Corporate Taxes and Retail Prices*

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Abstract

We study the impact of corporate taxes on barcode-level product prices, using linked survey and administrative data. Our empirical strategy exploits the dichotomy between the location of production and the location of sales, providing estimates free from the confounding demand shocks. We find significant effects of corporate taxes on prices with a net-of-tax elasticity of 0.17. The effects are larger for lower-price items and products purchased by low-income households and weaker for high-leverage firms. Approximately 31% of corporate tax incidence falls on consumers, suggesting that models used by policymakers significantly underestimate the incidence of corporate taxes on consumers.

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1 Introduction

As an accounting fundamental, higher corporate taxes must result in lower payments to shareholders, lower wages, more tax avoidance, or higher product prices. This incidence of corporate taxes on workers, consumers and capital is key to debates on tax policy. While a large body of work starting with Harberger (1962) focuses on the incidence of corporate taxes on shareholders, and more recent work has studied the impacts on wages (Fuest, Peichl and Siegloch, 2018; Ljungqvist and Smolyansky, 2016) and avoidance through firm location choices (Giroud and Rauh, 2019; Suárez Serrato and Zidar, 2016), no empirical work has yet examined effects of corporate tax changes on consumer prices.[1] While the passage of the 2017 Tax Cuts and Jobs Act instituted the biggest federal corporate tax cut in recent American history, the impact on consumers was unknown – models used by policymakers assume that corporate taxes are fully incident on only capital and labor (CBO, 2018; Cronin, Lin and Powell, 2013).

This study uses linked administrative and survey data to study the impact of corporate taxes on barcode-level product prices, which is key in evaluating the incidence of corporate taxes on consumers. We present the first estimates of corporates taxes on retail prices, finding that taxes levied on producers do impact the final retail sales prices of their products. This finding stands in contrast to much early theoretical work which argued that, in a closed economy, corporate taxes should be fully incident on capital (Harberger, 1962) and joins a growing literature that recognizes the effect of corporate taxes on other economic stakeholders.

There are two significant challenges to identifying the effects of state-level corporate taxation on retail prices. The first is that corporate tax changes may be correlated with other factors that determine retail prices. For example, states may be more likely to raise taxes during recessions, when price growth is lower due to lower demand. The second challenge is simply that it has been difficult to assemble a corpus of data with information both on retail prices and the tax nexus of firms that produce those items. The tax rate in the location where the transaction occurs cannot be relied upon as the applicable rate since firms that produce tradable goods are often located in states other than the states where goods are sold.

[1] Harberger (1962) argued that corporate taxes will be incident on capital in a closed economy. Later work argued that when corporate and non-corporate firms produced the same good, the incidence can fall on labor and consumers (Feldstein and Slemrod, 1980; Gravelle and Kotlikoff, 1989). See Auerbach (2006) for a review of classic work on the incidence of corporate taxation.

We deal with the first empirical challenge by utilizing the fact that if a firm has a tax nexus (employees and property) in one state, but sells products in multiple states, then the firm's profits will be primarily subject to the tax laws of state where the firm has a nexus. We are able to use tax changes in the states where firms' primary operations are located, and study the impact on retail prices in other states in which their products are sold (which we refer to as a 'sold-state').

In this manner, we avoid the issue stemming from the endogeneity of the local tax changes by exploiting the dichotomy between the location of production and the location of product sales, in a similar spirit of Bertrand and Mullainathan (2003). This approach thus allows us to include retailer by sold-state by year fixed effects. That is, we can compare items sold *within* the same retailer in the same state and year, but whose producer firms face different levels of corporate taxation due to their tax nexus being located in different states. Our fixed effects capture time-varying state-specific shocks to retail prices such as local economic conditions where an item was sold, as well as time-varying retailer shocks which may affect pricing, such as a national retail chain facing financial distress.

To overcome the second empirical challenge and implement our empirical approach, we link several datasets that enable us to observe barcode-level product prices, the location of each items' producers, and tax rates. First, and most importantly, we link the Nielsen Retail Measurement Services (RMS) scanner data, a representative sample of retail sales in all major metropolitan areas to barcode data from GS1, the company which assigns an item a Universal Product Code (UPC). This database contains the identity of the firm that produced an item sold. This provides us with a link between the firm which produced an item, and the item's final retail sale price in different geographical locations by various retailers. We further identify firm characteristics from the ORBIS database, which contains administrative and ownership data. Finally, we assemble corporate tax rate by using data from Giroud and Rauh (2019), which we extend to 2017 using the same set of sources.

Our empirical analyses are motivated by a simple model of corporate tax incidence. We find an elasticity of retail price to net of corporate tax rate of approximately 0.17. This means that a one percentage point increase in the corporate tax rate leads to a 0.17 percent increase in retail product prices. The results remain stable when we include retailer by year, sold-state by year, and retailer by sold-state by year fixed effects. While our data does not contain information to identify the wage effects of corporate taxes, our model and empirical estimates allow for a back-of-envelope calculation of the wage elasticity to be 0.43. This estimate is in line with the point estimate close to 0.4 found in Germany by Fuest, Peichl and Siegloch (2018) and serves as a plausibility check for our price effect estimation.

Informed by our empirical estimate, we can gauge the incidence of corporate taxes on consumers by relating the welfare change of consumers induced by a marginal change in the net-of-tax rate to the sum of the welfare changes of consumers, workers and firm owners (Suárez Serrato and Zidar, 2016; Fuest, Peichl and Siegloch, 2018). We find the incidence on consumers, workers and shareholders is 31%, 38% and 31%, respectively. This stands in sharp contrast to the case if we do not take into account the effect of corporate income tax on product prices, where workers and shareholders will bear 42% and 58% of the tax burden, respectively.

We complement our main analysis with a graphical event study, using large state-level corporate tax changes, defined as tax changes greater than one percentage point (see Figure 1 for a map of tax changes). Our analysis indicates that, for both tax increases and cuts, the timing of price changes following tax events reflects the events studied. We see little price movement in the periods immediately before tax events, and we see prices rise or fall following tax increases and cuts respectively.

Additionally, we repeat our analysis using a set of firms that are unlikely to be subject to corporate taxes: S-corporations (Yagan, 2015). S-corporations belong to another legal form of organization and are required to pay *personal* income taxes rather than *corporate* income taxes. If our empirical strategy identifying the causal effects of corporate tax changes is valid, we should find that the price effects of corporate taxes to be only present for C-corporations and not for S-corporations. On the other hand, if changes in state corporate income taxes are correlated with unobserved supply-side shocks, then both C-corporations and S-corporations should be affected. We find positive and significant price effects for C-corporations seeing corporate income tax rate changes. In contrast, we see no price effects for tax rate changes that do not affect the legal entity; in other words for C-corporations seeing personal income tax rates change, and S-corporations when corporate income tax rates change.

We also conduct graphical analyses showing the bin scatter plots of changes in retail prices against changes in corporate tax rates across 100 quantiles for C-corporations and S-corporations.

Consistent with our parametric regression outcomes, we find a strong relationship between corporate taxes and prices for C-corporations while a flat relationship between changes in prices and changes in corporate tax rates for S-corporations.

We conduct several further tests. First, we find no effect for items produced in states with full sales tax apportionment. In these states, taxes are not apportioned by the firms' property and payroll, and therefore changes in tax rates of certain states will only affect taxes on items sold in that particular state. Since we already absorb the sold-state by year fixed effects, we do not expect to find any effect of changes in corporate taxes on prices for these states. We find it is indeed the case in this placebo test. Second, we show that the effects are stronger in states with throwback and throwout rules, which allow states to claw back taxes on untaxed sales from states with lower taxes. Since a corporation's main tax nexus usually lies in the headquarter state due to the presence of employees and properties, this rule will reinforce the effect of tax changes in the headquarter state for products sold out of state. Third, our results are robust to controlling for various state-level tax credits or grants that might be correlated with changes in corporate tax rates: (1) investment tax credits (2) upper and lower bounds of R&D tax credits (3) job creation tax credit indicators and (4) job creation grant indicators.

We also demonstrate significant heterogeneous effects across products and firms. We find that the lowest price goods tend to respond most to corporate tax changes, with average magnitudes almost twice as high for the lowest tercile relative to the highest tercile. Similarly, we find suggestive evidence of a larger effect for UPCs commonly purchased by households with lower incomes relative to those purchased by high-income households. Another dimension of heterogeneity we examined is corporate leverage. Since corporate debt can be used as a tax-shield, product prices for firms with higher leverage should be less sensitive to the corporate income tax changes. This is indeed what we find. Lastly, we also find some purely suggestive evidence that the tax elasticity of price is smaller in more competitive product markets, though not statistically significant. Further work on the interplay between product market competition and corporate tax changes for product prices could be promising.

Our paper links closely to the literature studying corporate tax incidence. To our knowledge, this is the first study to empirically estimate how corporate taxes affect product prices. Early work starting with Harberger (1962) argued that, in a closed economy, corporate tax incidence is borne almost entirely by capital. However, subsequent work has noted that in open economies business taxes can impact investment and consumer prices (Kotlikoff and Summers, 1987). Gravelle (2013) provides a review of much of the classic literature on corporate tax incidence.

Newer empirical work has focused on the incidence of corporate taxes on firm location choice and workers. Giroud and Rauh (2019) study how corporate taxes impact firm location choices and employment reallocation, comparing S- and C- corporations, while Ljungqvist and Smolyansky (2016) study the impact of corporate taxes on regional employment and income. Suárez Serrato and Zidar (2016) estimate the incidence of corporate taxes on workers and owners and find that roughly one-third of corporate taxes are incident on workers. Fajgelbaum, Morales, Suárez Serrato and Zidar (2018) study spatial misallocation, taking into account worker and firm preferences.

There is less empirical work on the direct incidence of corporate taxes on wages, though in an important study Fuest, Peichl and Siegloch (2018) use German data and find that corporate taxes do indeed affect wages. Recent studies have also focused on how corporate taxes impact firm leverage (Heider and Ljungqvist, 2015), risk-taking (Ljungqvist, Zhang and Zuo, 2017) and corporate innovation (Mukherjee, Singh and Žaldokas, 2017; Atanassov and Liu, forthcoming). We add to this literature by providing, to our knowledge, the first direct estimates of the effects of corporate taxes on product prices. We find that corporate taxes have significant effects on product prices, affecting who ultimately bears the burden of taxation and bear important policy implications.

Our paper has important implications for the progressivity of corporate taxes, and that due to effects on prices, corporate taxes are more similar to sales taxes in their effects. Many studies of corporate tax incidence ignore impact on consumers, as do models used by policy makers. For example, the CBO (2018) assumes that corporate taxes are not incident on households through consumer prices, but instead allocates incidence purely to owners of capital and through labor income, with three-quarters being incident on shareholders. The US Treasury model assumes an even higher incidence on shareholders, with more than four-fifths of corporate tax incidence borne by capital income (Cronin, Lin and Powell, 2013). Our analysis reveals a striking result that approximately 31% of the total incidence of corporate taxation falls on consumers through higher product prices, while capital owners only bear an equally 31%.

The remainder of this paper is organized as follows. Section 2 discusses our setting, presents a stylized model and our main empirical strategy. Section 3 discusses the data used for our analysis. Section 4 presents the main empirical results, and the incidence of corporate taxes on consumers. Section 5 presents placebo analyses, and explores heterogeneity in product, household and firm levels. Section 6 concludes and discusses avenues for future research.

2 The Price Effects of Corporate Taxes

2.1 Mechanics of State Corporate Taxation

State corporate tax rules vary from state to state, and typically states tax activities that occur within their own borders.[2] Firms thus have a tax nexus in states where they have a physical presence, such as establishments, sales, or employees. Multi-state firms must pay taxes in each state where the firm has nexus, and taxes are apportioned as a fraction of federal taxable income.

In our main empirical analysis, we exclude products sold in the same state where they are produced, and our empirical strategy relies on comparing how the price of items sold in one state is affected by tax changes in other states where an item is produced. Our main specifications utilize an apportionment approach to define the appropriate corporate tax rate that is incident on a producer. That is, we estimate the corporate tax rates a firm is subject to given the states in which it payroll employees and sales. Each state has different time-varying rules governing the weights applied to each of these factors.[3]

2.2 Model

Our analysis begins with a stylized model demonstrating how corporate taxes impact prices, which motivates our subsequent empirical analysis.[4] We assume firms operate in a standard environment

[2]See Giroud and Rauh (2019) and Heider and Ljungqvist (2015) for a detailed discussion of corporate tax nexus. The precise tax nexus also depends on whether a state has a throwback or throwout rule, under which sales of untaxed activities in other states are included in the home states' tax base.

[3]In the appendix, we follow Heider and Ljungqvist (2015) and Ljungqvist and Smolyansky (2016) and measure corporate taxes at the level of a firm's headquarter state, demonstrating that our results are robust to alternative definitions of the appropriate corporate tax nexus. The fact that a firm's headquarter state may not be the only state where it has a nexus may introduce some measurement error in our estimates. This would likely have the effect of attenuating these results, leading us to underestimate the incidence of corporate taxes on consumers.

[4]Appendix A provides further model details.

similar to De Loecker (2011) and Suárez Serrato and Zidar (2016), and that firms are monopolistically competitive. Firms are endowed with some productivity level B, and combine labor, L and capital, K to produce output y with the following production function, $y = B \cdot L^{\gamma} \cdot K^{1-\gamma}$.

Firms take input prices as given and the output price p is given by an inverse demand curve from CES preference with $y = I \cdot (\frac{p}{\bar{p}})^{\varepsilon}$, where $\bar{p}$ is the price level and is normalized to 1 and $\varepsilon < 0$, is the demand elasticity. The firm maximizes profits, which are taxed at a rate τ. The firm thus solves:

$$\max_{L,K}(1-\tau) \cdot (p \cdot y - w \cdot L) - \rho \cdot K \tag{1}$$

where w is the wage rate for labor and ρ is the rate of return for capital. For any given level of taxes τ, if we solve the above static problem, the firm's optimal price level in logs, $ln(p)$ will be given by

$$\ln(p) = -(1-\gamma)\ln(1-\tau) + (1-\gamma)\ln(\rho) + \gamma\ln(w) + Z \tag{2}$$

where Z is a constant. Appendix A provides the derivation details. Equation (2) shows that product price, p, depends on corporate taxes τ and motivates $\ln(1-\tau)$, i.e., the net-of-tax rate. This particular functional form for the empirical analysis follows the public finance literature and makes the coefficient readily interpretable as the net-of-tax elasticity (Suárez Serrato and Zidar, 2016; Fuest, Peichl and Siegloch, 2018).[5]

2.3 Empirical Approach

To isolate causal impacts of corporate tax changes on retail prices, we include state by retailer by year fixed effects and compare retail prices of items *within the same state and year and sold by the same retailer* but are subject to different state-level corporate tax rates. We thus are able to control for confounding factors like local demand fluctuations due to business cycles. The remainder of this section outlines the approach in detail.

Our empirical approach relies on the fact that a given producer generally has physical properties and payroll that are more (and differently) geographically concentrated than their sales. That is, if a firm has most of its employees and property in a state h, but sales spread across many states $s \in S$, then a firm's profits will be primarily subject to the corporate tax laws of state h. In contrast,

[5]Our results lead to similar conclusions if we use $\ln(1-\tau)$ or τ as the independent variable.

demand for a producer's products will be primarily affected by local economic conditions in the states in which the product is sold.

Our apportionment approach means that a given firm may be affected by the corporate tax rate in several states, depending on the geographic spread of their property, payroll, and sales and the applicable weights of the various states. For our purposes, the identifying variation will come from the fact that changes in applicable state-level corporate tax rates affecting that firm will be divorced from the economic fundamentals of the states where that firm distributes its retail goods. A product i is produced by a producing firm and is sold at time t in state s by a retailer r, which operates in multiple states. We estimate the following equation, which comes directly from the theoretical model presented in Section 2.2, restricting to firms that we can identify as C-corporations.

$$\ln(p_{i,f,r,s,t+1}) = \alpha_{r,s,t+1} + \alpha_{i,r,s} + \beta \ln(1 - \tau^c_{f,t}) + \gamma_1 X_{i,t+1} + \gamma_2 X_{f,t+1} + \varepsilon_{i,f,r,s,t+1} \quad (3)$$

where $p_{i,f,r,s,t+1}$ is the retail price of product i of firm f sold by retailer r in state s at time $t+1$ and $\tau^c_{f,t}$ is the corporate tax rate relevant for firm f that produces an item. For all specifications, τ includes both federal and state level taxes. The applicable corporate tax rate for a particular firm, $\tau^c_{f,t}$, is a sale and employee share weighted average of state corporate tax rates in states in which it operates. See Section 3.6 for more details.

We also include product specific controls $X_{i,t+1}$, as well as controls $X_{f,t+1}$ for variables in the states in which the producer's headquarters is located. These include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. $\varepsilon_{i,f,r,s,t+1}$ is an error term, which we assume is conditionally orthogonal to $\ln(1 - \tau^c_{f,t})$. We cluster standard errors at the headquarter state level.

We include product by retailer by sold-state fixed effects $\alpha_{i,r,s}$ for each item identified by a UPC code. These absorb time invariant product-specific price factors. Note that since each item is produced by one firm, these fixed effects also absorb the time invariant effects of the locations and networks of their producers. For example, the fixed effects capture the fact that some producers may be located in states with better transportation networks, which could lower product prices.

An important feature of our strategy is the fact that we include retailer by sold-state by year fixed effects $\alpha_{r,s,t}$. These fixed effects absorb any time specific factors in the seller state such as the effects of local business cycles, changing tastes in different regions, or the differential severity of recessions in particular states. These retailer by time fixed effects also capture time-specific retailer shocks, such as a major national chain declining in popularity or facing a financial shock.

Our empirical specification thus compares items sold by the same retailer in the same state at the same time, but whose producer companies face different levels of corporate taxation due to their properties and employees being mostly located in different states. In general, products in a retailer that are produced by affected out-of-state producers make up only a small fraction of total goods sold in that retailer. Thus, any change in the price of an out-of-state good affected by a corporate tax increase will likely have minimal impacts on the other goods sold in that retailer. For instance, a retail store in Nevada has only a few items sold by producers in Tennessee who are affected by a corporate tax change in Tennessee.

3 Data

Table 1 shows summary statistics for the main analysis variables. Appendix Table A.1 describes the main analysis variables and Appendix Table A.2 shows statistics on the various steps taken to link the different datasets and construct our final sample.

3.1 State Corporate Tax Data

To assemble data on state-level corporate tax records, we utilize and extend data shared by Giroud and Rauh (2019). In their paper, they construct a database of corporate taxes primarily from the University of Michigan Tax Database (1977-2002), the Tax Foundation (2000-2011), and the "state finance" chapter of the "Book of States". We extend this data from 2013 to 2017 utilizing the same sources, primarily relying on the Tax Foundation. To complement our analysis of C-corporations and corporate tax rates, we obtain personal income tax rate data from the NBER database for placebo tests.

Figure 1 displays the geographic distribution of changes in corporate tax rates that we rely on for variation during our sample period. We see a substantial number of both increases and decreases in tax rates. A sizable number of these changes in corporate tax rates are fairly large, with 23 of the tax changes being 1% or more.[6]

3.2 Nielsen Retail Measurement Services (RMS) Scanner Data

The Nielsen Retail Measurement Services (RMS) scanner data set is provided by the Kilts-Nielsen Data Center at the University of Chicago Booth School of Business. The RMS data is generated by point-of-sale systems and our sample contains over 41,000 distinct stores from 91 retail chains across 371 MSAs and about 2500 counties between 2006 and 2017. A distinctive feature of this database is that it provides comprehensive coverage of the universe of products and the full portfolio of firms.

In comparison to other scanner data sets collected at the store level such as IRI Symphony dataset, the RMS covers a much wider range of products and stores.[7] The data set comprises around 12 billion transactions per year worth, on average, $220 billion. Over the sample period, the total sales across all retail establishments are worth approximately $2 trillion and represent roughly half of all sales in grocery stores or in drug stores, about a third in mass merchandisers (Argente, Lee and Moreira, 2018). The stores are spread across the United States, covering 98% of Designated Market Areas (DMAs).

We utilize the RMS scanner data to construct a database of prices at the annual retailer-state-UPC level. For each good, we construct an annual price from the weighted average (based on the number of units sold at each price) of all goods purchased in a year. After merging with tax and firm data, the final C corporation sample accounts for about 11% UPCs and 17% of aggregate sales in the RMS database.

[6] Figure A.1 displays changes in the level of corporate tax rates at three points during our sample period. Figure A.2 shows the distribution of state-level corporate tax rate levels near the two ends of our sample period and Figure A.3 illustrates the distribution of changes during our sample period.

[7] In an earlier version of our paper we used the Nielsen Homescan dataset. This dataset is more restricted than the RMS, as it collects information on the realized purchases of 40,000-60,000 US households and covers less than 60% of the products the RMS covers in a given year. However, the Homescan panel is constructed as a representative sample of the American population and is tracked through the inclusion of numerous demographic indicators, including the location of the household. We report results using the Homescan data mirroring our main results in Appendix Table A.3.

3.3 GS1 Barcode Data

The GS1 Company data allows us to derive UPC level linkages between items and their producers (Argente, Lee and Moreira, 2018), giving a relatively comprehensive match for retail-good-producing firms. The GS1 Company offers a method to map UPCs to products and individual producers in order to help firms manage their inventory. Each UPC acts as a unique identifier for a product (e.g., an individual 20-ounce plastic bottle of Coca-Cola Classic) and allows us to link purchase and price in the RMS data to information about the firm that produced each item, as well as the location of a given firm's headquarters. UPCs (barcodes) are nearly ubiquitous for products carried by the retailers that we study and, if they are in a relevant industry, will be available for essentially all goods that a given producer manufactures. Moreover, the linkages should be unique for a product and are generally unchanged over time.

The link between UPC code and producer is driven by the first 6 to 9 digits of the UPC, known as the 'company prefix'. However, the number of digits contained in this company prefix is not fixed across UPCs and firms. Thus, for each UPC, we extract its first 6 to 9 digits as four company prefix candidates. Then, we match these candidates to the pool of company prefixes in order to create possible UPC-producer links. According to the GS1, "As the GS1 Company Prefix varies in length, the issuance of a GS1 Company Prefix excludes all longer strings that start with the same digits from being issued as GS1 Company Prefixes." Essentially, for one particular UPC code with its associated four company prefix candidates, there will be only one candidate fully matched to the company prefix pool. Our matching algorithm confirms this unique relationship. In the end, we use the GS1 Data Hub to exactly match 83% of the UPCs in the data to a GS1 company prefix.

3.4 Orbis Data - Firm Location and Structure

We construct our database on firm characteristics primarily through the use of the Orbis database, developed by Bureau van Dijk (BvD). This database contains administrative and ownership data on 130 million firms across the globe. It covers both public and private firms, offering us an opportunity to identify the incorporation type of producers in our pricing database.

Orbis collects data on both public and private firms from administrative and other sources and organizes them in a consistent format. This includes information on the legal form/incorporation type that a given firm has undertaken, as noted by the 'Standardized Legal Form' and 'National Legal Form' variables. Unfortunately, these variables do not definitively determine whether a firm is a C-corporation or an S-corporation and we are forced to also supplement these variables with information on the number and type of shareholders in order to infer the incorporation type.

We first utilize the legal forms to categorize all public companies as C-corporations. We treat partnerships as S-corporations and non-profit organizations and public authorities as firms that are exempt from corporate taxes altogether. For the rest of unidentified producers, we resort to information about their shareholders. We download the legal form information and the shareholder information of firms at the most recently available date. There is a reporting lag in Orbis data of roughly two years. Since we downloaded the data in 2019, the latest available year is 2017 or occasionally 2016.

According to the definition of an S-corporation (26 U.S. Code 1361.(b)), they should not have more than 100 shareholders and their shareholders should be individuals, not other firms or holding companies. Consequently, we treat producers who have more than 100 shareholders or who have non-individual shareholders as C-corporations, i.e., firms ineligible to be taxed as S-corporations. Due to data limitations, what we identify is essentially whether a firm is eligible to elect to be taxed as S-corporation. However, whether the eligible firms execute this option is unobserved to us.

For those firms that satisfy the shareholder requirement, they can still elect to be taxed as a C-corporation, rather than choose to pass the income to their shareholders. Therefore, this approach enables us to relatively accurately measure C-corporations, while S-corporations could only be more noisily identified. For this reason, we use accurately identified C-corporations for baseline analysis and use the noisily identified S-corporations to conduct placebo tests in similar spirits of Giroud and Rauh (2019) and Yagan (2015).

To match our categorized Orbis data to our database of prices, we make use of a matching software on the web platform of Orbis. This system automatically matches firms according to names, locations, industry and other information. Since firms could operate at multiple locations, we restrict the matching criteria to company names and industries. We also conduct hand-matching on firm names to supplement the matching for the largest firms in our sample. In the end, we match approximately 80% GS1 producers and over 90% of all the UPCs in our pricing data.

3.5 Reference USA (Infogroup) Data

Broadly, Infogroup provides data on tens of millions of businesses in the United States at both aggregated and disaggregated levels. These data are collected by Infogroup in a variety of ways, from public statistics up to direct phone calls and emails to businesses. In particular, we use data from Reference USA (owned by Infogroup) to establish the geographic spread of business activity within a given firm, as measured by the location of employees in a firm across states. We use this geographic distribution of employees and sales to compute the weighted average tax rate for a firm.

3.6 State Tax Apportionment

Each state that levies a corporate tax uses a formula to determine the fraction of a firm's activities occurred in that state for tax purposes. In general, states attempt to measure this concept using a weighted average of the fraction of sales, property, and employees a firm has in that state. These 'apportionment weights' vary significantly across states and over time, as well. Thus, the actual corporate tax rate that a firm is subject to is itself a weighted average of these state-level tax rates. For a firm operating in many states, they may be affected by changes in corporate tax rates in any one of those states, but will be most heavily affected by corporate tax rates in the state in which they have a majority of their operations (generally their headquarters states for firms in our sample).

We follow Heider and Ljungqvist (2015), and approximate the effective tax rate according to the geographic distribution of sales and employment. We match the producers from GS1 database to the Reference USA dataset, which tracks firms' sales and employment at the establishment level. This allows us to compute firm's nexus-based tax rate as follows:

$$\tau^c_{f,t} = \sum_s \left(\frac{1}{2}\frac{E_{f,s,t}}{E_{f,total,t}} + \frac{1}{2}\frac{S_{f,s,t}}{S_{f,total,t}}\right) \times \tau^c_{s,t} \tag{4}$$

where the $\tau^c_{f,t}$ is the nexus-based corporate tax rate for firm f in year t. $E_{f,s,t}$ and $S_{f,s,t}$ are firm f's number of employees and sales in state s in year t, while $E_{f,total,t}$ and $S_{f,total,t}$ are the total number of employees and sales across all states in year t. $\tau^c_{s,t}$ is the state i's corporate tax rate in year t.

In addition to the state-level corporate tax rates, we extract apportionment rates and throw-back or throw-out rules from the Commerce Clearing House's State Tax Handbooks up through 2017. We also collect Data on state investment incentive programs during 2006 and 2017 (i.e., tax credits for investment, R&D, and job creation, as well as job creation grant programs) from three sources: individual state-level Department of Economic Development websites, Department of Revenue websites, and legislature websites. The numbers are also double-checked with State Tax Rule Books when available.[8]

4 Main Results

4.1 Main Estimates of Tax Elasticity

Table 2 presents estimates of equation (3), using ordinary least squares. All specifications include UPC by retailer by sold-state fixed effects, and other controls noted in Section 2.3. Standard errors are clustered at the headquarter state level.[9] Column (1) includes controls and UPC by retailer by sold-state fixed effects as well as year fixed effects to control for macroeconomic conditions. The estimates suggest large changes in retail prices stemming from corporate tax changes (measured as the change in state and federal corporate tax rates), with an elasticity of prices to net of corporate tax rates of approximately 0.17. The estimate is statistically significant at the 0.01 level.

To further control for state-specific economic conditions, column (2) includes sold-state by year fixed effects. These capture state-specific temporal factors, for example the housing boom and bust being more severe in certain states (for instance, Stroebel and Vavra (2019) show that local real estate prices impact retail prices.) The estimates remain statistically significant at the 0.01 level and almost identical to column (1). Column (3) uses retailer by year fixed effects. The retailer by year fixed effects address firm-specific temporal shocks. For example, firm financing shocks may impact retail prices (Kim, 2018). Here, the estimated elasticity is also similar to the estimate in column (2). Column (4) includes both sold-state by year and retailer state by year fixed effects. The estimate is basically unchanged compared to those in earlier columns. Finally, column (5) adds in sold-state by retailer by year fixed effects. The results again remain very similar to those in column (4), and significantly different from zero at the 0.01 level.

[8]We show in the Appendix Table A.4 that the results are also robust to utilizing a different measure of tax nexus, based on a firm's headquarter location only. The point estimates are slightly smaller in terms of absolute value, which is consistent with a firm's headquarter location being a noisy proxy for the true tax nexus.

[9]Appendix Table A.5 shows that the main results are robust to sales weighted regressions. Results using firm-level clustering are reported in Appendix Table A.6.

Figure 2 shows the timing of price effects following large tax changes. This exercise serves as a test of our identification strategy, and the timing of observed results should coincide with the timing of tax changes. We define a large tax event as an increase or decrease of more than one percentage point, following Giroud and Rauh (2019). There are 23 large tax changes in our sample, including 10 tax increases and 13 tax cuts.

We re-estimate our main specification, replacing the main treatment with an indicator of a time period before and after the large tax event, scaled by the change of tax rate.[10] The shaded area denotes a 95% confidence interval. We indeed find that the timing of observed effects lines up with large tax changes. That is, we see insignificant effects in the years prior to the tax event but substantial price effects following the tax change.

4.2 Plausibility Check on Magnitudes

In the previous section, we utilize a reduced form estimation to measure the elasticity of prices to corporate taxes. However, one should not interpret our estimates as $1-\gamma$, the capital share of gross output. Tax increases have a direct effect on wages, which we do not observe, so we can not separately identify the effect of taxes on wages.[11] In fact, our empirically identified price elasticity I_p will be equal to $1-\gamma-\gamma I_w$ in absolute value, where I_w is the wage elasticity.[12]

We take the value of γ (the labor elasticity) to be 0.58 (Giandrea and Sprague, 2017), and informed by our empirical estimate of I_p, we can back out $I_w = 0.43$. This estimate is close to Fuest, Peichl and Siegloch (2018), who find the corporate income tax estimate of wage to be around 0.4 in Germany. We take this back-of-envelope calculation as evidence that our estimate for the price elasticity to corporate taxes is of reasonable magnitude.

We can extend the model in section 2.2 to include intermediate goods in the production function

[10] Specifically, the figure plots coefficients β_i are from the following specification: $\ln(p_{i,f,r,s,t}) = \alpha_{r,s,t} + \alpha_{i,r,s} + \sum_{n=-2}^{n=3} \beta_n \mathbb{1}[t=n] \times \Delta ln(1-\tau^c_{f,t}) + \gamma_1 X_{i,t} + \gamma_2 X_{f,t} + \varepsilon_{i,f,r,s,t}$. Appendix Figure A.4 presents a simpler exercise, showing the price response following large tax cuts and increases. The figure shows a statistically insignificant rise following tax increases, and a statistically significant fall in prices following tax cuts.

[11] Indeed wages could directly affect product prices as shown in Equation 2. However, to the extent that changes in wages are due to changes in corporate taxes, the effect on prices is already captured by our empirical strategy through the log-linear term of $\ln(1-\tau)$. In unreported analyses, we further control for higher-order terms of τ to allow for potential non-linear effects of corporate taxes on wages, and find results unchanged. It is also worth noting that, since an increase in corporate taxes leads to lower wages and wages and product prices are positively correlated, this at best introduces a non-first-order underestimate bias into our empirical estimate.

[12] We assume capital owners supply capital perfectly elastically at the national rate, consistent with Suárez Serrato and Zidar (2016).

and use the model as well as estimates from the literature to separately identify the intermediate input good price elasticity. Ex ante, this should be weakly lower than the product price elasticity, as intermediate goods may be sourced in the same state a firm is located, or another state.[13] Our data can not separately identify wage or intermediate input price change. Therefore our identified price incidence includes wage incidence, which we denote I_w, and intermediate good price incidence is denoted by I_M. Our empirically identified price incidence I_p will be equal to $-\delta + \gamma I_w + (1 - \delta - \gamma) I_M$.

We follow Suárez Serrato and Zidar (2016) and can set the values of γ (the labor elasticity) and $1 - \gamma - \delta$ (where δ is the capital elasticity) accordingly using BEA's 2012 data on shares of gross output by industry. These indicate that for private industries, compensation and intermediate inputs account for 28.5% and 45.6% respectively of the shares of gross output. Fuest, Peichl and Siegloch (2018) estimate that I_w is around 0.4, and given our estimate of $I_p = -0.17$, this implies that the intermediate good price elasticity $I_M = -0.055$. As a firm' intermediate inputs could be sourced locally or nationally, this -0.055 is a reasonable value of intermediate price incidence compared with the output price elasticity of -0.17.

Alternatively, we could back out a range of the wage incidence of corporate taxes by assuming two extreme cases for intermediate goods: in one case all intermediate goods are sourced nationally and there is no price incidence on intermediate goods due to local tax changes, $I_M = 0$, then the identity gives $I_w = 0.312$; in the other case, all intermediate goods are sourced locally and there is a same level of price incidence as output, $I_M = -0.17$, then the identity gives $I_w = 0.585$. The back-of-envelope calculated range of labor incidence from 0.312 to 0.585 is within the 95% confidence internal of Fuest, Peichl and Siegloch (2018), which is estimated for the incidence of corporate taxes on wages in Germany and lies between 0.168 and 0.630.

4.3 Incidence of Corporate Taxes on Consumers

Our empirical analysis estimates the elasticity of output price with respect to the net-of-business tax rate, $\delta_p = \frac{dp}{d(1-\tau)} \frac{(1-\tau)}{p}$. Armed with this estimate, we quantify the incidence of corporate taxes on product prices as the share of the total corporate income tax burden born by consumers. We enrich

[13] In the extreme case where all intermediate goods are sourced out of states that do not witness any tax change, the intermediate good price elasticity could be 0.

the setting in Fuest, Peichl and Siegloch (2018) by allowing for the welfare change of consumers induced by a marginal change in the net-of-tax rate, along side workers and firm owners.

More specifically, we consider three types of agents: (1) the consumer in state s and (2) the worker and (3) the firm owner, both in state h. We assume that $(h \neq s)$, which is consistent with our empirical setting. Consumers maximize the utility function $U(C_s, L_s)$ given the budget constraint: $p \cdot C_s = (1-\tau_s^p) w_s L_s$, where p is the price for the consumption good, C_s is consumption quantity, τ_s^p is personal income tax rate, w_s is the wage received by consumer and L_s is the quantity of labor. Since the consumer we are concerned with is not from the state where there is a tax shock, we assume the wage and labor supply, w_s and L_s, will not change. We can write the indirect utility function as $V_{con_s}(p)$ and a change in consumer utility as a result of a change in the product price is given by $dV_{con_s} = -C_s \cdot dp$, by the envelope theorem.

The worker in state h will maximize the utility function $U(C_h, L_h)$ given the budget constraint: $p \cdot C_h = (1 - \tau_h^p) w_h L_h$, where for simplicity we assume only wages are affected. Then the indirect utility is given by $V((1-\tau)w)$ and the change in worker utility induced by tax change is $dV_{wkr_h} = (1 - \tau_h^p) L_h \cdot dw_h$. A representative firm in state h faces a corporate tax rate τ_h^c and maximizes profits, $\Pi = (1 - \tau_h^c)(pF(K, L_h) - w_h L_h) - rK$, over capital K and labor L. We similarly apply the envelope theorem and solve for the marginal effect in welfare for firm owners: $dV_{f_h} = (1 - \tau_h^c) F(K, L_h) dp - (pF(K, L_h) - w_h L_h) d\tau$.

The share of consumers, workers and firm owners in the overall burden of a marginal change in the corporate tax rate is given by the respective share of their own marginal effect in welfare out of the total sum $dV_{con_s} + dV_{f_h} + dV_{wrk_h}$. For example, the share of tax burden born by consumers is $I_{con_s} = \frac{dV_{con_s}}{dV_{con_s} + dV_{f_h} + dV_{wrk_h}}$.

The share of consumers in the tax burden can be expressed as:

$$I_{con_s} = \frac{s_{con}\delta_p}{s_{con}\delta_p - (1-\tau_h^p)s_{labor}\delta_w - (1-\tau_h^c)\delta_p - (1-\tau_h^c)(1-s_{labor})} \tag{5}$$

Here, $s_{con} = \frac{pC_s}{pF(K, L_s)}$ is the consumption share over total output and $s_{labor} = \frac{w_h L_h}{pF(K, L_h)}$ is the labor share over total output. δ_p is the tax elasticity of price and δ_w is the tax elasticity of wage. As is clear, the price elasticity and wage elasticity to the net of tax rate are two sufficient statistics to calculate marginal welfare changes of consumers, workers and firms.[14]

Our data only allows for identification of the output price elasticity, which we find to be $\delta_p = -0.17$ and we take the wage elasticity from Fuest, Peichl and Siegloch (2018) so that $\delta_w = 0.4$. Using this, we can calculate that the incidence on consumers, workers and shareholders is 31%, 38%, and 31%, respectively.[15] The results suggest that approximately one third of corporate taxes incidence falls on consumers, potentially making corporate taxes more similar to sales taxes and hence much less progressive.

5 Placebo Analysis and Heterogeneity

5.1 Placebo Analysis: S- and C- Corporations

So far, we have focused on C-corporations, which are subject to corporate income taxation. A natural placebo test is to repeat our analysis on other firms that produce goods for retail sales but do not pay corporate taxes (Yagan, 2015; Giroud and Rauh, 2019). In the United Status, S-corporations fill this role as they are subject to personal income tax rates on their earnings. Figure 3 shows annual price changes and tax changes across 100 quantiles for both C-corporations and S-corporations. The left panel shows the relationship for C-corporations. The right panel displays the same relationship, for S-corporations.

While all firms that we classify as C-corporations will be properly classified, there is some classification error for S-corporations. This is discussed in more detail in Section 3.4, and will result in classifying some C-corporations as S-corporations. This measurement error would likely bias us *away* from finding a zero result for firms classified as S-corporations. In these panels, we find a strong relationship between corporate taxes and prices for C-corporations, consistent with the evidence presented in Section 4.1. However, we see a flat relationship between changes in prices and changes in corporate tax rates for S-corporations. The fact that we see no impact of tax changes on firms that do not pay corporate taxes suggests that any possible source of bias in our

[14]We also use $s_{con} = 0.675$ from BEA's consumption share of GDP, $s_{labor} = 0.58$ from Giandrea and Sprague (2017), $\tau_h^p = 0.40$ as personal income tax rate including federal and state taxes, and $\tau_h^c = 0.55$ as the sum of federal and state level corporate income tax rate. Appendix A provides further derivation details.

[15]If we do not take into the account the effect of corporate income tax on product prices, the resultant incidence falls primarily (58%) on capital. This is largely consistent with Suárez Serrato and Zidar (2016) – as they find that the incidence of the corporate tax falls 65-70% on capital – as well as with CBO and Treasury estimates.

estimates must impact *only* C-corporations, but not S-corporations. This relationship is tested and confirmed in a regression framework in Table 3, where we include the full battery of fixed effects as in our main specifications.

Another version of our placebo test can be conducted by replacing the corporate income tax rate with personal income tax rate in the equation (3). That is, we test whether the prices of C-Corporation-produced retail goods are responsive to personal income tax rates. We present our results in Table A.7. The coefficients are close to zero in magnitude and not statistically significantly different than zero, confirming that the changes in state-level corporate income tax rates are not capturing other time-varying shocks that coincide with changes in product prices.

5.2 Variations in Sales Apportionment

States differ significantly in their corporate tax apportionment regulations. One important dimension along which apportionment rules differ is on the share of a firm's sales that are in a particular state. Some states, such as California, apportion corporate tax income entirely by sales revenue within a state. In these states, corporations pay taxes on profits apportioned by the share of sales in a state. For states with full sales tax apportionment, we would not expect to find a significant effect of state corporate taxes on prices, as we absorb sold-state by year fixed effects, and changes in a firm's corporate tax rate will only affect taxes on items sold in-state, which we dropped.

Table 4 explores these apportionment rules. The table shows estimates similar to those in the main specification, interacting $\ln(1 - \tau_{c,f,t})$ with a dummy for whether producers' headquarter state's sales apportionment ratio is 100%. For such states, the effect of the headquarter state corporate taxes on the product prices should be low – the relevant corporate tax rate is the one where sales are made rather than where they are produced. For states that apportion corporate taxes purely by the share of sales, there is no significant combined effect of corporate taxes on prices (eg. adding coefficients in rows 1 and 2). This provides further evidence that our observed effects are driven by changes in corporate taxes, rather than other confounding factors correlated with state tax changes. Appendix Table A.8 presents a variant of this, restricting our main analysis to states with 100% sales apportionment. Consistent with the findings in Table 4, we find no significant effect of corporate tax changes among this sample.

5.3 Variation in Throwback and Throwout Rules

States' apportionment rules also differ in the sense that several states have throwback and throwout rules for apportionment when calculating the taxable income. Under throwback rules, some states like California require the firms to add back sales that are to buyers in a state where the company has no nexus to the taxable income. Throwout rules achieves a similar goal and also target 'nowhere sales', which are sales to buyers in a state where the company has no nexus. Under the throwout rule, states require firms to subtract the 'nowhere sales' from total sales, thereby increasing the apportionment weights. We thus expect stronger effects of corporate tax changes in states with throwback and throwout rules.

Table 5 presents estimates similar to our main specification, interacting with an indicator of whether a producer headquarter state has a throwback or a throwout rule, respectively. For throwout, the interaction effects are negative and statistically significant at 5% level, though the results are generally not significant for throwback, but are consistently negative across both interactions. This provides suggestive evidence consistent with throwback and throwout rules generating higher retail price pass-through.

5.4 Additional State Controls

While our state by year fixed effects can rule out any time varying sold-state specific demand channel, they do not capture time varying producer state factors that could be correlated with corporate tax changes. One potential concern is that corporate tax increases or cuts may be coupled with corresponding changes in state policies that could impact firms. For example, states may couple increases in corporate tax rates with increases in R&D tax credits or job creation tax credits. We note that our placebo tests using S-corporations suggest this is not the case, as the S-corporations are not similarly affected as C-corporations. Here we conduct an additional test, adding additional controls for producer state policy changes.

Table 6 explores this concern, by adding the following producer state controls used in Heider and Ljungqvist (2015): (1) investment tax credits (2) upper and lower bounds of R&D tax credits (3) job creation tax credit indicators and (4) job creation grant indicators.[16] The elasticity estimates

[16]The data on state investment incentive programs are primarily collected from three sources. First, state Department of Economic Development websites, second, Department of Revenue websites and finally state legislature websites.

remain statistically significant, and there is a slight increase in magnitudes when producer state controls are added. This suggests that the effects are not driven by observable producer state policy changes that coincide with corporate tax changes.

5.5 Good-level Heterogeneity in Pass-through

Table 7 exploits some dimensions along which the effect of corporate taxes on retail prices differs across goods. We break down the UPCs in our sample at the median according to two different metrics. In Panel A, we divide the sample of UPCs according to the average income of the households who purchased that item. The Nielsen Consumer Panel data tracks household income according to income bins that vary at an annual level. We use the midpoints of these bins and construct the weighted average of household income for the average customer for each UPC. We extract this information from the Consumer Panel and supplement it to our RMS sample. Then, we sort the UPCs into halves according to this metric.

In general, we find larger effects for UPCs commonly purchased by households with lower incomes relative to those purchased by high-income households. Here the results are not as consistently statistically significant, but the point estimates are still substantial, associated with pass-through of corporate tax changes approximately 80-120% greater than those of products purchased by high-income households.

In Panel B, we look for differential responses across UPCs depending on how expensive the products are, on average. That is, for each UPC we measure the average price paid by households across all time periods in our sample. We then split the UPCs into two groups, interacting the corporate tax changes with indicators for the lower-priced group (the highest-price group is the baseline category). We find that the lower priced goods tend to respond more to corporate tax changes, with average magnitudes about twice as high as with the higher-priced set of goods. The difference is also statistically significant at a 5% level, suggesting a robust pattern of higher pass-through for lower-priced goods.

When possible, we double-check estimates with State Tax Rule Books.

5.6 Heterogeneity in Leverage

US tax law makes interest rate payments on debt deductible for corporations. Thus a natural implication is that firms with higher levels of debt can benefit from tax shields, making them less sensitive to changes in corporate tax rates. Table 8 provides evidence that this is indeed the case. We merged our sample by company name with Compustat to obtain information on leverage, which resulted in a reduced sample. The table interacts corporate tax rates with an indicator of whether a firm is above or below the median debt ratio in the sample (0.24). We find that the effects tend to materialize on firms with lower levels of leverage. For firms with higher leverage, which can take larger debt tax shields, we see no statistically significant effect of changes in corporate tax rates on product prices.

5.7 Robustness and Competition

Finally, in the appendix we show that our results are robust to a number of alternative specifications. We show in Appendix Tables A.9 and A.10 that our results are robust to including two-digit SIC code by year fixed effects and product group by year fixed effects. As mentioned previously, in Appendix Table A.4 we also demonstrate that our results are robust to using an alternative measure of corporate taxes, the state headquarter tax rate, as in Heider and Ljungqvist (2015).

Market concentration can play an important, but theoretically ambiguous role in price pass-through depending on the sign of the elasticity of marginal surplus (Weyl and Fabinger, 2013). Table A.11 interacts corporate tax rates with an indicator of the Herfindahl-Hirschman Index (HHI) being below the sample median, where the HHI is calculated within each product group market. Given the national representativeness of the RMS, the market share should be a good approximation of the real market share. We discuss further details of computing the HHI in Appendix section C. We caution that the results in Table A.11 should be treated as purely suggestive, as retail prices and HHI could be jointly determined. The results suggest lower pass-through in more competitive markets, although the effects on the interaction between corporate taxes and HHI are not statistically significant. This is consistent with theories in which competitive markets preventing firms from passing through increased costs.

6 Concluding Remarks

This paper provides evidence that corporate taxes impact retail product prices, and that a significant portion of corporate tax incidence falls on consumers. We use linked price and firm data, and changes in a firm's apportioned tax rates to examine their effects in product prices. A one percentage point increase in the corporate tax rate leads to an increase in retail product prices of approximately 0.17 percent. Our analysis exploits state-level tax changes, and the fact that goods produced in a firm located in one state are sold in another state. This allows us to include sold-state by retailer by year fixed effects, thus avoiding a large number of potential biases and empirical concerns.

The fact that corporate taxes affect product prices, as well as payouts to shareholders and wages, has important implications for tax policy. In particular, models use by policymakers such as the CBO and US Treasury may underestimate the incidence of corporate taxes on consumers (CBO, 2018; Cronin et al., 2013).If corporate taxes are incident on consumer prices, rather than primarily being borne by shareholders and workers, these taxes may be much less progressive than is commonly asserted. This is especially true if lower priced goods and goods purchased by low income households are the ones most sensitive to changes in corporate taxes.

While the fact that we exploit state-level tax changes, and goods sold in other states allows us to avoid many empirical challenges, there remain several fruitful avenues for further exploration. First, our analysis necessarily focuses on trade across US states, which are essentially small open economies. Much of the early theoretical debate on corporate tax incidence focused on differences between open and closed economies. Effects may be different at the national level, where there are different opportunities for tax avoidance or adjustments in corporate structure. Second, market structure could play an important role in price pass-through of taxes. This may make higher or lower corporate taxes in more or less competitive industries optimal. Third, while we focus on retail goods, incidence may be very different in other sectors or in services.

References

Argente, David, Munseob Lee, and Sara Moreira, "Innovation and product reallocation in the great recession," *Journal of Monetary Economics*, 2018, *93*, 1–20.

Atanassov, Julian and Xiaoding Liu, "Can corporate income tax cuts stimulate innovation?," *Journal of Financial and Quantitative Analysis*, forthcoming, pp. 1–51.

Auerbach, Alan, "Who bears the corporate tax? A review of what we know.," *Tax Policy and the Economy*, 2006, *20*, 1–40.

Bertrand, Marianne and Sendhil Mullainathan, "Enjoying the quiet life? Corporate governance and managerial preferences," *Journal of Political Economy*, 2003, *111* (5), 1043–1075.

Broda, Christian and David E. Weinstein, "Product creation and destruction: Evidence and price implications," *American Economic Review*, 2010, *100* (3), 691–723.

CBO, "The distribution of household income, 2014," *Congressional Budget Office Staff Report*, 2018.

Cronin, Julie Anne, Emily Lin, and Laura Powell, "Distributing the corporate income tax: Revised U.S. Treasury methodology," *National Tax Journal*, 2013, *66* (1), 239–262.

Einav, Liran, Ephraim Leibtag, and Aviv Nevo, "Recording discrepancies in Nielsen Homescan Data: Are they present and do they matter?," *QME*, 2010, *8* (2), 207–239.

Fajgelbaum, Pablo D, Eduardo Morales, Juan Carlos Suárez Serrato, and Owen Zidar, "State taxes and spatial misallocation," *The Review of Economic Studies*, 2018, *86* (1), 333–376.

Feldstein, Martin and Joel Slemrod, "Personal taxation, portfolio choice and the effect of the corporation income tax," *Journal of Political Economy*, 1980, *88* (5), 854–866.

Fuest, Clemens, Andreas Peichl, and Sebastian Siegloch, "Do higher corporate taxes reduce wages? Micro evidence from Germany," *American Economic Review*, 2018, *108* (2), 393–418.

Giandrea, Michael D and Shawn A Sprague, "Estimating the US labor share," *Monthly Labor Review*, 2017.

Giroud, Xavier and Joshua Rauh, "State taxation and the reallocation of business activity: Evidence from establishment-level data," *Journal of Political Economy*, 2019, *127* (3).

Gravelle, Jane and Laurence Kotlikoff, "The incidence and efficiency costs of corporate taxation when corporate and noncorporate firms produce the same good," *Journal of Political Economy*, 1989, *97* (4), 749–780.

Gravelle, Jennifer, "Tax Incidence," *National Tax Journal*, 2013, *66* (1), 185–214.

Harberger, Arnold, "The incidence of the corporation income tax," *Journal of Political Economy*, 1962, *70* (3), 215–240.

Heider, Florian and Alexander Ljungqvist, "As certain as debt and taxes: Estimating the tax sensitivity of leverage from state tax changes," *Journal of Financial Economics*, 2015, *118* (3), 684–712.

Kim, Ryan, "The effect of the credit crunch on output price dynamics: The corporate inventory and liquidity management channel," *Working Paper*, 2018.

Kotlikoff, Laurence and Lawrence Summers, "Tax incidence," *Handbook of Public Economics*, 1987, *2*, 1043–92.

Ljungqvist, Alexander and Michael Smolyansky, "To cut or not to cut? On the impact of corporate taxes on employment and income.," *Working Paper*, 2016.

_ , Liandong Zhang, and Luo Zuo, "Sharing risk with the government: How taxes affect corporate risk taking," *Journal of Accounting Research*, 2017, *55* (3), 669–707.

Loecker, Jan De, "Product differentiation, multiproduct firms, and estimating the impact of trade liberalization on productivity," *Econometrica*, 2011, *79* (5), 1407–1451.

Mukherjee, Abhiroop, Manpreet Singh, and Alminas Žaldokas, "Do corporate taxes hinder innovation?," *Journal of Financial Economics*, 2017, *124* (1), 195–221.

Stroebel, Johannes and Joseph Vavra, "House prices, local demand, and retail prices," *Journal of Political Economy*, 2019, *127* (3).

Suárez Serrato, Juan Carlos and Owen Zidar, "Who benefits from state corporate tax cuts? A local labor markets approach with heterogeneous firms," *American Economic Review*, 2016, *106* (9), 2582–2624.

Weyl, E Glen and Michal Fabinger, "Pass-through as an economic tool: Principles of incidence under imperfect competition," *Journal of Political Economy*, 2013, *121* (3), 528–583.

Yagan, Danny, "Capital tax reform and the real economy: The effects of the 2003 dividend tax cut," *American Economic Review*, 2015, *105* (12), 3531–63.

Figure 1: Change in State Corporate Taxes

Notes: This figure shows the change in state corporate tax rates between 2004 and 2017. Source: Giroud and Rauh (2019) and Tax Foundation.

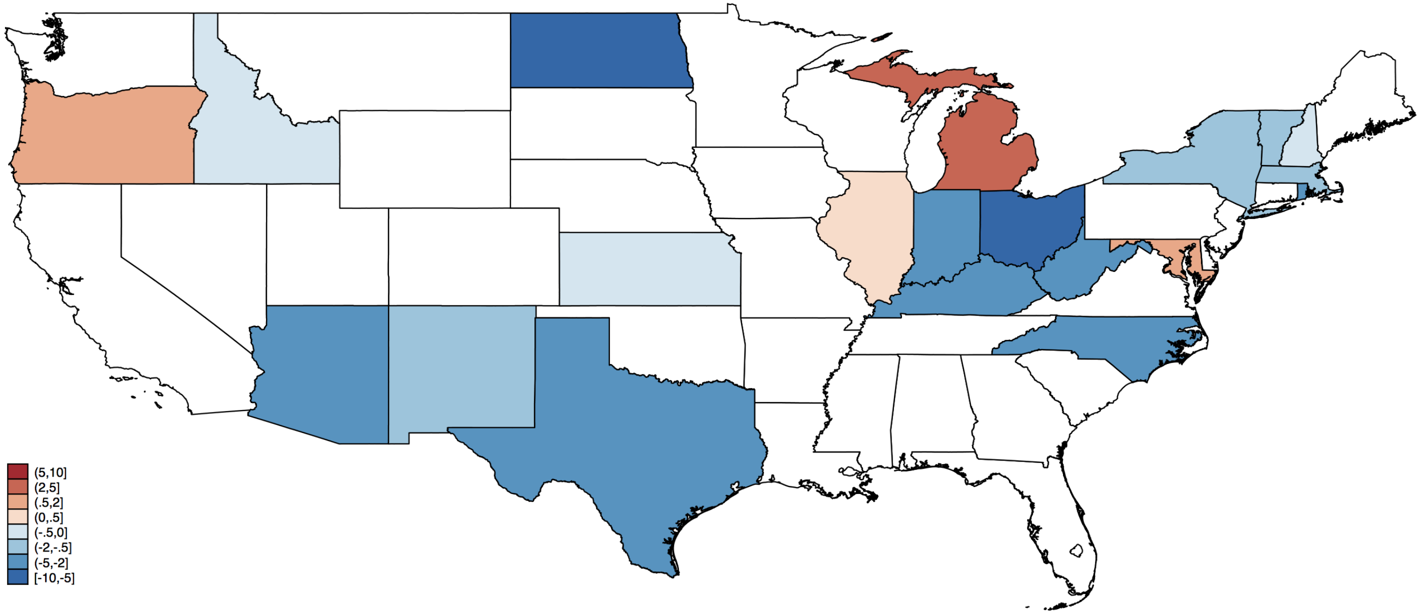


Figure 2: Prices Following Large Tax Changes

Notes: This figure shows the impact on product prices of a one percentage point or greater change in corporate tax rate over time (scaled by the actual change of tax). The figure plots coefficients β_i from the following specification: $\ln(p_{i,f,r,s,t}) = \alpha_{r,s,t} + \alpha_{i,r,s} + \sum_{n=-2}^{n=3} \beta_n \mathbb{1}[t = n] \times \Delta ln(1 - \tau^c_{f,t}) + \gamma_1 X_{i,t} + \gamma_2 X_{f,t} + \varepsilon_{i,f,r,s,t}$. The solid line denotes point estimates. The shaded area denotes a 95% confidence interval. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1.

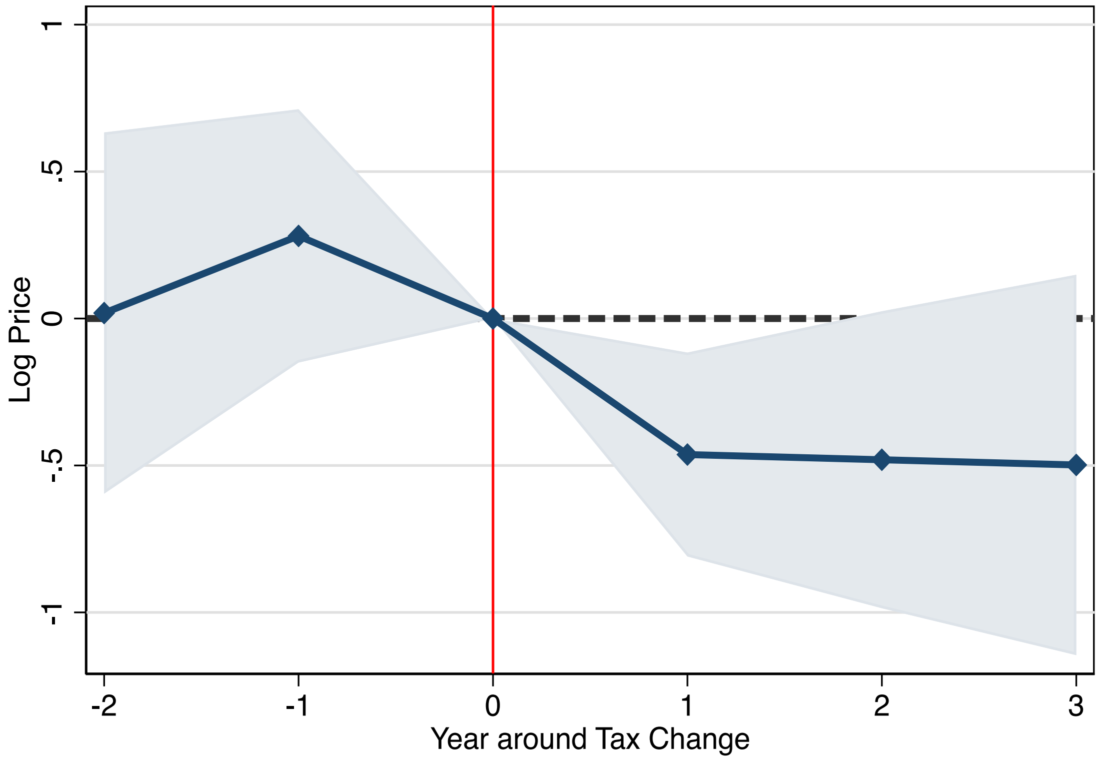


Figure 3: Corporate Taxes and Retail Prices

Notes: This figure shows percentile binned scatter plots of changes in prices $\Delta Log(Price_{t+1})$ and changes in corporate tax rates $\Delta Log(1-\tau_{c,t})$, inclusive of federal and state taxes. The left panel shows results for C-corporations, which pay corporate tax rate, while the right panel shows results for S-corporations, which pay at individual income tax rates. Retailer by sold-state by year fixed effects are absorbed. Source: Nielsen and GS1.

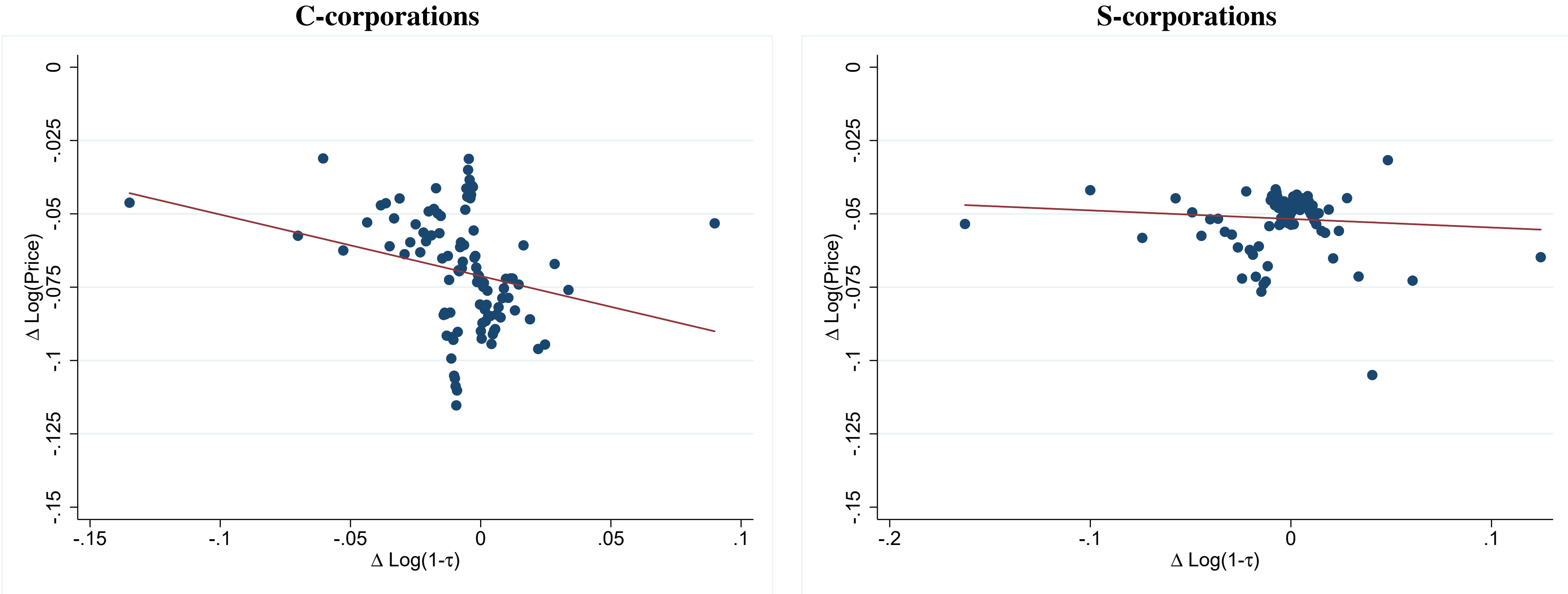


Table 1: Summary Statistics

This table shows summary statistics for the main analysis sample. Observations are at the UPC- Retailer Store - sold-state - Year level. The sale-weighted price is the average price of one UPC sold by a particular retailer at a state in one year, and it is weighted by the sold quantities. The sales are the dollar sales of a UPC product sold by a retailer in a state in a given year. Other variables are defined in the Appendix Table A.1. This panel shows all data, while the panel in the next page shows data for firms identified as C-corporations. Source: Nielsen and GS1.

	(1) Total Sample				
	Mean	Std. Dev.	25^{th} Pctl.	Median	75^{th} Pctl.
Sale-Weighted Price	6.71	10.89	2.29	3.99	7.59
Sales	7,317.68	45,365.99	68.36	479.59	2,924.36
Nexus-Based State Corporate Tax Rate	8.48	3.52	6.90	7.92	8.84
Nexus-Based Total Personal Income Tax Rate	41.82	6.26	39.01	40.79	44.05
State General Revenue (thousands)	96,456,818	74,206,349	41,213,212	62,004,987	146,972,023
State Total Revenue (thousands)	121,659,712	100,923,735	45,684,189	83,631,798	185,619,993
Property Tax Revenue (thousands)	598,295	982,175	0	8,052	815,756
Unemployment Rate	6.80	2.21	4.90	6.30	8.30
Unemployment Insurance Rate	7.88	1.80	6.20	8.15	9.00
Unemployment Insurance Base Wage	12,455	7,523	8,000	9,000	12,960
GDP (millions)	945,926	736,557	386,626	620,931	1,427,813
Throwout	0.05	0.24	0.00	0.00	0.00
Throwback	0.41	0.49	0.00	0.00	1.00
Observations			91,292,801		

Table 1: Summary Statistics (Continued)

This table shows summary statistics for the main analysis sample. Observations are at the UPC- Retailer Store - sold-state - Year level. The sale-weighted price is the average price of one UPC sold by a particular retailer at a state in one year, and it is weighted by the sold quantities. The sales are the dollar sales of a UPC product sold by a retailer in a state in a given year. Other variables are defined in the Appendix Table A.1. This panel shows data for firms identified as C-corporations. Source: Nielsen and GS1.

	(1) C-Corporations				
	Mean	Std. Dev.	25^{th} Pctl.	Median	75^{th} Pctl.
Sale-Weighted Price	6.71	10.02	2.49	4.29	7.59
Sales	8,300.06	49,363.87	88.45	615.71	3,602.16
Nexus-Based State Corporate Tax Rate	8.93	3.79	7.06	7.98	8.84
Nexus-Based Total Personal Income Tax Rate	41.56	5.62	38.98	40.23	44.05
State General Revenue (thousands)	95,856,593	69,232,832	41,353,995	62,101,023	140,881,819
State Total Revenue (thousands)	120,780,465	93,938,634	46,771,460	87,341,858	185,619,993
Property Tax Revenue (thousands)	515,822	907,795	0	250	755,937
Unemployment Rate	6.75	2.15	5.00	6.30	8.30
Unemployment Insurance Rate	8.14	1.69	6.20	8.50	9.10
Unemployment Insurance Base Wage	12,150	7,251	8,500	9,000	12,000
GDP (millions)	927,294	688,497	396,348	609,634	1,355,581
Throwout	0.03	0.17	0.00	0.00	0.00
Throwback	0.32	0.46	0.00	0.00	1.00
Observations			46,643,119		

Table 2: Corporate Taxes and Retail Prices

The table shows the relationship between retail prices and corporate taxes from OLS regressions. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the firm headquarter state level. Source: Nielsen and GS1. * $p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ^c)	-0.168***	-0.166***	-0.170***	-0.168***	-0.169***
	(0.0620)	(0.0610)	(0.0548)	(0.0542)	(0.0538)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table 3: Corporate Taxes and Retail Prices: Placebo Estimates

The table shows placebo estimates by repeating the analysis for S-corporations, which do not pay corporate taxes. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ^c)	-0.0375	-0.0414	-0.0501	-0.0498	-0.0506
	(0.0602)	(0.0609)	(0.0539)	(0.0541)	(0.0547)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	36,964,871	36,964,871	36,964,871	36,964,871	36,964,871

Table 4: Corporate Taxes and Retail Prices, Sales Apportionment

The table shows the relationship between retail prices and corporate taxes, interacted with a dummy of whether producers' headquarter state's sales apportionment ratio $\alpha_{sales} = 100\%$. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^c)	-0.205*	-0.205*	-0.241**	-0.240**	-0.242**
	(0.106)	(0.106)	(0.0972)	(0.0966)	(0.0954)
Log(1-τ^c) $\times$ $\mathbb{1}\{$Sales apportion $= 100\%\}$	0.198	0.201	0.287	0.285	0.287
	(0.184)	(0.182)	(0.179)	(0.178)	(0.177)
$\mathbb{1}\{$Sales apportion $= 100\%\}$	0.0883	0.0900	0.142	0.142	0.143
	(0.100)	(0.0998)	(0.0984)	(0.0980)	(0.0972)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table 5: Corporate Taxes and Retail Prices, Throwback and Throwout

The table shows the relationship between retail prices and corporate taxes for producers whose headquarter state's sales apportionment applying a throwback or a throwout rule ($\mathbb{1}\{\text{throwout}\}$, $\mathbb{1}\{\text{throwback}\}$). Results in the two panels are from separate regressions. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ^c)	-0.166***	-0.165***	-0.168***	-0.167***	-0.168***
	(0.0618)	(0.0608)	(0.0548)	(0.0542)	(0.0538)
Log(1 - τ^c) $\times$ $\mathbb{1}\{\text{throwout}\}$	-0.126	-0.130	-0.188**	-0.189**	-0.194**
	(0.103)	(0.102)	(0.0923)	(0.0916)	(0.0909)
Log(1 - τ^c)	-0.152**	-0.151***	-0.154***	-0.153***	-0.155***
	(0.0566)	(0.0554)	(0.0507)	(0.0500)	(0.0496)
Log(1 - τ^c) $\times$ $\mathbb{1}\{\text{throwback}\}$	-0.139	-0.137	-0.134	-0.134	-0.130
	(0.132)	(0.132)	(0.124)	(0.124)	(0.124)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table 6: Corporate Taxes, Retail Prices, with Additional State Controls

The table shows the relationship between corporate taxes and retail prices across products, adding additional state-level controls. These controls include state investment tax credits, R&D taxes and job creation tax credits and grants. State-level controls are measured at the state headquarter level. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. State-level tax incentive related state-level variables are those used in Heider and Ljungqvist (2015): (1) investment tax credits (2) upper and lower bounds of R&D tax credits (3) job creation tax credit indicators and (4) job creation grant indicators. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. Standard errors are clustered at the firm headquarter state level. Source: Nielsen and GS1. $^{*}p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^c)	-0.175***	-0.173***	-0.177***	-0.176***	-0.177***
	(0.0582)	(0.0572)	(0.0550)	(0.0544)	(0.0541)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Producer State Controls	**X**	**X**	**X**	**X**	**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table 7: Corporate Taxes and Retail Prices - Pass-through Heterogeneity

The table shows the relationship between corporate taxes and retail prices across products with different average customer incomes and average retail prices. $\mathbb{1}\{$<Median Income$\}$ is an indicator of whether an item is purchased by a household below the median income in the sample. $\mathbb{1}\{$<Median Price$\}$ is an indicator of whether an item is below the median price in the sample. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the firm headquarter state level. Source: Nielsen and GS1. $^*p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^c)	-0.0979*	-0.0972*	-0.114*	-0.113*	-0.114*
	(0.0550)	(0.0539)	(0.0584)	(0.0578)	(0.0577)
Log(1-τ^c) $\times$ $\mathbb{1}\{$<Median Income$\}$	-0.119**	-0.118**	-0.0892	-0.0887	-0.0887
	(0.0533)	(0.0544)	(0.0566)	(0.0568)	(0.0561)
Observations	45,359,352	45,359,352	45,359,352	45,359,352	45,359,352
Log(1-τ^c)	-0.0589	-0.0605	-0.112*	-0.111*	-0.111*
	(0.0682)	(0.0675)	(0.0629)	(0.0625)	(0.0620)
Log(1-τ^c) $\times$ $\mathbb{1}\{$<Median Price$\}$	-0.215***	-0.210***	-0.113**	-0.113**	-0.116**
	(0.0683)	(0.0669)	(0.0481)	(0.0484)	(0.0492)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table 8: Corporate Taxes, Retail Prices, and Debt

The table shows the relationship between corporate taxes and retail prices across products with different debt ratio or leverage. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. $\mathbb{1}\{<\text{Debt}\}$ is an indicator of whether a firm is below the median debt ratio. We compute the debt ratio as the ratio of the sum of current and long-term liabilities over total assets. Debt information is collected from Compustat. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as public firms in Compustat. Standard errors are clustered at the firm headquarter state level. Source: Nielsen, GS1 and Compustat. $^*p < .1$, $^{**}\ p < .05$, $^{***}\ p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^c)	0.123	0.119	0.0900	0.0868	0.0799
	(0.331)	(0.328)	(0.275)	(0.273)	(0.271)
Log(1-τ^c) $\times$ $\mathbb{1}\{<\text{Median Debt}\}$	-0.104	-0.104	-0.162**	-0.161**	-0.160**
	(0.0998)	(0.0967)	(0.0762)	(0.0756)	(0.0748)
$\mathbb{1}\{<\text{Median Debt}\}$	-0.0976	-0.0972	-0.135**	-0.134**	-0.133**
	(0.0724)	(0.0700)	(0.0556)	(0.0550)	(0.0543)
Controls	**X**	**X**	**X**	**X**	**X**
UPC$\times$Retailer$\times$Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State$\times$Year		**X**		**X**	
Retailer$\times$Year			**X**	**X**	
Sold State$\times$ Retailer$\times$Year					**X**
Observations	22,115,113	22,115,113	22,115,113	22,115,113	22,115,110

A Model and Incidence

A.1 Model Details

This appendix provides further context for our motivating model, and derives the main expression in section 2.2 which provides a basis for our empirical strategy and subsequent analysis of incidence. We assume firms operate in a monopolistically competitive environment similar to De Loecker (2011) and Suárez Serrato and Zidar (2016). Firms are endowed with some productivity level B, and combine labor, L and capital K to produce output y with the following production function,

$$y = B \cdot L^{\gamma} K^{1-\gamma} \tag{6}$$

Firms take input prices as given and the output price p is given by an inverse demand curve from CES demand with $y = I \cdot (\frac{p}{\bar{p}})^{\varepsilon}$, where $\bar{p}$ is the price level and is normalized to 1 and $\varepsilon < 0$, is the demand elasticity. The firm maximizes profits, which are taxed at a rate τ. The firm thus solves

$$\max_{L,K} (1-\tau) \cdot (p \cdot y - w \cdot L) - \rho \cdot K \tag{7}$$

where w is the wage rate for labor, and ρ is the rate of return for capital.

Inserting the price equation into the objective function yields the firm's problem:

$$\max_{L,K} (1-\tau)(y^{\frac{1}{\mu}} I^{-\frac{1}{\varepsilon}} - w \cdot L) - \rho \cdot K \tag{8}$$

Where the markup $\mu \equiv [\frac{1}{\varepsilon} + 1]^{-1}$ is constant due to CES demand. The solution yields for L:

$$\frac{y^{\frac{1}{\mu}}}{\mu} \cdot \frac{\gamma}{L} \cdot I^{-\frac{1}{\varepsilon}} = w \tag{9}$$

We solve for K and obtain a similar expression:

$$\frac{y^{\frac{1}{\mu}}}{\mu} \cdot \frac{1-\gamma}{K} \cdot I^{-\frac{1}{\varepsilon}} = \rho(\frac{1}{1-\tau}) \tag{10}$$

Comining 8 and 10 with the firm's production function $y = BL^{\gamma}K^{1-\gamma}$ and solving for p

yields the equation below, which directly motivations our main estimating equation and empirical strategy.

$$ln(p) = -(1-\gamma)ln(1-\tau) + (1-\gamma)ln(\rho) + \gamma ln(w) + Z \tag{11}$$

where Z is a constant and given by

$$Z = -ln(B) - ln(\frac{1}{\varepsilon} + 1) - (1-\gamma)ln(1-\gamma) - \gamma ln(\gamma) \tag{12}$$

A.2 Incidence Calculations

We further extend the framework of Fuest, Peichl and Siegloch (2018) and consider three agents in this setting: the firm owner at state h, the worker from state h and the consumer from state s ($h \neq s$). We evaluate the tax burden by relating the welfare change of consumers paying higher prices induced by the corporate tax change from other states to the sum of welfare changes of firm owners, workers and consumers.

The firm owner's welfare change relates to the following value function:

$$V_f = max_{K,L_h}(1-\tau_h^c)(pF(K,L_h) - w_h L_h) - rK \tag{13}$$

Here the K is capital, L_h is the local labor amount employed by the firm at state h and r is the return rate on capital. Taking the differential, and noting that $\frac{\partial V_f}{\partial L_h} = 0$, $\frac{\partial V_f}{\partial K} = 0$ from optimization, we have dV_f is equivalent to:

$$\frac{\partial V_f}{\partial K} \cdot (K_p dp + K_{\tau_h^c} d\tau_h^c) + \frac{\partial V_f}{\partial L_h} \cdot (L_{h,p} dp + L_{h,\tau_h^c} d\tau_h^c) + \frac{\partial V_f}{\partial p} \cdot dp + \frac{\partial V_f}{\partial \tau_h^c} \cdot d\tau_h^c = \frac{\partial V_f}{\partial p} \cdot dp + \frac{\partial V_f}{\partial \tau_h^c} \cdot d\tau_h^c \tag{14}$$

The term above can be rewritten as:

$$(1-\tau_h^c)F(K,L_h)dp - (pF(K,L_h) - w_h L_h)d\tau_h^c \tag{15}$$

The consumer's welfare change stems from each consumer maximizing the utility function $U(C_s, L_s)$, subject to the budget constraint: $p \cdot C_s = (1-\tau^p)w_s L_s$, where p is the price for the goods, C_s is the quantity purchased, τ^p is the personal income tax, w_s is the wage received by consumer and L_s is the labor. Since the consumer in our analysis is not from the same producer state where there is a tax shock, we assume the wage and labor supply, w_s and L_s, will not change. The consumer's welfare will be changed only by the price of products purchased. Then, the value function of the consumer is a function of the price:

$$V_{cons}(p) = U(C_s, L_s) - \lambda(pC_s - (1-\tau^p)w_s L_s) = U(C_s, L_s) - (pC_s - (1-\tau^p)w_s L_s) \quad (16)$$

Note that $\lambda = 1$ is due to the assumption that the marginal utility of income is normalized to unity. Taking the differential of the value function, and noting that here $\frac{\partial V_{cons}}{\partial L_s} = 0$, $\frac{\partial V_{cons}}{\partial C_s} = 0$ are due to optimization, we have:

$$dV_{cons} = \frac{\partial V_{cons}}{\partial C_s} C_{s,p} \cdot dp + \frac{\partial V_{cons}}{\partial L_s} L_{s,p} \cdot dp + \frac{\partial V_{cons}}{\partial p} \cdot dp = \frac{\partial V_{cons}}{\partial p} \cdot dp = -C_s \cdot dp \quad (17)$$

The local worker in the producer state maximizes the utility function, $U(C_h, L_h)$, subject to the constraint, $pC_h = (1-\tau^p_h)w_h L_h$. We assume locally that the price of goods will not change, therefore welfare of the worker is changed only due to the wage, w_h, received, and the value function of the worker is a function of the wage. The corresponding value function is:

$$V_{wkr_h}(w_h) = U(C_h, L_h) - \lambda(pC_h - (1-\tau^p_h)w_h L_h) = U(C_h, L_h) - (pC_h - (1-\tau^p_h)w_h L_h) \quad (18)$$

where λ is unity for the same normalization purpose as in the consumer problem. Taking the differential of the value function, where again $\frac{\partial V_{wkr_h}}{\partial L_h} = 0$, $\frac{\partial V_{wkr_h}}{\partial C_h} = 0$ due to worker optimization, we have:

$$dV_{wkr_h} = \frac{\partial V_{wkr_h}}{\partial C_h} C_{h,w_h} \cdot dw_h + \frac{\partial V_{wkr_h}}{\partial L_h} L_{h,w_h} \cdot dw_h + \frac{\partial V_{wkr_h}}{\partial w_h} \cdot dw_h = \frac{\partial V_{wkr_h}}{\partial w_h} \cdot dw_h = (1-\tau^p_h) L_h \cdot dw_h \quad (19)$$

We can thus write the share of the tax burden on the consumer, the firm and the worker using the above framework. The tax burden share of the consumer would be the following formula:

$$I_{cons} = \frac{dV_{cons}}{dV_{cons} + dV_{wrk_h} + dV_f} \quad (20)$$

As a consequence, the incidence on consumers is given by:

$$I_{con_s} = \frac{-C_s \frac{dp}{d\tau}}{-C_s \frac{dp}{d\tau} + (1-\tau_h^p) L_h \frac{dw_h}{d\tau} + (1-\tau_h^c) F(K, L_h) \frac{dp}{d\tau} - (pF(K, L_h) - w_h L_h)} \tag{21}$$

The paper estimates the price elasticity with respect to corporate tax as: $\delta_p = \frac{\frac{dp}{p}}{\frac{d(1-\tau)}{1-\tau}} = \frac{dp}{d\tau}(-\frac{(1-\tau)}{p})$. The wage elasticity is given by $\delta_{w_h} = \frac{\frac{dw_h}{w_h}}{\frac{d(1-\tau)}{1-\tau}} = \frac{dw_h}{d\tau}(-\frac{1-\tau}{w_h})$. Combining the relevant elasticities into equation (21), we have the incidence formula:

$$I_{con_s} = \frac{pC_s\delta_p}{pC_s\delta_p - (1-\tau_h^p) w_h L_h \delta_{w_h} - (1-\tau_h^c) pF(K, L_h)\delta_p - (1-\tau_h^c)(pF(K, L_h) - w_h L_h)} \tag{22}$$

Moreover, the consumption share over the output is $s_{con} = \frac{pC_s}{pF(K,L_h)}$, and the labor share is $s_{labor} = \frac{w_h L_h}{pF(K,L_h)}$. Inserting the shares into the incidence, we have:

$$I_{con_s} = \frac{s_{con}\delta_p}{s_{con}\delta_p - (1-\tau_h^p) s_{labor}\delta_{w_h} - (1-\tau_h^c)\delta_p - (1-\tau_h^c)(1-s_{labor})}$$

Similarly, the incidence on the worker is given by:

$$I_{wrk_h} = \frac{dV_{wrk_h}}{dV_{con_s} + dV_{wrk_h} + dV_f} \tag{23}$$

$$= \frac{-(1-\tau_h^p) s_{labor}\delta_{w_h}}{s_{con}\delta_p - (1-\tau_h^p) s_{labor}\delta_{w_h} - (1-\tau_h^c)\delta_p - (1-\tau_h^c)(1-s_{labor})}$$

And the incidence on the firm owners' can be written:

$$I_f = \frac{dV_f}{dV_{con_s} + dV_f + dV_{wrk_h}}$$

$$= \frac{-(1-\tau_h^c)\delta_p - (1-\tau_h^c)(1-s_{labor})}{s_{con}\delta_p - (1-\tau_h^p) s_{labor}\delta_{w_h} - (1-\tau_h^c)\delta_p - (1-\tau_h^c)(1-s_{labor})} \tag{24}$$

To quantify the magnitude of the corporate tax pass-through, we use our estimated elasticity δ_p with other economic statistics into the formula above. The parameters we used are:

1) $s_{con} = 0.675$

2) $s_{labor} = 0.58$

3) $\delta_w = 0.4$

4) $\tau_h^c = 0.55$

5) $\tau_h^p = 0.40$

Combined with the estimated price elasticity with respect to the tax, $\delta_p = -0.17$, we calculate the tax incidence on consumers, firm owners and workers are 31%, 31%, and 38%, respectively.

B Nielsen Consumer Panel

In our main analysis, we use the Nielsen Retail Measurement Services (RMS) data. We replicate our main findings with a sample of the Nielsen Consumer Panel, which surveys consumers rather than retailers. The Nielsen Consumer Panel (NCP; formerly known as 'Homescan' data) contains 40,000-60,000 American households across 52 metropolitan areas, spanning the years of 2004-2017 and covering almost 2 million unique items purchased. The panel is constructed as a representative sample of the American population and is tracked through the inclusion of numerous demographic indicators, including the location of the household.

Nielsen attempts to ensure high levels of participation among households in the panel through regular reminders that go out to households, encouraging them to report purchases and trips fully. Prizes, both monetary and in-kind, are utilized to incentivize high levels of continued engagement among participant households, and households that seem to be reducing levels of reporting are removed from the sample periodically. Including these non-compliers, about 20% of households exit from the sample each year, with the average tenure in-sample being about 4 years.[17]

The NCP mostly covers trips to pharmacies, grocery stores, and big-box/mass-merchandise stores. Consequently, the products generally span groceries, drugs and sundries, small electronics and household appliances, home furnishings (though generally not large furniture), garden and kitchen equipment, and some soft goods. While somewhat limited in scope (eg. the data excludes services, rents and mortgages, restaurants), the NCP covers a substantial fraction of household

[17] Broda and Weinstein (2010) and Einav, Leibtag and Nevo (2010) provide more detail and analysis of the NCP. In general, they find accurate coverage of household spending and non-imputed prices.

spending on non-services: approximately $375 of spending per household per month. This constitutes about 30% of all household expenditures on goods in the CPI basket.The ultimate matched sample takes account of 65% annual sales (65% monthly sale) of the persistent sample and thus, covers 15% annual sale of the Homescan database. This matched sample also covers 50% unique UPC in the persistent sample which is 2% UPC in the Homescan database.

C Market Structure

We investigate the heterogeneity of the pass-through regarding the market competition. To measure the level of market competition, we calculate the HHI index for each product market, using the product group information in the Retailscan. The Retailscan offers detail categorization of each product. There are 125 product groups and 1,075 product modules stored in the Nielsen RMS data. Product group is a broader categorization, while the product module is a more granular definition. The examples of product group are beer and coffee, candy, whereas the corresponding product modules are light beer, near beer, coffee - soluble flavored and so on.

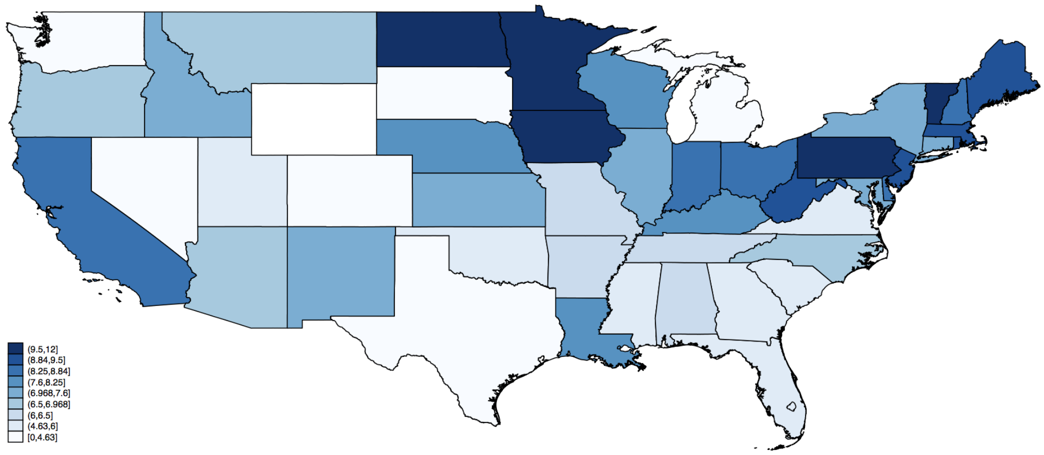
We define each combination of product module - retailer - state as a separate market and calculate the HHI for each of them at different years. We first aggregate a company's sales in one market in one year and then estimate the market share. By summing up the square of market shares, we get the HHI for the market in each year. Note that we have distinguished the product market across different regions. This market concentration measure will refect the geographical heterogeneity and is more informative in representing the competition level in the local product market.

The product module of one UPC may change within one year, and since we aggregate the product prices within one year into one observation, it is not obvious to assign a product market to the yearly observation if the product module changes. Therefore, based on our main sample, we further restrict to UPCs that don't change their categorization within one year. This restriction makes the number of observations drop by 0.6%. In our final sample, the median of the HHI is 0.15, and the mean of the HHI is 0.26, with standard deviation of 0.28. Results are suggestive of a lower tax pass-through in a more competitive market.

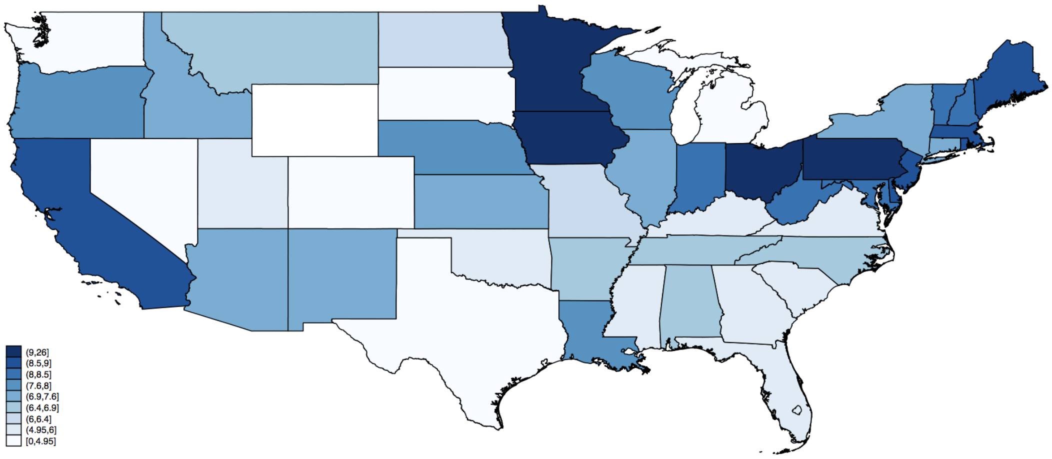
Figure A.1: State Corporate Taxes Over Time

Notes: This figure shows corporate tax rates across states in 2004, 2010 and 2017. Maximum corporate tax rates are displayed. Source: Giroud and Rauh (2019) and Tax Foundation.

2004



2010



2017

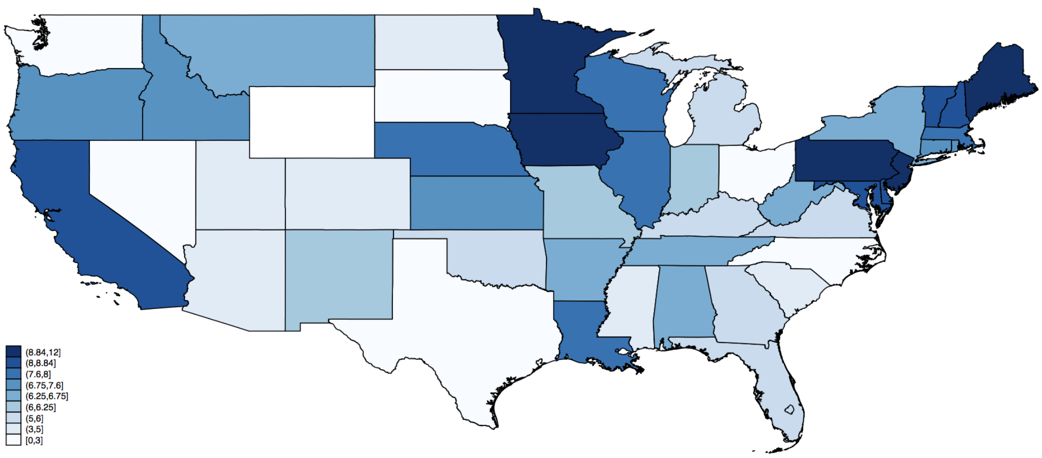


Figure A.2: Distribution of Tax Rates

Notes: This figure shows the density of state corporate tax rates tax rates in 2005 and 2017.

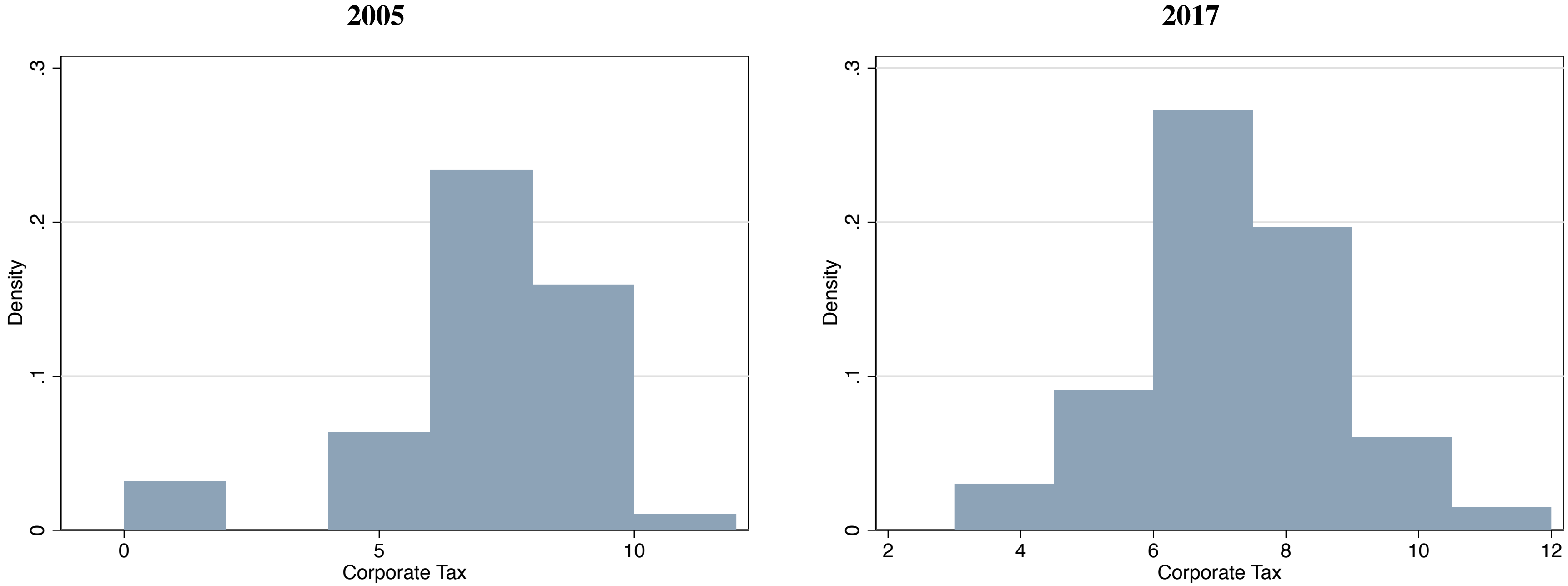


Figure A.3: Distribution of Tax Rate Changes

Notes: This figure shows the change in state corporate tax rates between 2017 and 2005.

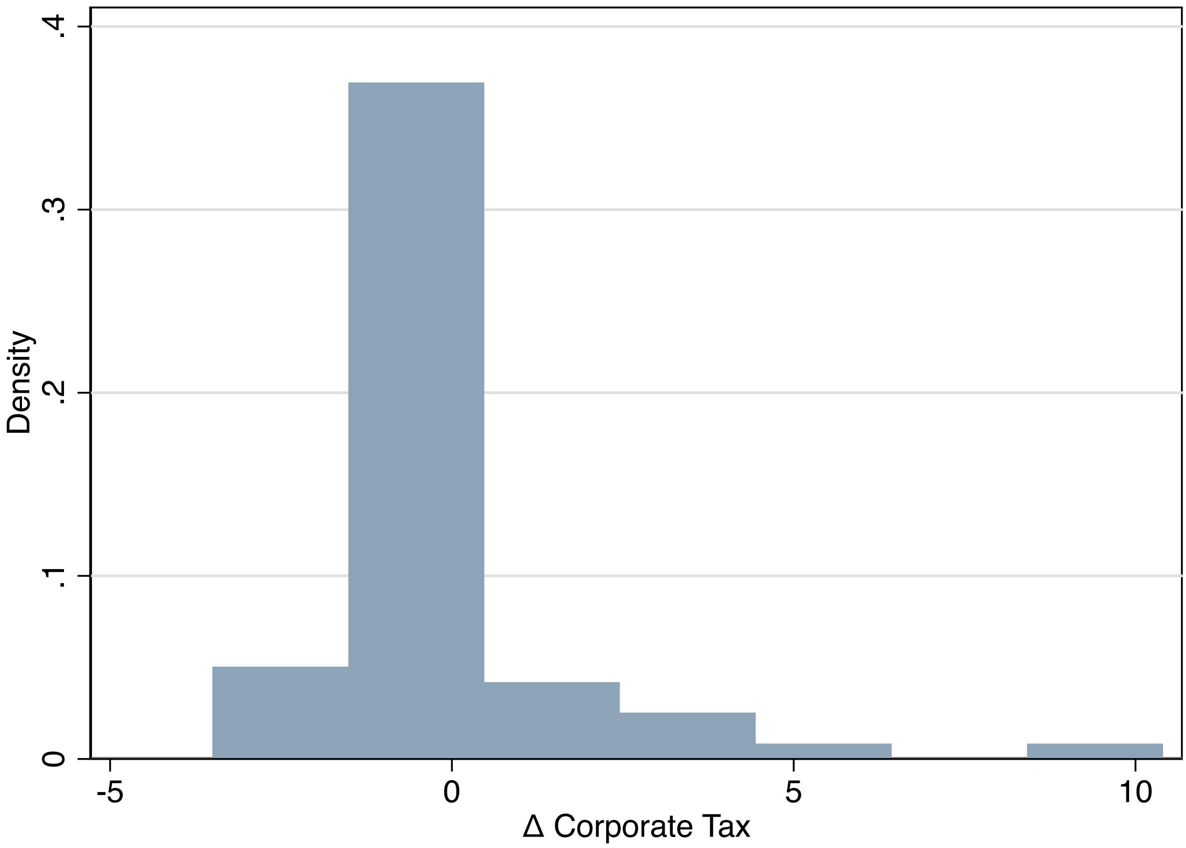


Figure A.4: Prices Following Large Tax Changes

Notes: This figure shows the impact on product prices of a one percentage point or greater change in corporate tax rate over time. The left panel shows the response following an increase, while the right panel shows the response following a decrease. The figure plots coefficients β_i from the following specification: $\ln(p_{i,f,r,s,t}) = \alpha_y + \sum_{n=-2}^{n=3} \beta_n \mathbb{1}[t = n] + \gamma_1 X_{i,t} + \gamma_2 X_{f,t} + \varepsilon_{i,f,r,s,t}$. The solid line denotes point estimates. The shaded area denotes a 95% confidence interval. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1.

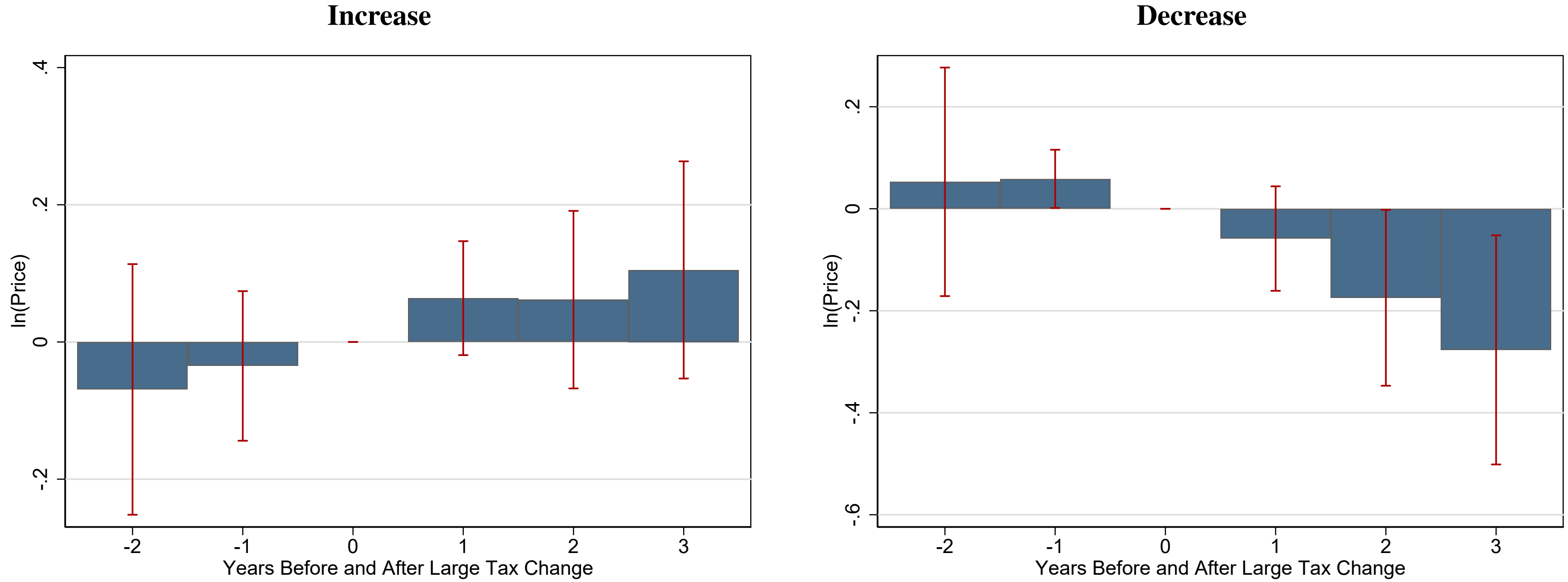


Table A.1: Main Variable Descriptions

Name	Source	Description
Price	Nielsen Homescan	Price of a UPC sold by a retailer in a state. The price data is aggregated to compute the weighted average price of that item sold at this retailer in each state. The price is weighted by the quantity sold.
Sales	Nielsen Homescan	Annual sale for each UPC- retailer-sold-state pair.
Corporate Income Tax	Various	The state corporate income tax rate for each state in different years. This is obtained from the State Tax Handbook, the Tax Foundation (2006-2011), the Book of States, and the state Tax Policy Center (2013-2017)
Personal Income Tax	NBER	The state personal income tax rate for each state.
Nexus-Based Corporate Tax Rate	Infogroup	We aggregate the state corporate tax rates to the firm level according to its distribution of sale and employee. The company's sale share and employee share in each state are obtained from Infogroup.The nexus-based personal income tax is computed analogously.
Property Apportionment	State Tax Handbook	Weight assigned to the property factor in the apportionment formula. The multi-state firms must apportion its profits according to the formula when deciding how much tax it should pay.
Sales Apportionment	State Tax Handbook	Weight assigned to the sales factor in the apportionment formula. The multi-state firms must apportion its profits according to the formula when deciding how much tax it should pay.
Throwback	State Tax Handbook	Indicator of whether a state has adopted a throwback rule when calculating the taxable income. Under the throwback rule, the state requires the firms to add sales that are to buyers in a state where the company has no nexus.
Throwout	State Tax Handbook	Indicator of whether a state has adopted a throwout rule when calculating the taxable income. The sales that are to buyers in a state where the company has no nexus are called nowhere sales. Under the throwout rule, the state requires the firms to subtract the nowhere sales from total sales (the denominator), and thereby increasing the apportion weights.
Property Tax Revenue	Census	Total property tax revenue in a given year.
State Total Revenue	Census	Total state tax revenue in a given year.
State General Revenue	Census	Total state general revenue in a given year.
GDP	BLS	State GDP in millions of dollars.
Unemployment Insurance Base	State UI Laws	Maximum wage base subject to state unemployment insurance tax.
Unemployment Insurance Rate	State UI Laws	Maximum unemployment insurance rate at each state in a given year.
Unemployment Rate	BLS	State unemployment rate.

Table A.2: Summary Statistics for Sample Construction

This table describes the main analysis sample. It shows the number of observations after each data merge, along with the number of product codes, producers, C-Corporations and basic summary statistics for total sales.

Sample	# Obs.	# UPCs	# Producers	# C-Corps	Total $ Sales			
					Mean	25th	Median	75th
Full UPC Sample	264,194,038	1,990,373	-	-	8,684	70	516	3,243
Matched GS1 Sample	227,702,908	1,561,623	40,183	-	7,871	65	471	2,953
Matched Orbis Sample	207,795,462	1,413,159	32,656	4,996	7,436	63	454	2,823
Matched Infogroup Sample	96,590,167	748,074	17,150	2,976	7,744	70	492	3,041
Exclude Sold In-State	92,510,596	713,590	15,530	2,836	7,306	69	479	2,920
Matched Control Variables	91,292,801	697,792	14,781	2,713	7,318	68	480	2,924
C-Corporations	50,097,156	271,482	2,713	2,713	7,850	73	535	3,258
Final Sample (drop singleton obs)	46,643,119	220,388	2,437	2,437	8,300	88	616	3,602

Table A.3: Corporate Taxes and Retail Prices Using Nielsen Homescan Data

The table replicates the analysis in Table 2 and also accounts for apportionment factors. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured as the average tax rate weighted by the apportionment factors. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. We restrict the products to those that have been consumed in one retailer chain at one state for at least 24 consecutive months, to minimize the effects of rapid entry and exit of products. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^c)	-0.217**	-0.220**	-0.205**	-0.180**	-0.194**
	(0.0898)	(0.0884)	(0.0780)	(0.0783)	(0.0851)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	352,328	352,328	352,328	352,328	352,328

Table A.4: Corporate Taxes and Retail Prices, Alternative Tax Nexus (HQ)

The table shows the relationship between retail prices and corporate taxes from weighted regressions. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured based on apportionment formulas and the state where a firm is located. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates as well as state-level tax incentive variables used in Heider and Ljungqvist (2015). The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the state level. Source: Nielsen and GS1. $*p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^c_{HQ})	-0.101***	-0.0984**	-0.0988**	-0.0979**	-0.0982**
	(0.0373)	(0.0366)	(0.0379)	(0.0375)	(0.0367)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Product Group × Year	**X**	**X**	**X**	**X**	**X**
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,367,279	46,367,279	46,367,279	46,367,279	46,367,279

Table A.5: Corporate Taxes and Retail Prices, Sales Weighted

The table shows the relationship between retail prices and corporate taxes from OLS regressions. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the firm headquarter state level. Results are weighted by sales. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ^c)	-0.164***	-0.163***	-0.165***	-0.164***	-0.165***
	(0.0588)	(0.0578)	(0.0530)	(0.0525)	(0.0522)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table A.6: Corporate Taxes and Retail Prices, Clustering at Firm Level

The table shows the relationship between retail prices and corporate taxes. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the firm level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ^c)	-0.168**	-0.166**	-0.170**	-0.168**	-0.169**
	(0.0830)	(0.0816)	(0.0768)	(0.0760)	(0.0758)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,643,119	46,643,119	46,643,119	46,643,119	46,643,119

Table A.7: Placebo Test Using Personal Income Tax

The table replicates the analysis in Table 2 using personal incomes taxes, which C corporations do not pay. Retail prices are measured in the geographic location where a good is sold. Personal taxes are measured at the state in which a company is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ^p)	-0.0254	-0.0247	-0.0162	-0.0160	-0.0159
	(0.0245)	(0.0244)	(0.0231)	(0.0230)	(0.0231)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,619,664	46,619,664	46,619,664	46,619,664	46,619,664

Table A.8: Placebo Test Using 100% Sales Apportionment

The table replicates the analysis in Table 2 using states with 100% sales apportionment. Retail prices are measured in the geographic location where a good is sold. Personal taxes are measured at the state in which a company is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1)	(2)	(3)	(4)	(5)
			Log(Price)		
log(1 - τ_c)	0.136	0.139	0.199	0.200	0.201
	(0.373)	(0.369)	(0.324)	(0.322)	(0.319)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	22,504,354	22,504,354	22,504,354	22,504,354	22,504,352

Table A.9: Corporate Taxes and Retail Prices, SIC $\times$ Year Fixed Effect

The table shows the relationship between retail prices and corporate taxes from OLS regressions. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. Additionally, we include the 2 digits SIC by year fixed effect. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the firm headquarter state level. Source: Nielsen and GS1. $*p < .1$, $**\ p < .05$, $***\ p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
log(1 -τ_c)	-0.276**	-0.272**	-0.230**	-0.229**	-0.229**
	(0.106)	(0.104)	(0.0925)	(0.0912)	(0.0908)
Controls	**X**	**X**	**X**	**X**	**X**
UPC$\times$Retailer$\times$Sold State	**X**	**X**	**X**	**X**	**X**
Two Digit SIC $\times$ Year	**X**	**X**	**X**	**X**	**X**
Sold State$\times$Year		**X**		**X**	
Retailer$\times$Year			**X**	**X**	
Sold State$\times$ Retailer$\times$Year					**X**
Observations	45,436,515	45,436,515	45,436,515	45,436,515	45,436,515

Table A.10: Corporate Taxes and Retail Prices, Product Group × Year Fixed Effect

The table shows the relationship between retail prices and corporate taxes from OLS regressions. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. Additionally, we include the product group by year fixed effect. The sample is restricted to firms that we can identify as C-corporations. Standard errors are clustered at the firm headquarter state level. Source: Nielsen and GS1. $^{*}p < .1$, $^{**}\ p < .05$, $^{***}\ p < .01$.

	(1)	(2)	(3)	(4)	(5)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
log(1 -τ_c)	-0.152***	-0.150***	-0.140***	-0.140***	-0.141***
	(0.0437)	(0.0431)	(0.0426)	(0.0423)	(0.0417)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Product Group × Year	**X**	**X**	**X**	**X**	**X**
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,367,279	46,367,279	46,367,279	46,367,279	46,367,279

Table A.11: Corporate Taxes, Retail Prices and Market Concentration

The table shows the relationship between retail prices, corporate taxes and market concentration.Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured via an estimate of the tax nexus. The inclusion of controls and fixed effects is denoted beneath each specification. Controls include logged forms of total product level sales, state property tax revenues, total and general state revenue, state GDP, UI base wage and insurance rates, as well as state unemployment rates. The sample is restricted to firms that we can identify as C-corporations. We extract product module information and calculate the HHI within each product module market. The product module market is defined by product module, sold-state and the retailer. Then, we divide goods into two groups according to their market concentration. The sample is restricted to firms that we can identify as C-corporations and that have market concentration information. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

	(1) Log(Price)	(2) Log(Price)	(3) Log(Price)	(4) Log(Price)	(5) Log(Price)
Log(1-τ^c)	-0.350***	-0.342***	-0.293***	-0.290***	-0.288***
	(0.127)	(0.124)	(0.101)	(0.101)	(0.0984)
Log(1-τ^c) * $\mathbb{1}\{$ <Median HHI$\}$	0.198*	0.191*	0.134	0.132	0.129
	(0.104)	(0.103)	(0.107)	(0.107)	(0.105)
Controls	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**
Year	**X**				
Sold State×Year		**X**		**X**	
Retailer×Year			**X**	**X**	
Sold State× Retailer×Year					**X**
Observations	46,367,280	46,367,280	46,367,280	46,367,280	46,367,280