Borderline Tax Planning

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Abstract. We analyze establishment-level data to assess the impact of county-level property taxes on the location decisions of business establishments. Our findings indicate that, despite a general trend for businesses to locate in areas with relatively higher taxes, there is a significant tendency for establishments to prefer lower-taxed counties when situated near a county border. Specifically, the likelihood of a business choosing the lower property-taxed side increases by 11 percent if the establishment is within 1 km of the county border. This tendency is more pronounced when the property tax rate differential between adjacent counties is larger. Further analysis reveals that businesses engaging in less federal income tax planning are more inclined to establish themselves in lower-taxed areas. We did not find a significant association between other business metrics, such as business profitability, and property tax-based location decisions, suggesting that the primary driver behind these location choices is the tax rate differential.

Keywords: property tax planning, business location decisions, cross-border tax effects

JEL Classification: H25, H71, R32

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1. Introduction

Companies in the U.S. are subject to taxation from a variety of jurisdictions, including federal, international, state, and local taxes. To maximize after-tax value, firms carefully consider their exposure to certain taxes. It is well documented that companies manage their income tax liabilities (Wilde and Wilson 2018; Dyreng, Hanlon, and Maydew 2008). Non-income tax planning, however, has received less attention due to the broad range of tax jurisdictions involved, limited data availability, and the challenges involved in assessing non-income tax strategies. Corporate income taxes, however, only make up about 6 percent of total government revenue in the U.S., compared to 11.4 percent for property taxes (Bunn and Perez Weigel 2023). In this paper, we examine how property tax rates influence business location decisions. We find that on the margin—areas very near to county borders (within 1 km)—property taxes have a clear and compelling effect on location decisions. We also find that this form of tax planning appears to be negatively correlated with corporate income tax planning, such that those with the lowest income tax rates are less likely to engage in borderline property tax planning.

We are not the first to examine firm location decisions and property taxes. Oakland (1978) notes that "there are few issues in public finance which arouse as much controversy as the impact of jurisdictional tax differentials upon the location of industry." That is, while the question was thoroughly examined at the time, it resulted in mixed evidence. The key takeaway from this early literature is that among the many factors that drive the choice of the "location of industry", property taxes may not be first order relative to the many other considerations. Fox (1981), however, notes that "property tax differentials may become a more important locational factor as the geographic area of study is narrowed." In this paper, we use new data unavailable to these prior studies to examine the effect property taxes have on location decisions along a narrowed geographic bandwidth.

Questions related to property tax avoidance have been difficult to answer due to limited data availability. Our approach, which uses precise geolocations of establishments, paired with data on historical property tax records, allows us to study property taxes from a new perspective. More specifically, we use variation in establishment locations around U.S. county borders to study whether companies strategically locate in lower property-taxed counties. Because many factors influence where a company decides to place an establishment, we conduct our examination around tight-distanced bandwidths around county borders, effectively holding many of these extraneous factors constant. We also limit our analysis to county borders within the same state, ruling out factors varying across state borders (e.g., state taxes and regulations).

Using CoreLogic's real estate transaction data, we compute effective commercial property tax rates across U.S. counties, thus accounting for various jurisdiction-specific exemptions and adjustments that differentiate the statutory rate from the actual rate paid by businesses. Next, we geo-locate all establishments contained in the SafeGraph Places dataset to identify each establishment's location, its distance in meters to the nearest county border, and the adjacent county across the border. Thus, by integrating the tax rates obtained from CoreLogic with the geo-located data from SafeGraph Places we can assess the effective property tax rate for the counties where each establishment is situated, as well as for that of the closest neighboring county. Focusing on establishments that are close to a county border, we then analyze the frequency of business locating just within counties that have a lower effective property tax rate relative to the closest adjacent county.

We find that establishments not extremely close to county borders are more likely to be on the high-taxed side of the border, likely reflecting non-tax factors that make some high-taxed jurisdictions favorable for establishment location. However, closer to the border, taxes appear to be a significant factor in real location decisions. Using a counterfactual analysis where we compare establishment locations to non-profit establishments which should be less influenced by property taxes, we find that tax paying firms are 11.7 percent more likely than non-profits to locate on the low-taxed side of the border. We also find significant effects after controlling for county fixed effects, which ensures our findings are not related to county-level factors (e.g., county building or other regulations). That we still find effects after including county fixed effects is not surprising, as our identification strategy, using nearness to the border, already takes advantage of within-county variation in the costs and benefits of circumventing higher property taxes by changing location decisions. Predictably, we also find locations decisions appear to be more important as the tax differential between counties increases, and that the odds of locating on the low-taxed side increase almost monotonically with the county tax differential. At the extremes, increasing the tax differential from the bottom 2 percent to the top 2 percent increases the likelihood an establishment is located on the low-taxed side by 5.65 percent, which increases the odds ratio of being located on the low-taxed side from 0.961 to 1.205.

Firms engage in many different kinds of tax planning, and, so far in this paper, we have examined real planning around the property tax. Our next set of tests examine whether income and property tax avoidance are substitutes or complements. We do this by combining our establishment-level data with financial statement data from Compustat to examine whether the decision to locate on the low-taxed side of the border is associated with federal corporate effective tax rates. Our results show that firms with higher federal effective tax rates are more likely to locate their establishments in the low-taxed side of the border. This association indicates a substitution effect, where firms that engage in less income tax planning appear to turn to property tax planning as an alternative way to lower their levels of taxation and increase their after-tax value. To rule out the possibility that our results are simply capturing other features of firm behavior (for example, that large retailers have high ETRs and many brick-and-mortar locations, meaning that they may be good property tax planners), we examine other firm attributes that explain the property tax decision, and, fail to find a significant association between any other factor other than income tax avoidance.

Our study makes two key contributions to prior literature. First, we document the extent to which property tax rates matter to business establishment location decisions. Property tax incentives are a meaningful factor for firms located close to a tax border but matter less as the distance to the border increases—they matter on the margin. This finding adds to prior work in this area, which find that fiscal factors across jurisdictions matter to real location decisions. We add to this area by using a large sample of establishments, which increases the generalizability of our findings. Further, our study rules out state- and county-level differences, using within county geographic variation, helping ensure the presence of a tax mechanism. This use of a large dataset is not without tradeoffs, of course. As we use more data to be more generalizable, it makes it impossible for us to take into account the myriad of institutional details that occur at the very localized level.

Second, our study adds to the corporate tax avoidance literature by detailing how companies trade off tax planning under different types of taxation. This provides insights into the breadth at which companies focus on tax savings at all levels of taxation, not just the federal, state, or international levels. By highlighting the extent of property tax planning, counties may reconsider tax policies such that they stay more competitive in attracting businesses. These findings also highlight a major expense of companies that currently do not require any specific disclosure. Users of the financial statements could benefit from seeing companies' property tax expense to assess how effectively different companies are at managing property taxes compared to competitors. Overall, these findings suggest that real location planning at a local level is another strategy employed by corporations to increase after-tax cash flows, and that this strategy is negatively correlated with income tax planning.

2. Motivation and Institutional Setting

Our paper addresses property tax planning and business location decisions. There is a large literature on tax planning, and, on how taxes affect location decisions, but, this literature primary focuses on the corporate income tax. Corporate income tax planning is a widely researched topic, which gained interest in the two decades following Shackelford and Shevlin's (2001) survey calling for additional research on corporate tax avoidance. Since then, hundreds of studies have examined the determinants and effects of income tax avoidance. While most prior studies of corporate income tax avoidance focus on federal income taxes, there are some papers that examine how firms respond to state taxes (Gupta and Mills 2002).[3] Examining location decisions more specifically, Giroud and Rauh (2019) estimate how firms respond when state income tax rates increase, finding that corporations reduce the number of establishments and the number of employees when state tax rates increase. While these studies focus on state income tax rates and not property tax rates, it shows that firms take interest in avoiding taxes beyond just federal income taxes and that they will engage in location decisions to aid their tax planning.

There is a very large literature in public economics about the property tax, with most of the emphasis being on property taxes remitted by individuals, not businesses. The early literature in property taxes focused on the taxing jurisdiction's choice of tax rates, and, how that might balance

[3] Dyreng et al. (2013) highlights the role that taxes play in firms' decisions to locate subsidiaries in Delaware. They find that a Delaware-based state tax avoidance strategy significantly lowers state effective tax rates.

with the basket of services available to residents. For example, Oates (1969) finds that local property values bear a significant negative relationship to effective tax rates and a positive relationship with expenditure per pupil. These findings suggest that consumers weigh the varying packages of local public services and property tax rates to make location decisions that best satisfy their tastes (Oates 1969; Tiebout 1956). This likely carries over into commercial settings also where firms consider many factors on where to locate, with property taxes being one of these important factors. Other papers examine whether property tax values are capitalized into housing prices (Oates 1969; Palmon and Smith 1998; Wales and Wiens 1974), how property tax changes affect housing prices (Elinder and Persson 2017; Lutz 2008), how property taxes change the stock of housing (Orr 1968; Black 1974), how specific features of property tax reassessments affect a myriad of outcomes (Mikesell 1980; Strumpf 1999; Heavey 1978), etc.

Some papers have examined the specific location decisions of firms and business property taxes. In this early literature, this very question was exceptionally important. Charney (1983) quotes Oakland as noting that "There are few issues in public finance which arouse as much controversy as the impact of jurisdictional tax differentials upon the location of industry." This question received a lot of early attention. For example, Fox (1978) analytically examines property taxes and business location decisions, focusing on both the businesses decision where to locate, but, also, communities decision to set a tax rate to fund public goods. Fox concludes that these community decisions can have a "significant" impact on location decisions by businesses.

Fox (1981) uses empirical data to study firm location decisions and the property tax. This paper makes the important observation that property taxes may not play an important role in location decisions on a grand scale, as relative to all the other factors that shape location decisions, the differences between jurisdictions in property taxes may be small. However, Fox notes "property tax differentials may become a more important locational factor as the geographic area of study is narrowed." This concept is tested within Cuyahoga County, Ohio, which has 60 municipalities, 43 of which have populations over 2,500. Using this "large" sample of 43 jurisdictions (other studies of the day use even fewer jurisdictions), Fox finds that the tax rate does explain business demands for sites in a jurisdiction. This is indicative of much of the research in state and local taxes—that studies focus on specific jurisdictions in order to take advantage of all the institutional richness in one setting. This, of course, comes at the cost of generalizability, and, sample size, which might limit studies' ability to detect what may be small effect sizes due to a lack of power.

Our paper is very much in the spirit of Fox (1981), however, we are able to use virtually all counties in the US, and, rather than just looking for business activity in general in a jurisdiction, are able to pinpoint exactly where in the jurisdiction the business is and use variation in the distance from a border to study the effect of property taxes on location decisions. Further, we are able to use cross-border differences in tax rates, such that even within a single county, different establishments will face different incentives to locate across the border as some adjacent counties may have different tax rates.

Many others from this era also study this same question, however, like Fox, this investigation generally takes the form of panel regressions, conducted at the jurisdiction level, examining the relationship between business activity and the tax rate. Finer, location-specific data on taxes and borders was simply not available.

A newer literature has examined other business-related outcomes and property taxes. For example, Dye, McGuire, and Merriman (2001) study property tax rate variation in Chicago. They find that high property tax rates lead to slower growth rates for employment, commercial property investment, and industrial property investment. These depressed economic signs could be a result of companies avoiding weak areas in terms of economic growth or they could be showing poor growth because companies are avoiding certain high rate areas. Similar other papers study how property taxes impact local business decisions (Wu 2010; Funderburg, Bartik, Peters, and Fisher 2013; Gabe and Bell 2004; Weber, Bhatta, and Merriman 2003).

Other research looks at who bears the incidence of property taxes assessed on businesses: the owner, the tenant, or the consumer, though contradicting evidence makes conclusions difficult. Mieszkowski and Zodrow (1989) argue that consumers must bear the burden of commercial property taxation in the form of higher prices. Meanwhile, Man (1995) suggests that commercial property taxes are borne by the property owners. From a tenant rather than consumer perspective, Wheaton (1984) also finds that the property owners bear the burden of property tax differences as opposed to the tenant bearing the burden.

Overall, there is a large body of on corporate tax planning and separate research on property taxes. However, a direct link established at the establishment level which studies commercial or corporate tax planning for property taxes has not been well-studied. Finally, few papers have examined the relationship between income tax planning and non-income tax planning. One exception is Robinson (2012), who examines non-income taxes, including property taxes, at the broad corporate level. Using a dataset of multinational corporations, Robinson establishes that non-income tax avoidance and income tax avoidance are positively correlated (the opposite of our finding).

3. Sample Selection

The data for our analyses come from three main sources: SafeGraph Places, CoreLogic Historical Property, and Compustat Fundamentals Annual. As we are interested in granular location decision making, we rely on SafeGraph's Places dataset, updated as of December 2022, for point of interest (POI) data for millions of establishments in the United States.

The SafeGraph data contain precise coordinates, addresses, brand affiliations, category tagging, operating hours, and contact information for locations around the globe. We first narrow our sample of establishments down to U.S. located establishments and remove any duplicates based on coordinates and brand name. SafeGraph contains data on numerous POI's that are unlikely to make property-tax related decisions. We browse the data by industry and remove the following: transit stations, ATM's and other kiosks, mail drop locations, cemeteries, parks, museums, and charging stations. Importantly, we also remove manufacturing and medical establishments as these industries are often subject to differing property tax rates and are more likely to receive abatements. They may also be more subject to non-tax considerations, such as easy access to railways, major trucking routes, or shipping ports.

We geo-locate all these establishments using a Python script and geoJSON shape files containing all county coordinates in the United States. SafeGraph does not contain any county identifiers for the establishments, so the first portion of the script identifies the county that the establishment belongs to. The second portion of the script triangulates the closest point along the bordering counties and calculates the distance (in meters) to these points from the establishment. We then store the distance to the closest county and the name and county identifier (FIPS code) of that closest county. Figure 1 visually depicts what the code does.

Property taxes vary with many different jurisdictional boundaries, such as school districts, fire districts, water districts, etc. We select county boarders as the jurisdictional boundaries to examine for a couple reasons. County borders are much less likely to change over time, meaning businesses establishing locations in response to county boundaries have more certainty of the tax effects of these choices. Further, counties are the major and most salient within-state jurisdictional boundary.

We match these locations to county effective property tax rates calculated using CoreLogic Historical Property data. The CoreLogic data provides detailed information about specific properties. Examples of variables in this data include address, county, land use (e.g., residential, commercial, non-profit, etc.), assessed value, market value, and taxes paid. However, we use the CoreLogic data only to compute the effective property tax rate for businesses by county. We do this by dividing property taxes paid by market value for the commercial properties in the dataset. We do not use the assessed value of the properties because different jurisdictions assess values differently and often do not update these assessment values over time. This method also partially addresses the concern of different counties offering property tax abatements that could influence our outcomes—to the extent some counties are generous with their property tax abatements, this will influence overall effective tax rates by county.

We use property data from 2015-2021 which totals 31,452,373 commercial establishment observations. We then group these individual property effective tax rates at the county level, keeping the median value. Some counties in CoreLogic's data do not provide sufficient commercial properties, taxes paid information, or market valuations to calculate an ETR. These 634 counties are excluded from the sample. Poor coverage of these key variables is often related to states because of state limits on what data CoreLogic is able to collect. We lose 9 entire states as a result of these data requirements.[4] We end with 2,609 counties with useable effective

[4] The states we lose are CA, CT, DE, DC, HI, MA, ME, NH, RI, VT.

commercial property tax rates out of the possible 3,243 counties in the U.S. Appendix B visualizes the coverage of our data.

We merge our effective property tax rates onto the geo-located SafeGraph data. We ensure that each establishment observation contains an effective tax rate for the county it resides in as well as an effective tax rate for the closest neighboring county. We drop observations where the closest neighboring county is from a different state in order to not pick up state-based location decisions. Lastly, we drop observations that are farther than 10 km away from the county border because we are only interested in location decisions on the margin and our tests focus on close-to-the-border establishments. In total, we have 2,805,455 establishments with adequate data. Table 1 displays our sample selection process. Table 2 Panel A shows the composition of the sample by industry. Table 3 provides the counts of the most frequent brands in the sample and likelihood of locating on the lower-taxed side of a county border. Further, Table 4 provides descriptive statistics for the variables that we use in the coming sections. The average effective county property tax rate is 2.1%, meaning business property pays on average 2.1% of its market value in property taxes. The average differential between rates at county borders is 0.5%, which as a fraction of 2.1% is very large. The average *Cash ETR* is 20%, slightly lower than the U.S. statutory tax rate of 21%.

For our last set of tests, we merge Compustat financial data onto the public companies contained in the SafeGraph data. The main financial statement variables we examine are the cash effective federal tax rate, return on assets, gross profit margin, net profit margin, size, and number of stores. In total, our tests include 181 - 267 corporations with Compustat data which we are able to link with the SafeGraph data.

4. Empirical Tests

To test our predictions, we employ several different techniques and models. The tests generally consider the relationship that being close to the county border has on locating on the lower-taxed side of the that county line. We contend that establishments that wish to be in an area near a county border in the first place will be the ones most likely to consider a move into the lower-taxed side. Establishments further away from county borders are less likely to consider property taxes because of other elements driving their location decision such as customer traffic and resources.

4.1 Establishment Counts

We begin our analysis with descriptive counts of the number of establishments near county borders at varying distance bandwidths, recognizing that the closer to the border an establishment is, the lower-cost it would be to be on the other side of the border. We document the number of total establishments near the border as well as the number of establishments on the lower property taxed side. We then analyze these count patterns for different groups of borders based on the property tax rate differential that exists. We calculate the differential of a county border as the absolute value difference of the two neighboring counties' effective commercial property tax rates. To calculate the differentials, we sort all unique county borders and assign a percentile value to each border which we split the sample on.

We report initial results of frequencies in Table 5. The table displays the total number of establishments and the frequency of how many of these establishments are on the lower taxed side of the border for different distance bandwidths to the border. The table is split into two parts, first showing the number of establishments within specific 500 meter bins and then showing a cumulative count of establishments that are closer than a given distance to the border. The first set of counts only consider the observations in a specific 500 meter distance bin. The second section considers any observation with a distance less than the listed distance to be in its group. The rightmost column of each section displays the percentage of firms that are on the lower property-taxed side of the border at different distances from the border. The bottom row shows that, of establishments in our sample, 45.5% are on the lower-taxed side, which mean that 54.5% of establishments are on the relatively higher taxed side of the border. More densely populated, metropolitan areas, are likely responsible for the majority of establishments residing in the higher-taxed counties. As we begin focusing in around the border at tighter bandwidths, we see monotonic increases in the percentage of firms that locate on the lower-taxed side of the border. Compared to the full sample, firms that are within 1 km of the border have a 4 percentage point increase in the probability of locating on the lower-taxed side of the border. This equates to a (49.5–45.5)/45.5 = 8.8% percent increase of firms on the low tax side if the establishment is close to the border. A similar trend is present in the binned counts. Between 10,000m and 9,500m from the border, only 40% of establishments are on the lower taxed side of a border, but this number is closer to 50% for establishments that are within 1km of a county border.

While the previous analysis examines all county borders, the incentives to locate on a low-tax side increase in the tax rate differential. For example, the Walmart depicted in Figure 1 is in Chatham County, with an effective average property tax rate of 0.10%, while the neighboring Orange County has an effective property tax rate of 0.17%. These large rate differentials should provide even more incentive to consider property taxes when locating establishments. Table 6 examines similar frequencies but cross-sections by the border rate differentials and only considers close firms that are within 1 km of the county border. ">98th Percentile" in the table for example represents the borders that have the largest differences between their effective commercial property tax rates, and "2nd Percentile" represents firms around county borders with the smallest effective tax rate differentials. We expect and find that borders with the largest rate differentials will have the largest proportion of establishments on the lower taxed side because the incentive and opportunity to avoid high taxes is greater. We see a fairly constant increasing pattern in the proportion of establishments on the low tax side as the differential increases. The proportion in the lowest differential borders is 49% and increases to 54.7% in the highest differential borders. We put these estimates into an odds ratio as a way to further interpret the results. The odds of locating on the low side increase from .961 to 1.205 as the differential goes from the lowest 2% of border differentials to the top 2%. Further, by taking the ratio of these high and low differential proportions, we see that the extremes have the largest differences in the proportion of establishments on the low tax side. These results are consistent with firms avoiding property taxes, especially when the benefits from doing so are the greatest.

4.2.1 Bunching Analysis

Our next set of tests examines establishment location decisions compared to a counterfactual group that should be relatively unaffected by property taxation. We identify 303,265 non-profit establishments that serve as counterfactuals. These non-profits consist of churches, schools, and public buildings which we collected based on NAICS code. The property tax situation of non-profits varies across jurisdiction, and, it is impossible for us to know exactly how non-profits are subject to property taxes in each jurisdiction. However, in many jurisdictions, non-profits are exempt from property taxes, such that on average, they will generally be less sensitive to property tax concerns than our for-profit establishments. We use these relatively less sensitive establishments as a counterfactual to where establishments would locate absent property tax considerations. This counterfactual is not perfect—aside from some non-profits being subject to property taxes, some non-profits may have other incentives to locate differently than the mostly retail outlets we study. For example, schools locate within a school district, which boundaries may coincide with county boundaries. As a result, schools may tend to be in the center of counties, as opposed to near the borders. Some churches or government buildings may locate in strip malls, which may locate on the low-tax side of a border for tax purposes. However, as our analysis compares the frequency of for-profit establishments near a border with non-profits near a border, and then examines which side of the border they are on, the fact that some non-profits may not locate near borders is not relevant, and will only serve to bias the difference between these non-profits and commercial properties downward. All remaining establishments in our sample besides this counterfactual group serve as treated establishments. Table 2 Panel B breaks down the split between treated and control observations.

We plot the densities of these two groups around county borders and analyze divergence between treated and control observations. To plot the densities, we use distance to the border as the running variable and we treat the border as 0 on the graphs. Then we identify whether an establishment is on the lower-taxed side of the county border by comparing the effective tax rate of the county that the establishment resides in to its closest neighboring county. If the establishment is in the relatively lower taxed side of the border, we label these establishments as "Low Tax Side". We plot these "Low Tax Side" densities on the left of the border at 0, such that these distance bins take negative values for presentation purposes. The density of establishments on the "High Tax Side" of the county border are plotted to the right side of the border. The graphical analysis considers firms within 4 km of the county border. We use 200 meter bins when creating the densities. The plotted densities are accumulations of thousands of counties which has the benefit of providing an on average effect. To ensure that a handful of counties with the most establishments aren't driving results, we drop counties from bins where more than 5% of the observations in a given bin are from one county.

From these densities we also calculate the excess number of firms that exist around the border in the treated group relative to the counterfactual group. These excess density estimates are calculated by comparing the number of firms that are predicted to be near the border from the counterfactual densities to the actual number of firms near the border in the treatment group. For these tests, we consider firms within 1 km of the county border to be most susceptible to making real location decisions regarding property taxes, thus we label our bunching window to be 1 km on either side of the border. We create 4 four measures of excessive bunching: 1) total bunching in the 2 km window extending 1km into the "Low Tax Side" and 1km into the "High Tax Side", 2) bunching in the 1 km window on the left or "Low Tax Side" of the border, 3) bunching in the 1 km window on the right or "High Tax Side" of the border, and 4) net bunching calculated by subtracting 3 from 2. We calculate the net bunching estimate to account for other factors that may motivate firms to locate near a border beyond property tax incentives, for example, zoning, licensing, or simply more economic activity. By subtracting the excess mass of the higher-taxed side from the excess mass of the lower-taxed side, we can get at a closer estimate of the economic activity at the border that is attributable to property taxes. These estimates represent the percent increase in treated firms around the border. We bootstrap these estimates with 200 bootstrapped samples to calculate standard errors used in significance testing.

Figure 2 plots the densities of the counterfactual non-profit establishments and the treated taxed establishments. The figure shows that treated densities and counterfactual densities generally track in a consistent manner, except for around the border. We see a decline in non-profits around the border and an increase in taxed establishments around the border. From this we might infer that for-profit firms have a number of incentives driving the decision to locate in one county vs another. Examples of these incentives might include business friendliness, abatements, licensing, permits, etc. However, we see more treated firms on the "Low Tax Side" of the border than the "High Tax Side", which indicates that property taxes could be a factor.

To explore the property tax component of this county line bunching, we replicate the previous figure but split it up by border rate differentials. We expect to see and find evidence that there is more bunching at the border when the differential in rates is higher. These differential cross-sections show that the gap between treated and control establishments around the border is higher when the differential is higher. We also see spikes occurring on the "Low Side" which represents bunching into the lower taxed side of the border compared to the higher taxed side. Figure 3 displays these graphs. Notably, for the highest border differentials, we see a large mass of firms on the lower-taxed side of the border, and we see this mass dissipate as the differential decreases.

To quantify these effects, we compare the densities of the counterfactual to the densities of the treatment group to come up with a measure of excess firms around the border. Table 7 displays these results. Our first measure is the "Total" excess as seen in column 1 of Table 7. As an example, the 12.75% indicates that in the highest differential borders, there are 12.75% more treated establishments around the border than are predicted by the counterfactual. This "Total" measure captures excess in the entire window from -1,000 to 1,000, or 1 km into both sides of the border. Column 2's 18.11% can be interpreted as there being 18.11% more treated firms than predicted by the counterfactual over the window of -1,000 to 0, or just the low tax side of the border. The same process is used in Column 3, but for the high tax side. Column 4 is simply the difference between Column 2 and Column 3. This "Net" measure tells us how much extra bunching occurred in the low-tax side, excluding the simultaneous bunching on the high tax side that is not explained by property tax planning. The "Net" results thus give us a better approximation of the tax motivated bunching near the border. We estimate all 4 of the estimates for 6 different differential groupings, with ">90th Percentile" representing the biggest differential borders and "10th Percentile" representing the lowest differential borders and so on.

We find that the estimates are largest for the highest differential borders. When the differential is the largest, there are 11.71% more establishments around the border that we attribute to tax planning. Without netting, there are 18.11% more establishments on the low-tax side of the county border. These results decrease in magnitude as the differentials become less extreme. By calculating standard errors from bootstrapping, we find that all estimates are statistically different than 0 except for the "Net" measure for the lowest differential borders. This suggests that taxes only matter when the costs and benefits are large enough. Considering all borders regardless of differential, we estimate that 2.67% more establishments locate on the lower-taxed side of county borders.

4.2.2 Additional Bunching Analysis – Population Density and Foot Traffic

To further identify where property taxes matter most and for which firms, we run a similar analysis as above but condition on county population density and foot traffic of specific establishments. First, we split our sample by population density in order to understand how more rural or urban areas contribute to our results. We use publicly available population density data from the U.S. Census Bureau's 2014-2018 American Community Survey. We split the sample into two parts – counties with above median population density (*Urban*) and counties with below median population density (*Rural*). We expect more bunching on the lower-tax side of a county border for *Rural* counties because space and lot availability is likely less constraining. In *Urban* regions, cities and towns are more fully developed, leaving less room for precise location decision-making. Further, businesses in urban areas likely depend more on being where people (i.e., potential customers more likely to be on foot) are located, prioritizing consumer traffic rather than marginal tax savings.

Figure 4 displays our graphical and numeric estimates for *Rural* vs *Urban* counties. Both graphs show significant bunching around the border of treated firms relative to the non-profit counterfactual. However, for rural counties, this bunching is largely concentrated on the low-tax side of the county border. Point estimates suggest that for rural counties, there are 13.8% more taxed establishments on the low-tax side of the county border than are predicted by a non-profit counterfactual. This estimate is lower for urban counties at 12.8%. By netting out the bunching on the high-tax side of the border, rural counties experience a net 7.04% bunching estimate compared to urban counties' 5.77%. These results are consistent with firms in rural establishments being more sensitive to property taxes and taking advantage of tax planning opportunities.

We also conduct a cross-sectional test where we split on establishment level consumer foot traffic. Foot traffic data comes from Advan and is merged with SafeGraph's point of interest (POI) dataset by a unique POI identifier. Advan provides weekly and monthly foot traffic data for millions of specific POI's around the world, such as retail stores, restaurants, malls, hospitals, and airports. These data use anonymized tracking of smartphones to create measures of how many people visit a location in a certain day, how long they stay, distance from their home, and related stores that they visit. We use the count of visitors at each establishment to group the data into a high foot traffic group and a low foot traffic group. We use foot traffic data for December 2022 and split the data at the median number of visits. We expect establishments with more foot traffic to be less tax sensitive as their location decisions revolve around locating where potential customers are. Low foot traffic locations are likely less reliant on customer traffic and more willing to locate with border and tax considerations in mind. We perform the same method as above to create figures and estimates of bunching around the border. We hold the counterfactual constant in each test so that we are comparing high vs low foot traffic establishments with all establishments.

Figure 5 displays our results. Graphical results suggest that there is more bunching on the low-tax side of the border for low foot traffic establishments compared to high foot traffic establishments. On the low-tax side of the border, there are 15.31% more low foot traffic establishments than predicted by the counterfactual compared to an estimate of 10.15% for high foot traffic establishments. Using the net bunching estimate which subtracts off bunching on the high-tax side, low foot traffic establishments exhibit a measure of 7.00% which is more than twice the size of the estimate for the high foot traffic group.

Together, our examination of population density and foot traffic begin to show the numerous factors that go into firm location decisions. We show cross-sections that exploit the willingness and the opportunity of firms to make tax-motivated location decisions, finding that firms with more potential location options and less reliance on customer visits make a greater effort to be located in lower-taxed counties.

4.3 Regression Estimation

We examine the association that county tax rate differentials and treated vs control establishments have on the distance that these establishments locate from the county border. These tests serve the purpose of showing interaction effects and including fixed effects which control for constant county factors. We estimate the following regression specification:

$$Distance_i = \beta_0 + \beta_1 Border\ Differential_i + \beta_2 Treated\ Indicator_i + \beta_3 Border\ Differential * Treated\ Indicator_i + \sum \beta_c County_c + \epsilon_i \quad (1)$$

Distance is a continuous variable that takes the value of 0 to 10,000. It measures the distance in meters that an establishment is from the nearest county border. *Border Differential* is a continuous variable of the absolute value difference that exists between the county tax rate that the establishment is in compared to the closest neighboring tax rate, multiplied by 100. *Treated Indicator* is an indicator variable equal to 1 if the establishment is part of the treatment group, and 0 if the establishment is part of the counterfactual group. We also include county fixed effects to control for county wide effects such as incentives, business friendliness, and other confounding factors. We cluster standard errors at the border level. We predict negative coefficients on β_1 and β_3. A negative coefficient on β_1 signifies that as the differential at a border increases, firms become more tax sensitive and locate closer to county borders. A negative coefficient on β_3 would highlight how this effect is most salient in treated firms that pay property taxes. Because distance alone does not explain what side of the border the establishment locates on, we run the regression on 3 separate variations of the dependent variable *Distance.* The first variation, *Adjusted Distance* entails setting the distance value equal to 0 for all observations on the high tax side of the border. This helps us examine if the result is being driven by firms on the low tax side of the border. We then also run the model in cross sections, first only for establishments on the low tax side and second only for the establishments on the high tax side. Finding a result on the low tax side and not the high tax side would be consistent with firms moving into lower taxed counties, thus being closer to the border on the lower-tax side but not necessarily on the higher-taxed side.

Table 8 shows our OLS results. We find that after controlling for county fixed effects, the general level of the differential, and being a treated firm, the interaction of the border differential and being a treated firm has a statistically significant negative relationship with distance to the border. This finding in Panel A shows that treated firms in high differential counties are more likely to be closer to the border, which reflects that they may have just barely located in a certain county to avoid taxes.

Panel B of Table 8 swaps the dependent variable for *Adjusted Distance* which sets all high side observations to 0. This should allow us to confirm that this trend is being driven by the low taxed side of the border rather than border bunching as a whole. Indeed, we find a statistically significant negative relationship between the interaction of the differential and being a treated firm. We also cross section by low vs high side (Panel C). We continue to find a result in the low tax side group but do not find a result in the high side observations, which fits with this trend being a result of firms locating just into lower taxed counties. In Panel D, we partition by below and above median differential. We find that this effect is strongest in the borders that are already experiencing high differentials, suggesting that firms near borders with high differentials are incrementally more sensitive to property taxes.

4.4 Relationship to Income Tax Planning

To examine the relationship that exists between property tax avoidance and firm characteristics, we merge Compustat Annual data onto our sample of establishments. We are mainly interested in the cash effective federal tax rate (*CashETR*) which proxies for corporate tax avoidance. We study whether there exists a complement or substitute effect between property tax planning and federal tax planning. We calculate *CashETR* by dividing taxes paid by pretax income net of special items. We create a 5-year average measure of *CashETR* by taking the average over the period 2018-2022. After merging Compustat with our establishment data, we are left with 267 unique firms for the following analysis. We estimate an equation similar to Equation 1, but replacing the treated indicator with *CashETR*:

$$Distance_i = \beta_0 + \beta_1 Border\ Differential + \beta_2 CashETR_i + \beta_3 Border\ Differential * CashETR_i + \sum\beta_c County_c + \sum\beta_m Industry_m + \epsilon_i \quad (2)$$

We follow the same procedure as before and alternate the dependent variable with *Adjusted Distance* and cross-section by keeping only the high tax side or low tax side observations. A positive coefficient on *CashETR* would indicate a complement effect because a higher federal effective tax rate indicates lower levels of tax avoidance, consistent with *Distance* increasing simultaneously. A negative coefficient would show a substitute effect where the poorer federal tax planners are more successful property tax planners.

Table 9 displays the results of estimating Equation 2. We control for county fixed effects and industry fixed effects in these analyses. We find that the interaction of *Border Differential* and *CashETR* is statistically significant and negative. This means that as the differential gets higher (firm gets more tax sensitive) and effective corporate tax rates increase (tax avoidance decreases), establishments are more likely to locate close to the border. Again, we use *Adjusted Distance* to tease out which side of the border is driving the result. By cross-sectioning on either side of the border, we also see that this decreasing distance is attributable to the lower taxed side of the border. This shows a substitution effect between federal tax planning and property tax planning. Firms are perhaps unable to effectively lower federal taxes, so they turn to an alternative route to decrease overall tax burden and increase profits.

As an alternative specification, we run a linear probability model to estimate the probability of locating on the low tax side of the border in association with being close to the border and *CashETR*:

$$OnLowSide_i = \beta_0 + \beta_1 Close_i + \beta_2 CashETR_i + \beta_3 Close_i * CashETR_i + \sum\beta_c County_c + \sum\beta_m Industry_m + \epsilon_i \quad (3)$$

In Equation 3, the dependent variable, *OnLowSide*, is an indicator equal to 1 if the establishment is on the lower taxed side of the border. The first explanatory variable is *Close* which is an indicator equal to 1 if the establishment is within 1km of the county border. We interact this variable with *CashETR*. In this model, we would expect there to be positive coefficient on β_3 if there exists a substitution effect between federal tax planning and property tax planning. That is, as *CashETR* increases (lower level of tax avoidance) and the firm is close to the border, the more likely that it is that the firm locates on the low taxed side.

Table 10 estimates displays estimates for Equation 3. Using this alternative specification, we continue to find evidence that higher *CashETR* firms are more likely to locate on the lower tax side of the border. The interaction term of *Close* and *CashETR* loads statistically significant when fixed effects are included and indicates that when a firm is both close to the border and has increasing *CashETR* that they are more likely to locate on the lower taxed side of the county line.

Lastly, we study other financial metrics that may be associated with a firm's decision to locate establishments in lower taxed counties. We continue to examine *CashETR,* but now also incorporate *Return on Assets*, *Gross Profit Margin*, *Net Profit Margin*, firm size (*SIZE*), and the number of stores for each firm (*Number of Stores*). We calculate a 5-year measure for each of these variables, except *NumStores* because this variable is calculated at a fixed point. We include *CashETR* to study whether there exists a complement or substitute effect with federal tax planning. We include *Return on Assets*, *Gross Profit Margin*, *Net Profit Margin* to examine associations with profitability. *SIZE* controls for the effects that total assets have on property tax sensitivity. We also control for number of stores to account for how the number of establishments that a corporation has is related to property tax planning. We keep all observations that are within 1 km of the county border and drop the remaining observations because we are interested in the likelihood of locating on the lower taxed side if you are close to the border to begin with. We also ensure that each firm has at least 10 observations within this 1km bandwidth. We then collapse the data down to the firm level such there is only one observation per firm. The variable of interest is now the *OnLowSide* measure which is ratio of how many establishments locate on the low tax side relative to all firm in this close region. We estimate the following regression:

$$
\begin{aligned}
OnLowSide_i = {} & \beta_0 + \beta_1 CashETR_i + \beta_2 Return\ on\ Assets_i + \beta_3 Gross\ Profit\ Margin_i \\
& + \beta_4 Net\ Profit\ Margin_i + \beta_5 SIZE_i + \beta_7 NumStore_i + \epsilon_i \qquad (4)
\end{aligned}
$$

We combine our federal tax avoidance analysis with other factors that may influence the likelihood of locating on the lower taxed side of a county border. Table 11 presents estimates from Equation 4. Notably, *CashETR* continues to load in this new specification showing that lower tax avoidance is associated with higher property tax avoidance. Firms that have lower margins are likely more sensitive to taxes because taxes further decrease the firms profitability. However, the three measures of profitability do not have a significant effect. We also test whether the number of locations affects a firm’s willingness to property tax plan. On one hand, firms with many stores likely have higher property taxes which they'd like to avoid. On the other hand, firms with many locations might be less willing to move to lower-taxed areas because it places them further from traffic and their customers. We also do not find a statistically significant relationship between number of stores and locating in the lower-taxed side of a county border. None of these other determinant variables being statistically different than 0 provides further support that there is a tax component that is not confounded by other performance measures.

6. Conclusion

Property taxes can amount to a major and recurring expense for companies. Unlike state or federal taxation, property taxation has received little attention in the tax avoidance literature. For one, property taxes do not usually entail the complexities that federal or state taxes do which allow creative tax avoidance strategies in the first place. Another reason for the little attention to property taxes is the difficulty in acquiring data or methods to analyze ways in which a company would consider property tax avoidance. These taxes are assessed at local levels spanning thousands of jurisdictions across the United States. Further, decisions on where a company locates is based on a huge variety of variables. We aim to tackle some of these problems and provide evidence of real location planning by examining frequencies of establishments located right around county borders. Using a combination of granular datasets of POIs and taxes paid, we are able to construct measures of whether an establishment lies on the lower versus higher taxed side of a county border.

We find evidence consistent with our predictions that companies locate just within county lines on the lower property taxed side. We show that as differences between effective property tax rates between counties is higher, firms are even more likely to locate in the lower-taxed side. We also find that firms which are poor federal tax planners are less likely to engage in our measure of property tax planning, indicating that taxes at all levels are of concern to companies.

This study contributes to the tax avoidance literature by showing the real location decisions that are made by companies to save on taxes. Profit maximizing firms will consider all possible avenues to reduce taxes paid and thus increase after-tax cash flows. By understanding the extent to which companies will plan around even local taxation, we can better understand the decision making processes of companies. The high levels of taxation such as federal and international are becoming more understood, but the lower level decisions (such as property taxes) that are likely being made by lower level managers is also of importance. This study has implications for local governments as they strive to compete for businesses and increase their tax revenues. By understanding the importance of property taxes for firms, local governments can weigh that importance into their considerations for how to best attract business to their counties.

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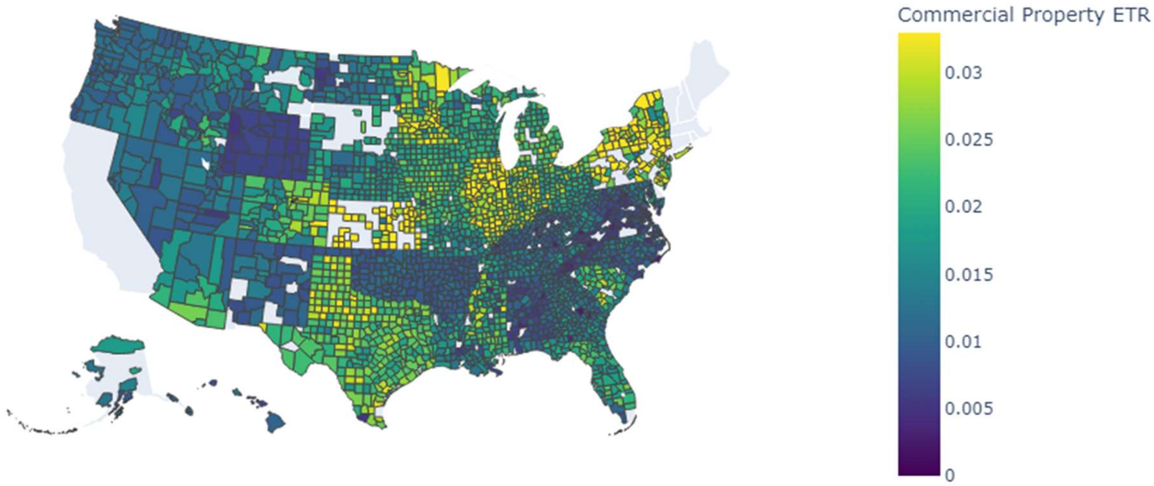
Appendix A

Descriptive Statistics

Variable name	Variable Description
Main Analyses	
Distance	The distance from an establishment to the closest county neighboring county in meters.
Adjusted Distance	The distance from an establishment to the closest county neighboring county in meters, however if the establishment is on the higher taxed side of this border, then the Distance is set equal to 0.
Treated Indicator	An indicator variable equal to 1 if the establishment is part of the treatment group (not a non-profit); 0 otherwise.
CountyETR	The effective commercial property tax rate for a given county. This is calculated by averaging CoreLogic's commercial properties' effective tax rates calculated as taxes paid divided by market price.
Border Differential	The absolute value differential of an establishment's own county effective property tax rate minus the closest neighboring county's effective property tax rate, multiplied by 100.
Firm Characteristic Analyses	
CashETR	Cash Effective Tax Rate, calculated as taxes paid divided by pretax income net of special items, multiplied by 100. 5 year average from 2018-2022. Data from Compustat.
Return on Assets	Return on assets, calculated as income before extraordinary items divided by total assets, multiplied by 100. 5 year average from 2018-2022. Data from Compustat.
Gross Profit Margin	Gross profit margin, calculated as sales minus cogs divided by sales, multiplied by 100. 5 year average from 2018-2022. Data from Compustat.
Net Profit Margin	Net profit margin, calculated as income before extraordinary items divided by sales, multiplied by 100. 5 year average from 2018-2022. Data from Compustat.
SIZE	Size of firm, calculated as the natural logarithm of total assets.
Number of Stores	Number of stores for a company, caclulated as the count of stores belong to a specific brand. This variable is constructed before any sample cuts in order to approximate nationwide store counts.
Close	Indicator variable equal to 1 if the establishment is within 1 km of the county border; 0 otherwise.
OnLowSide	Indicator variable equal to 1 if the establishment is on the lower taxed side of the closest county border; 0 otherwise.

Appendix B



This figure plots the coverage of the U.S. counties that are included in our sample. Due to lack of data availability in CoreLogic for property market values, we lose

Table 1

Sample Selection

Observations from SafeGraph Places dataset as of Dec 31, 2022, after removing duplicates and geolocating	10,674,296
Less:	
Establishments farther than 10,000m from the border	4,295,140
Establishments in counties missing an effective property tax rate or neighboring county effective property tax rate	1,891,996
Establishments whose closest neighboring county is a different state	588,483
Medical (2 digit NAICS = 62)	585,748
Manufacturing (2 digit NAICS = 31, 32, or 33)	128,747
Museums, Historical Sites, and Similar Institutions	61,641
Death Care Services	90,514
Urban Transit Systems, ATMs, Mailboxes, Electric Charging Stations, Redbox	226,495
Singleton County Observations	77
Final Sample	2,805,455

This table shows the sample selection. The appendix contains detailed variable definitions.

Table 2

Descriptive Statistics: Industry Counts

Panel A			
Sector	Description	Frequency	Percent
11	Agriculture, Forestry, Fishing and Hunting	522	0.02%
21	Mining, Quarrying, and Oil and Gas Extraction	24	0.00%
22	Utilities	3,582	0.13%
23	Construction	126,661	4.51%
42	Wholesale Trade	32,537	1.16%
44	Retail Trade	507,358	18.08%
45	Retail Trade	147,934	5.27%
48	Transportation and Warehousing	37,570	1.34%
49	Transportation and Warehousing	3,308	0.12%
51	Information	43,615	1.55%
52	Finance and Insurance	122,675	4.37%
53	Real Estate and Rental and Leasing	385,475	13.74%
54	Professional, Scientific, and Technical Services	124,361	4.43%
55	Management of Companies and Enterprises	4,535	0.16%
56	Administrative and Support and Waste Management and Remediation Services	45,897	1.64%
61	Educational Services	89,602	3.19%
71	Arts, Entertainment, and Recreation	97,696	3.48%
72	Accommodation and Food Services	384,117	13.69%
81	Other Services (except Public Administration)	612,728	21.84%
92	Public Administration	33,631	1.20%
NA	Other	1,627	0.06%
		2,805,455	100.00%
Panel B			
	Treated Establishments	2,502,190	89.19%
	Non-Profit Counterfactual (NAICS: 61, 92, 8131)	303,265	10.81%
		2,805,455	100.00%

This table provides information about what industries make up our sample. Panel B shows the composition of our treatment and control groups used in several.

Table 3

Top 80 Brands

Counts within 1 km of County Border

Brand	Observations on Low Tax Side	Total Observations	Percent on Low Tax Side	Brand	Observations on Low Tax Side	Total Observations	Percent on Low Tax Side
Freeman Health System	73	91	80.22	GNC (General Nutrition Centers)	46	91	50.55
Jiffy Lube	53	85	62.35	Burger King	127	252	50.40
Mattress Firm	61	100	61.00	Arby's	75	149	50.34
Sunoco	176	295	59.66	Exxon Mobil	184	367	50.14
Extra Space Storage	60	101	59.41	Allstate Insurance	180	359	50.14
Fresenius Kidney Care	55	95	57.89	Edward Jones	290	580	50.00
Health Street	138	239	57.74	Keyme Kiosk	87	174	50.00
Dunkin'	218	382	57.07	KFC	71	142	50.00
Jersey Mike's	53	93	56.99	Hertz	44	88	50.00
Circle K	109	192	56.77	7-Eleven	217	435	49.89
NAPA Auto Parts	122	216	56.48	McDonald's	264	534	49.44
Public Storage	94	170	55.29	Walgreens	149	302	49.34
Sherwin-Williams	85	154	55.19	Chevron	93	189	49.21
Suzuki	60	109	55.05	Raymond James Financial	58	118	49.15
CrossFit	110	200	55.00	Speedway	84	171	49.12
Holiday Inn Express	47	86	54.65	O'Reilly Auto Parts	96	196	48.98
Great Clips	117	216	54.17	Starbucks	279	571	48.86
Waffle House	59	109	54.13	Kroger Pharmacy	62	127	48.82
Walmart	83	154	53.90	Marathon	152	312	48.72
Rotary Club	147	273	53.85	Hampton	53	109	48.62
BP	193	359	53.76	Dollar General	486	1000	48.60
Krispy Krunchy Chicken	77	144	53.47	Domino's Pizza	113	233	48.50
Goodwill Industries	78	146	53.42	Enterprise Rent-A-Car	75	155	48.39
Sonic	82	154	53.25	Casey's General Stores	57	118	48.31
Sherwin-Williams	79	149	53.02	Hunt Brothers Pizza	291	603	48.26
Chipotle Mexican Grill	63	119	52.94	GameStop	55	114	48.25
Keller Williams	45	85	52.94	DaVita	54	112	48.21
Advance Auto Parts	120	229	52.40	Phillips 66	54	112	48.21
Papa John's	61	117	52.14	Tesla Destination Charger	65	135	48.15
H&R Block	160	307	52.12	ALDI	49	102	48.04
Mobil	102	196	52.04	Taco Bell	141	294	47.96
REMAX	65	125	52.00	7-Eleven Fuel	91	190	47.89
Valero Energy	116	226	51.33	CVS	160	336	47.62
State Farm	376	736	51.09	Farmers Insurance Group	199	421	47.27
AT&T	97	190	51.05	Popeyes Louisiana Kitchen	52	110	47.27
Wendy's	134	264	50.76	Shell Oil	257	544	47.24
Chick-fil-A	68	134	50.75	Family Dollar Stores	157	334	47.01
Cricket Wireless	69	136	50.74	Health Mart	48	103	46.60
Anytime Fitness	45	89	50.56	Sears Home Services	43	93	46.24
Subway	411	813	50.55	Pizza Hut	103	224	45.98

This table displays the counts of the top 80 most frequent brands in the sample, ordered by those most frequently on the low-tax side.

Table 4

Descriptive Statistics

	Mean	SD	0.25	Median	0.75	Observations
Variables for Main Analyses						
Distance	4739	2807	2357	4599	7059	2,805,455
Adjusted Distance	2087	2959	0.000	0.000	3967	2,805,455
Treated	0.892	0.311	1.000	1.000	1.000	2,805,455
CountyETR	2.120	1.049	1.354	2.023	2.680	2,805,455
Diff	0.519	0.858	0.133	0.291	0.599	2,805,455
Variables for ETR Analyses						
CashETR	0.20	0.08	0.17	0.20	0.24	219,046
ROA	8.26	6.14	4.48	6.07	9.45	219,046
GPM	34.18	16.13	21.46	32.94	49.12	219,046
NPM	9.07	8.02	3.56	7.20	12.09	219,046
SIZE	10.03	1.89	8.59	10.03	11.42	219,046
N_stores	8.01	1.33	7.23	8.44	8.97	219,046
OnLowSide	0.45	0.50	0.00	0.00	1.00	219,046

Unique County and Border Counts

	Unique	Average N per County or Border
Counties	2,690	1,043
Borders	5,842	480

This table displays summary statistics for the variables used in our analyses as well as information about the number of counties and borders in the sample.

Table 5

Frequency of Establishments by Distance to Border

Distance to Border (meters)	Establishments In Each 500m Bin			Cumulative Count Closer than Distance		
	Total Firms	Count on Low Side of Border	% on Low Side	Total Firms	Count on Low Side of Border	% on Low Side
500	129,642	64,230	49.5%	129,642	64,230	49.5%
1,000	126,306	63,248	50.1%	255,948	127,478	49.8%
1,500	133,006	63,660	47.9%	388,954	191,138	49.1%
2,000	146,165	69,737	47.7%	535,119	260,875	48.8%
2,500	130,472	60,623	46.5%	665,591	321,498	48.3%
3,000	133,450	63,586	47.6%	799,041	385,084	48.2%
3,500	147,691	68,756	46.6%	946,732	453,840	47.9%
4,000	142,015	64,803	45.6%	1,088,747	518,643	47.6%
4,500	136,805	63,798	46.6%	1,225,552	582,441	47.5%
5,000	147,742	69,106	46.8%	1,373,294	651,547	47.4%
5,500	130,506	58,618	44.9%	1,503,800	710,165	47.2%
6,000	120,616	54,386	45.1%	1,624,416	764,551	47.1%
6,500	123,401	54,660	44.3%	1,747,817	819,211	46.9%
7,000	114,514	50,771	44.3%	1,862,331	869,982	46.7%
7,500	110,167	48,306	43.8%	1,972,498	918,288	46.6%
8,000	108,799	47,174	43.4%	2,081,297	965,462	46.4%
8,500	111,629	46,895	42.0%	2,192,926	1,012,357	46.2%
9,000	100,775	41,925	41.6%	2,293,701	1,054,282	46.0%
9,500	98,180	40,438	41.2%	2,391,881	1,094,720	45.8%
10,000	110,309	44,169	40.0%	2,502,190	1,138,889	45.5%

This table shows the number of establishments in certain distance bins around county borders and the corresponding percentage of firms which locate on the low property tax side of the border. “Establishments in Each 500m Bin” reflects the number of observations inside each 500m bin. “Cumulative Count Closer than Distance” displays the count of observations that are a certain distance or less to border.

Table 6

Border Rate Differentials

Counts				
Differential	Total Close Firms	Count on Low Side	% on Low Side	Odds Ratio
2nd Percentile	996	488	49.00%	0.961
10th Percentile	14,233	6,779	47.63%	0.909
25th Percentile	41,916	20,471	48.84%	0.955
50th Percentile	101,185	50,120	49.53%	0.981
>50th Percentile	154,980	77,472	49.99%	1.000
>75th Percentile	90,485	44,983	49.71%	0.989
>90th Percentile	52,082	27,301	52.42%	1.102
>98th Percentile	19,490	10,651	54.65%	1.205
High vs Low Differential Ratios				
">50th Perc." / "50th Perc."	1.009			
">75th Perc." / "25th Perc."	1.018			
">90th Perc." / "10th Perc."	1.101			
">98th Perc." / "2nd Perc."	1.115			

This table shows the frequency of establishments locating on the low side of county border for different magnitudes of rate differentials that exists at a border. Top 2% for example represents the county borders with the biggest difference in effective property tax rates.

Table 7

Excess Establishments Around Border

Bin Width	200			
Counterfactual	Non-Profit			
Differential Percentile	(1) Total [-1000,1000]	(2) Left [-1000,0]	(3) Right [0, 1000]	(4) Net Left - Right
>90th Percentile	12.75	18.11	6.40	11.71
	(1.328)***	(2.181)***	(1.494)***	(2.667)***
>75th Percentile	9.72	15.46	4.48	10.98
	(0.941)***	(1.705)***	(0.925)***	(1.907)***
>50th Percentile	8.49	11.39	5.88	5.51
	(0.693)***	(1.089)***	(0.913)***	(1.441)***
50th Percentile	11.00	11.08	10.92	0.16
	(0.918)***	(1.318)***	(1.331)***	(1.907)
25th Percentile	8.52	6.77	10.28	-3.51
	(1.287)***	(1.818)***	(2.01)***	(2.829)
10th Percentile	4.16	5.05	3.18	1.87
	(1.91)**	(2.691)*	(2.582)	(3.634)
All	10.04	11.42	8.75	2.67
	(0.55)***	(0.833)***	(0.777)***	(1.175)**

This table displays estimates from our counterfactual and treated firm bunching analysis. Compare to Figure 3. The estimates represent the percentage of excess firms that exist in a given region relative to a counterfactual distribution of non-profit establishments. Standard errors are estimated from 200 bootstrapped samples. Standard errors are indicated in paratheses and *,**,*** indicate statistical significance at the 10%, 5%, 1% level respectively.

Table 8

OLS Regression Estimates

	DV = Distance		
	(1)	(2)	(3)
Observations. DV = *Distance*			
Border Differential	-135.50		-88.82
	(-3.90)***		(-2.10)**
Treated Indicator		-4.61	22.25
		(-0.24)	(1.29)
Interaction			-52.36
			(-2.00)**
Constant	4,809.64	4,743.42	4,789.86
	(165.87)***	(213.33)***	(158.87)***
Fixed Effects	County	County	County
Observations	2,805,455	2,805,455	2,805,455
R-squared	0.22	0.22	0.22
Observations. DV = *Adjusted Distance*			
Border Differential	225.46		256.25
	(1.64)		(1.89)*
Treated Indicator		-14.34	3.21
		(-1.03)	(0.25)
Interaction			-34.52
			(-1.71)*
Constant	1,970.04	2,099.86	1,967.22
	(22.81)***	(52.54)***	(22.82)***
Fixed Effects	County	County	County
Observations	2,805,455	2,805,455	2,805,455
R-squared	0.49	0.49	0.49

Table continued on next page

Table 8 Continued

titioning into Low Tax Side and High Tax Side of border. DV = *Distance*		
	(1)	(2)
	High Tax Side Observations	Low Tax Side Observations
Border Differential	233.64	-68.26
	(1.48)	(-1.09)
Treated Indicator	36.79	3.36
	(1.57)	(0.15)
Interaction	-40.02	-58.13
	(-1.42)	(-1.80)*
Constant	4,730.24	4,650.26
	(55.48)***	(115.07)***
Fixed Effects	County	County
Observations	1,529,728	1,275,727
R-squared	0.26	0.24

titioning into Above and Below Median Differential. DV = *Distance*		
	(1)	(2)
	Below Median Border Differential	Above Median Border Differential
Border Differential	693.04	-92.84
	(0.92)	(-2.32)**
Treated Indicator	37.21	-2.98
	(0.88)	(-0.12)
Interaction	52.43	-42.36
	(0.17)	(-1.73)*
Constant	4,851.16	4,667.13
	(47.09)***	(119.16)***
Fixed Effects	County	County
Observations	1,237,761	1,567,635
R-squared	0.27	0.24

This table estimates Equation 1. Panel B uses an alternative DV. Panel C cross-sections based on high vs low side observations. Panel D splits the same based on below and above median border tax rate differential. T-statistics based on border level clustered standard errors are shown in parentheses and *,**,*** indicate statistical significance at the 10%, 5%, 1% level respectively.

Table 9

Effective Tax Rate Analysis

	(1) DV = *Distance*	(2) DV = *Adjusted Distance*	(3) DV = *Distance* Only High Side	(4) DV = *Distance* Only Low Side
Border Differential	-102.65	368.63	227.79	-30.72
	(-1.82)*	(3.32)***	(1.09)	(-0.46)
CashETR	-1.60	-0.72	-2.57	0.02
	(-1.95)*	(-0.97)	(-2.37)**	(0.01)
Interaction	-1.10	-0.98	0.46	-2.87
	(-1.65)*	(-2.14)**	(0.46)	(-3.31)***
Constant	4,927.33	1,925.76	4,900.31	4,719.00
	(125.85)***	(27.03)***	(48.50)***	(91.04)***
Fixed Effects	County, Industry	County, Industry	County, Industry	County, Industry
Observations	218,914	218,914	121,364	97,311
R-squared	0.27	0.53	0.30	0.30

This table estimates Equation 2. T-statistics based on border level clustered standard errors are shown in parentheses and *,**,*** indicate statistical significance at the 10%, 5%, 1% level respectively.

Table 10

Alternative Effective Tax Rate Analysis

	DV = *OnLowSide*		
	(1)	(2)	(3)
Close to Border Indicator	0.0410061	0.0058879	0.0057684
	(2.07)**	(0.79)	(0.78)
CashETR	0.0003406	-0.0002274	-0.0001442
	(1.84)*	(-2.92)***	(-1.63)
Interaction	0.0007133	0.0003779	0.000381
	(1.48)	(1.81)*	(1.83)*
Constant	0.4331	0.4483	0.4467
	(38.63)***	(60.17)***	(59.62)***
Fixed Effects	None	County	County, Industry
Observations	219,046	218,914	218,914
R-squared	0.00	0.70	0.70

This table estimates Equation 3. T-statistics based on border level clustered standard errors are shown in parentheses and *,**,*** indicate statistical significance at the 10%, 5%, 1% level respectively.

Table 11

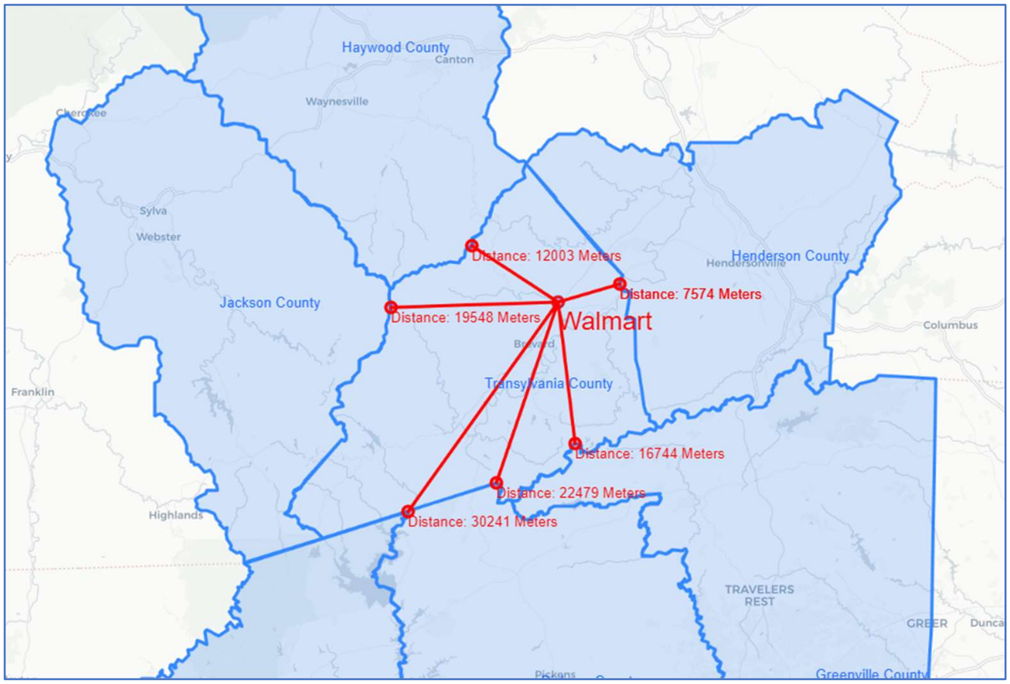
Determinants Analysis

	DV = *OnLowSide*						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CashETR	0.0017*						0.0018*
	(1.87)						(1.93)
ROA		0.0000					0.0004
		(0.02)					(0.29)
GPM			0.0003				0.0004
			(0.79)				(0.78)
NPM				-0.0005			-0.001
				(-0.57)			(-0.77)
SIZE					-0.0022		-0.0006
					(-0.52)		(-0.11)
NumStores						-0.0062	-0.0061
						(-1.36)	(-1.19)
Constant	0.4687***	0.5062***	0.4966***	0.5113***	0.5278***	0.5520***	0.5110***
	(23.93)	(47.76)	(33.02)	(50.27)	(11.74)	(14.59)	(7.60)
Fixed Effects	Industry	Industry	Industry	Industry	Industry	Industry	Industry
Observations	181	181	181	181	181	181	181
R-squared	0.07	0.04	0.05	0.05	0.05	0.05	0.09

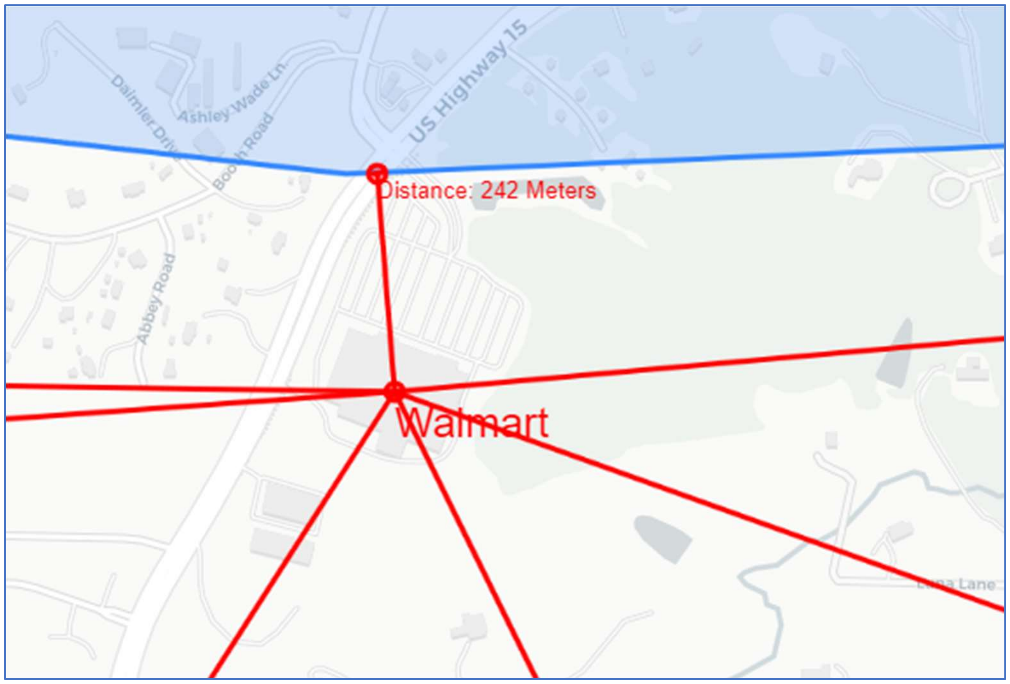
This table estimates Equation 4. T-statistics based on border level clustered standard errors are shown in parentheses and *,**,*** indicate statistical significance at the 10%, 5%, 1% level respectively.

Figure 1
Visualization of Geo-Locating

Not Close to Border



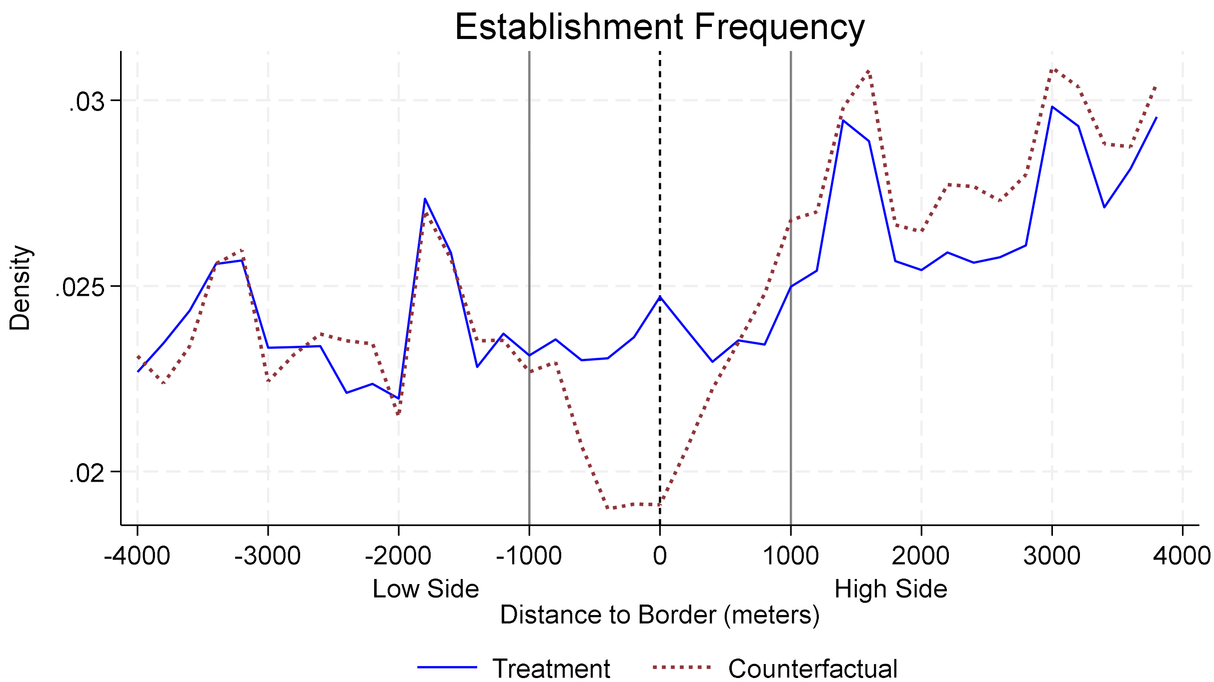
Close to Border



This figure displays the triangulation of how the establishments were geolocated. We calculated the distance to each neighboring county and stored the closest county and distance.

Figure 2

Analysis of Establishment Frequencies around Borders

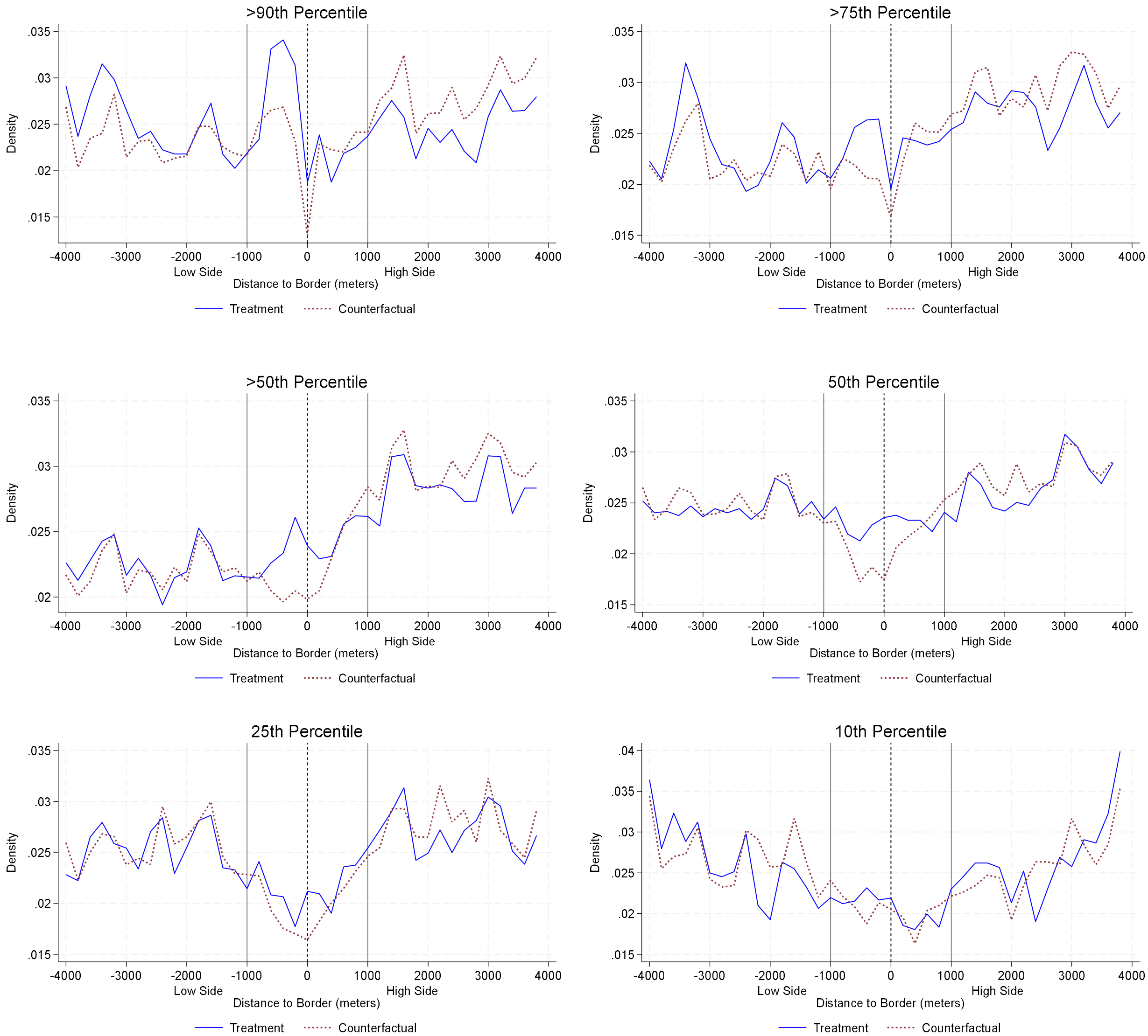


This figure plots the densities of the non-profit counterfactual distribution and the distribution of all other establishments. Negative distance simply denotes that this is the density into the low tax side of a county border and positive distance denotes the density into the high tax side of a county border.

Figure 3

Analysis of Establishment Frequencies around Borders

By Border Rate Differentials

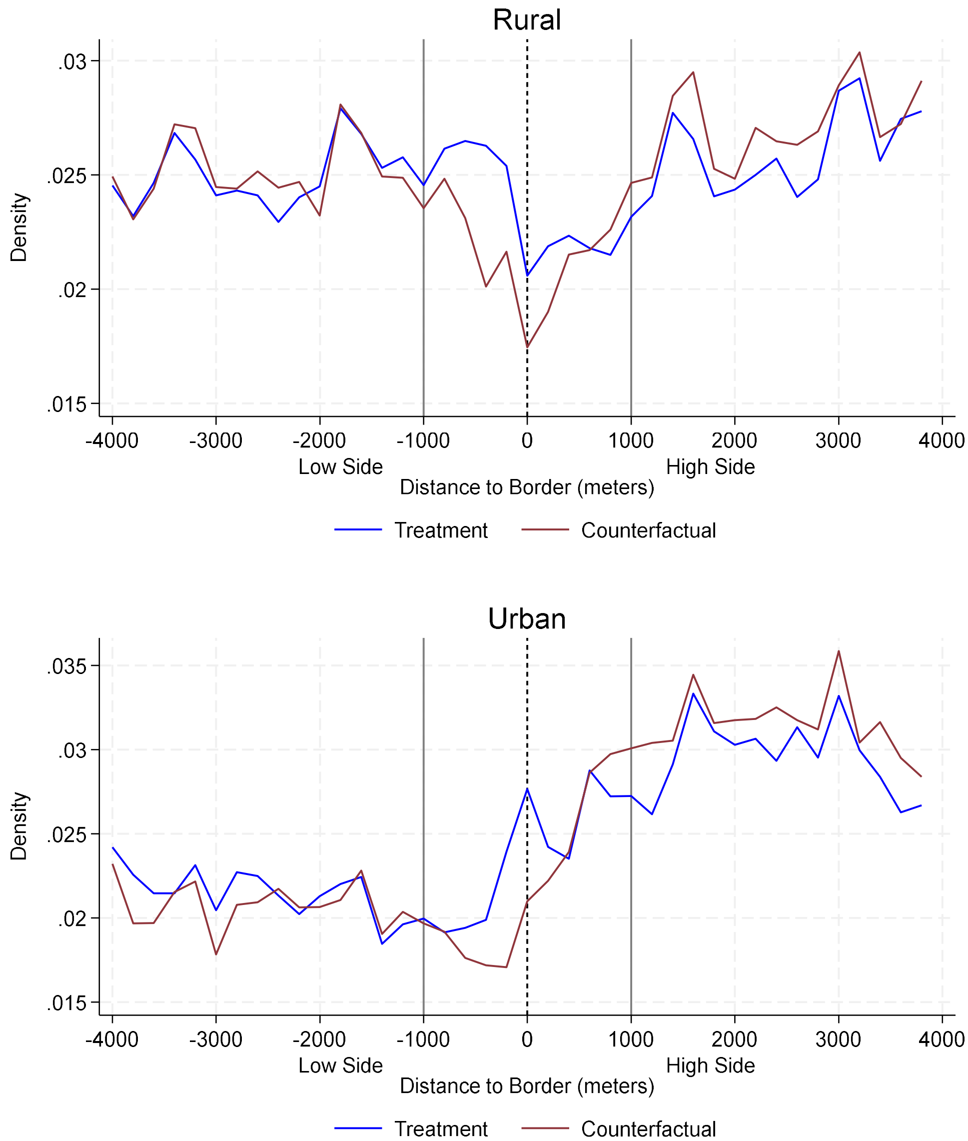


This figure plots the densities of the non-profit counterfactual distribution and the distribution of all other establishments by the size of the tax rate differentials that exists between borders. “>90th Percentile” indicates borders with the largest tax differentials. “>50th Percentile” represents the above median differentials. Negative distance simply denotes that this is the density into the low tax side of a county border and positive distance denotes the density into the high tax side of a county border.

Figure 4

Analysis of Establishment Frequencies around Borders

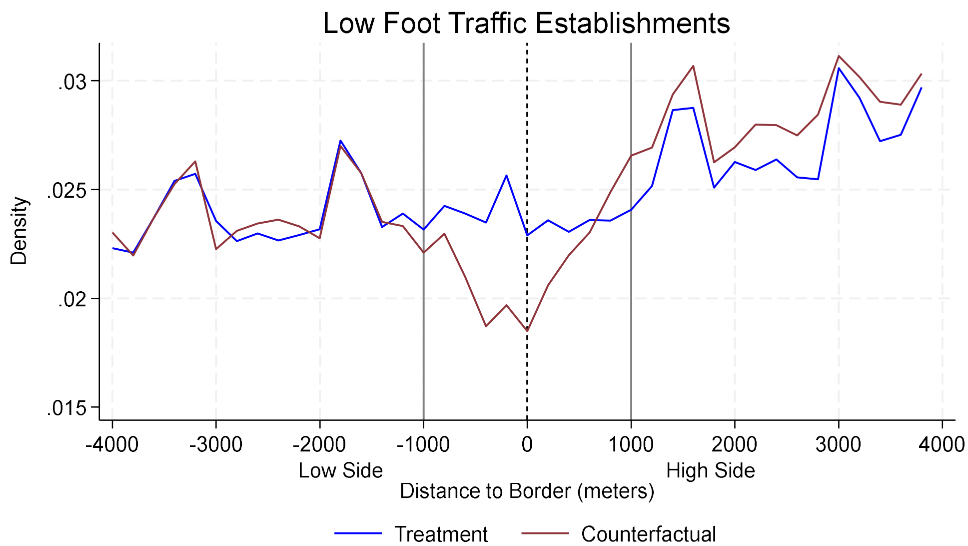
By Rural vs Urban

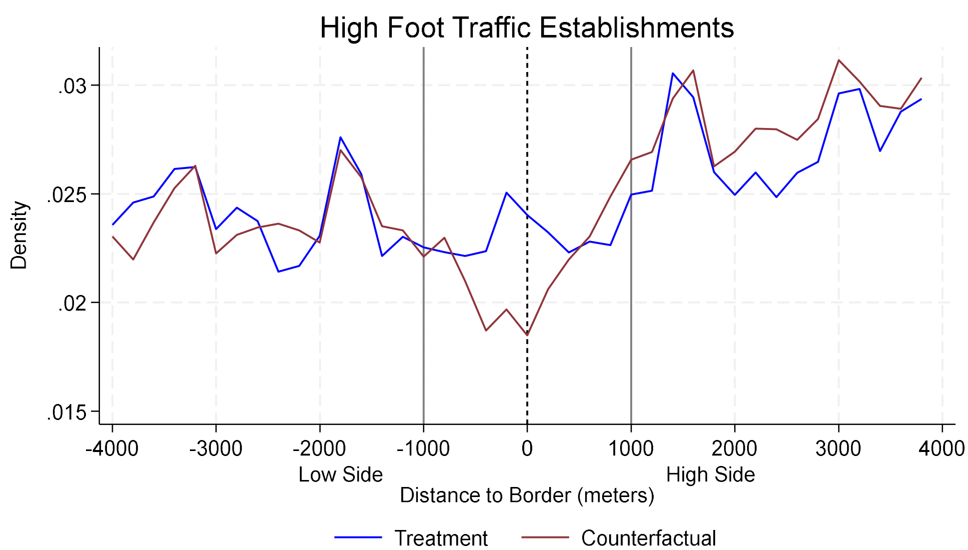


Differential Percentile	(1) Total [-1000,1000]	(2) Left [-1000,0]	(3) Right [0, 1000]	(4) Net Left - Right
Rural	10.46	13.80	6.76	7.04
	(0.752)***	(1.239)***	(1.029)***	(1.719)***
Urban	9.47	12.82	7.05	5.77
	(0.727)***	(1.416)***	(0.895)***	(1.777)***

This figure plots the densities of taxed establishments and a non-profit counterfactual. The data is split into Rural and Urban counties based on population density. Accompanying point estimates at attached.

Figure 5
Analysis of Establishment Frequencies around Borders
By Low vs High Consumer Foot Traffic





Differential Percentile	(1) Total [-1000,1000]	(2) Left [-1000,0]	(3) Right [0, 1000]	(4) Net Left - Right
Low Foot Traffic	11.73	15.31	8.30	7.00
	(0.883)***	(1.419)***	(0.945)***	(1.615)***
High Foot Traffic	8.94	10.15	7.78	2.37
	(0.599)***	(0.969)***	(0.815)***	(1.325)*

This figure plots the densities of taxed establishments and a non-profit counterfactual. The data is split into Rural and Urban counties based on population density. Accompanying point estimates at attached.