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 endogeneity of state tax changes as well as confounding demand shocks. We find significant effects of corporate taxes on prices with an elasticity of 0.27. The effects are largest for lower-price items and products purchased by low-income households. Approximately 41% 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, 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) has focused on the incidence of corporate taxes on shareholders,[1] and more recent work has focused on 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 effects of corporate tax changes on consumer prices. While the passage of the 2017 Tax Cuts and Jobs Act instituted the biggest federal corporate tax cut in recent American history, models used by policy makers assume that corporate taxes are fully incident on capital and labor, rather than consumers (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 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).

There are two significant challenges to identifying the effects of 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 which produce those items. Tax rates in the location where the transaction occurs cannot be relied upon as the relevant rate since firms that produce goods are often located in states other than the states where goods are sold.

We deal with the first empirical challenge by utilizing the fact that if a firm has tax nexus

[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.

(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 nexus. We use tax changes in the states where firms' headquarters are located, and study the impact on retail prices in other states in which their products are sold. 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 the same spirit as 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 the same retailer in the same state and year, but whose producer firms face different levels of corporate taxation due to their tax nexus location in other 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 which 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 Consumer Panel, a representative panel of households in 52 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 different 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 estimates are motivated by a simple model of corporate tax incidence. We find an elasticity of retail prices to corporate tax rates of approximately 0.27, meaning that a one percent increase in corporate tax rates leads to a 0.27 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 0.38. This estimate is in line with those found in Germany by Fuest, Peichl and Siegloch (2018) and serves as a plausibility check for our price elasticity. Informed by our empirical estimate, we can gauge the incidence of corporate taxes on consumers. We find the incidence on consumers, workers and shareholders is 41%, 24% and 35%, 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 32% and 68% of the tax burden, respectively.

We also demonstrate important heterogeneous effects across products. We find that the lowest price goods tend to respond most to corporate tax changes, with average magnitudes almost twice as high for this 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.

We complement our main analysis with a graphical event study, using large tax increases and cuts, 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 prices 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 which are unlikely to be subject to corporate taxes: S-corporations. 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 causal effects of corporate tax changes, we should find that the price effects of corporate taxes to be only present for C-corporations and not for S-corporations. This placebo analysis is implemented with a specification similar to Giroud and Rauh (2019). We find positive and significant price effects for C-corporations seeing corporate income tax rates change. 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.[2]

Our paper links closely to a 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 was borne

[2] We see positive, albeit insignificant, effects on S-corporations of personal income tax changes. The insignificant results could be due to the fact that, while in our sample while we can accurately identify C-corporations, S-corporations are only noisily identified.

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 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, and 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) and risk-taking (Ljungqvist, Zhang and Zuo, 2017). 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.

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 effects 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 rather 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 demonstrates that approximately 41% of the total incidence of corporate taxation falls on consumers, through higher product prices.

The remainder of this paper is organized as follows. Section 2 discusses our setting, presents a theoretical 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 concludes and discusses avenues for future research.

2 The Price Effects of Corporate Taxes

2.1 Mechanics of Corporate Taxes

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

2.2 Model

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

[3] See Giroud and Rauh (2019) and Heider and Ljungqvist (2015) for a detailed discussion of corporate tax nexus. The precise tax nexus 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.

[4] Appendix A provides further model details.

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 prices, p, will depend on corporate taxes τ and motivates $\ln(1-\tau)$. The particular functional form for the empirical analysis follows recent important papers, Fuest, Peichl and Siegloch (2018) and Suárez Serrato and Zidar (2016).[5]

2.3 Empirical Approach

Our empirical approach relies on the fact that, if a firm has employees and property in a state h, but sales in many states, then a firm's profits will be primarily subject to the corporate tax laws of state h. We compare tax rate changes in a firm's headquarter state h, and observe price changes in other states s where the produced items are sold by retailers. The approach allows us to include state by retailer by year fixed effects, so we can compare retail prices of items *within the same state and year and sold by the the same retailer*. 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.

A product i is produced by a firm headquartered in state h, 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.

$$\ln(p_{i,h,r,s,t+1})=\alpha_{r,s,t+1}+\alpha_{i,r,s}+\beta\ln(1-\tau_{c,h,t})+\gamma_1X_{i,t}+\gamma_2X_{h,t}+\varepsilon_{i,h,r,s,t+1} \tag{3}$$

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

where $p_{i,h,r,s,t+1}$ is the retail price of product i from a firm headquartered in state h sold by retailer r in state s at time $t + 1$ and $\tau_{c,h,t}$ is the corporate tax rate in the state in which the firm that produces an item is headquartered, h at time t. We include product specific controls $X_{i,t}$, as well as firm headquarter state controls $X_{h,t}$. These include 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. $\varepsilon_{i,h,r,s,t+1}$ is an error term, which we assume is conditionally orthogonal to $(1 - \tau_{c,h,t})$. We cluster standard errors at the headquarter state level.

We include product fixed effects α_i 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, the product fixed effects α_i also absorb the time invariant effects of headquarters states h. For example, the UPC fixed effects capture the fact that some producers may be headquartered in states with better transportation networks, which could lower final product prices.

An important feature of our strategy is the fact that we include sold state by retailer by time 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. The fact that these include retailer by time fixed effects also captures time specific retailer shocks, such as a major national chain declining in popularity. Our empirical specification thus compares items sold in the same state at the time, but whose producer companies face different levels of corporate taxation due to their headquarters being located in different states.

3 Data

We utilize the Nielsen Consumer Panel (NCP) data to construct a database of prices at the retailer-state-UPC-month 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. To minimize issues of rapid entry and exit of products, we restrict the sample to the UPCs that have been consumed in one retailer chain at one state for at least 24 consecutive months. In total, this selection accounts for about 4% of UPCs and 23% of aggregate sales in the NCP database. We then match this sample with the GS1 producer information via UPC matching, in a similar approach as Kim (2018).

We link the NCP price and purchase data to retailers utilizing a database of UPCs from the GS1 Company. The firm offers a method to map UPCs to products and to individual producers in order to help firms manage their inventory. Each UPC acts as a unique identifier for a product (eg. a 20-ounce plastic bottle of Coca-Cola Classic) and allows us to link a purchase and price in the NCP data to information about the firm that produced each item. This data includes the location of the firm's headquarters which we utilize to identify the applicable state-level corporate tax rate for each product and firm.[6] We additionally link firms to the ORBIS database, which contains administrative and ownership data for firms.

Finally, 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 use alongside data on S-corporations and prices. In addition to the tax rates, we extract apportionment rate and throw-back/throw-out rules from the Commerce Clearing House's State Tax Handbooks up through 2017.

Table 1 shows summary statistics for the main analysis variables.[7] Table A.2 shows statistics on the various steps taken to link the different datasets and construct our final sample.

3.1 Nielsen Consumer Panel Data

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.

[6] We follow Heider and Ljungqvist (2015) and measure tax changes at the state headquarter level. In appendix C we utilize a different measure of tax nexus, loosely following Suárez Serrato and Zidar (2016).

[7] Table A.1 describes the main analysis variables.

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.[8]

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 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.

3.2 GS1 Barcode Data

The GS1 Company data allows us to derive UPC level linkages between items and their producers (Kim, 2018), giving a relatively comprehensive match for retail-good-producing firms. 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 manufacturers. Moreover, the linkages should be unique for a product and will be 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 singular 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.

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

3.3 Orbis Data

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 some 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 recent available date. There is a reporting lag in Orbis data of roughly two years. Since we download the data in 2019, the latest available year is 2017 or occasionally 2016.

According to the definition of an S-corporation (seen at 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 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 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 manually match the name 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.

4 Main Results

4.1 Main Estimates of Tax Elasticity

Table 2 presents estimates of equation (3), using weighted ordinary least squares, where the weights are product level sales.[9] All specifications include UPC by retailer by sold state fixed effects, and other controls noted in section 2.3. Column (1) includes only controls and UPC by retailer by sold state fixed effects. The estimates suggest large declines in retail prices stemming from corporate tax changes, with an elasticity of prices to corporate tax rates of approximately 0.428. The estimates are statistically significant at the 0.01 level. The estimates in column (1) may suffer from bias stemming from corporate tax changes being correlated with macroeconomic conditions. To address this concern, column (2) adds in year fixed effects. The estimates remain statistically significant, and the estimates of the elasticity of prices to corporate tax rates drops to approximately 0.297.

To further control for state specific economic conditions, column (3) 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. Column (4) adds in 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 falls to 0.279 but remains statistically significant at the 0.01 level. The estimates in column (4) are also statistically indistinguishable from the estimates in column (3).

[9] Appendix table A.3 shows that the main results are robust to equally weighting regressions.

Column (5) includes both sold state by year and retailer state by year fixed effects. The estimates remain very similar to those in column (4). Finally, column (6) adds in sold state by retailer by year fixed effects. The results again remain very similar to those in column (4), and statistically significantly different than zero at the 0.01 level.

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 29 large tax changes in our sample, including 10 tax increases and 19 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. In the three years following an increase in corporate taxes of 1%, prices tend to fall by about 0.2-0.4%.

4.2 Interpretation of 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 not observe, so we can not separately identify the effect of taxes on wages. 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.[11]

We take the value of γ (the labor elasticity) to be 0.53 (Elsby, Hobijn and Şahin, 2013), and informed by our empirical estimate of I_p, we can back out $I_w = 0.38$. 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 to be of reasonable magnitude.

[10] Specifically, the figure plots coefficients β_i from the following specification: $\ln(p_{i,h,r,s,t}) = \alpha_{r,s,t} + \alpha_{i,r,s} + \sum_{n=-4}^{n=3} \beta_n \mathbb{1}[t=n] \times \Delta \ln(1-\tau_{c,h,t}) + \gamma_1 X_{i,t} + \gamma_2 X_{h,t} + \varepsilon_{i,h,r,s,t}$

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

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 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 a different 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: $p \cdot C_s = (1-\tau_{p,s})w_s L_s$, where p is the price for the consumption good, C_s is consumption quantity, $\tau_{p,s}$ 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: $p \cdot C_h = (1-\tau_{p,h})w_h L_h$, 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 $dV_{wkr_h} = (1-\tau_{p,h})L_i \cdot dw_h$. A representative firm in state h faces a corporate tax rate $\tau_{c,h}$ and maximizes profits, $\Pi = (1-\tau_{c,h})(pF(K, L_h) - w_h L_h) - rK$, over capital K and labor L. We similarly apply the envelope theorem and solve that the marginal effect in welfare for firm owners: $dV_f = (1-\tau_{c,h})F(K, L_h)dp - (pF(K, L_h) - w_h L_h)d\tau$.

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 $dV_{con_s} + dV_f + dV_{wrk_h}$. For example, the share of tax burden born by consumers is $I_{con_s} = \frac{dV_{con_s}}{dV_{con_s} + dV_f + dV_{wrk_h}}$.

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

$$I_{con_s} = \frac{s_{con}\delta_p}{s_{con}\delta_p - (1-\tau_{p,h})s_{labor}\delta_w - (1-\tau_{c,h})\delta_p - (1-\tau_{c,h})(1-s_{labor})} \quad (4)$$

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.[12]

Our data only allows for identification of the output price elasticity, which we find to be $\delta_p = -0.268$ and we take the estimate of wage elasticity from Fuest, Peichl and Siegloch (2018), $\delta_w = 0.4$. Using this, we can calculate that the incidence on consumers, workers and firms is 41%, 24%, and 35%, respectively.[13] The results suggest that approximately one quarter of corporate taxes incidence falls on consumers, potentially making corporate taxes more similar to sales taxes and hence much less progressive.

4.4 Heterogeneity

Table 3 exploits some dimensions along which the effect of corporate taxes on retail prices differs across goods. We break the UPCs in our sample into terciles according to two different metrics. In columns 1-4, we look for differential responses across UPCs depending on how expensive the UPCs 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 three groups, interacting the corporate tax changes with indicators for each group (the highest-price group is the excluded category). We find that the lowest price goods tend to respond most to corporate tax changes, with average magnitudes almost twice as high for this lowest tercile relative to the highest tercile.

Columns 5-8 divide the sample of UPCs according to the average income of the households who purchase that item. Nielsen 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 then sort the UPCs into terciles according to this metric. Similar to the previous columns, we find generally larger effects for UPCs commonly purchased by households with lower incomes relative to those purchased by high-

[12] We also use $s_{con} = 0.675$ from BEA's consumption share of GDP, $s_{labor} = 0.6$ from BLS's estimate of labor share, $\tau_{p,h} = 0.35$ as personal income tax rate including federal and state taxes, and $\tau_{c,h} = 0.2$ as the sum of federal and state level corporate income tax rate. Appendix A provides further derivation details.

[13] If we do not take into the account the effect of corporate income tax on product prices, the resultant incidence on workers and capital is 32% and 68%. This is consistent with Suárez Serrato and Zidar (2016) – as they find that the incidence of the corporate tax falls 30-35% on workers – as well as with CBO and Treasury estimates.

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 25-50% greater than those of 'high-income UPCs'. These coefficients are also displayed in Table 3.

4.5 Placebo Analysis

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 which produce goods for retail sales but do not pay corporate taxes. 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.[14]

In these panels, we find a strong relationship between corporate taxes and prices for C-corporations, consistent with 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 estimates must impact *only* C-corporations, but not S-corporations. We also conduct a formal statistical test by replacing the corporate income tax rate with personal income tax rate in the equation (3) and present our results in table 4. The coefficients are close to zero in magnitude and not statistically significant, confirming that the corporate income tax rate does not capture other time-varying shocks that coincide with changes in product prices.

We formalize the graphical evidence in Figure 3, and complement our main approach with analysis following Giroud and Rauh (2019). We estimate the following specification:

$$\ln(p_{i,h,r,s,t+1}) = \alpha_{r,s,t+1} + \alpha_{i,r,s} + \beta_1 \ln(1-\tau_{c,h,t}) \times \mathbb{1}[\text{C-Corp}] + \beta_2 \ln(1-\tau_{p,h,t}) \times \mathbb{1}[\text{C-Corp}]$$

$$+ \beta_3 \ln(1-\tau_{c,h,t}) \times \mathbb{1}[\text{S-Corp}] + \beta_4 \ln(1-\tau_{p,h,t}) \times \mathbb{1}[\text{S-Corp}] + \zeta_1 X_{i,t} + \zeta_2 X_{h,t} + \nu_{i,t} \quad (5)$$

The indicator functions $\mathbb{1}[\text{C-Corp}]$ and $\mathbb{1}[\text{S-Corp}]$ denote whether a firm is a C- or S-corporation,

[14] 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 section 3.3, and will result in classifying some C-corporations as S-corporations. This would bias us away from finding a zero result for our firms classified as S-corporations.

respectively. $\tau_{p,h,t}$ indicates the personal tax rate in the state (h) in which the firm producing an item is headquartered at time t. Otherwise the notation is identical to that presented in equation (3).

Table 5 presents the results of this estimation. The first row presents estimates of β_1, which captures the effects of corporate tax rate changes on C-corporations. The results are unsurprisingly quite similar to those presented in Table 2, confirming that there is a strong relationship between corporate taxes and prices. The final row of Table 5 presents estimates of β_4, which captures the effect of personal tax rate changes on S-corporations, which pay those taxes. Once retailer and year fixed effects are included, the magnitudes are quite similar to those in the first row, however the standard errors are quite large and the results are statistically insignificant. This is consistent with their being some mis-classification error for S-corporations.

The middle rows show the impact of personal tax rate changes in C-corporations and the impact of corporate tax rate changes on S-corporations. Since C-corporations are only subject to corporate income tax rates, while S-corporations are only subject to personal income tax rates, each type of firm is unaffected by the rates in these rows. Consistent with the placebo exercise, we see no significant effects in these rows, and estimates are very close to zero.

5 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 used linked price and firm data, and use tax changes in a producer firm's state to examine their effects in other states. A one percent increase in the corporate tax rate leads to an increase in retail product prices of approximately 0.27 percent. Our analysis exploits state level tax changes, and the fact that goods produced in a firm headquartered in one state are sold in another state. This allows us to include sold state 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. If corporate taxes are incident on consumer prices, rather than primarily being borne by shareholders, these taxes may be less progressive than is commonly asserted. 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).

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 effectively focuses on 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 aggregate or national level, where there are fewer opportunities for tax avoidance. Second, market structure should 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.

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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.

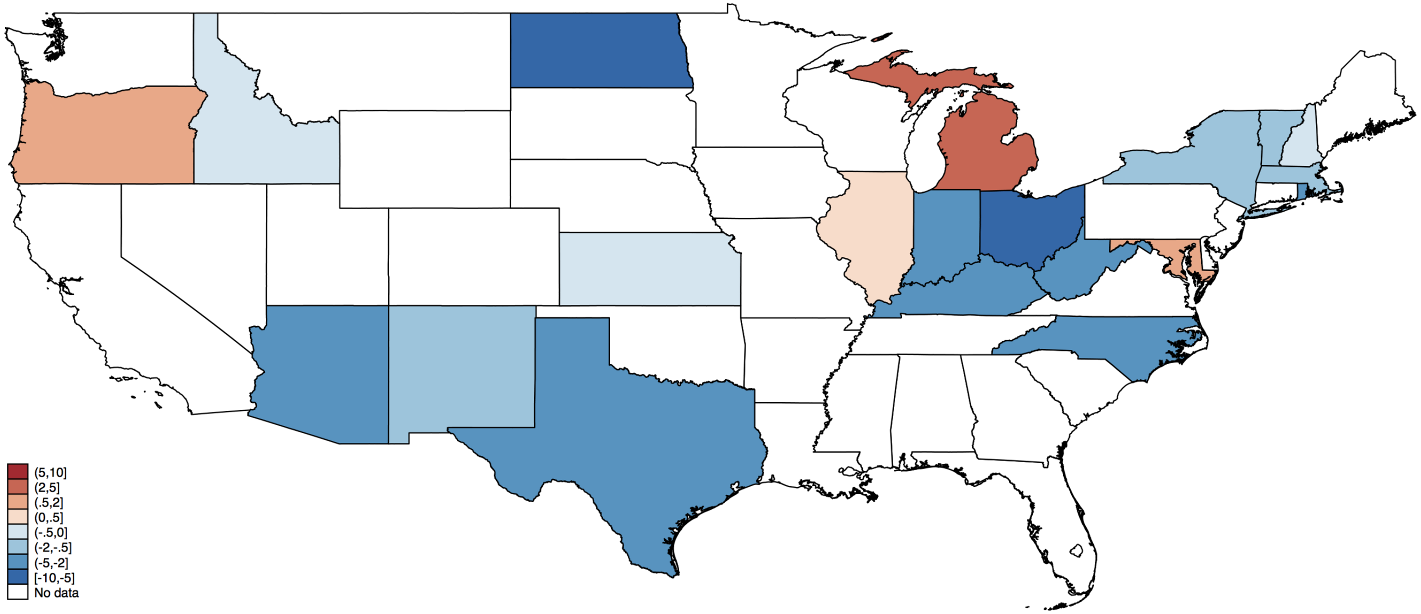

Figure 2: Prices Following Large Tax Changes

Notes: This figure shows the impact on product prices of a one percent corporate tax change over time (scaled by the change of tax). The figure plots coefficients β_i from the following specification: $\ln(p_{i,h,r,s,t}) = \alpha_{r,s,t} + \alpha_{i,r,s} + \sum_{n=-4}^{n=3} \beta_n \mathbb{1}[t = n] \times \Delta \ln(1 - \tau_{c,h,t}) + \gamma_1 X_{i,t} + \gamma_2 X_{h,t} + \varepsilon_{i,h,r,s,t}$. 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.

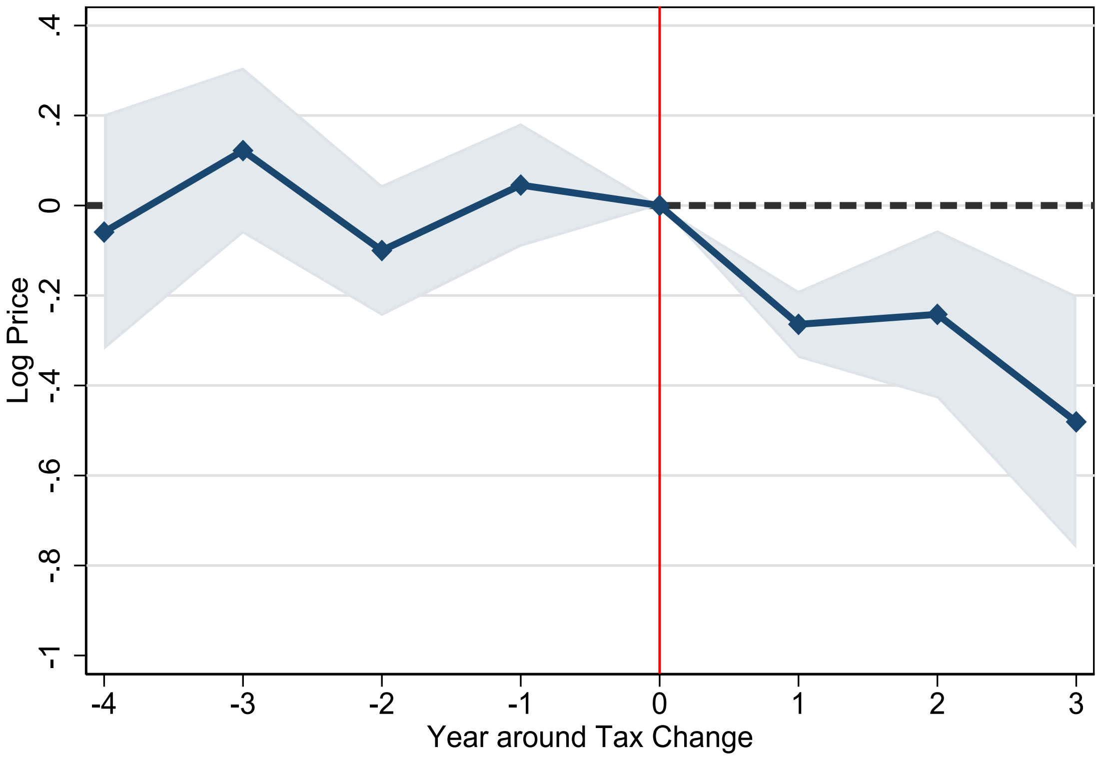

Figure 3: Corporate Taxes and Retail Prices

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

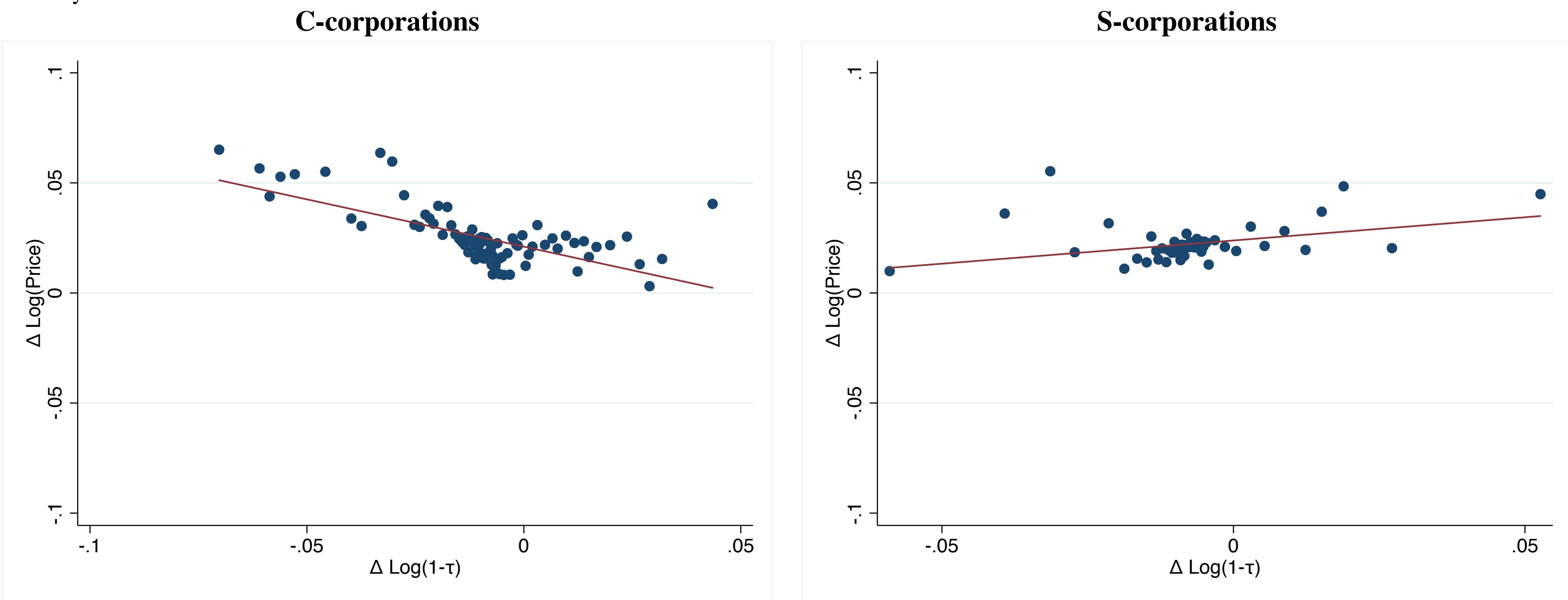

Table 1: Summary Statistics

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. The top panel shows all data, while the bottom panel 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	3.31	4.15	1.32	2.22	3.47
Sales	735.01	4275.06	127.91	228.69	464.86
State Corporate Tax Rate	8.53	4.10	6.50	7.75	9.50
State Personal Income Tax Rate	6.02	2.99	3.75	6.08	7.21
Observations			787,960		

	(1) C-Corporations				
	Mean	Std. Dev.	25^{th} Pctl.	Median	75^{th} Pctl.
Sale-weighted Price	2.73	2.73	1.18	2.10	3.12
Sales	342.69	618.84	116.28	199.10	363.66
State Corporate Tax Rate	7.60	3.16	6.50	7.10	8.84
State Personal Income Tax Rate	6.90	3.06	5.40	7.11	7.95
Observations			344,564		

Table 2: Corporate Taxes and Retail Prices

The tables shows the relationship between retail prices and corporate taxes from weighted regressions, using sales as weight. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. 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) Log(Price)	(2) Log(Price)	(3) Log(Price)	(4) Log(Price)	(5) Log(Price)	(6) Log(Price)
log(1 - τ_c)	-0.428***	-0.297***	-0.303***	-0.279***	-0.275***	-0.268***
	(0.136)	(0.0371)	(0.0374)	(0.0406)	(0.0365)	(0.0395)
Controls	**X**	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**
Observations	344,564	344,564	344,564	344,564	344,564	344,564

Table 3: Corporate Taxes and Retail Prices - Pass-through Heterogeneity

The tables shows the relationship between corporate taxes and retail prices across products with different average customer incomes and average retail prices, and the regression is weighted by sales. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. 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) Log(Price)	(2) Log(Price)	(3) Log(Price)	(4) Log(Price)	(5) Log(Price)	(6) Log(Price)	(7) Log(Price)	(8) Log(Price)
Log(1-τ_c)	-0.265***	-0.241***	-0.244***	-0.230***	-0.265***	-0.251***	-0.273***	-0.254***
	(0.0440)	(0.0511)	(0.0524)	(0.0525)	(0.0411)	(0.0603)	(0.0590)	(0.0579)
Log(1-τ_c) $\times$ $\mathbb{1}\{$ 1^{st} $tercile\ of\ prices\}$	-0.267*	-0.237**	-0.214*	-0.219*				
	(0.132)	(0.114)	(0.122)	(0.122)				
Log(1-τ_c) $\times$ $\mathbb{1}\{$ 2^{nd} $tercile\ of\ prices\}$	-0.0509	-0.0628	-0.0424	-0.0676				
	(0.0515)	(0.0543)	(0.0633)	(0.0530)				
Log(1-τ_c) $\times$ $\mathbb{1}\{$ 1^{st} $tercile\ of\ cust.\ inc.\}$					-0.141***	-0.104	-0.0716	-0.0673
					(0.0505)	(0.0671)	(0.0535)	(0.0457)
Log(1-τ_c) $\times$ $\mathbb{1}\{$ 2^{nd} $tercile\ of\ cust.\ inc.\}$					-0.0309	-0.0231	0.0125	-0.00779
					(0.0348)	(0.0457)	(0.0461)	(0.0432)
Controls	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Sold State×Year	**X**		**X**		**X**		**X**	
Retailer×Year		**X**	**X**			**X**	**X**	
Sold State× Retailer×Year				**X**				**X**
Observations	344,564	344,564	344,564	344,564	344,564	344,564	344,564	344,564

Table 4: Corporate Taxes and Retail Prices: Placebo Estimates

The tables 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 in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. *$p < .1$, ** $p < .05$, *** $p < .01$.

S-corporations

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ_c)	-0.451	0.0605	0.0248	-0.0477	-0.0594	-0.0253
	(0.548)	(0.156)	(0.177)	(0.171)	(0.174)	(0.167)
Controls	**X**	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**
Observations	404,556	404,556	404,556	404,556	404,556	404,556

Table 5: Taxes, Firm Type and Retail Prices

The tables shows the relationship between retail prices, corporate and personal taxes, by whether a firm is identified as a C or S Corporation. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. The sample is restricted to firms that we can identify as C-corporations.The regression is weighted by sales. Standard errors are clustered at the headquarter state level. Source: Nielsen and GS1. $*p < .1$, $**\ p < .05$, $***\ p < .01$.

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1 - τ_c) $\times$ C-Corp.	-0.466**	-0.283***	-0.279***	-0.255***	-0.250***	-0.242***
	(0.176)	(0.0290)	(0.0251)	(0.0285)	(0.0267)	(0.0250)
Log(1 - τ_p)$\times$ C-Corp.	-0.0142	0.223***	0.201***	0.0744	0.0760	0.0885
	(0.139)	(0.0653)	(0.0716)	(0.0732)	(0.0737)	(0.0694)
Log(1 - τ_c) $\times$ S-Corp.	0.301	0.165	0.129	0.184	0.191	0.206
	(0.323)	(0.203)	(0.191)	(0.188)	(0.182)	(0.182)
Log(1 - τ_p) $\times$ S-Corp.	-1.986**	-0.943	-0.971	-1.116	-1.113	-1.021
	(0.936)	(0.828)	(0.829)	(0.915)	(0.922)	(0.849)
Controls	**X**	**X**	**X**	**X**	**X**	**X**
UPC$\times$Retailer$\times$Sold State	**X**	**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	787,960	787,960	787,960	787,960	787,960	787,960

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 L 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 9 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 i, the worker from state i and the consumer from state j $(i \neq j)$. 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:

$$V_f = max_{K,L_i}(1-\tau_j)(pF(K,L_i) - w_iL_i) - rK \tag{13}$$

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

$$\frac{\partial V_f}{\partial K}\cdot(K_p dp + K_\tau d\tau_j) + \frac{\partial V_f}{\partial L_i}\cdot(L_{i,p}dp + L_{i,\tau_j}d\tau_j) + \frac{\partial V_f}{\partial p}\cdot dp + \frac{\partial V_f}{\partial \tau_j}\cdot d\tau_j = \frac{\partial V_f}{\partial p}\cdot dp + \frac{\partial V_f}{\partial \tau_j}\cdot d\tau_j$$

The term above can be rewritten as:

$$(1-\tau_j)F(K,L_i)dp - (pF(K,L_i) - w_iL_i)d\tau_j \tag{14}$$

The consumer's welfare change stems from each consumer maximizing the utility function $U(C_j, L_j)$, subject to the budget constraint: $p\cdot C_j = (1-\tau_j)w_jL_j$, where p is the price for the goods, C_j is the quantity purchased, τ_j is the personal income tax, w_j is the wage received by consumer and L_j 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_j and L_j, 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:

$$V_{con_j}(p) = U(C_j, L_j) - \lambda(pC_j - (1-\tau_j)w_jL_j) = U(C_j, L_j) - (pC_j - (1-\tau_j)w_jL_j) \quad (15)$$

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 $\frac{\partial V_{con_j}}{\partial L_j} = 0$, $\frac{\partial V_{con_j}}{\partial C_j} = 0$ are due to optimization, we have:

$$dV_{con_j} = \frac{\partial V_{con_j}}{\partial C_j} C_{j,p} \cdot dp + \frac{\partial V_{con_j}}{\partial L_j} L_{j,p} \cdot dp + \frac{\partial V_{con_j}}{\partial p} \cdot dp = \frac{\partial V_{con_j}}{\partial p} \cdot dp = -C_j \cdot dp \quad (16)$$

The local worker in the producer state maximizes the utility function, $U(C_i, L_i)$, subject to the constraint, $pC_i = (1-\tau_i)w_iL_i$. We assume locally that the price of goods will not change, therefore welfare of the worker is changed only due to the wage, w_i, received, and the value function of the worker is a function of the wage. The corresponding value function would be:

$$V_{wkr_i}(w_i) = U(C_i, L_i) - \lambda(pC_i - (1-\tau_i)w_iL_i) = U(C_i, L_i) - (pC_i - (1-\tau_i)w_iL_i) \quad (17)$$

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

$$dV_{wkr_i} = \frac{\partial V_{wkr_i}}{\partial C_i} C_{i,w_i} \cdot dw_i + \frac{\partial V_{wkr_i}}{\partial L_i} L_{i,w_i} \cdot dw_i + \frac{\partial V_{wkr_i}}{\partial w_i} \cdot dw_i = \frac{\partial V_{wkr_i}}{\partial w_i} \cdot dw_i = (1-\tau_i)L_i \cdot dw_i \quad (18)$$

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:

$$I_{con_j} = \frac{dV_{con_j}}{dV_{con_j} + dV_{wrk_i} + dV_f} \quad (19)$$

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

$$I_{con_j} = \frac{-C_j \frac{dp}{d\tau}}{-C_j \frac{dp}{d\tau} + (1-\tau_i) L_i \frac{dw_i}{d\tau} + (1-\tau) F(K, L_i) \frac{dp}{d\tau} - (pF(K, L_i) - w_i L_i)} \tag{20}$$

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 $\delta_{w_i} = \frac{\frac{dw_i}{w_i}}{\frac{d(1-\tau)}{1-\tau}} = \frac{dw_i}{d\tau}(-\frac{1-\tau}{w_i})$. Combining the relevant elasticities into equation (20), we have the incidence formula:

$$I_{con_j} = \frac{pC_j \delta_p}{pC_j \delta_p - (1-\tau_i) w_i L_i \delta_{w_i} - (1-\tau) pF(K, L_i) \delta_p - (1-\tau)(pF(K, L_i) - w_i L_i)} \tag{21}$$

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

$$I_{con_j} = \frac{s_{con} \delta_p}{s_{con} \delta_p - (1-\tau_i) s_{labor} \delta_{w_i} - (1-\tau) \delta_p - (1-\tau)(1 - s_{labor})}$$

Similarly, the incidence on the worker is given by:

$$I_{wrk_i} = \frac{dV_{wrk_i}}{dV_{con_j} + dV_{wrk_i} + dV_f} \tag{22}$$

$$= \frac{-(1-\tau_i) s_{labor} \delta_{w_i}}{s_{con} \delta_p - (1-\tau_i) s_{labor} \delta_{w_i} - (1-\tau) \delta_p - (1-\tau)(1 - s_{labor})} \tag{23}$$

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

$$I_f = \frac{dV_f}{dV_{con_j} + dV_f + dV_{wrk_i}}$$

$$= \frac{-(1-\tau) \delta_p - (1-\tau)(1 - s_{labor})}{s_{con} \delta_p - (1-\tau_i) s_{labor} \delta_{w_i} - (1-\tau) \delta_p - (1-\tau)(1 - s_{labor})} \tag{24}$$

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) $s_{labor} = 0.6$

3) $\delta_w = 0.4$

4) $\tau_{c,h} = 0.2$

5) $\tau_{p,h} = 0.35$

Combined with the estimated price elasticity with respect to the tax, $\delta_p = -0.268$, we calculate the tax incidence on consumer, firm and worker are 41%, 24%, and 35%, respectively.

B 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 Consumer Panel. The Consumer Panel data offers detail categorization of each product. There are 125 product groups and 1,075 product modules stored in the NCP. 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 product group as a separate market and calculate the HHI for each of them at different years. We first aggregate a company's sale 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 the sale information we used is the consumption by panelists, not the real sale of each products. However, given the national representativeness of the NCP, the market share within the panelists is a good approximation of the real market share, and thus, the HHI constructed is likely reliable.

The product group of one UPC will 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 group changes. Therefore, based on our main sample, we further restrict to the UPCs that donât change their categorization within one year. This restriction makes the number of observation drop by 0.4%. In our final sample, the median of the HHI is 0.09, and the mean of the HHI is 0.12, with standard deviation of 0.089.

The results are shown in table A.6. We find smaller pass-through effects in more concentrated markets.

C Alternative Tax Nexus Definition

In our main analysis, we follow Heider and Ljungqvist (2015) and measure tax changes at the state headquarter level. When a firm operates in many states, it needs to decide which state has the power to tax it. Our next analysis takes into account of apportionment of taxable income for multi-state firms. If a firm has activities other than "mere solicitation of orders" in one state, or has a physical presence in that state, this state has the power to tax the firm in that fiscal year. The amount of taxable income for one state is determined by the sale, payroll and property distribution of the firm. Specifically, the share of the taxable income a state has power to charge is a weighted average of the share of sale, payroll and property the firm has in that state. The weights for these three factors are different across states by year.

To estimate the effective tax rate of a firm, we supplement our data with the sale and payroll information at the establishment level from Infogroup data. Due to the limitation of the data, we assume that the property share in one state is equal to the payroll share, and approximate the payroll share by the employment share. We follow the approach used by Suárez Serrato and Zidar (2016), and only use the geographical distribution of firms' activity in the first available year to construct the apportioned tax rate. That is, we assume that the firm didn't reallocate their activity in the following year. As a result, the variation of the effective tax rate comes from the change of tax rate and variation in the tax rules. The tax rate has the following formula:

$$\tau_{c,t,apportioned} = \sum_{s} (\omega_{sale,t} \times \theta_{sale} + \omega_{prop,t} \times \theta_{prop} + \omega_{pay,t} \times \theta_{pay}) \times \tau_{c,s,t} \tag{25}$$

Where the $\omega_{sale,t}$, $\omega_{prop,t}$ and $\omega_{pay,t}$ are factor weights on sale, property and payroll at year t, the θ_{sale}, θ_{prop} and θ_{pay} are the share of sale, property and payroll of a firm at the first available year. $\tau_{c,s,t}$ is the corporate tax rate at state s in year t.

The results using alternative tax incidence are shown in table A.4, and are largely consistent with our main results.

Figure A.1: Change in State Corporate Taxes

Notes: This figure shows the state corporate tax rates in 2004, 2010 and 2017. Source: Giroud and Rauh (2019) and Tax Foundation.

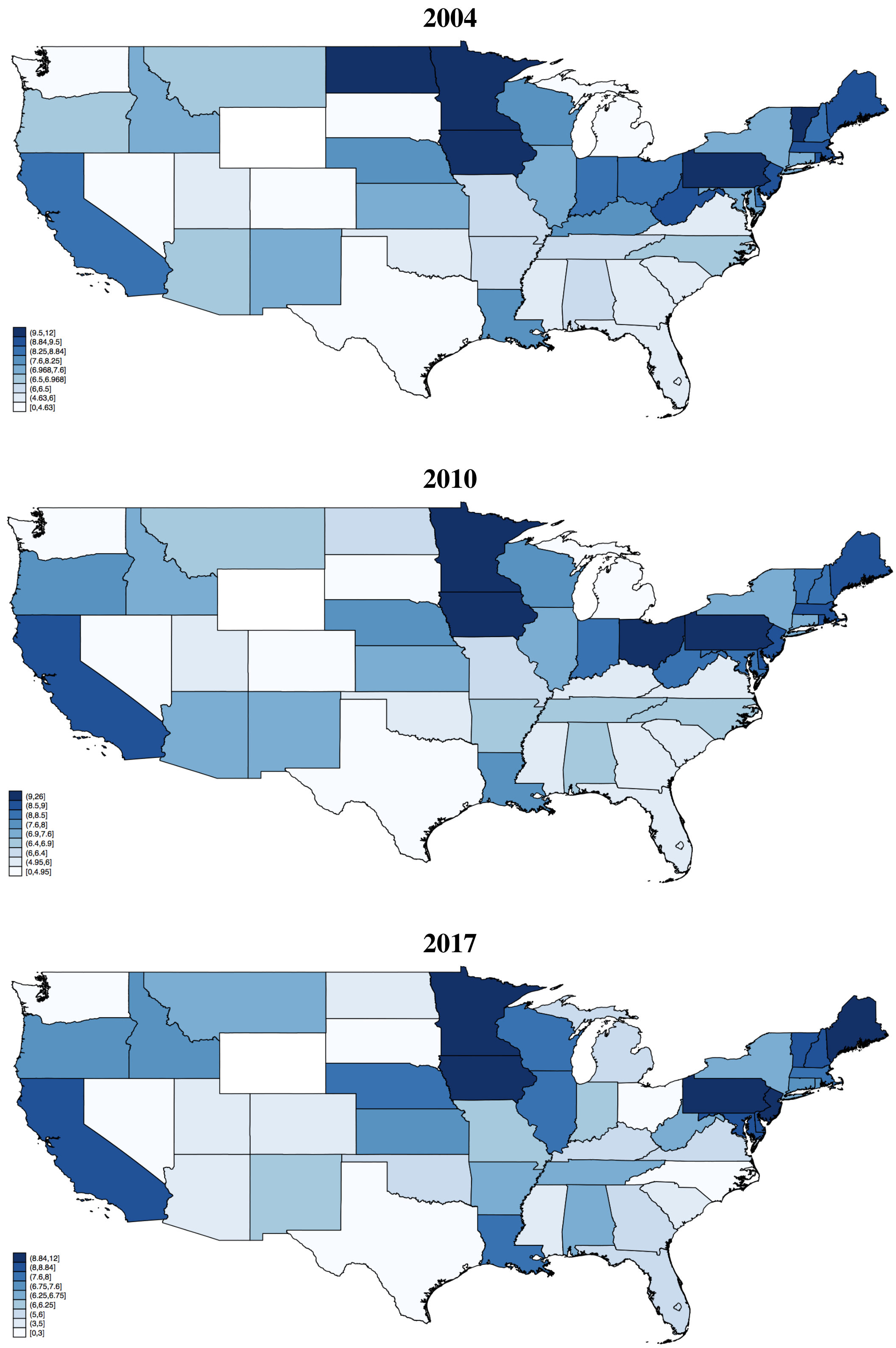

Figure A.2: Prices Following Large Tax Changes

Notes: This figure shows the impact on product prices of a one percent corporate tax increase or decrease over time. The figure plots coefficients β_i from the following specification: $\ln(p_{i,h,r,s,t}) = \alpha_{r,s,t} + \alpha_{i,r,s} + \sum_{n=-3}^{n=3} \beta_n \mathbb{1}[t=n] \times \ln(1-\tau_{c,h,t}) + \gamma_1 X_{i,t} + \gamma_2 X_{h,t} + \varepsilon_{i,h,r,s,t}$. 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.

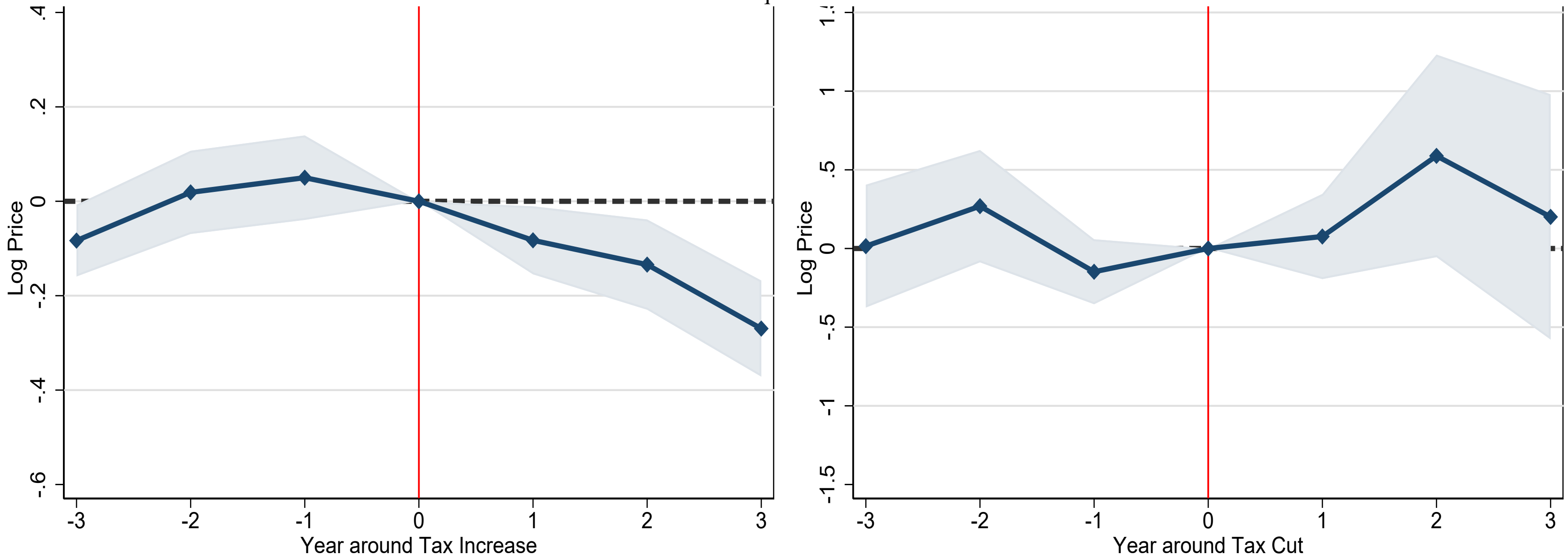

Figure A.3: Corporate Taxes and Retail Prices

Notes: This figure shows the relationship between corporate taxes and retail prices across products with different average customer incomes and average retail prices. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured in the state where a firm is headquartered. Estimates include UPC and state year fixed effects. 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.

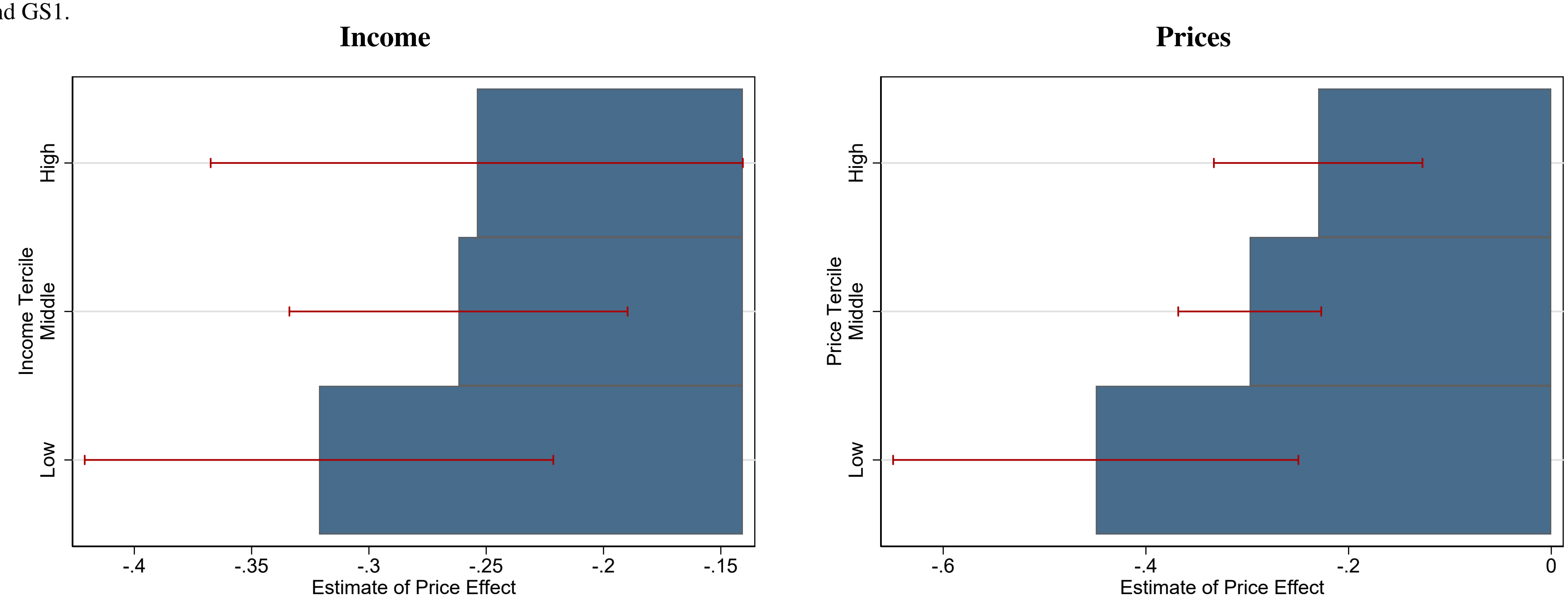

Table A.1: Variable Descriptions

This table describes the main analysis variable used.

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 (2004-2011), 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.
Nonstandard Tax	State Tax Handbook	Indicator of whether a state imposed a non-standard corporate tax.
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.
Total State Revenue	Census	Total state tax revenue in a given year.
General State Revenue	Census	Total state general revenue in a given year.
Total Expenditure	Census	Total state expenditure in a given year.
GDP	BLS	State GDP in millions of dollars.
UI Base	State UI Laws	Maximum wage base subject to state unemployment insurance tax.
UI Rate	State UI Laws	Maximum unemployment insurance rate at each state in a given year.
UI	State UI Laws	Unemployment insurance base wage multiplied by the unemployment insurance rate.
Unemployment	BLS	State unemployment rate.
Budget Balance	Census	State/s budget balance, computed as (revenues - expend) / expend
LFO	Orbis	The legal form organization is identification by the legal form information and shareholder information from the Orbis database. Non-profit organizations and public authorities are labeled firms who don/t need to pay a tax. Public limited companies, and firms with more than 100 shareholders or with non-natural persons as shareholders are identified as C corporations, leaving the rest as the S corporations.

Table A.2: Summary Statistics for Sample Construction

Sample	# Obs.	# UPCs	# Retailers	# Producers	# C-Corps	Total $ Sales			
						Mean	25th	Median	75th
Full UPC Sample	162,231,673	2,545,667	1,238	-	-	27.5	3	6	16
Persistent UPC Sample	1,336,198	91,956	670	-	-	650.3	120.9	214.4	427.1
Matched GS1 Sample	1,323,033	90,087	670	3,937	-	653	121	214.6	427.5
Matched Orbis Sample	1,160,260	82,925	666	3,551	919	694.9	120.4	214.9	435.9
Exclude own-state	969,304	59,944	649	2,713	783	736.5	120.6	216.3	443.4
Final Sample	787,960	36,443	449	1,971	609	735.01	127.91	228.69	464.86

Table A.3: Corporate Taxes and Retail Prices, Equal Weighted Regressions

The tables 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 in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. 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)	(6)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
log(1 - τ_c)	-0.381**	-0.215***	-0.211***	-0.186***	-0.181***	-0.181***
	(0.143)	(0.0486)	(0.0516)	(0.0485)	(0.0444)	(0.0455)
Controls	**X**	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**
Observations	344,564	344,564	344,564	344,564	344,564	344,564

Table A.4: Corporate Taxes and Retail Prices Using Alternative Tax Nexus

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. 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)	(6)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
log(1 - $\tau_{c,apportioned}$)	-0.760***	-0.390**	-0.412**	-0.372**	-0.333**	-0.362**
	(0.255)	(0.161)	(0.163)	(0.151)	(0.156)	(0.167)
Controls	**X**	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**
Observations	336,401	336,401	336,401	336,401	336,401	336,401

Table A.5: Corporate Taxes and Retail Prices across Product Categories and Retailers

The table replicates the analysis of column (5), (6) in Table 2 and further examines the elasticity across product categories and retailers.The regression is weighted by sales. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. 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)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ_c) $* I\{Miscellaneous\}$	-0.0422	-0.0388		
	(0.0269)	(0.0296)		
Log(1-τ_c) $* I\{Drinks\}$	-0.311	-0.278		
	(0.316)	(0.273)		
Log(1-τ_c) $* I\{ElectricalAppliances\}$	-0.748	-0.702		
	(0.525)	(0.500)		
Log(1-τ_c) $* I\{Food\}$	-0.432***	-0.436***		
	(0.0714)	(0.0754)		
Log(1-τ_c) $* I\{Hhd, office, schoolSupplies\}$	-0.327*	-0.311		
	(0.190)	(0.198)		
Log(1-τ_c) $* I\{DiscountStore\}$			-0.133***	-0.136***
			(0.0377)	(0.0351)
Log(1-τ_c) $* I\{Grocery\}$			-0.351***	-0.369***
			(0.0444)	(0.0531)
Log(1-τ_c) $* I\{WarehouseClub\}$			-0.348***	-0.315***
			(0.0741)	(0.0594)
Log(1-τ_c) $* I\{Otherstores\}$			-0.402*	-0.130
			(0.239)	(0.144)
Controls	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**
Sold State×Year	**X**		**X**	
Retailer×Year	**X**		**X**	
Sold State× Retailer×Year		**X**		**X**
Observations	344,560	344,560	344,560	344,560

Table A.6: Corporate Taxes, Retail Prices and Market Concentration

The tables shows the relationship between retail prices, corporate taxes and market concentration.The regression is weighted by sales. Retail prices are measured in the geographic location where a good is sold. Corporate taxes are measured in the state where a firm is headquartered. The inclusion of controls and fixed effects is denoted beneath each specification. We extract product group information and calculate the HHI within each product group market. 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)	(6)
	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)	Log(Price)
Log(1-τ_c)	-0.578***	-0.469***	-0.470***	-0.435***	-0.431***	-0.428***
	(0.156)	(0.0731)	(0.0737)	(0.0794)	(0.0716)	(0.0806)
Log(1-τ_c) $* HHI_{prod\ group}$	1.226***	1.428***	1.389***	1.296***	1.297***	1.325***
	(0.374)	(0.479)	(0.482)	(0.448)	(0.441)	(0.460)
Controls	**X**	**X**	**X**	**X**	**X**	**X**
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**
Observations	343,285	343,285	343,285	343,285	343,285	343,285

Table A.7: Corporate Taxes and Retail Prices Robustness

This table shows the relationship between retail prices and corporate taxes, dropping each individual state, shown in the left-most column. The sample is otherwise identical to the main specification. Standard errors are clustered at the headquarter state level. All specifications include controls. 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)	(6) Log(Price)
Drop SC	-0.428 ***	-0.297 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop AZ	-0.428 ***	-0.298 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop UT	-0.428 ***	-0.298 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop VT	-0.427 ***	-0.296 ***	-0.302 ***	-0.278 ***	-0.274 ***	-0.267 ***
	(0.136)	(0.037)	(0.038)	(0.041)	(0.037)	(0.041)
Drop ND	-0.427 ***	-0.298 ***	-0.303 ***	-0.28 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.039)
Drop WV	-0.428 ***	-0.298 ***	-0.303 ***	-0.28 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.038)	(0.041)	(0.037)	(0.04)
Drop KY	-0.427 ***	-0.297 ***	-0.302 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.037)	(0.04)
Drop NM	-0.428 ***	-0.297 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop ME	-0.427 ***	-0.297 ***	-0.303 ***	-0.28 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.038)	(0.041)	(0.037)	(0.04)
Drop MS	-0.428 ***	-0.297 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop MO	-0.428 ***	-0.299 ***	-0.304 ***	-0.28 ***	-0.276 ***	-0.269 ***
	(0.136)	(0.037)	(0.038)	(0.041)	(0.037)	(0.04)
Drop KS	-0.428 ***	-0.298 ***	-0.303 ***	-0.28 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.038)	(0.041)	(0.037)	(0.04)
Drop OK	-0.428 ***	-0.298 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.037)	(0.04)
Drop ID	-0.427 ***	-0.297 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.267 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop NE	-0.428 ***	-0.299 ***	-0.304 ***	-0.279 ***	-0.275 ***	-0.269 ***
	(0.135)	(0.037)	(0.037)	(0.041)	(0.038)	(0.041)
Drop OR	-0.427 ***	-0.297 ***	-0.303 ***	-0.279 ***	-0.274 ***	-0.267 ***
	(0.136)	(0.037)	(0.037)	(0.04)	(0.036)	(0.039)
Drop CO	-0.426 ***	-0.294 ***	-0.299 ***	-0.276 ***	-0.271 ***	-0.265 ***
	(0.134)	(0.036)	(0.036)	(0.039)	(0.035)	(0.038)
Drop FL	-0.434 ***	-0.301 ***	-0.306 ***	-0.291 ***	-0.292 ***	-0.273 ***
	(0.147)	(0.041)	(0.04)	(0.046)	(0.042)	(0.043)
Drop VA	-0.43 ***	-0.304 ***	-0.31 ***	-0.287 ***	-0.283 ***	-0.276 ***
	(0.136)	(0.037)	(0.037)	(0.04)	(0.036)	(0.039)
Drop MI	-0.386 ***	-0.282 ***	-0.283 ***	-0.272 ***	-0.268 ***	-0.258 ***
	(0.098)	(0.029)	(0.025)	(0.032)	(0.033)	(0.032)
Drop LA	-0.428 ***	-0.298 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**

Table A.7: Corporate Taxes and Retail Prices Robustness (Continued)

This table shows the relationship between retail prices and corporate taxes, dropping each individual state, shown in the left-most column. The sample is otherwise identical to the main specification. Standard errors are clustered at the headquarter state level. All specifications include controls. 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)	(6) Log(Price)
Drop GA	-0.43 ***	-0.292 ***	-0.297 ***	-0.27 ***	-0.266 ***	-0.259 ***
	(0.135)	(0.036)	(0.036)	(0.038)	(0.034)	(0.036)
Drop MN	-0.436 ***	-0.293 ***	-0.299 ***	-0.283 ***	-0.28 ***	-0.274 ***
	(0.135)	(0.037)	(0.037)	(0.04)	(0.037)	(0.04)
Drop WA	-0.411 ***	-0.301 ***	-0.306 ***	-0.268 ***	-0.264 ***	-0.256 ***
	(0.139)	(0.04)	(0.037)	(0.039)	(0.034)	(0.037)
Drop OH	-1.398 ***	-0.506 ***	-0.546 ***	-0.577 ***	-0.526 ***	-0.527 ***
	(0.228)	(0.139)	(0.134)	(0.129)	(0.108)	(0.145)
Drop PA	-0.428 ***	-0.3 ***	-0.304 ***	-0.28 ***	-0.275 ***	-0.268 ***
	(0.135)	(0.037)	(0.038)	(0.041)	(0.037)	(0.04)
Drop MA	-0.426 ***	-0.293 ***	-0.302 ***	-0.28 ***	-0.275 ***	-0.267 ***
	(0.135)	(0.036)	(0.037)	(0.041)	(0.037)	(0.039)
Drop AR	-0.406 ***	-0.286 ***	-0.286 ***	-0.233 ***	-0.243 ***	-0.23 ***
	(0.113)	(0.044)	(0.045)	(0.045)	(0.046)	(0.046)
Drop IL	-0.395 ***	-0.307 ***	-0.307 ***	-0.285 ***	-0.275 ***	-0.268 ***
	(0.116)	(0.04)	(0.037)	(0.039)	(0.034)	(0.037)
Drop RI	-0.428 ***	-0.297 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop CT	-0.425 ***	-0.285 ***	-0.288 ***	-0.262 ***	-0.255 ***	-0.249 ***
	(0.137)	(0.035)	(0.034)	(0.038)	(0.031)	(0.035)
Drop IN	-0.423 ***	-0.295 ***	-0.301 ***	-0.278 ***	-0.273 ***	-0.266 ***
	(0.133)	(0.036)	(0.036)	(0.039)	(0.035)	(0.038)
Drop WI	-0.425 ***	-0.293 ***	-0.298 ***	-0.276 ***	-0.271 ***	-0.263 ***
	(0.135)	(0.038)	(0.037)	(0.041)	(0.037)	(0.039)
Drop TX	-0.413 ***	-0.297 ***	-0.302 ***	-0.268 ***	-0.264 ***	-0.264 ***
	(0.13)	(0.04)	(0.04)	(0.042)	(0.039)	(0.044)
Drop MD	-0.428 ***	-0.295 ***	-0.301 ***	-0.277 ***	-0.273 ***	-0.266 ***
	(0.137)	(0.036)	(0.037)	(0.041)	(0.036)	(0.039)
Drop TN	-0.428 ***	-0.298 ***	-0.303 ***	-0.28 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.036)	(0.04)
Drop IA	-0.428 ***	-0.298 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.037)	(0.04)
Drop AL	-0.428 ***	-0.298 ***	-0.303 ***	-0.279 ***	-0.275 ***	-0.268 ***
	(0.136)	(0.037)	(0.037)	(0.041)	(0.037)	(0.04)
Drop NJ	-0.431 ***	-0.294 ***	-0.302 ***	-0.276 ***	-0.273 ***	-0.268 ***
	(0.139)	(0.037)	(0.038)	(0.041)	(0.038)	(0.041)
Drop CA	-0.414 ***	-0.288 ***	-0.295 ***	-0.288 ***	-0.283 ***	-0.278 ***
	(0.132)	(0.035)	(0.035)	(0.038)	(0.035)	(0.039)
Drop NC	-0.424 ***	-0.299 ***	-0.305 ***	-0.28 ***	-0.276 ***	-0.268 ***
	(0.135)	(0.038)	(0.038)	(0.04)	(0.036)	(0.04)
Drop NY	-0.418 ***	-0.315 ***	-0.314 ***	-0.282 ***	-0.274 ***	-0.264 ***
	(0.123)	(0.039)	(0.039)	(0.039)	(0.037)	(0.039)
UPC×Retailer×Sold State	**X**	**X**	**X**	**X**	**X**	**X**
Year		**X**				
Sold State×Year			**X**		**X**	
Retailer×Year				**X**	**X**	
Sold State× Retailer×Year						**X**