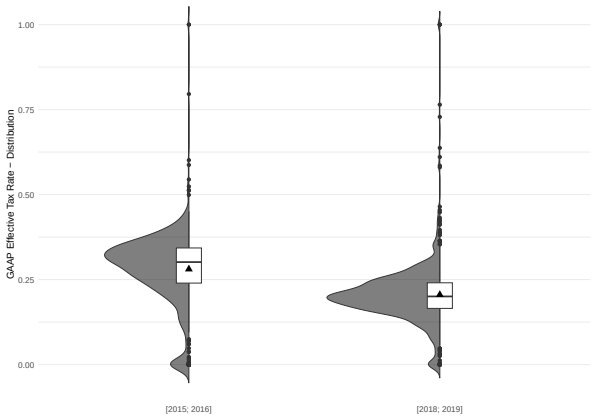
[12] For Illinois' apportionment regulations, see 35 ILCS §5/304(c)(3)(i)-(iii).
[13] Public Law 115-97.
[14] For an explanation, see irs.gov/government-entities/2018-fiscal-year-blended-tax-rates-for-corporations; essentially the tax is blended based on the number of days in the taxable year when the different rates were in effect.

Figure 1: Banks' Tax Reporting around the TCJA

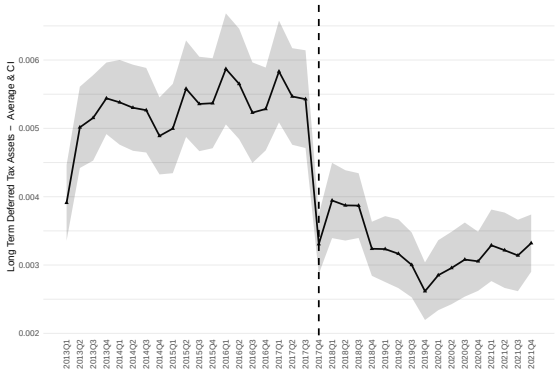
This figure depicts in panel (a) GAAP Effective Tax Rates of banks in the Compustat-CRSP merged bank data (*items* in parentheses). GAAP ETR is calculated as income taxes (txt) over pretax income (pi) net of special items (spi) over a 20 year horizon, whereas (i) missing spi are reset to zero, (ii) GAAP ETR with a negative denominator is set to missing, and (iii) GAAP ETR is winsorized at $[0; 1]$. Panel (b) depicts distributions (i.e., density plot and boxplot with triangle-marked average) of banks' GAAP ETRs in two-year-intervals around the TCJA (leaving out 2017). Panel (c) depicts banks' quarterly reported long term deferred tax assets ($txdbaq$) over a bank's sample period average total assets. In panels (a) and (c) the triangles/lines mark averages, the light gray area shows the 95%-confidence interval, and the vertical dashed line marks the passage of the TCJA.



(a) Banks' GAAP ETRs



(b) Changes in Banks' GAAP ETRs



(c) Banks' Deferred Tax Assets

assets and liabilities as of the date of the TCJA's enactment, with resulting tax effects accounted for in the fourth quarter of 2017. To reflect the new lower tax rate, a write-down of deferred tax assets was necessary. Figure 1c show a substantial decline in the value of deferred tax assets that, in turn, resulted in a one-time increase in tax expense and GAAP effective tax rate in 2017, explaining the peak in banks' 2017-GAAP ETRs in Figure 1a.

4 Data

4.1 TransUnion Consumer Credit Panel

This paper exploits the granularity of the Booth TransUnion Consumer Credit Panel ("TU panel"). The TU panel is an anonymized 10% sample of the TransUnion data, with a small number of individuals added each month to maintain representativeness and compensate for people leaving the panel (e.g., due to death). The panel contains trade-line level information about loans for a vast set of lenders. Importantly, the data contains anonymized lenderkeys and an identifier indicating whether a lender is a bank, credit union or other lender. We use the latter information to form comparable treatment and control groups. To ensure the comparability of lenders, we focus the analysis on banks as the treatment group and credit unions unaffected by corporate income tax changes as control group.[15] We focus on auto loans due to the large market share of credit unions, due to the frequent usage of auto loans by American households, because interest rates can be imputed, and the limited government interventions relative to mortgage and student loan markets. Similar to other papers using the TU panel, we impute interest rates for auto loans relying on the annuity formula (Yannelis and Zhang, 2021; Jansen et al., 2022). We exclude zero interest loans from our analysis as they likely reflect car sale promotions. We refer to those papers for greater

[15]In other words, we exclude loans not originated by a bank or credit union as classified by TransUnion.

details on the computation of interest rates.

4.2 Summary Statistics

We start our empirical analysis by providing basic information on the auto loan market over the sample period from January 2016 to December 2019. We present summary statistics for our regression sample in Table 1. Panel A shows summary statistics for auto loans originated by banks. Panel B shows summary statistics for auto loans originated by credit unions.

Our sample contains approximately 911,000 auto loans originated by banks and credit unions between 2016 and 2019. 315,000 loans are originated by banks and 595,000 are originated by credit unions. The average interest rate is 4.61% for banks and 4.62% for credit unions. The average loan size is approximately $24,900 for banks and $23,300 for credit unions. Bank borrower credit scores are 757 points on average, while credit union borrower credit scores are modestly lower on average at 731 points. Loan maturity is similar at 5.52 and 5.56 years for banks and credit unions, respectively.

Next, we describe the evolution of average interest rates and loan sizes in our regression sample. We split loans by their treatment status and plot their evolution in Figure 2. Banks are shown in red while the control sample of credit unions is plotted in blue.

Figure 2a shows the development of interest rates by treatment status. The level and evolution of average interest rates is very similar for treated (banks) and control (credit unions) lenders in the pre-TCJA period. Both banks and credit unions originate loans with average interest rates around 4.25%. With the passage of the TCJA at the end of 2017, bank interest rates start to diverge from credit union interest rates. While both groups show upward trending interest rates throughout 2018, bank interest rate increase stronger in early 2018 but peak at around 5.25%. Credit union interest rates, however, continue to increase until early 2019 and surpass 5.5% on average. We observe subsequent declines in interest rates. Banks' interest rates declines are more pronounced and start

Table 1: Summary Statistics by Treatment Status

This table displays summary statistics for the main variables in our regression sample of Table 2 over the period from 2016 to 2019. *Interest rate* is the imputed interest rate of a loan. We exclude zero interest loans as they likely reflect car sale promotions. *Loan Size* is the loan principal. *Credit Score* is the credit score of the borrower at the origination of the loan. *Maturity* is the length of the loan in years. Observations are conditional on being included in the regression of Table 2.

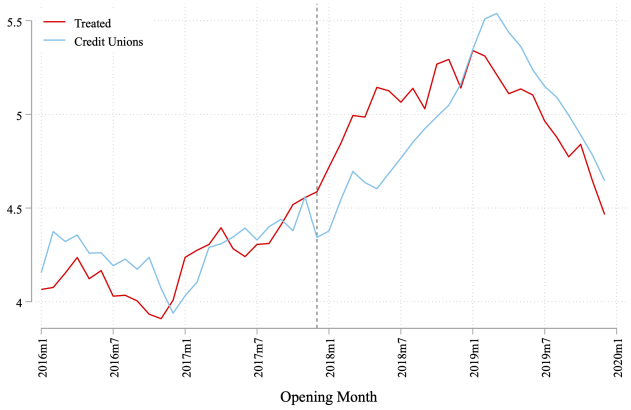
	Count	Mean	Sd	P25	P50	P75
Panel A: Banks						
Interest Rate	315,494	4.61	2.20	3.24	4.18	5.52
Loan Size	315,494	24,918	10,434	17,013	23,827	31,937
Credit Score	315,494	757	67	711	778	815
Maturity	315,494	5.52	0.84	5.00	6.00	6.00
Panel B: Credit Unions						
Interest Rate	595,618	4.62	2.63	3.03	3.92	5.20
Loan Size	595,618	23,289	10,853	15,000	21,997	30,498
Credit Score	595,618	731	73	672	736	804
Maturity	595,618	5.56	0.99	5.00	6.00	6.08

earlier, pushing interest rates below those of credit unions throughout 2019. Until the end of 2019, bank interest rates decline to approximately 4.5% while credit union interest rates drop to 4.75%. Figure 2a thus indicates a decline in interest rates for treated banks relative to the control sample of credit unions in 2019. While this initial evidence is encouraging, we caution that these means do not account for differences in credit quality and customer characteristics across banks and credit unions. A more formal analysis follows in subsequent sections.

Figure 2: Interest Rates and Loan Size by Treatment Status

This figure plots the evolution for the average interest rates and average loan size by lender treatment status for our regression sample. Banks are shown in red. Credit unions are shown in blue. Panel (a) shows average interest rates and Panel (b) shows average loan sizes.

(a) Interest Rates



(b) Loan Size

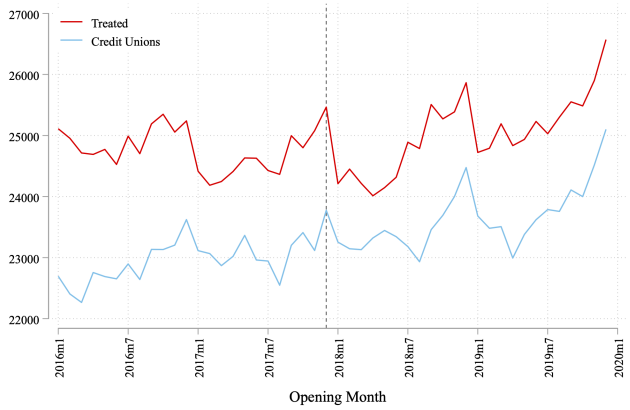


Figure 2b plots average loan sizes by treatment status. The graph shows average loan sizes for banks to be larger than for credit unions confirming the summary statistic in Table 1. Average levels in loan sizes differ by approximately $1,700 throughout the sample period, with the wedge being - if anything - slightly larger at the beginning (January 2016) than at the end (December 2019) of the sample period. Overall loan sizes trend similarly over the sample period showing an upward trend. While bank loan sizes decrease early 2018, compressing the wedge between bank and credit union

loan sizes temporarily, we observe an increase to approximately $26,500 in late 2019. Credit union loan sizes surpass $25,000 in late 2019. Figure 2b thus suggests that loan sizes of banks and credit unions developed largely parallel throughout the sample period.

5 Identification Strategy

We exploit the granularity of the consumer credit data and implement a difference-in-differences design at the loan level to estimate the effect of corporate income tax cuts on interest rates and loan amounts. In our main analysis, we estimate the following empirical specification using ordinary least squares:

$$ln(r_{ijt}) = \beta_{2018}\mathbb{1}\{t \in 2018\} \times Treated_j + \beta_{2019}\mathbb{1}\{t \in 2019\} \times Treated_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}, \quad (1)$$

in which $Treated$ is an indicator variable for commercial banks, $\mathbb{1}\{t \in 2018\}$ and $\mathbb{1}\{t \in 2019\}$ are indicator variables taking the value of one for the years 2018 and 2019, respectively. We interact the treatment indicator with year dummies to allow for transition effects and to acknowledge that for banks that are not on a December 31st taxable year, a blended tax rate was applicable for part of 2018 and the lower tax rate of 21% only became fully effective for the tax year that started during 2018.[16] η_{jmz} are lender × maturity × ZIP code fixed effects that tease out time-invariant lender-maturity-zip-specific differences. δ_{sbtmz} are credit score bucket × month × maturity × ZIP code fixed effects allowing for credit score, maturity, and zip-code specific time trends in interest rates and loan sizes. These fixed effects ensure that we compare interest rates and amounts of loans originated by commercial banks and credit unions in the same ZIP code during the same month and

[16] Transition effects can also stem from income effects that originate from revaluations of deferred taxes under the new corporate income tax rate. Further consistent with transition effects, US Bancorp executives noted in a Q1 2018 earnings call that "there is going to be some bleed [...], but I also expect that that's going to take place over a time".

with the same maturity to individuals within a 10-point wide credit score range.

Our granular fixed effects allow us to ensure that we are comparing loans with similar maturities to borrowers of similar risk that are located in the same geographic area but whose lenders were differently affected by the enactment of the TCJA. The empirical strategy assesses the TCJA's tax rate cut effect on interest rates by assuming that, conditional on these loan and borrower characteristics, commercial banks and unaffected credit unions would have adjusted rates similarly in the absence of the tax cut. Put differently, we estimate the TCJA's impact on interest rates under a parallel trends assumption, formally defined as:

$$E\left[ln(r_{j,2019}(0)) - ln(r_{j,Pre}(0))\middle|Treated_j = 1, \eta, \delta\right] = E\left[ln(r_{j,2019}) - ln(r_{j,Pre})\middle|Treated_j = 0, \eta, \delta\right], \tag{2}$$

where $ln(r_{j,2019}(0))$ represents the counterfactual level of interest rates had treated banks not been subject to the TCJA tax cuts.

6 Main Results

6.1 Pass-Through & Dynamic Effects

In this section, we estimate the impact of the TCJA on interest rates and average loan sizes. Table 2 reports coefficients and standard errors of this analysis.

The results in column (1) show that the TCJA is not associated with statistically significant lower interest rates in 2018. However, in 2019, it is linked to an 10.4% decline in interest rates for loans originated by commercial banks compared to unaffected credit unions. This magnitude corresponds to a 44bps relative to the average pre-treatment bank interest rate of 4.21%. Using this

Table 2: Loan-by-Loan: Interest Rate & Loan Size

This table shows the effect of the TCJA's corporate tax cut on interest rates and loan sizes, estimating the following loan-level difference-in-differences equation: $ln(r_{ijt}) = \sum_{y \in 2018,2019} \beta_y \mathbb{1}\{t \in y\} \times Treated_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}$. Treated is an indicator variable equal to one when the lender is a bank. Treated equals zero when the lender is a credit union. 2018 and 2019 are equal to one when the loan was originated in 2018 or 2019, respectively. Standard errors are in parentheses and clustered at the lender level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	Ln(Interest Rate)	Ln(Loan Size)
	(1)	(2)
Treated x 2018	0.003	-0.008
	(0.012)	(0.005)
Treated x 2019	-0.110***	0.016**
	(0.017)	(0.008)
Observations	911112	911112
Adjusted R^2	0.634	0.502
Lender x Maturity x Zip FE	Yes	Yes
Score Bucket x Month x Maturity x Zip FE	Yes	Yes
Cluster	Lender	Lender

estimate, we calculate the elasticity of interest rates to the net-of-tax-rate:

$$\delta_r = \frac{(1-\tau)}{r} \cdot \frac{dr}{d(1-\tau)}$$

where r is the interest rate and τ is the CIT rate that changed from 35% to 21%. The elasticity is $\delta_r \approx -0.49$, indicating that a 1% increase in the net-of-tax-rate (i.e., a tax decrease) leads to a 0.49% decrease in the interest rate.[17] Our main finding thus documents an economically meaningful response of banks' interest rates to the TCJA's corporate tax cut. We note that other estimates of the net-of-tax-rate elasticity are not directly comparable to ours as they result from alternative methods and specifications that are not easily comparable. Nevertheless, our estimate exceeds the 0.24 net-of-tax elasticity found in Baker et al. (2020) for the effect of corporate taxes on prices of

[17]The statutory corporate income tax rate changed from the top bracket 35% rate to 21%. The pre-period interest rate for banks is 4.21% and the change in interest rates is 44bps. Plugging into the formula for the net-of-tax-rate elasticity, we obtain $\frac{(1-0.35)}{4.21} \cdot \frac{0.44}{-0.14} = -0.49$.

consumer packaged goods in the United States. Our magnitude is closer to the 0.4 found in Fuest et al. (2018) for the impact of corporate taxes on wages. Our finding contrasts with Kang et al. (2021) who do not find an interest rate response to state level corporate income tax cuts in syndicated loan markets.

To put the tax-induced savings into an aggregate perspective, we compute the reduction in loan repayment for a standard 5-year loan of $24,918. The interest reduction of 44bps implies savings of approximately $59 per year or $297 over the loan lifetime. We extrapolate from the TU sample to the entire U.S. economy assuming that the average size and loan interest in the TU sample is representative. Given that commercial banks issue close to 7 million auto loans per year, we estimate $415 million in payment reductions for newly originated loans in the first year or close to $2.1 billion in total lifetime cost reductions for these loans. This compares to approximately $25.5 billion in reduced corporate income taxes per year due to the corporate income tax cut.[18]

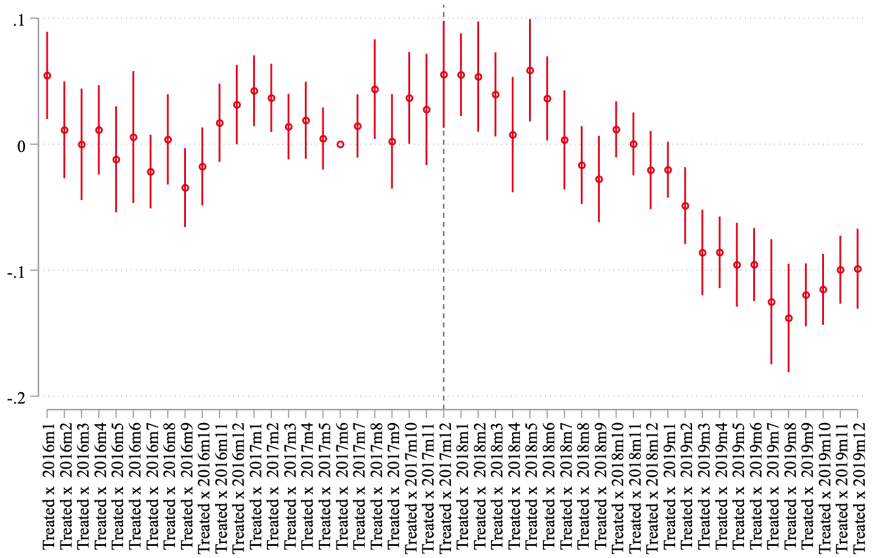
In column (2) of Table 2, we repeat the analysis using loan amount as the outcome variable. Loan size is a relevant measure because, as shown by Adams et al. (2009), loan demand is highly sensitive to downpayment requirements. Similar to findings in Einav et al. (2012), commercial banks may have relaxed these downpayment requirements, which in turn results in larger loan sizes. The coefficients in Table 2 suggest no statistically significant effect of the TCJA on loan sizes in 2018, but a modest, significant increase of 1.6% in 2019.

Next, we expand the empirical specification of equation 1 to include interactions of the treatment

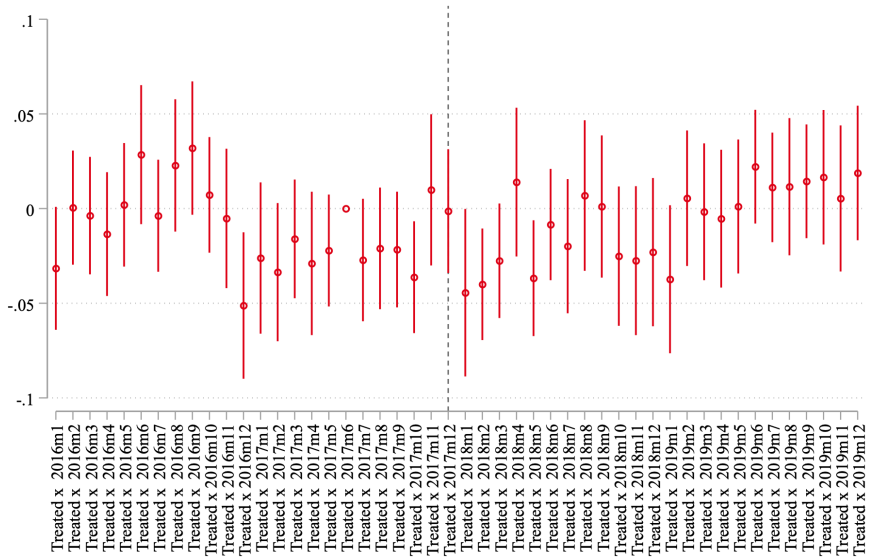
[18]We calculate the aggregate tax savings as the post-TCJA [2018;2019] pre-tax income of banks multiplied by the change in GAAP Effective Tax Rates from the pre- [2015;2016] to post-TCJA [2018;2019] period. When considering pre-TCJA [2015;2016] pre-tax income, tax savings approximate $21.73 billion. The calculation uses Call Report data of profitable public and private banks. The New York Times arrives at an aggregate tax savings of around $16 billion for the largest public banks (here).

Figure 3: Loan-by-Loan: Dynamic Effects on Interest Rate & Loan Size

This figure shows dynamic difference-in-differences estimates for the effect of the TCJA's corporate tax cut on (logged) interest rates (panel a) and (logged) loan size (panel b). Specifically, we estimate equation (3): $ln(r_{ijt}) = \sum_{m\in[2016m1;\ 2019m12]} \beta_m \mathbb{1}\{t \in m\} \times Treated_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}$ and plot the β_m point estimates with associated 95%-confidence intervals. We leave out the interaction for June 2017 as the base period. Treated is equal to one if the lender is a bank and equal to zero if the lender is a credit union. Standard errors are clustered at the lender level.



(a) Ln(Interest Rate): Banks vs Credit Unions



(b) Ln(Loan Size): Banks vs Credit Unions

indicator variable with a full set of monthly indicator variables. Specifically, we estimate:

$$ln(r_{ijt}) = \sum_{m \in [2016m1;\ 2019m12]} \beta_m \mathbb{1}\{t \in m\} \times Treated_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}, \tag{3}$$

and we plot the corresponding β_m coefficients with the associated 95%-confidence intervals in Figure 3. We omit the interaction for June 2017 as base period to allow for potential anticipation effects of the TCJA's corporate tax cut.

Figure 3a shows relatively stable coefficients in the pre-TCJA period. This stability supports our main identifying assumption as it suggests that, conditional on covariates, the interest rates set by commercial banks evolved similarly to those of credit unions prior to the tax cuts. The plot also provides further detail concerning the timing and speed of the TCJA's pass-through to interest rates. We find that the effects of the TCJA on interest rates are flat in the first half of 2018 but start to trend down early in the second half of 2018. This effect continues in 2019 and peaks in mid-2019. In other words, we find that the pass-through of the TCJA's corporate tax cut on interest rates unfolded gradually over time.

In Figure 3b, we show the effect of the TCJA's corporate tax cut on loan sizes over time. Although we observe some increases in loan sizes during 2019 compared to 2017, these effects are visually subtle. Overall, the plot suggests that any TCJA effect on loan sizes is likely minimal.

In sum, the results indicate that the TCJA's corporate tax cut is partially passed through to borrowers in consumer credit markets, with auto loan interest rates at treated banks decreasing by 44 basis points.

6.2 Effects by Credit Quality

In the previous section, we demonstrated that the average auto loan consumer benefited from the TCJA through access to lower-cost loans. Here, we explore whether consumers across different income groups shared equally in these improved credit conditions following the TCJA. This analysis helps determine whether the pass-through benefits are evenly distributed or if specific income groups capture most of the benefits from corporate tax cuts. Our analysis is predicated on empirical evidence in Albanesi et al. (2022), showing that credit scores are correlated with income. A larger reduction of interest rates among high-credit score borrowers would suggest a larger pass-through for high credit quality and likely wealthier borrowers. Conversely, a larger reduction of interest rates among low-credit score borrowers could suggest a trickle down effect of corporate income tax cuts to individuals most likely to need credit.

We test the heterogeneity of the tax pass-through at a credit score cutoff of 660, which is commonly used to identify (sub)prime credit scores.[19] Specifically, we run the following triple difference specification:

$$\begin{aligned} ln(r_{ijt}) =& \beta_{2018}\mathbb{1}\{t \in 2018\} \times Treated_j + \beta_{2019}\mathbb{1}\{t \in 2019\} \times Treated_j \\ &+ \beta_{2018,Above}\mathbb{1}\{t \in 2018\} \times Treated_j \times \mathbb{1}\{score_{it} \geq 660\} \\ &+ \beta_{2019,Above}\mathbb{1}\{t \in 2019\} \times Treated_j \times \mathbb{1}\{score_{it} \geq 660\} \\ &+ \eta_{jmz} + \gamma_{jsb} + \delta_{sbtmz} + \epsilon_{ijt}, \end{aligned} \tag{4}$$

in which, $\mathbb{1}\{score_{it} \geq 660\}$ is an indicator variable equal to one when the borrower's credit quality is high, as indicated by a credit score equal or above 660 (i.e, *prime*) at loan origination. We also include lender $\times$ credit score bucket fixed effects, γ_{jsb}, in this specification to capture invariant baseline differences in interest rates of treated and control lenders across the credit score partitions.

[19] For overviews of credit quality classifications, see vantagescore.com and consumerfinance.gov.

All other variables are defined similarly to equation (1).

Table 3 reports the results. Column (1) indicates an 7.4% interest rate decline for lower-credit quality borrowers, suggesting that even less advantaged segments of the population benefited from the pass-through of corporate tax cuts to interest rates. For higher-credit quality individuals, we find a statistically significant incremental reduction of 4.6%, resulting in a total interest rate reduction of approximately 12%.

In column (2), we include lender $\times$ month fixed effects, allowing us to focus on changes in interest rates offered by the same bank in the same month across loans to individuals with different credit scores. This specification accounts for overall shocks to lenders' costs and demand, using only within-lender variation to estimate how the interest rate spread between high- and low-credit-quality individuals changed following the TCJA. Our findings are consistent with those in column (1), showing greater pass-through of corporate tax cuts to high-credit-quality individuals following the TCJA. These results suggest redistributive effects, as lower-credit-quality individuals benefited less from reduced interest rates than higher-credit-quality individuals.

Finally, in columns (3) and (4), we do not find statistically significant differences in the effect of the TCJA on loan sizes across individuals with different credit quality. If anything, we find slightly smaller loans among prime credit score borrowers in 2018 but these effects are not statistically significant when we include lender $\times$ month fixed effects.

Next, we further expand the empirical specification of equation (4) to include a complete set of interactions between quarter dummies, treatment indicators, and indicator variables for the below- and above-prime lending cutoff (i.e., below and above 660 credit score). Formally, we implement the following specification:

Table 3: Effects on Interest Rate & Loan Size by Credit Score

This table shows the effect of the TCJA's corporate tax cut on interest rates by borrowers' credit scores. Treated is an indicator variable equal to one when the lender is a bank; Treated equals zero when the lender is a credit union. 2018 and 2019 are equal to one when the loan was originated in 2018 or 2019, respectively. Above is an indicator variable equal to one when the borrower's credit quality is high, as indicated by a credit score equal or above 660 (i.e, *prime*) at loan origination. Standard errors are in parentheses and clustered at the lender level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	Ln(Interest Rate)		Ln(Loan Size)	
	(1)	(2)	(3)	(4)
Treated x 2018	0.033		0.022	
	(0.021)		(0.015)	
Treated x 2019	-0.077***		0.012	
	(0.024)		(0.016)	
Above 660 x Treated x 2018	-0.039***	-0.040***	-0.031**	-0.021
	(0.013)	(0.013)	(0.015)	(0.015)
Above 660 x Treated x 2019	-0.047***	-0.048**	0.007	0.016
	(0.016)	(0.019)	(0.017)	(0.020)
Observations	888348	855883	888348	855883
Adjusted R^2	0.627	0.603	0.475	0.427
Lender x Score Bucket FE	Yes	Yes	Yes	Yes
Lender x Maturity x Zip FE	Yes	Yes	Yes	Yes
Lender x Month FE	No	Yes	No	Yes
Score Bucket x Month x Maturity x Zip FE	Yes	Yes	Yes	Yes
Cluster	Lender	Lender	Lender	Lender

$$
\begin{aligned}
ln(r_{ijt}) = & \sum_{q \in [2016q1;\ 2019q4]} \beta_{q,Above} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{score_{it} \geq 660\} \\
& + \sum_{q \in [2016q1;\ 2019q4]} \beta_{q,Below} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{score_{it} < 660\} \\
& + \eta_{jmz} + \gamma_{jsb} + \delta_{sbtmz} + \epsilon_{ijt},
\end{aligned} \tag{5}
$$

in which the group of $\{\beta_{q,Above}\}^{q \in [2016q1;\ 2019q4]}$ coefficients capture the effects of the TCJA among prime borrowers over time and the group of $\{\beta_{q,Below}\}^{q \in [2016q1;\ 2019q4]}$ coefficients capture the effects of the TCJA among lower credit quality borrowers over time.[20]

Figure (4a) plots the $\beta_{q,Above}$ and $\beta_{q,Below}$ coefficients with the associated 95%-confidence intervals. We observe incrementally larger interest rate effects among high credit quality borrowers throughout 2018 and 2019, confirming the take-away from Table 3.[21] In Figure (4b), we repeat the analysis using loan size as the outcome of interest and find neither economically nor statistically different effects on loan sizes when comparing low and high credit quality borrowers.

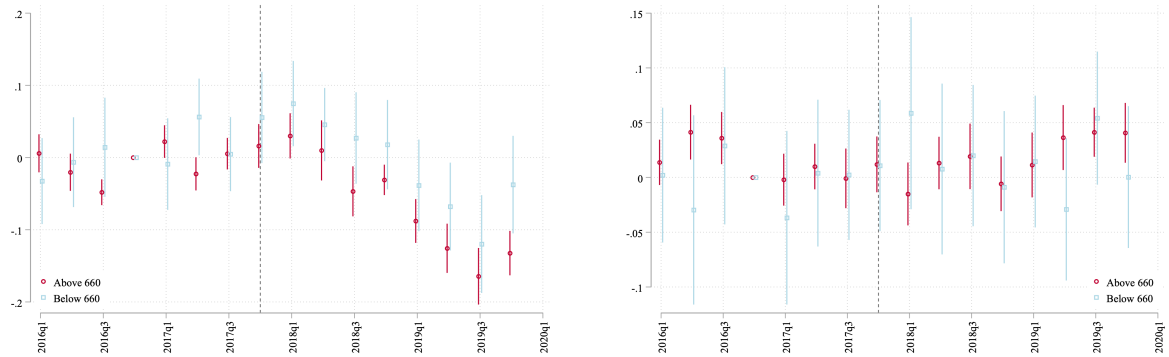
Taken together, the results in this section suggest that the pass-through of the TCJA's corporate tax cut to borrowers' auto loan interest rates materializes across the entire credit score distribution but is incrementally larger for prime credit score borrowers in 2018 and 2019.

[20] In equation (4), $\beta_{year,Above}$ captured the incremental effect of TCJA for higher-credit quality individuals relative to lower credit quality individuals.

[21] In the Online Supplement (Figure OS3), we examine longer horizons and find that interest rate declines for low credit quality borrowers continue and persist in 2020 and 2021 indicating larger pass-through in 2020 and 2021. Hence, the long-run estimation indicates faster but not necessarily greater pass-through for higher credit score individuals. However, we note that these longer-horizon analyses coincide with the Covid-19 crisis of 2020 and all subsequent fiscal policy measures, which might substantially confound the estimated coefficients during this period.

Figure 4: Dynamic Effects by Credit Score

This figure shows dynamic difference-in-differences estimates for the effect of the TCJA's corporate tax cut on (logged) interest rates (panel a) and (logged) loan size (panel b) by credit score. Specifically, we estimate equation (5): $ln(r_{ijt}) = \sum_{q\in[2016q1;\ 2019q4]} \beta_{q,Above} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{score_{it} \geq 660\} + \sum_{q\in[2016q1;\ 2019q4]} \beta_{q,Below} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{score_{it} < 660\} + \eta_{jmz} + \gamma_{jsb} + \delta_{sbtmz} + \epsilon_{ijt}$. We leave out the interaction for $q4$ 2016 as the base period. Treated is equal to one if the lender is a bank and equal to zero if the lender is a credit union. Above is an indicator variable equal to one when the borrower's credit quality is high, as indicated by a credit score equal or above 660 (i.e., *prime*) at loan origination. We plot the $\beta_{q,Above}$ in red and $\beta_{q,Below}$ in blue point estimates with associated 95%-confidence intervals. Standard errors are clustered at the lender level.



(a) Ln(Interest Rate)

(b) Ln(Loan Size)

7 Model

This section introduces a conceptual framework that guides our empirical investigation of the economic mechanisms behind the pass-through of the TCJA's corporate tax cut. The framework adapts prior work by Weyl and Fabinger (2013), Mahoney and Weyl (2017), and Cabral et al. (2018) to the setting of a corporate tax rate cut in the banking sector. It suggests that (partial) pass-through may be explained by, the degree of selection, the market power of banks, and banks' equity capitalization.

7.1 Model Setup

Suppose individuals differ in their expected individual cost of default, c_i, and their willingness to borrow is v_i. Banks provide symmetric, though potentially horizontally differentiated, products. We

assume banks cannot discriminate among consumers in loan contract terms based on interest rates. To the extent that banks do practice different prices according to risk characteristics, this model applies to a specific credit score risk group.

The aggregate demand at interest rate r is $Q(r)$, where $Q \in [0, 1]$, and represents the fraction of the market served by banks.

The bank financing cost are:

$$F(Q) = Q(r)[(1 - k)r_d + kr_e],$$

where k represents the equity capital ratio of the banking sector, r_d is the cost of deposits, and r_e is the cost of equity. We assume that companies are price takers in the market for deposits and equity capital and that banks' capital ratios are predetermined. Hence, pre-tax financing cost is a weighted average of cost of equity and debt.

Total losses are the sum of losses for loans actually taken out, that is, when willingness to pay (v_i) exceeds the price (r_i). Hence, total losses on loans (pre-tax) are:

$$C(Q) = \int_{v_i \geq r^{-1}(Q)} c_i$$

where $r^{-1}(Q)$ is the inverse demand function of the banking sectors. The average cost of the banking sector is $AC(Q) = \frac{C(Q)}{Q}$ and the respective marginal cost is: $MC(Q) = C'(Q)$

The type of selection in consumer credit markets will be reflected in the slope of the marginal cost curve (Einav et al., 2010; DeFusco et al., 2022). Positive price-cost variation, meaning that cost increase with price is known as adverse selection and leads to downwards sloping marginal cost curves:

$$MC'(Q) < 0 \text{ adverse selection}$$

Negative price-cost variation, i.e., the pool of borrowers gets worse as we lower prices, is known as advantageous selection and results in upward sloping marginal cost curves

$$MC'(Q) > 0 \text{ advantageous selection}$$

Incorporating corporate income taxes, we can write the post-tax profit as:

$$\pi = (1-\tau)rQ(r) - Q(r)[(1-\tau)(1-k)r_d + kr_e] - (1-\tau)C(Q)$$

7.2 Equilibrium

Perfect Competition: Exploiting the zero profit condition, we know that in a perfectly competitive equilibrium:

$$\pi = 0$$

such that the equilibrium interest rate, r, must satisfy:

$$r(1-\tau) = (1-\tau)AC(Q) + (1-\tau)(1-k)r_d + kr_e$$

If there is no adverse or advantageous selection, i.e. $MC'(Q) = 0$, there would be no pass-through if $k = 0$, as there would be no profits to tax. If banks are not financed by deposits or debt ($k = 1$) and $MC'(Q) = 0$, the corporate tax cut would function like an ad-valorem tax on the price-cost margin of each loan. In this case, competitive forces would adjust interest rates, leading to full pass-through of corporate tax cuts. When $k \in (0, 1)$ or $MC'(Q) \neq 0$, pass-through will be partial, as banks will reflect changes in expected loan costs in interest rates while also passing through their net-of-deposit-cost margin.

Monopoly: The lender maximizes profit by setting the interest rate, r, such that:

$$\max_r \pi$$

Rearranging the first-order condition, the equilibrium interest rate, r, has to satisfy:

$$(1-\tau)r = (1-\tau)\mu(r) + (1-\tau)MC(Q) + (1-\tau)(1-k)r_d + kr_e$$

where

$$\mu(r) = -\frac{Q(r)}{Q'(r)}$$

In the case of a monopoly with no adverse or advantageous selection and full-debt financing, there is also no pass-through of corporate tax cuts to interest rates as the optimization problem is not affected by a tax on profits. Otherwise, there will be partial pass-through of changes to the corporate tax rate.

Imperfect Competition: We now introduce the conduct parameter θ which captures intermediate level of competition. The higher θ, the more market power is present and the closer we are to the monopolistic equilibrium. Mahoney and Weyl (2017) show that for a broad range of oligopolistic models of competition, price-setting equations interpolate between the perfect competitions and monopoly equilibria. For instance, in Cournot competition, $\theta = \frac{1}{n}$, where n is the number of firms. Therefore, equilibrium interest rates will satisfy:

$$\begin{aligned}(1-\tau)r =& \theta\big[(1-\tau)\mu(r) + (1-\tau)MC(Q) + (1-\tau)(1-k)r_d + kr_e\big] \\ &+ (1-\theta)\big[(1-\tau)AC(Q) + (1-\tau)(1-k)r_d + kr_e\big]\end{aligned}$$

7.3 Pass-Through

The pass through is the change in the interest rate as the corporate income tax changes. Hence, pass through is the derivative $\frac{\partial r}{\partial \tau}$. In the perfectly competitive case, we can take the equilibirum condition:

$$(1-\tau)r = (1-\tau)AC(Q) + (1-\tau)(1-k)r_d + kr_e$$

and fully differentiating w.r.t τ. Rearranging yields:

$$\frac{\partial r}{\partial \tau} = \frac{r - (1-k)r_d - AC(Q)}{(1-\tau)\big[1 - \frac{\partial AC(Q)}{\partial r}\big]}$$

In the monopolist case, we totally differentiate the equilibrium condition and obtain the pass-through:

$$\frac{\partial r}{\partial \tau} = \frac{r - \mu(r) - MC(Q) - (1-k)r_d}{(1-\tau)\big(1 - \mu'(r) - \frac{\partial MC(Q)}{\partial r}\big)}$$

Combining both, we can obtain the pass-through under imperfect competition:

$$\frac{\partial r}{\partial \tau} = \frac{r - (1-k)r_d - \theta\mu(r) - \theta MC(Q) - (1-\theta)AC(Q)}{(1-\tau)\big(\theta(1 - \mu'(r) - \frac{\partial MC}{\partial r}) + (1-\theta)(1 - \frac{\partial AC}{\partial r})\big)}$$

Our model predicts that pass-through decreases when banks rely more on deposits with tax-deductible interest expenses, and that under adverse (advantageous) selection, pass-through is greater (smaller). However, the model does not provide clear predictions for the relationship between market power and pass-through rates. Specifically, increasing market power shifts optimal pricing from average cost to marginal cost and makes it more sensitive to the demand function's curvature through the term $\mu'(r)$. As a result, the impact of greater market power on pass-through rates is ambiguous.

With no adverse selection but some degree of market power, we have that MC'(Q) and AC'(Q) = 0, and the pass-through equation collapses to (the below equation AC(Q) = MC(Q):

$$\frac{\partial r}{\partial \tau} = \frac{r - (1-k)r_d - AC(Q) - \theta\mu(r)}{(1-\tau)\left(1 - \theta\frac{\partial \mu}{\partial r}\right)} \tag{6}$$

Under standard parameterizations of demand, the pass through (6) is declining in market power, θ. For instance with linear demand, we have $\mu'(r) = -1$ and the pass-through is

$$\frac{\partial r}{\partial \tau} = \frac{r - (1-k)r_d - AC(Q) - \theta\mu(r)}{(1-\tau)(1+\theta)}$$

Given that the standard absolute markup term, $\mu(r)$, is positive, pass-through will be declining in θ in this specific parametrization of the demand function. We note again, however, that pass-through could theoretically be increasing or declining on market power depending on $\mu^{'}(r)$.

8 Mechanisms

8.1 Market Power

We empirically test the predictions of Section 7 regarding the magnitude of pass-through. The model does not make clear predictions regarding how market power affects the pass-through of corporate tax cuts to interest rates but it indicates that under the special case of a linear demand function, pass-through is declining in market power.

Under Cournot competition or similar models of homogeneous products oligopoly, the conduct parameter, θ, is determined by the market share of the representative firm. We compute the average share of auto loans originated by a bank active in a given county in the year prior to the adoption of

the TCJA and we sort loans into quartiles of average bank market share.[22] Further, we interact the *Treated* × *Year* interactions with a full set of indicator variables for the assigned market share quartile. Specifically, we estimate:

$$\begin{aligned} ln(r_{ijt}) = &\sum_{Q\in[1,4]} \beta_{2018,Q} \mathbb{1}\{t \in 2018\} \times Treated_j \times \mathbb{1}\{q_c = Q\} \\ &+ \sum_{Q\in[1,4]} \beta_{2019,Q} \mathbb{1}\{t \in 2019\} \times Treated_j \times \mathbb{1}\{q_c = Q\} \\ &+ \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt} \end{aligned} \tag{7}$$

where q_c indicates the bank market share quartile of loans originated in county, c and all other variables are defined as in prior specifications.

Figure 5 plots the point estimates for the $\beta_{2019,q}$ coefficients in equation (7). Figure 5a shows larger pass-through (i.e., more negative coefficients) when bank market power is low. The interest rate effect in counties with the highest bank market power is approximately 8.4% while it is 12.6% in the counties with the lowest bank market power. The difference in coefficients between loans originated in the top and bottom quartile of the bank market power is both economically meaningful and statistically significant. Figure 5b shows that loan sizes generally move correspondingly in the opposite direction to interest rates, and visually, loan size increases are largest for quartiles with the largest interest rate declines. However, the difference in coefficients between the bottom and top quartiles is not statistically significant.

Overall, these results are consistent with a market power channel for tax pass-through as predicted by the model under a linear parametrization of demand and as indicated by banks' executive officers in earnings conference calls. However, we caution that this evidence is suggestive

[22] We compute the share of loans originated by banks in a given county in 2017 and divide the share by the number of banks active in the county in 2017.

as it is a cross-sectional comparison of the effect sizes across counties.

8.2 Selection

A second source of differential tax pass-through is selection. Examining the pass-through under perfect competition:

$$\frac{\partial r}{\partial \tau} = \frac{r - (1-k)r_d - AC(Q)}{(1-\tau)\left[1 - \frac{\partial AC(Q)}{\partial r}\right]}$$

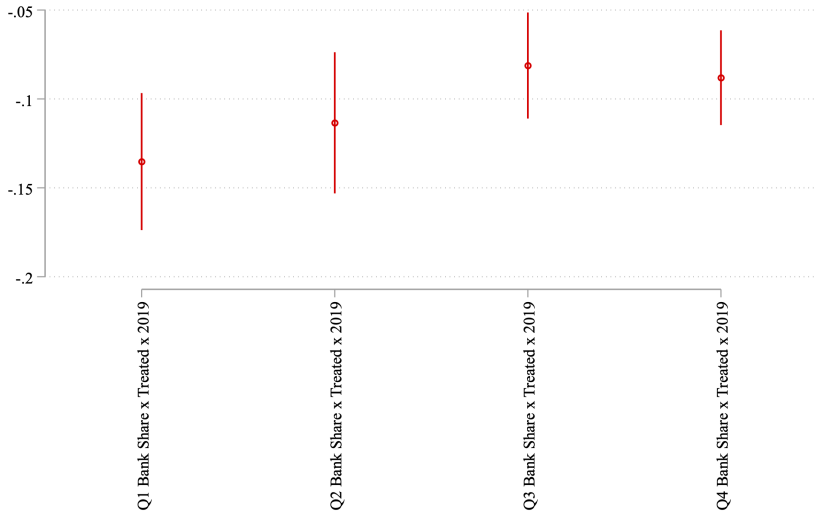
we can see that it depends on the slope of the average cost curve. Under advantageous selection, that is an upward sloping average cost curve, $\frac{\partial AC(Q)}{\partial Q} > 0$, we have that $\frac{\partial AC(Q)}{\partial r} < 0$ because $\frac{\partial Q}{\partial r} < 0$. Hence, pass-through is lower under advantageous selection. The less upward sloping or the more downward sloping (adverse selection) the average cost curve is, the larger pass-through will be. This argument closely follows Cabral et al. (2018).

Existing research shows mixed evidence of selection in auto loan markets, with findings of both adverse and advantageous selection, while some studies find no selection effect (Einav et al., 2012; Mahoney and Weyl, 2017; Jansen et al., 2022; Argyle et al., 2020). In our setting, testing for selection is challenging. Although the TCJA's corporate tax cut introduces variation in interest rates, estimating corresponding cost variation is complicated by the confounding effects associated with the Covid-19 period and subsequent policy measures that were implemented to offer financial relief to households (Dettling and Lambie-Hanson, 2021). The common assumption that expected costs equal realized costs (Einav et al., 2010) may be problematic because the two-year window used to measure defaults after loan origination encompasses the Covid-19 crisis for most loans originated post-TCJA.

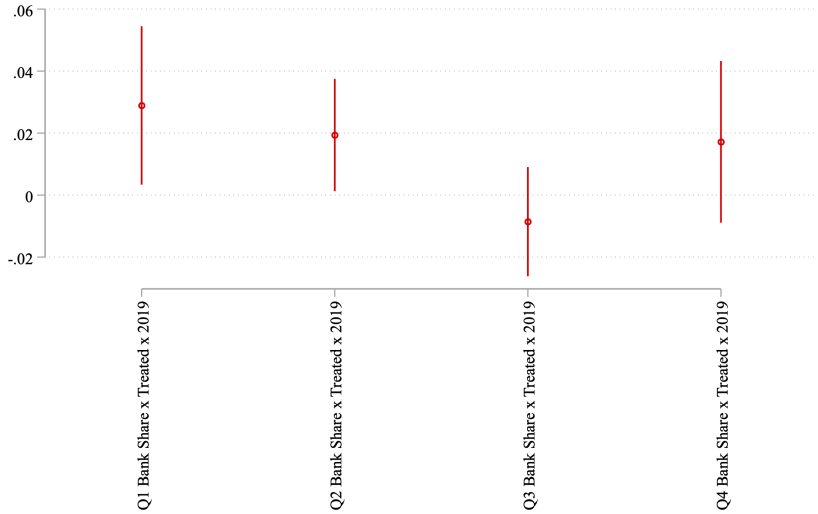
Nevertheless, we investigate whether future delinquencies of newly originated loans are affected by the TCJA's corporate tax cut. We estimate equation (1), using an outcome variable that indicates

Figure 5: Effects by Competition

This figure depicts the point estimates for the $\beta_{2019,q}$ coefficients in equation (7) with the associated 95%-confidence intervals. Panel (a) shows estimated coefficients with (logged) interest rate as the outcome variable. Panel (b) shows estimated coefficients with (logged) loan size as the outcome variable. Higher quartiles indicate higher bank market share and higher bank market power. Loans are sorted into bank share quartiles based on the county of origination. In panel (a) Q1 and Q4 coefficients are significantly different. Standard errors are clustered at the lender level.



(a) Ln(Interest Rate)



(b) Ln(Loan Size)

if a loan was 60-days delinquent within the next two years. A positive β_{2019} coefficient might indicate advantageous selection as a worse pool of borrowers is attracted by lower interest rates at commercial banks after the TCJA. Conversely, a negative β_{2019} coefficient could indicate adverse selection as a better pool of borrowers is attracted by lower interest rates.

Table 4: Loan Default Probability

This table shows the effect of the TCJA's corporate tax cut on the future default of newly originated loans. Default is measured by an indicator variable equal to one if the loan becomes 60 days delinquent within 2 years after origination. Specifically, we estimate: $Delinquent = \beta_{2018}\mathbb{1}\{t \in 2018\} \times Treated_j + \beta_{2019}\mathbb{1}\{t \in 2019\} \times Treated_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}$, which corresponds to equation (1). Treated is an indicator variable equal to one when the lender is a bank; Treated equals zero when the lender is a credit union. 2018 and 2019 are equal to one when the loan was originated in 2018 or 2019, respectively. Standard errors are in parentheses and clustered at the lender level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

	If 60 days delinquent
	(1)
Treated x 2018	-0.000
	(0.001)
Treated x 2019	-0.001
	(0.001)
Observations	911112
Adjusted R^2	0.003
Lender x Maturity x Zip FE	Yes
Score Bucket x Month x Maturity x Zip FE	Yes
Cluster	Lender

Table 4 shows the estimation results. We focus on the estimated coefficient for loans originated in 2019 because we show in Table 2 that interest rates are significantly lower for commercial banks relative to credit unions only in 2019. The coefficient β_{2019} is marginally negative but statistically insignificant. Effectively, the ratio of β_{2019} with default outcomes divided by β_{2019} with interest rate outcome gives us the derivative of cost with respect to interest rates. Because β_{2019} in Table 4 is small, this points to limited price-cost variation and, therefore, selection. Hence, Table 4 points to a limited role of selection in muting or amplifying tax pass-through.

8.3 Capital

A third potential source of differential pass-through is the capitalization level of lenders. As discussed in Section 7, pass-through can depend on the equity capital used in bank financing. Because the interest deductibility of debt shields debt-financed institutions from the effects of taxes, banks with lower equity capital also benefit less from the tax cut.

More specifically, examining the pass-through under perfect competition:

$$\frac{\partial r}{\partial \tau} = \frac{r - (1-k)r_d - AC(Q)}{(1-\tau)\left[1 - \frac{\partial AC(Q)}{\partial r}\right]}$$

we can see that $\frac{\partial r}{\partial \tau}$ depends on the share of equity capital k used by the lender. For lower values of k, the term $(1-k)r_d$ is larger and overall pass-through will be lower as the term enters with a negative sign. As long as the debt service cost r_d does not substantially change with k, this mechanism implies that pass-through will be lower for lenders with low equity ratios. For example, r_d may stay constant across banks with different levels of equity due to the effect deposit insurance. However, in richer models that account for agency frictions between banks and their financiers (including depositors), a positive supply shock could amplify the pass-through effect for low-equity banks. This amplification occurs by easing balance sheet constraints for banks more affected by these frictions, as proxied by their equity capital (e.g., Bernanke and Blinder, 1988; Jiménez et al., 2012). Therefore, the extent to which bank capitalization influences the pass-through of corporate tax cuts to interest rates ultimately requires empirical investigation.

We formally test this prediction of the model using banks' Tier 1 capital ratios to measure their level of equity capitalization. We compute quintiles of Tier 1 capital ratios as of Q4 2016 to avoid any mechanical impact of the TCJA on capital ratios.[23] Subsequently, we run the following

[23]This test relies on bank Call Report information we previously merged to the Booth-TransUnion panel. The merge is more closely described in Granja and Nagel (2023).

specification to estimate differential pass-through for banks with low equity capital:

$$\begin{aligned} ln(r_{ijt}) =& \beta_{2018}\mathbb{1}\{t \in 2018\} \times Treated_j + \beta_{2019}\mathbb{1}\{t \in 2019\} \times Treated_j \\ &+ \beta_{2018,Low}\mathbb{1}\{t \in 2018\} \times Treated_j \times \mathbb{1}\{\text{Low Tier 1}\}_j \\ &+ \beta_{2019,Low}\mathbb{1}\{t \in 2019\} \times Treated_j \times \mathbb{1}\{\text{Low Tier 1}\}_j \\ &+ \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}. \end{aligned} \tag{8}$$

In this equation, $\mathbb{1}\{\text{Low Tier 1}\}$ is an indicator variable that equals one when the bank is in the bottom quintile of Tier 1 Capital ratios of all banks in call reports in the fourth quarter of 2016. The coefficient of interest is $\beta_{2019,Low}$. The model predicts $\beta_{2019,Low}$ to be positive. That is, corporate income tax pass-through should be lower for banks with low equity capital share and high debt financing. The positive $\beta_{2019,Low}$ should be (partially) off-setting the expected negative coefficient on β_{2019}.

Table 5 column (1) shows the results with logged interest rates as outcome variable. As expected, we observe a 11.8% interest reduction for high equity capital banks relative to credit unions (β_{2019}). As predicted by the model, $\beta_{2019,Low}$ is indeed positive and indicates a 6.29% smaller reduction in interest rates for banks with low equity capitalization.

We then consider the dynamic effects of the corporate income tax cut by equity capital. Specifically, we estimate the following modification of equation (8):

$$\begin{aligned} ln(r_{ijt}) =& \sum_{q \in [2016q_1;\, 2019q_4]} \beta_{q,High}\mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{\text{High Tier 1}\}_j \\ &+ \sum_{q \in [2016q_1;\, 2019q_4]} \beta_{q,Low}\mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{\text{Low Tier 1}\}_j \\ &+ \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt} \end{aligned} \tag{9}$$

where $\mathbb{1}\{\text{Low Tier 1}\}$ is defined as before. $\mathbb{1}\{\text{High Tier 1}\}$ equals one when $\mathbb{1}\{\text{Low Tier 1}\}$ is

Table 5: Effects on Interest Rate & Loan Size by Equity Capital

This table shows the effect of the TCJA's corporate tax cut on interest rates by banks' equity ratio. Treated is an indicator variable equal to one when the lender is a bank; Treated equals zero when the lender is a credit union. 2018 and 2019 are equal to one when the loan was originated in 2018 or 2019, respectively. Low Tier 1 is an indicator variable equal to one when the bank was in the bottom quintile of Tier 1 Capital ratios of all banks in call reports in the fourth quarter of 2016. Standard errors are in parentheses and clustered at the lender level. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

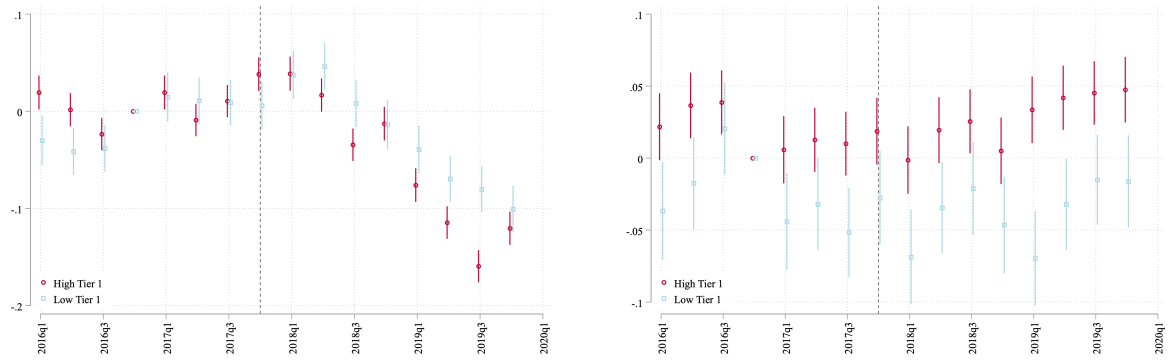
	Ln(Interest Rate)	Ln(Loan Size)
	(1)	(2)
Treated x 2018	-0.006	-0.005
	(0.014)	(0.006)
Treated x 2019	-0.126***	0.024***
	(0.018)	(0.008)
Treated x 2018 x Low Tier 1	0.035*	-0.013*
	(0.020)	(0.007)
Treated x 2019 x Low Tier 1	0.061***	-0.032***
	(0.023)	(0.008)
Observations	911112	911112
Adjusted R^2	0.634	0.502
Lender x Maturity x Zip FE	Yes	Yes
Score Bucket x Month x Maturity x Zip FE	Yes	Yes
Cluster	Lender	Lender

zero and the lender is a bank.[24] Figure 6 plots the $\beta_{q,High}$ coefficients in red and $\beta_{q,Low}$ in blue with associated 95%-confidence intervals. We leave out Q4 2016 as the base effect.

Figure 6a shows dynamic interest rate effects and broadly mirrors the path of the main Figure 3a with interest rate effects in 2019 for both high and low Tier 1 ratio banks. However, we can see a persistently stronger decline for high Tier 1 ratio banks as predicted by the model. In almost all post period quarters the high Tier 1 coefficients are below the low Tier 1 coefficients reaching their maximum effect size in Q3 of 2019. The average pre-period level of low Tier 1 coefficients is also slightly reduced relative to high Tier 1 ratio banks. Overall Figure 6a confirms the results of Table 5 column (1).

Figure 6: Dynamic Effects by Equity Capital

This figure shows dynamic difference-in-differences estimates for the effect of the TCJA's corporate tax cut on (logged) interest rates (panel a) and (logged) loan size (panel b) by banks' Tier 1 capital ratio. Specifically, we estimate equation (9): $ln(r_{ijt}) = \sum_{q\in[2016q1;\ 2019q4]} \beta_{q,High} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{\text{High Tier 1}\}_j + \sum_{q\in[2016q1;\ 2019q4]} \beta_{q,Low} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{\text{Low Tier 1}\}_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}$. We leave out the interactions for $q4$ 2016 as the base period. Treated is equal to one if the lender is a bank and equal to zero if the lender is a credit union. Low Tier 1 is an indicator equal to one if the bank is in the bottom quintile of Tier 1 Capital ratios of all banks in call reports in the fourth quarter of 2016. $\mathbb{1}\{\text{High Tier 1}\}$ equals one when $\mathbb{1}\{\text{Low Tier 1}\}$ is zero and the lender is a bank. We plot the $\beta_{q,High}$ point estimates in red and $\beta_{q,Low}$ point estimates in blue with associated 95%-confidence intervals. Standard errors are clustered at the lender level.



(a) Ln(Interest Rate)

(b) Ln(Loan Size)

We also consider the effect on loan sizes. Table 5 indicates a small significant effect on loan sizes

[24] We set the Tier 1 capital dummy to zero for all credit unions as we do not have capital adequacy information for credit unions in the Booth-TransUnion consumer panel.

in 2019 around 2.4% for borrowers from banks with high Tier 1 capital ratios. For borrowers from low Tier 1 capital ratio banks, there is a negative incremental effect of 3.1% amounting to a joint effect that is indistinguishable from zero. Figure 6b shows dynamic estimates and reveals that 2016 loan size levels are also elevated for high Tier 1 capital ratio banks indicating that loan size effects are likely close to zero if anything. The dynamic estimates for low Tier 1 loan sizes confirm the results of Table 5 column (2) showing no clear effect of the corporate tax cut on loan sizes.

Overall, this section provides evidence that interest rate pass-through–as predicted by the model–indeed differs by the share of equity capital used by a bank. Tax pass-through to interest rates is larger for banks utilizing more equity or conversely smaller for banks relying more on debt financing. This is interesting as it suggests that credit consumers' ability to benefit from the pass-through of corporate tax cuts may depend on their exposure to well-capitalized banks. That said, we note that in unreported results, we find that the differences in pass-through rates across credit scores documented in section 6.2 are not explained away by differences in exposure to low-capitalization banks across credit-score groups.

9 Conclusion

We analyze whether and how bank income taxation is passed through to interest rates and loan quantities for consumers. We exploit the change in banks' taxation of income through the Tax Cuts and Jobs Act and the tax-exempt status of credit unions to form a control group. Relying on data from TransUnion, a U.S. credit bureau covering individual consumer auto loans, we show that the TCJA's corporate tax cut leads to lower interest rates for consumers borrowing from affected banks. In particular, our main result suggests that affected banks reduce interest rates by 10.4% relative to unaffected credit unions. Relative to the pre-treatment average bank interest rate of 4.21%,

this translates to an effect of 44bps. We use the granularity of the data set to better understand heterogeneity in the rate of pass-through across individuals from different credit quality groups. We find that greater rates of pass-through for individuals with higher credit quality, which suggests that the corporate tax cuts benefited lower-income individuals less than others. We develop a conceptual framework that helps us understand the economic mechanisms through which the TCJA's corporate tax cuts are passed through to consumers and we empirically evaluate whether such mechanisms are borne in the data. We find that pass-through is declining in banks' market power. While we find a limited role for selection, our evidence indicates that pass-through increases with banks' equity capitalization. Taken together, these insights are highly relevant for legislators when evaluating the Tax Cuts and Jobs Act and designing future tax reforms.

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Online Supplement

The pass-through of corporate tax cuts to consumer loans: Evidence from the TCJA

Long-Run Effects

We use this supplement to extend our analysis beyond 2019. Generally, the optimal stopping point for our analysis involves the following trade-off. Our main analysis stops at the end of 2019, to avoid any impacts by the Covid-19 pandemic. Further, the longer we extend the time horizon, the stonger the parallel trends assumption. For example, it may be conceivable that interest rates would have trended similarly for treated and control lenders in the absence of treatment for two years after the the treatment but perhaps not for five or ten years. On the other hand, we intend to show that the relative interest rate effects for treated lenders are not limited to 2019 only. We, therefore, extend the analysis to 2020 and 2021 while cautioning that differential Covid-19 effects could threaten the estimates in 2020 and 2021.

Long-Run Effects on Interest Rate & Loan Size

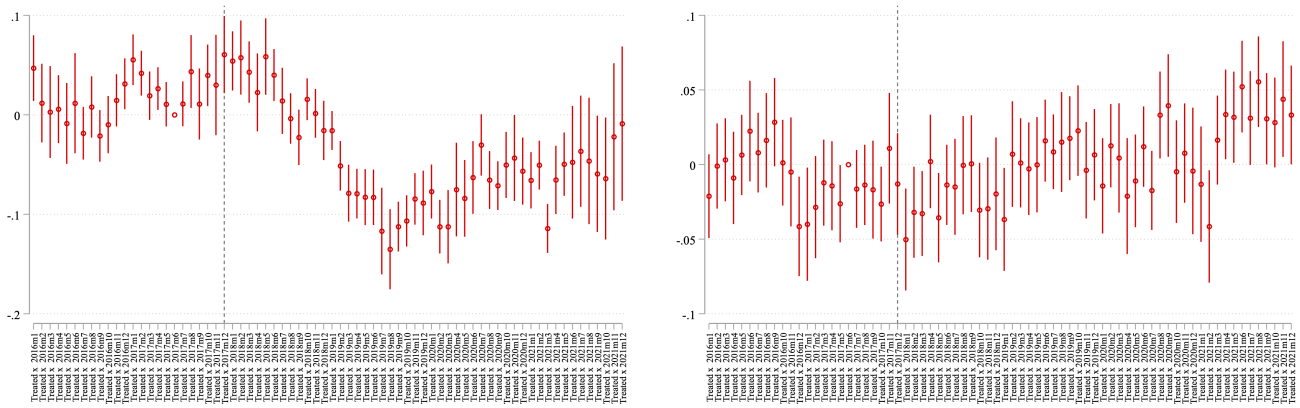
Figure OS1 shows the results for running equation (3) extending the time period to range from January 2016 to December 2021. Figure OS1a shows that the relative interest rate decline for borrowers from treated lenders persists throughout 2020 and 2021. While the interest rate reduction is strongest in 2019, the interest rate decline persists at around 7% for much of 2020 and 2021. Figure OS1b depicts the relative loan size development. Again, loan sizes develop largely similar for banks and credit unions. Perhaps, a slight uptick in loan sizes around 4% is notable in the second half of 2021. Overall, these long-run effects confirm our evidence when analyzing the dynamics until the end of 2019.

Long-Run Effects by Credit Score

We then examine the dynamics and long-run effects of the TCJA's corporate tax cut on individuals across the credit score distribution. Figure OS3 shows quarterly effects of the TCJA's corporate

Figure OS1: Long-Run Effects on Interest Rate & Loan Size

This figure shows long-run dynamic difference-in-differences estimates for the effect of the TCJA's corporate tax cut on (logged) interest rates (panel a) and (logged) loan sizes (panel b). Specifically, we estimate a modification of equation (3): $ln(r_{ijt}) = \sum_{m \in [2016m1;\ 2021m12]} \beta_m \mathbb{1}\{t \in m\} \times Treated_j + \eta_{jmz} + \delta_{sbtmz} + \epsilon_{ijt}$ and plot the β_m point estimates with associated 95%-confidence intervals. We leave out the interaction for June 2017 as the base period. Treated is equal to one when the lender is a bank and equal to zero when the lender is a credit union. Standard errors are clustered at the lender level.



(a) Ln(Interest Rate)

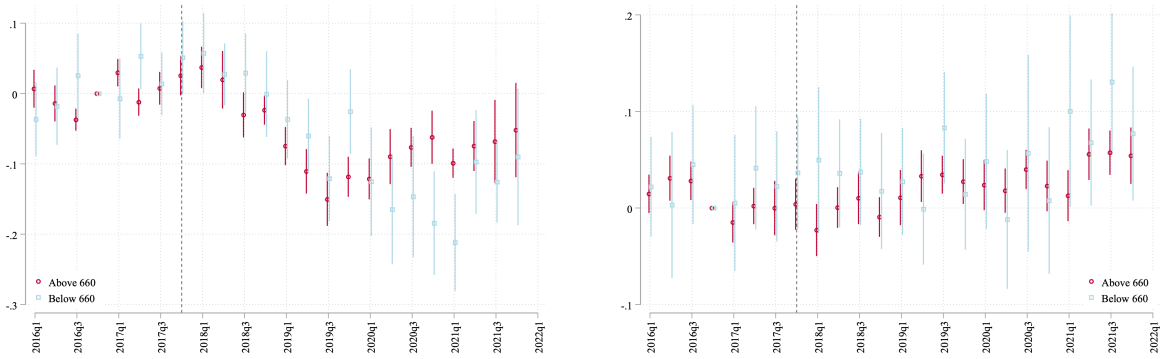
(b) Ln(Loan Size)

tax cut for individuals with credit scores equal or above 660 (i.e., *prime*) in red and below 660 in blue. Figure OS2a confirms the interest rate decline in the second half of 2018 and 2019. Further, it shows a stronger interest rate decline for individuals with prime credit scores until 2019. This confirms the take-away of Table 3. However, the long-run dynamic effects also reveal that it is not a persistently larger pass-through for individuals with higher credit scores. Instead, the transmission of the pass-through is faster for high credit score individuals while pass-through is persistently larger for individuals with credit scores below 660 in 2020 and 2021. Figure OS2b shows, initially consistent with our estimates from Table 3, dynamic effects on loan sizes by credit score. In the longer run, loan sizes - if anything - show a marginal increase from 2019 onwards. However, this increase does not appear markedly different for individuals with high or low credit scores.

While we caution that the long-run estimates in this supplement could be impacted by the Covid-19 pandemic, we generally identify long-run effects (across the credit score distribution) that

Figure OS2: Long-Run Effects by Credit Score

This figure shows long-run dynamic difference-in-differences estimates for the effect of the TCJA's corporate tax cut on (logged) interest rates (panel a) and (logged) loan size (panel b) by credit score. Specifically, we estimate a modification of equation (4): $ln(r_{ijt}) = \sum_{q\in[2016q1;\ 2021q4]} \beta_{q,Above} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{score_{it} \geq 660\} + \sum_{q\in[2016q1;\ 2021q4]} \beta_{q,Below} \mathbb{1}\{t \in q\} \times Treated_j \times \mathbb{1}\{score_{it} < 660\} + \eta_{jmz} + \gamma_{jsb} + \delta_{sbtmz} + \epsilon_{ijt}$. We leave out the interaction for $q4$ 2016 as the base period. Treated is equal to one if the lender is a bank and equal to zero if the lender is a credit union. Above is an indicator variable equal to one when the borrower's credit quality is high, as indicated by a credit score equal or above 660 (i.e, *prime*) at loan origination. We plot the $\beta_{q,Above}$ in red and $\beta_{q,Below}$ in blue point estimates with associated 95%-confidence intervals. Standard errors are clustered at the lender level.



(a) Ln(Interest Rate)

(b) Ln(Loan Size)

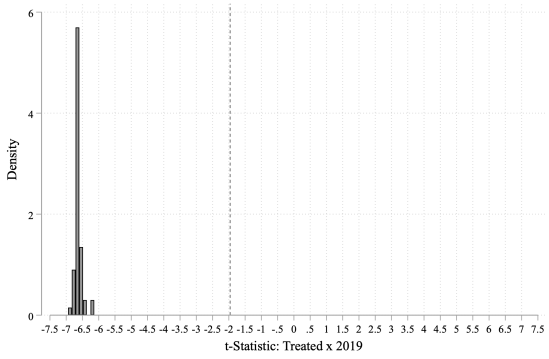
are consistent with our main findings. Notably, the long-run estimation indicates faster but not larger pass-through for higher credit score individuals.

Excluding States and Large Lenders

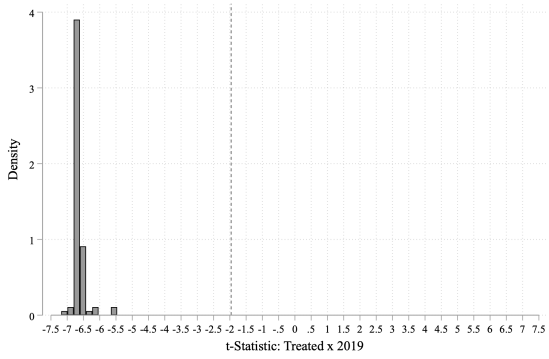
This section shows that the interest rate effect found in the main text is not driven by the effect within one state or solely driven by one large lender. Specifically, we re-estimate main specification (1) and exclude one state at a time. We record the t-statistic on the Treated × 2019 coefficient and then proceed estimating the same effect excluding a different state. We plot the distribution of t-statistics in Figure OS3a. The effects correspond to Table 2 column (1) simply varying the underlying sample. Figure OS3a also shows that absolute t-statistics are exceeding conventional significance thresholds in all regressions indicating that no individual state is driving the finding of pass-through of corporate income tax cuts to interest rates.

Figure OS3: Interest Rate Effects Excluding States and Large Lenders

This figure shows the t-statistic for the effect of the TCJA's corporate tax cut on (logged) interest rates in 2019 when excluding each state (panel a) and large lenders (panel b) one by one. In particular, for Panel A we re-run main equation (1) excluding each state one by one and plot the distribution of t-statistics on the Treated × 2019 coefficient. For Panel B we re-run main equation (1) excluding large lenders one by one and plot the distribution of t-statistics on the Treated × 2019 coefficient.



(a) Excluding States



(b) Excluding Large Lenders

We repeat this exercise excluding large lenders one at a time instead of states. This ensures that our finding is not driven by one particular large lender aggressively changing interest rates. We plot the distribution of t-statistics excluding one large lender at a time in Figure OS3b. Again, we find that absolute t-statistics are exceeding conventional significance thresholds in all regressions

indicating that no individual lender is driving the finding of pass-through of corporate income tax cuts to interest rates.