Impacts of Taxes on Firm Entry Rates Along State Borders

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Abstract

This paper uses a regression discontinuity approach to estimate the impacts of taxes on firm entry rates between neighboring states. We utilize matched county pairs as an approximate bandwidth around the discontinuity in state policies imposed at their border. This controls for unobserved location specific determinants of firm entry, as well as policy responses to shocks shared across borders. We then estimate the impacts of property, income, sales, corporate, capital gains, workers compensation, and unemployment insurance top marginal tax rates on the differences in firm entry between counties. Our array of taxes controls for joint changes in tax policy that governments may implement to accomplish policy goals. We estimate this impact using a sample of 107 state-border pairs between 1999 and 2009. Our results indicate that property and sales taxes have the largest negative effect on firm start up rates, and in more recent year's income taxes as well.

1 Introduction

This paper tests whether or not taxes impact firm entry rates between neighboring states. Estimation of this marginal effect has been historically difficult. Tax and other policy parameters tend to feature prolonged periods of stability, and changes may be endogenous to many common dependent variables, such that changes in GDP, wages, and employment will entice government officials to try and improve economic performance. This has led to time series applications to use narrative approaches to try and identify the impacts of exogenous shocks to tax rates on macroeconomic variables (Romer and Romer (2007), Mertens and Raven (2013)).

We use a border-differencing technique to establish local estimates of the impacts of taxes on firm entry rates. This method controls for endogeneity of government policy in response to local economic outcomes. For example, high economic activity states may raise their taxes knowing that local agglomeration factors will continue to attract an asymmetrically high amount of new firm startups, while low economic activity states may lower taxes to attract new businesses. This response would upwards-bias the estimate of the impacts of taxes. Using the differences in firm entry rates along state borders controls for local agglomeration factors, and treat differences in policy variables as exogenous.

This technique relies on the assumption that new firms pick entry locations within a local choice set. Recent studies on agglomeration economies seem to support this view, where Rosenthal and Strange (2003, 2005), and Arzaghi and Henderson (2008)) show that entrepreneurs weight locations within a mile of them significantly higher than distances further away. Use of border discontinuity designs started with Holmes (1998), though has quickly been adopted by researchers looking to identify effects of policies across public economics, including minimum wages (Dube et al (2008), Rohlin (2011)), welfare (McKinnish (2005, 2007)), and school quality by Dhar and Ross (2012). It has even been used by recent papers looking at the impacts of taxes on firm start up rates, including Rathelot and Sillard (2008), Duranton et al (2011), and Rohlin, Rosenthal, and Ross (2014).

Our paper builds on a longer literature looking at determinants of firm entry. Early papers such as Carlton (1979, 1983) and Schmenner (1975, 1982) failed to find incidence of taxes on firm entry rates, instead finding that higher taxes could attract more firms. Starting in the 80's methods and data allowed for cleaner identification, such that authors started to more definitively show that taxes had an impact on business activity, including Wasylenko & McGuire (1985), Bartick (1985), Papke (1991), and Hines (1996).

The literature studying the impacts of taxes on firm entry behavior has not settled on the best variables to use for identifying the effects of taxes on firm start up rates. Carlton (1983) used top marginal tax rates for corporate and income tax, but weighted them together, as well as property tax rates. Schmenner (1987) uses state and local property tax revenues per dollar of personal income. Helms (1985) used a budget constraint to estimate the impacts of rising tax revenue on explanatory variables. All three versions have modern equivalents and the literature has not settled on a single best practice to recover the proper marginal effects.

Theory indicates that marginal tax rates are what matter to individuals, and measures of average tax burden change due to both fluctuations in wages or profits, as well as to changes in tax rates.Using average tax rates may add endogeneity into models. Also, politicians may alter multiple taxes at once in order to accomplish policy goals, such that excluding taxes may imply omitted variable bias. Therefore, we argue that using top marginal tax rates is the preferred method of estimating marginal effects of taxes.

We use a data set that includes property, income, corporate, capital gains, sales, workers compensation, and unemployment insurance top marginal tax rates. We further add variables for government expenditures, including highways, education, and welfare. This mirrors the balanced budget approach of Helms (1985), Gabe and Bell (2004), and Ojede and Yamarik (2012). Entrepreneurs sorting along by government expenditures would imply that increasing tax rates to pay for certain services may not have negative effects on firm start up rates.

The paper proceeds in the following manner. First, we review literature relating to estimating the determinants of firm entry. We then provide a model to show how utilizing discontinuities along state borders allow researchers to control for location specific determinants of firm entry. Next, we explain our empirical design, which uses matched county pairs on either side of state borders to identify the effects on taxes on firm start up rates. We then provide estimates of these impacts. We conclude by showing which borders have the largest firm start up discrepancy, and talk about applications of our work.

2 Literature Review

Location choice of firms and individuals has a rich history in economics. At its core, the question is what drives sorting behavior of firms into particular communities. One of the earliest models to approach sorting behavior of individuals was Tiebout (1956), who argued that individuals sorted into locations through preferences for prices and public amenities. Tiebout posited that counties as a result of this sorting behavior receive pressure on their provision of services in order to attract individuals.[1]

As a result Tiebout's model, the early firm entry literature focused on sorting over all available possible markets. These papers used conditional Logit models to explain the probability of agents entering into particular markets. McFadden (1974) showed a general framework on how to use conditional Logit function to estimate firm entry sorting. Dowding, John, and Biggs (1994) review 200 articles and books that there is evidence that taxes and services affect location decisions of firms and households, and less assuredly, property values as is implied in the traditional Tiebout models.

Guimaraes, Figueirido, and Woodward (2003) showed that the conditional Logit models of firm entry can be estimated by a Poisson distribution under relatively mild assumptions. Gabe and Bell (2004) used Poisson and Negative Binomial regressions show how taxes and government spending on education impact firm location in Maine. They recover the coefficient on taxes by imposing a balanced budget requirement equivalent to Helms (1985). Their results show that increasing tax rates to raise education spending per pupil causes no distortion on firm entry rates. A review was on the differences between discrete choice models and Poisson models was done by Arauzo-Carod et al (2010). They show that as time has gone on, the discrete choice model has lost favor in favor of count data models. In their review they show that agglomeration and market size tend to have a significant positive effect, while wages and taxes act in the opposite direction.

Modern papers on firm entry paper have increasingly used border discontinuity methods. In these models researchers test whether or not local discontinuities in policy induce firms or individuals to change their start up or housing location. The first paper to use a

[1]Sorting literature similarly gave birth to tax competition among states as over viewed by Wilson (1999). Our paper can be seen as an extension of this literature, where states compete to have preferential tax differentials compared to neighboring states

matched county-pair estimator is Holmes (1998). In Holmes' paper, he uses right to work status as a proxy for an unobserved cost of being on either side of a state border imposed by "pro" and "anti" business policies. He then tested whether or not right to work status affected manufacturing employment growth. His estimates found that counties that have right to work status attract more manufacturing firms than states without right to work status.

Since Holmes' work, authors have utilized this technique to test a variety of expanding topics in public economics. A recent paper by Rohlin, Ross, and Rosenthal (2014) mirrors our paper very closely. They estimate a linear probability model of firm entry using a border difference estimator. They use GIS coded data to get a closer bandwidth to the border than our method, and show that increasing the personal income tax differential actually increases the likelihood of firms entering on one side of the border. However, they show that increasing the corporate and sales tax differential can drastically reduce the relative firm entry probability.

Earlier work by Rohlin (2011) looked at the impact of minimum wages on firm start up rates using less aggregated data. By utilizing the Dun and Bradstreet Marketplace data files Rohlin constructed bands around state borders, and then derived estimates on the impact of minimum wage changes on firm start up rates. He showed that increasing the minimum wage decreased new establishment activity in industries that relied heavily on minimum wage workers, but that changes in the minimum wage did not decrease employment in existing establishments.

Chirinko and Wilson (2008) use a border discontinuity technique to estimate the impacts of state investment tax credits on firm start up rates. Rathelot and Sillard (2008) use the border discontinuity technique in a Probit model to show that increasing the total tax rate differential increases the probability of a firm picking a side between 1-5%. Duranton et al (2011) took the difference in the firm entry rate in neighboring areas to estimate the impacts of taxes on employment. They provide estimates both for traditional OLS estimates without the difference, which estimated a positive relationship between taxes and firm entry rates, but after applying the spatial difference, taxes negatively impacted firm start up rates.

From the literature, we see that on average taxes negatively impact firm start up rates, especially as researchers have gone from studying sorting over all available entry choices, to local choices along policy discontinuities. However, how taxes are calculated and used in studies differs wildly among authors. Various studies have used measures of average tax revenue, added together top marginal tax rates, or included a single available tax rate. As a result, we employ more recent spatial difference techniques to get a clear estimate, while employing a larger array of top marginal tax rates than other authors.

3 Theory

As entrepreneurs and firms look to start up a business in a new location they first choose a market to enter. This choice is due to primary considerations such as labor market characteristics, or location preferences of the owner. They then pick among possible locations in that market. Our model looks at choice of firm entry across state borders, such that individuals have mobility across the border. As a result, firms treat location specific determinants of profit as the same on both side of the border. This process leaves policy drivers as remaining difference in expected profits. We formalize the conditions for this process below.

Assume there exists a spatial equilibrium where wages and capital costs are adjusted to local tax and location specific variables affecting firm level productivity. If markets are competitive firms will make zero economic profit in the long run, but in the short run demand or policy shocks can leave short run profits. We expect that if a regime changes its taxes over time, higher production costs and lower profits exist in that county, and that market will deter a relative amount of firms from entering. Since firms will bid up or down prices relative to taxes, those prices can be proxied by the tax rates directly. Firms make decisions based on information from the previous year, as governments might concurrently change policy along with market entry and there may exist costs to establishing a business.

Assumption 3.1. *Assume that a firms' profit can be expressed as a linear function, for a given location, state, and time pair denoted* (i, j, t)*,*

$$\pi_{i,j,t} = \gamma + \beta_i + \beta_j + X_{i,t-1}\beta_1 + X_{j,t-1}\beta_2 + \epsilon_{i,j,t} \tag{1}$$

$$E[\epsilon_{ijt}] = 0 \tag{2}$$

$X_{i,t-1}$ *is a* $1 \times K_1$ *row vector of location specific terms, and* $X_{j,t=1}$ *is a* $1 \times K_2$ *row vector of state specific terms, and* β_i, β_j *are location and state specific fixed effects.*

Location specific variables are any variable that is specific to a location, such as local agglomeration figures, education attainment, and other variables driven by the distribution of labor and productive factors in each regime. Variables at the regime level include taxes, regulatory policies, and government expenditures. Both sets of variables are allowed to evolve over time. Therefore this assumption simply states that our policy variables have to enter directly into the profit function, and that it is shared across all firm types.

Now let us focus on a market that is defined by the interval $[-1, 1]$, such that for $i \in [-1, 0)$ a firm is in state A, and for $i \in [0, 1]$, they are in state B. Therefore, if a firm has two choices, $y \in [-1, 0)$ and $\hat{y} \in [0, 1]$, then the firm chooses y over $\hat{y}$ if

$$E[\pi_{y,A,t} - \pi_{\hat{y},B,t}] > 0 \tag{3}$$

Assumption 3.2. *β_i and $X_{i,t-1}$ are continuous locally on $[-1, 1]$, such that for any $\epsilon > 0$, where $|\beta_i - \beta_j| < \frac{\epsilon}{K+1}$, and $|(X_{y,t-1,k} - X_{\hat{y},t-1,k})| < \frac{\epsilon}{(K+1)|\beta_k|} \forall k \in \{1, ..., K_1\}$, then there exists a δ such that $|y - \hat{y}| < \delta$*

This statates that as the locations firms choose between get asymptotically close to the border, the difference between unobserved location specific fixed effects and observed location specific variables converge to zero. This is a technical illustration of labor and capital mobility in close geographic areas. As the distance between the two locations increases this may no longer be the case, as illustrated in Holmes (1998).

Therefore, conditional on firms choosing locations $(y, \hat{y})$ arbitrarily close to the border, the profit function becomes,

$$E[\pi_{y,A,t} - \pi_{\hat{y},B,t}] = \beta_A - \beta_B + (X_{A,t-1} - X_{B,t-1})\beta_2 \tag{4}$$

As we move away from the border location characteristics might dominate the policy effect, especially when we expect policy effects to be small. This theory favors the use of regression discontinuity techniques for estimating policy treatment effects, especially when location specific drivers of firm entry might be unknown or unobserved.

4 Variables and Data

4.1 Matching Process

Our matching procedure is as follows. We first obtained Census county adjacency files.[2], then used it to construct county-pairs by generating all pairs of counties that have adjacent counties in a neighboring state. From this matching we also tracked state FIPS codes to create a list of state pairs. For each state-pair we assigned one side of a border to be either a subject (sub) or neighbor (nbr) side of the border, which we use in our data construction. This matching generates 1213 matched county-pairs with 107 state-pairs in each year. Throughout we will index each state-pair by $g = 1, ..., 107$, and the set of matched county pairs for each state pair by $i_g = 1, ..., N_g$, where N_g is the number of pairs for each border.

We then generated an extended border match. For this process we matched each subject county to each of its neighbor's neighbor, then excluded from any county in the original matching set. We provide a graphical representation of these matching processes in Figure 8. This extended match connects 1549 county-pairs across 107 state pairs each year.

4.2 Firm Entry Data

Our primary variable of interest were county level firm start up rates for all firms in a year. This data set was procured at the Census Bureau's Business Dynamic Statistics program.[3] The data included the number of firm births, deaths, expansions, and contractions for each year from 1999 to 2013. It also provided these figures for broad NAICS coded

[2] `https://www.census.gov/geo/reference/county-adjacency.html`

[3] `http://www.census.gov/ces/dataproducts/bds/overview.html`

industries. As a result, our main variable of interest, *births_ratio* is calculated for each matched counties along state pair (A, B) in time t as,

$$births\_ratio_{i,g,t} = \ln(n_{sub,A,t}) - \ln(n_{nbr,B,t}) \quad (5)$$

4.3 Tax Data

We included top marginal tax rates of seven taxes from 1977 to 2008. In all cases we used a one period lagged difference in top marginal values. For each tax rate τ_i and state pair $g = (A, B)$, at time t the tax ratio was calculated

$$tax\_ratio_{g,t} = \tau_{A,t} - \tau_{B,t} \quad (6)$$

State marginal income tax and long term capital gains tax rates were obtained from The National Bureau of Economic Research. For income tax rates we used the highest marginal tax rates available, as this is the rate most applied to small business and S corporations. When not available, we calculated the highest implied tax rate. [4]

Corporate and sales tax rates were compiled from The Council of State Governments Book of States[5]. We used the highest marginal state tax rates on business corporations. Where rates differ between banks and non-banks, we use the non-bank rate, and we restrict to sales tax rates levied on general merchandise, rather than food, clothing, or medicine.

Property taxes were calculated from household level data provided by the Minnesota

[4] http://users.nber.org/~taxsim/allyup/ http://users.nber.org/~taxsim/marginal-tax-rates/ http://users.nber.org/~taxsim/state-marginal/

[5] http://knowledgecenter.csg.org/kc/category/content-type/content-type/book-states

Population Center's Integrated Public Use Micro-data Series (IPUMS).[6] Workers compensation was calculated from Thomason et al (2001) between 1977 and 1995, with data afterwards provided by the Oregon Department of Consumer and Business Services.

Finally, The top marginal unemployment insurance tax rates were provided by the US Department of Labor. To calculate, they multiplied the top marginal tax rate, $\tau_{u,it}^{max}$, by the maximum wage level to which the rate is applied, W_{it}^{max}. They normalized this figure by the average wage in a state in a current year, $\bar{W}_{it}^{max}$. Then the unemployment insurance tax was calculated for each state as;

$$\tau_{A,t} = \frac{\tau_{A,t}^{max} W_{A,t}^{max}}{\bar{W}_{A,t}^{max}} \tag{7}$$

4.4 Government Expenditures

We compiled log state governments expenditures on highways, education, and welfare per capita using Census data on State Government Finances.[7] We used expenditures on "Education" for our education value, welfare sums up expenditures on "Public Welfare", "Hospitals," and "Health," while highways is calculated from "Highways" expenditures pulled from annual historical data accounts. To calculate per capita terms we divided each figure by Census state population estimates,[8] and then took logs. For each of our expenditure figures, the state differenced variable for two states and time t was calculated as,

$$exp\_percap_{-g,t} = \log(exp_{A,t}/pop_{A,t}) - \log(exp_{B,t}/pop_{B,t}) \tag{8}$$

[6] https://usa.ipums.org/usa/

[7] https://www.census.gov/govs/state/

[8] http://www.census.gov/popest/

4.5 Additional Controls

As a final series of controls, we included state level variables for percent of workforce unionized, log real fuel prices, population density, percent of industry manufacturing, and percent of population with high school education. This data was collected from "Union Membership and Coverage Database from the CPS."[9]

Lastly, amenity data was acquired from the USDA.[10] We used normalized values of hours of sunlight in January, temperature in July, humidity in July, topology score, and percent of county that is water. After normalization each amenity variable is normal with approximate mean zero and standard deviation 1. As a result, interpretation of these terms should be done in terms of deviations from the mean. Again, we take difference in county level Z-scores, and it is the only county level data we include in our empirical estimates.

4.6 Preliminary Analysis

Summary statistics are provided in Table (**??**).

We test the hypothesis that states use taxes jointly to accomplish policy goals. We plot simple cross correlations between our differenced tax variables in Table 8 as a heuristic test. Between 1998 and 2008, income tax and capital gains tax rates exhibit highly positively correlation, the simple correlation between values is 0.64. We further see that sales, payroll, workers compensation, and unemployment insurance tax rates have low rates of correlation with other tax rates.

The presence of simple correlations indicate policy makers might have shifted taxes jointly to accomplish policy goals and tried to advantageously shift tax incidence. Thus,

[9] `http://www.unionstats.com/`

[10] `http://www.ers.usda.gov/data-products/natural-amenities-scale.aspx`

modeling firm entry using a larger set of top marginal tax rates will improve estimates of tax incidence on firm start up rates.

5 Empirical Design

As outlined in the previous section, the main parameters of interest are the impacts of top marginal tax rates on firm start up rates. We estimate a pseudo-regression discontinuity approach as a way of trying to remove local determinants of firm entry, as well as shared responses to larger macroeconomic shocks.

5.1 Regression Discontinuity Approach

Our theory section showed that as the entry choice of firms centers around a border the location specific terms become insignificant in the difference in expected profits. We estimate this bandwidth by using county level data on firm entry rates. The average county in our data set is 1260 square miles, or about 35 miles per side if believed to be approximately square. This distance is slightly longer than more refined approaches such as Rohlin, Rosenthal, and Ross (2014). Then, our first each county-pair, the estimated model is,

$$\ln(n_{sub,stA,t}) - \ln(n_{nbr,stB,t}) = (X_{stA,t-1} - X_{stB,t-1})\beta_2 + \epsilon_{sub,stA,t} - \epsilon_{nbr,stB,t} \qquad (9)$$

Larger and shorter lags where also tested, but our variables are heavily inter-temporally correlated, so there was no major difference occurs in sign or significance, such that only fit deteriorates as we extended the lag structure. This model imposes $\beta_{stA}, \beta_{stB} = 0$ from Equation (4). We index each state-pairs (stA, stB) by $g = 1, ..., G$, and index each

(sub, nbr) pairs by $i_g = 1, ..., N_g$. Then we make the following definitions.

$$\ddot{\ln}(n_{i,g,t}) = \ln(n_{sub,stA,t}) - \ln(n_{nbr,stB,t}) \tag{10}$$

$$\ddot{X}_{g,t-1} = 1 + (X_{stA,t-1} - X_{stB,t-1}) \tag{11}$$

$$\ddot{\epsilon}_{i,g,t} = \epsilon_{sub,stA,t} - \epsilon_{nbr,stB,t} \tag{12}$$

Assume $\ddot{\epsilon}_{i,g,t}$ be an i.i.d white noise draw, $\ddot{X}_g = (\ddot{X}'_{g,0}, ..., \ddot{X}'_{g,T-1})'$ be a $T \times (1 + K_2)$ matrix, and $\ddot{\epsilon}_{ig} = (\ddot{\epsilon}_{i,g,1}, ..., \ddot{\epsilon}_{i,g,T})'$ be a $T \times 1$ vector. Next we assume the traditional OLS moment conditions.

Assumption 5.1. *Let* $\ddot{X}_g = (\ddot{X}'_{g,0}, ..., \ddot{X}'_{g,T-1})'$ *be a* $T \times (1+K_2)$, *and* $\ddot{\epsilon}_{i,g} = (\ddot{\epsilon}_{i,j,1}, ..., \ddot{\epsilon}_{i,j,T})'$ *a* $T \times 1$ *vector. Then*

$$E[\ddot{X}'\ddot{\epsilon}] = 0, \quad \forall i, g \tag{13}$$

Assumption 5.2.

$$E[\ddot{X}'_g \ddot{X}_g] = 1 + K_2 : \quad \forall g \tag{14}$$

As a result of applying assumption 5.1 and 5.2 to Equation 9, our estimator takes the form,

$$\hat{\beta}_2 = \left(\frac{1}{TG} \sum_{t=1}^{T} \sum_{g=1}^{G} \frac{\sum_{i=1}^{N_g} \ddot{X}'_{g,t-1} \ddot{X}_{g,t-1}}{E[N_g]} \right)^{-1} \left(\frac{1}{TG} \sum_{t=1}^{T} \sum_{g=1}^{G} X'_{g,t-1} \frac{\sum_{i=1}^{N_G} \ddot{\ln}(n_{igt})}{E[N_g]} \right) \tag{15}$$

$$E[N_g] = \frac{\sum_{g=1}^{G} N_g}{G} \tag{16}$$

There may be shocks to the state-pair border, so we use clustered standard errors on the state pair grouping. An example of border specific shocks would be if the Mississippi river floods. This will affect states that are divided by the river, but not along borders far away from the river.

5.2 Sensitivity Tests

5.2.1 Added Controls

The first sensitivity test we implement is to run Equation (9) with a variety of controls. We first report our benchmark model, which includes our seven top marginal tax rates, and our three sources of government expenditures. We then have two sets of controls, county level geographic amenities, and state level economic controls. We estimate models that include and exclude one of each, and then include both. We want to check whether or not our tax and regulatory variables become statistically insignificant once we account for these additions, and in our second model check whether or not they properly become indistinguishable from zero.

As a final round of controls, we estimate our model with state-pair fixed effects. This allows $\beta_{stA} \neq 0, \beta_{stB} \neq 0$ for all state-pairs. This is equivalent to the difference in expected profit when there exist state specific fixed effects as shown in Equation (4)

$$\ddot{\ln}(n_{i,g,t}) = \beta_{stA} - \beta_{stB} + \ddot{X}_{g,t-1}\beta_2 + \ddot{\epsilon}_{i,g,t} \tag{17}$$

Our theory indicated that the difference in county level fixed effects becomes negligible when we take the difference, but state specific fixed effects may remain. This model allows those effects to be non zero.

5.2.2 Extended Bandwidth

We then extend the bandwidth of our estimator. This used the extended bandwidth match from our Data section. We matched every subject county with every neighbor's neighbor that the subject county was not previously matched with. This estimate extends the distance between each of our observations so we expect state tax differentials to play a less important role. Our new match becomes the model,

$$\ln(n_{sub,stA,t}) - \ln(n_{nbr\_nbr,stB,t}) = (X_{stA,t-1} - X_{stB,t-1})\beta_2 + \epsilon_{sub,stA,t} - \epsilon_{nbr\_nbr,stB,t} \quad (18)$$

5.2.3 Relaxing Coefficient Symmetry

We then test a version of this model where we do not impose symmetry in the coefficients across borders.Instead we let coefficients take on their own value in the difference, and do a set of F-tests on whether or not our assumption that $\beta_{k,A} = -\beta_{k,B}$, $\forall k \in \{1, ..., K_2\}$ holds in the difference as assumed.

$$\ddot{\ln}(n_{g,t}) = X_{stA,t-1}\beta_{2,sub} + X_{stB,t-1}\beta_{2,nbr} + \ddot{e}_{igt} \quad (19)$$

5.2.4 Period Specific Cross Section Analysis

Forth, we test a set of regressions where we estimate cross-sectional models for each year in our sample. We then compare these estimates to our pooled OLS estimates to gauge if tax incidence on firm start up rates remains stable over time.

$$\ddot{\ln}(n_{g,t}) = X_{stA,t-1}\beta_{stA} + X_{stB,t-1}\beta_{stB} + e_{i,g,t} : \quad t = 1999, ..., 2008 \quad (20)$$

5.2.5 Industry Sub codes

As a final control, we estimated main model, Equation (9), on NAICS code level firm entry. This is meant to test for the stability of our coefficients across Agriculture, Fishing, Forestry, and Hunting; Retail Trade; Manufacturing; and Finance and Insurance.

5.2.6 Endogeneity along the Borders

Finally, we do not test for endogeneity where states change taxes in response to the difference in firm entry rates. Due to the stability of our policy parameters, it seems unlikely that governments are responding to firm start up rates in particular counties as modeled by our estimator.

6 Results

Our main results are reported in Table (**??**). The first four columns respond to different pooled OLS estimates where we include or exclude our set of control or amenity variables. The last two columns report our fixed effect estimates. Our pooled OLS estimates show that the inclusion of the geographic amenities makes property taxes lose statistical significance. However, the results still economic intuition that most likely the impacts are small and negative across all of our model estimates. Averaging across models would imply that a 1% increase in the relative property tax difference would decrease firm start up rates by around 0.2%. The impacts of income and sales tax differentials remain relatively stable across our OLS estimate, such that a 1% increase in income tax differentials correspond to a 0.8$ decrease in the relative firm start up rates, and similarly a 1% increase in sales tax differentials corresponds to a 0.1% decrease in the relative firm start up rates. Even though capital gains, corporate tax, workers compensation, and unemployment insurance tax rates are individually insignificant, joint F-tests for all seven taxes show they are jointly significant.

We further see evidence that the difference in log welfare spending per capita is also statistically significant, but the coefficient is economically very small, such that a 1% increase in the difference corresponds to 0.001% higher firm entry rates. Finally, contrary our assumptions, not all of our county level geographic amenities and state level controls become zero at the border. The difference in log real fuel price remains positive and statistically significant, and both the difference in Temperature in January and Log Area with Water remain significant among the geographic controls.

When we run models with state-pair level fixed effects we fail to obtain any statistically significant results. However, the value of these models are dubious. We first argue that our pooled OLS estimates are most likely the properly specified model as firm start up rates are an already differenced estimate. Thus the inclusion of state pair fixed effect require year to year divergence in expected profit from entry, which shouldn't occur under perfect competition. Rather this still might imply that there are still relevant variables we may be leaving out of our model.

Table **??** we estimate the extended bandwidth version of our model. We expect that the longer distance between two locations will make taxes have a smaller impact on firm start up rates, while traditional measures of state or local agglomeration economies will have a larger impact. Consistent with this, we see that our tax rates become less individually statistically significant across model types. Further, our state level controls remain largely insignificant, as do our geographic controls. Thus, the fit of the model at large seems to decrease as the distance between counties increases.

When we run pooled OLS estimates where we do not impose that coefficients we see that for most of our variables remain equal but opposite across the border. Table **??** reports coefficients, while Table **??** provides F tests for the assumption of the coefficients being the same across borders. We test for each variable that $\beta_{i,sub} = -\beta_{i,nbr}$. The results verify our belief that coefficients are the same and opposite in our design is a valid assumption. The exception is sales tax rates and workers compensation tax rates, for the subject county they are strongly and negatively significant, but for the neighbor they not significant at all. However, given that the rest of them pass, this might be a spurious result due to the number of regressors. We see an equivalent note in the workers compensation figures in our F tests, where for the neighboring county it appears to be significant, but not for the subject county.[11]

Table **??** shows regression results for *births_ratio* for the every year between 1999 and 2009. We use the model that includes state controls but excludes geographic amenities. We see that property taxes remain consistently negative and statistically significant. Sales tax rates remain negative and statistically significant, and even appears to grow in its deterrance of new entry. Income taxes start off insignifcant, but negative, and become statistically significant from zero. Log highway and welfare expenditures per capita vary in their significance across the sample, but remain positive drivers of firm entry when they appear.

Finally, in Table **??** we report an estimated model equivalent to Equation 9, but where we condition firm entry on specific NAICS subcodes. For our reported estimates we include Agriculture, Fishing, Forestry, and Hunting, Retail Trade, Manufacturing, and

[11]Also, the assignment process here might be driving results. We are not running each coefficient as a fixed effect for each border, but rather across all counties defined as "neighbor" in our sample. However, by using clustered standard errors we do not have the degrees of freedom to run this test for each state-pair.

Finance and Insurance. We find that our initial results in Table **??**, including magnitude and strength. This is somewhat surprising, as we would expect characteristics that drive firm entry to differ across firm types. Namely, property taxes may deter agriculture more than financial firms, however it appears that the correlation between different firm types superscedes this selection.

As a final output of our paper, we compare two different rankings. First we calculate the weighted tax differential by multiplying the tax coefficients from Table **??**, column 4 times each states marginal tax values. These are plotted in Figure 8. We see that for most states the weighted tax differential is very small, thus the implied impact of taxes on relative firm start up rates is ultimately small. However, for a few counties, this is not the case, and we see clear outliers where more than 1% of the differential is motivated by the difference in tax rates.

To calculate How important this effect is still aggregately we provide a table of the difference in the mean number of firm start ups along each state border, as well as the weighted tax differential. Since we calculate these terms in absolute value, we similarly show which side of the border is preferred for the borders with the top 50 largest difference in mean firm start ups. This ranking is provided in Table **??**. We seen that 62% of the time the side with the preferred weighted tax differential also has the higher mean firm start up differential.

7 Conclusion

Our paper tests the impact of taxes on firm start up rates. We present a model illustrating that when firm entry locations are close together and split across state borders, location specific determinants of firm entry become insignificant. This allows researchers to estimate policy effects. We estimate this model by taking the difference in county firm start up rates on opposite sides of a state border. This allows us to examine firm entry behavior around state borders by an approximate bandwidth.

In our empirical results, we included property, income, corporate, capital gains, workers compensation, and unemployment insurance top marginal tax rates. We further include log expenditures per capital on education, highways, and welfare. We control for state level agglomeration averages such as population density, fuel prices, union rate, and percent of population with a high school degree, as well as and county level geographic amenities, such as January temperature, July humidity, and log area with water.

Our estimated model shows that property, income, and sales taxes have the strongest determining factor on firm start up rates. On average, a 1% increase in the difference in property taxes decreases firm start up rates by 0.3%, while a 1% increase in income and sales tax differentials decreases firm start up rates by 0.01%.

The fact that corporate and capital gains taxes are not significant follows from characteristics of new firm entrant. Generally many new firms are small S corporations, meaning that owners pay top marginal income taxes rather than corporate taxes, and that sales and property taxes may play a significantly larger role on their profits than capital gains and corporate tax rates. Also, the average new firm has a relatively short timeline, such that investments in the company will probably not be recouped, and that capital gains tax rates are not likely to impact the majority of small new firm entrants.

In our sensitivity tests, we found that coefficients are the same across counties. We also show that the sign, size, and significance of property and sales taxes remain consistent for each time period in our sample, while income taxes gain significant over time. Finally, we show that when we include an array of state-pair specific fixed effects all of our estimates become insignificant, but our tax variables remain the largest, keeping their sign and relative importance.

Government expenditure variables do not seem to impact firm start up rates. This might be due to the fact that individuals can live in one county that has a preferred public expenditure bundle and still set up a businesses in a neighboring county that has a preferred regulatory policy. Rohlin, Rosenthal, and Ross (2014) control for this by including reciprocal agreements in their specification, which require workers to pay their income tax in the state of residence rather than the state of employment. This may control for some of the sorting of entrepreneurs we observe.

We finally provided a weighted tax differential, showing that the impacts of taxes on firm entry rates remain small, only accounting for about 0.2% of the difference in firm start up behavior across borders. Despite this, the side with the preferred taxation policy had more firm start ups 62% of the time in our sample. Therefore while taxes might have a marginally small impact, their adjustment may still be beneficial to communities and states.

Going forward obtaining firm specific characteristics will help establish better estimates of tax incidence on firm start up and life cycle behavior. Generating county level agglomeration figures and testing their impacts might also be a way of estimating the interior impacts of tax differentials on firm start up rates. Finally, looking to test the welfare impacts of new firm entrants is important. Current theory is agnostic about the impacts of firm entry on welfare, and ensuring that policy changes improve lives required for program efficacy.

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8 Appendix: Figures & Tables

Example of Border Matching

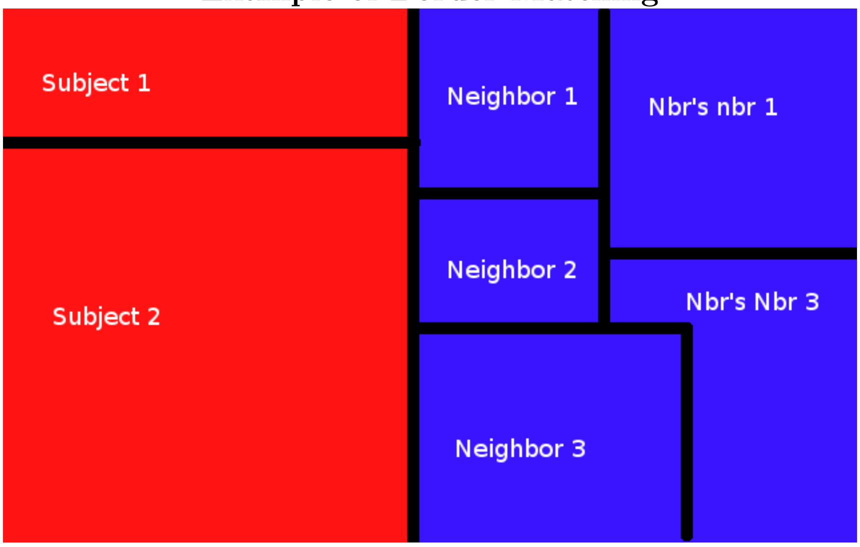


Figure 1: Red rectangles are subject counties, and blue are neighbor counties. In this example Subject 1 would be only matched to Neighbor 1, while "Subject 2" would be paired with Neighbor 1-3. Similarly, when we broaden the bandwidth, Subject 1 would be matched with Nbr's Nbr 1, whle Subject 2 would be paired with Nbr's Nbr 1 and 2

Original Bandwidth Borders

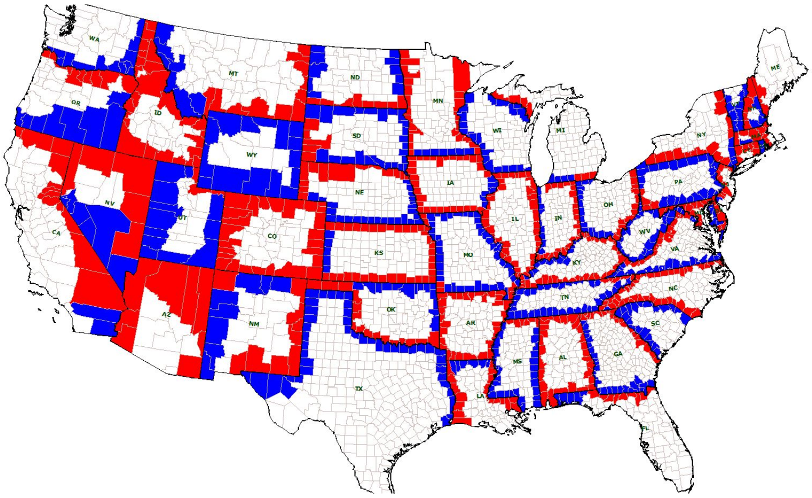


Figure 2: Red borders are subject counties, blue borders are neighbor counties

Extended Bandwidth Borders

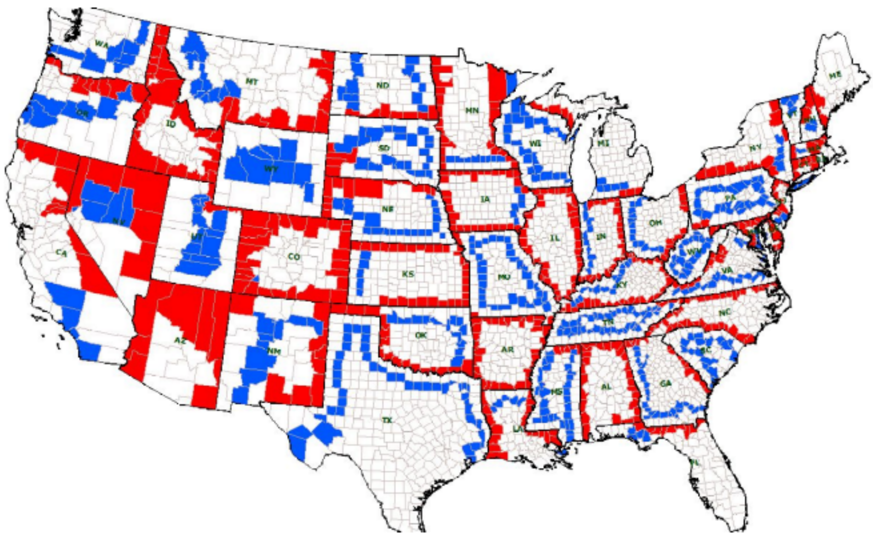


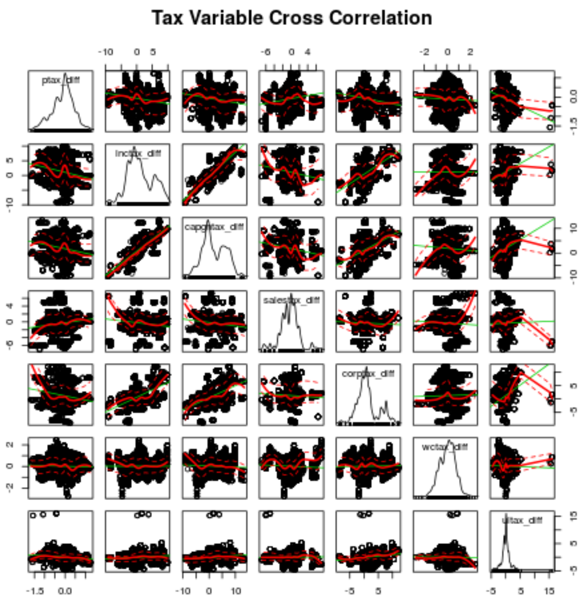
Figure 3: Red borders are subject counties, blue borders are neighbor counties

Summary Table for Total Firm Births ==

Statistic N Mean St. Dev. Min Max ——————————————————————————

—- Births Ratio 13,115 -0.059 1.550 -5.670 5.328 Property Tax Difference 13,115 -0.099 0.503 -1.672 1.241 Income Tax Difference 13,115 1.220 3.988 -9.280 9.860 Capital Gains Tax Difference 13,115 1.911 4.321 -9.280 13.420 Sales Tax Difference 13,115 -0.316 2.137 -7.000 7.250 Corp Tax Difference 13,115 1.282 3.678 -8.900 12.000 Workers Comp Tax Difference 13,115 0.030 0.666 -2.762 2.451 Unemp. Tax Difference 13,115 0.034 1.344 -4.564

16.070 Educ Spending Per Cap Diff 13,115 9.589 210.233 -807 692 Highway Spending Per Cap Diff 13,115 -39.025 144.832 -756 358 Welfare Spending Per Cap Diff 13,115 -38.699 267.490 -1,072 953 Pct Highschool 13,115 0.273 3.762 -10.100 12.000 Real Fuel Price 13,115 0.306 2.351 -7.500 8.200 Pct Union 13,115 0.636 4.672 -14.900 16.100 Pop Density 13,115 41.985 162.362 -746.200 901.000 Pct Manuf 13,115 0.011 0.067 -0.240 0.250 Jan Temp Z Diff 13,115 0.002 0.206 -1.291 1.291 Jan Sun Z Diff 13,115 0.042 0.582 -2.499 3.583 Jul Temp Z Diff 13,115 0.065 0.601 -4.475 4.115 Jul Hum Z Diff 13,115 -0.029 0.424 -3.697 3.081 Topog Z Diff 13,115 -0.023 0.645 -2.578 2.123 Ln Water Z Diff 13,115 -0.054 0.872 -3.456 3.155 ————————————————————————-



Regression Discontinuity Models for Total Firm Births ===

Dependent variable: ——————————————————— births ratio births$_r$*atioOLSOLSOLSOLSFEFE*(1)(2)(3)(4)(5)(6) − − − − − − − − −

− −

− − *PropertyTaxDifference* − 0.206 − 0.371 ∗ ∗ − 0.136 − 0.297 ∗ ∗0.0250.027(0.151)(0.147)(0.148)(0.150)(0.119)(0.122)*IncomeTaxDifference* − 0.093 ∗

∗ ∗ −0.085 ∗ ∗ ∗ −0.088 ∗ ∗ ∗ −0.075 ∗ ∗ ∗ −0.011 −0.009(0.027)(0.026)(0.028)(0.026)(0.034)(0.035)*CapitalGainsTaxDifference*0.0160.0080.0280.020 −0.001 −

0.002(0.023)(0.023)(0.024)(0.024)(0.012)(0.012)*SalesTaxDifference*−0.112∗∗∗−0.101∗∗∗−0.110∗∗∗−0.087∗∗∗0.0020.001(0.029)(0.030)(0.029)(0.032)(0.040)(0.

0.013−0.012(0.020)(0.018)(0.020)(0.019)(0.026)(0.026)*WorkersCompTaxDifference*0.0010.090−0.0070.0510.0400.044(0.111)(0.108)(0.096)(0.105)(0.069)(0.07

0.002 − 0.006 − 0.002 − 0.002(0.040)(0.036)(0.042)(0.038)(0.017)(0.017)*EducSpendingPerCapDiff* − 0.0002 − 0.0003 − 0.0002 − 0.0002 − 0.0002 −

0.0002(0.0003)(0.0003)(0.0003)(0.0003)(0.0002)(0.0002)*HighwaySpendingPerCapDiff*0.00040.00040.00020.00030.00010.0001(0.0004)(0.0004)(0.0004)(0.0004)(

∗0.001∗∗0.001∗∗0.0004∗−0.00005−0.00005(0.0003)(0.0003)(0.0003)(0.0003)(0.0001)(0.0001)*Constant*−0.045−0.055−0.037−0.046(0.084)(0.086)(0.088)(0.087)−

− −

− −*controlsYesYesNoNoYesYesamenitiesYesNoYesNoYesNo* ===

Extended Bandwidth Models for Total Firm Births ==================================

Dependent variable: ———————————————— births ratio births$_{r}atio OLS OLS OLS OLS FE FE (1)(2)(3)(4)(5)(6)$ − − − − − − − − − − − −

− −

$--PropertyTaxDifference 0.039-0.019 0.104 0.074 0.007 0.006 (0.147)(0.152)(0.143)(0.148)(0.112)(0.114) IncomeTaxDifference -0.054-0.063*-0.043-$

$0.050 0.008 0.012 (0.035)(0.036)(0.038)(0.037)(0.033)(0.034) CapitalGainsTaxDifference 0.039 0.048*0.043 0.053*-0.013-0.013 (0.029)(0.028)(0.033)(0.030)(0.012$

$0.040-0.042-0.051-0.041 0.018 0.020 (0.049)(0.054)(0.052)(0.055)(0.037)(0.038) CorpTaxDifference 0.006-0.001 0.004 0.002-0.024-0.024 (0.026)(0.025)(0.027)($

$*0.139 0.216-0.008-0.007 (0.126)(0.152)(0.142)(0.178)(0.066)(0.068) Unemp.TaxDifference -0.113*-0.110*-0.111-0.109 0.011 0.011 (0.062)(0.064)(0.068)(0.07$

$0.0001-0.0001 (0.0005)(0.001)(0.0005)(0.001)(0.0002)(0.0002) HighwaySpendingPerCapDiff 0.0002 0.0001-0.0002-0.0003 0.0001 0.00005 (0.0005)(0.001)(0.0005$

$0.001*0.001*-0.00003-0.00004 (0.0004)(0.0004)(0.0004)(0.0004)(0.0001)(0.0001) Constant -0.033-0.017-0.026 0.002 (0.100)(0.111)(0.105)(0.113)---$

− −

$controls Yes Yes No No Yes Yes amenities Yes No Yes No Yes No$ ==================================

Not Symmetric Effects for Total Firm Births ==

Dependent variable: ——————— births ratio OLS OLS (1) (2) ——————————— ——————- Property Tax Sub -0.048 -0.363** (0.185) (0.172) Property Tax Nbr 0.209 0.352** (0.162) (0.148) Income Tax Sub -0.149*** -0.125*** (0.053) (0.044) Income Tax Nbr 0.076* 0.057* (0.039) (0.032) Capital Gains Tax Sub 0.037 0.025 (0.034) (0.031) Capital Gains Tax nbr -0.069** -0.047 (0.034) (0.031) Sales Tax Sub -0.149*** -0.142*** (0.044) (0.041) Sales Tax Nbr 0.036 0.005 (0.045) (0.045) Corp Tax Sub 0.026 0.029 (0.028) (0.027) Corp Tax Nbr 0.011 0.001 (0.023) (0.024) Workers Comp Tax Sub -0.142 -0.113 (0.131) (0.120) Workers Comp Tax Nbr -0.122 -0.226 (0.149) (0.150) Unemp. Tax Sub -0.018 -0.059 (0.043) (0.044) Unemp. Tax Nbr -0.014 -0.023 (0.076) (0.057) Educ Spending Per Cap Sub -0.0001 -0.001 (0.0004) (0.0004) Educ Spending Per Cap Nbr 0.0002 0.0001 (0.0004) (0.0004) Highway Spending Per Cap Sub 0.0004 0.001 (0.001) (0.001) Highway Spending Per Cap Nbr -0.001 -0.0004 (0.001) (0.001) Welfare Spending Per Cap Sub 0.001** 0.001** (0.0003) (0.0003) Welfare Spending Per Cap Sub -0.0005 -0.0003 (0.0003) (0.0003) Constant 1.085 1.667** (0.863) (0.764) ——————————————- amenities Yes No == ==

F-Tests for Symmetry of Coefficients for Total Firm Start Ups ========================

Test F-Stat P(¿ F) ——————————————- ptax$_s ub = -ptax_n br 0.0064 0.9361 inctax_s ub = -inctax_n br 1.7426 0.1868 capgntax_s ub = -capgntax_n br 0.3873 0.5337 salestax_s ub = -salestax_n br 4.56580$ $-corptax_n br 0.6824 0.4088 wctaxfixed_s ub = -wctaxfixed_n br 3.2369 0.072 uitaxrate_s ub = -uitaxrate_n br 1.8872 0.1695$ –

Psuedo-RD for Stability over Time for Total Firm Births

	Dependent variable: births ratio										
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Prop Tax Diff	-0.411***	-0.371**	-0.426***	-0.390**	-0.320**	-0.479***	-0.344**	-0.364**	-0.396**	-0.311	-0.351**
	(0.152)	(0.145)	(0.158)	(0.153)	(0.158)	(0.148)	(0.153)	(0.152)	(0.156)	(0.190)	(0.166)
Inc Tax Diff	-0.025	-0.026	-0.066**	-0.061**	-0.047	-0.055*	-0.063*	-0.136***	-0.127***	-0.123***	-0.117***
	(0.031)	(0.030)	(0.028)	(0.029)	(0.038)	(0.033)	(0.034)	(0.028)	(0.028)	(0.035)	(0.031)
Cap Tax Diff	-0.045*	-0.040	-0.025	-0.006	-0.018	-0.032	-0.029	0.054**	0.036	0.032	0.028
	(0.026)	(0.027)	(0.024)	(0.027)	(0.045)	(0.036)	(0.036)	(0.024)	(0.027)	(0.033)	(0.029)
Sal Tax Diff	-0.083***	-0.097***	-0.104***	-0.106***	-0.095**	-0.119***	-0.136***	-0.102**	-0.110***	-0.140***	-0.132***
	(0.030)	(0.027)	(0.029)	(0.031)	(0.037)	(0.035)	(0.039)	(0.041)	(0.042)	(0.041)	(0.036)
Corp Tax Diff	-0.015	0.011	0.010	0.007	0.035*	0.030	0.037*	0.019	0.004	0.014	-0.007
	(0.021)	(0.020)	(0.023)	(0.021)	(0.019)	(0.019)	(0.021)	(0.020)	(0.020)	(0.021)	(0.020)
Work Comp Diff	0.309**	0.225	0.201	0.018	0.029	0.071	0.066	0.142	0.102	0.086	0.089
	(0.123)	(0.147)	(0.138)	(0.145)	(0.155)	(0.122)	(0.117)	(0.113)	(0.116)	(0.124)	(0.108)
Unemp. Tax Diff	-0.045	0.0001	0.015	0.027	-0.022	0.062	0.003	-0.014	-0.034	0.020	0.070
	(0.061)	(0.033)	(0.077)	(0.056)	(0.069)	(0.063)	(0.057)	(0.047)	(0.048)	(0.055)	(0.046)
Ln Educ Diff	-0.0001	-0.0002	-0.0003	-0.0002	-0.0002	-0.001*	-0.0003	0.0001	-0.0002	-0.0001	-0.0002
	(0.001)	(0.0005)	(0.0004)	(0.0005)	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0003)	(0.0002)	(0.0003)
Ln Hwy Diff	0.001**	0.002**	0.001**	0.0002	0.0004	0.0004	0.0001	0.0002	0.0001	-0.0002	-0.0004
	(0.001)	(0.001)	(0.001)	(0.0004)	(0.0005)	(0.0004)	(0.0004)	(0.001)	(0.0005)	(0.0004)	(0.0005)
Ln Welf. Diff	0.001***	0.001	0.001***	0.001*	0.001	0.0005	0.001**	0.001*	0.001**	0.001**	0.001**
	(0.0005)	(0.001)	(0.0004)	(0.0004)	(0.0004)	(0.0003)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0003)
Constant	-0.034	-0.026	-0.013	-0.057	0.007	-0.042	-0.015	-0.097	-0.072	-0.086	-0.075
	(0.092)	(0.078)	(0.082)	(0.086)	(0.110)	(0.102)	(0.100)	(0.089)	(0.094)	(0.103)	(0.089)
controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
amenities	No	No	No	No	No	No	No	No	No	No	No

Results for Firm Entry across NAICS Subcodes for ==

Dependent variable: —————————————————- births ratio Farming Farming Manuf Manuf Retail Retail Finance Finance (1) (2) (3) (4) (5) (6) (7) (8) —————————————————————————- Property Tax Difference -0.367** -0.300** -0.365** -0.294** -0.354** -0.282* -0.375** -0.302** (0.144) (0.147) (0.145) (0.149) (0.148) (0.152) (0.146) (0.149) Income Tax Difference -0.083*** -0.073*** -0.081*** -0.071*** -0.082*** -0.073*** -0.085*** -0.075*** (0.025) (0.026) (0.026) (0.026) (0.026) (0.026) (0.026) (0.026) Capital Gains Tax Difference 0.008 0.019 0.006 0.017 0.005 0.017 0.009 0.020 (0.024) (0.024) (0.024) (0.024) (0.024) (0.024) (0.024) (0.024) Sales Tax Difference -0.102*** -0.087*** -0.100*** -0.085*** -0.107*** -0.091*** -0.105*** -0.090*** (0.029) (0.030) (0.030) (0.031) (0.030) (0.032) (0.030) (0.032) Corp Tax Difference 0.020 0.012 0.017 0.011 0.019 0.011 0.017 0.010 (0.018) (0.018) (0.018) (0.018) (0.018) (0.019) (0.018) (0.019) Workers Comp Tax Difference 0.086 0.047 0.094 0.053 0.086 0.048 0.088 0.046 (0.106) (0.103) (0.108) (0.104) (0.110) (0.106) (0.107) (0.104) Unemp. Tax Difference 0.011 -0.006 0.011 -0.006 0.013 -0.007 0.013 -0.005 (0.035) (0.038) (0.036) (0.038) (0.037) (0.039) (0.036) (0.038) Educ Spending Per Cap Diff -0.0003 -0.0002 -0.0002 -0.0002 -0.0002 -0.0002 -0.0002 -0.0002 (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) Highway Spending Per Cap Diff 0.0004 0.0003 0.0003 0.0002 0.0003 0.0003 0.0003 0.0002 (0.0004) (0.0004) (0.0004) (0.0004) (0.0004) (0.0004) (0.0004) (0.0004) Welfare Spending Per Cap Diff 0.001** 0.0004 0.001** 0.0005* 0.001** 0.0005* 0.001** 0.0004* (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) (0.0003) Constant -0.062 -0.053 -0.058 -0.049 -0.057 -0.049 -0.064 -0.054 (0.084) (0.085) (0.084) (0.085) (0.086) (0.087) (0.085) (0.086) ———————————————————————- controls Yes No Yes No Yes No Yes No amenities No No No No No No No No

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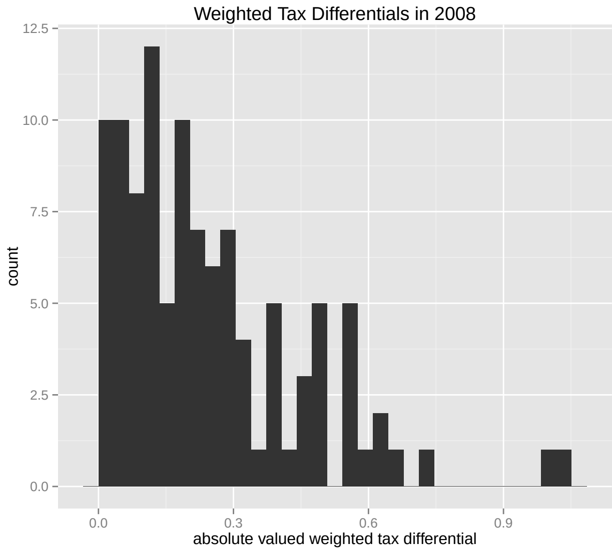

Result Comparison for Total Firm Births ==

mean firm entry preffered side abs weighted tax preferred side same? sub state nbr state ——————————————————————————————— 2.591 nbr 0.010 sub different kansas nebraska 2.260 nbr 0.016 nbr same maryland west virginia 2.194 sub 0.294 sub same alabama georgia 2.126 sub 0.205 nbr different minnesota wisconsin 1.808 sub 0.097 nbr different ohio pennsylvania 1.743 sub 0.555 sub same colorado kansas 1.568 nbr 0.105 nbr same arizona nevada 1.513 nbr 0.256 sub different idaho utah 1.477 sub 0.119 sub same oklahoma texas 1.376 nbr 0.015 nbr same kentucky west virginia 1.350 sub 0.121 sub same new mexico oklahoma 1.230 sub 0.023 nbr different arizona utah 1.170 sub 0.046 nbr different arkansas missouri 1.170 nbr 0.136 nbr same iowa minnesota 1.146 nbr 0.608 nbr same delaware maryland 1.140 nbr 0.409 nbr same minnesota south dakota 1.139 sub 0.043 nbr different minnesota north dakota 1.095 nbr 0.281 sub different missouri nebraska 1.065 nbr 0.207 nbr same indiana michigan 1.011 nbr 0.111 sub different illinois kentucky 0.991 nbr 0.109 sub different illinois indiana 0.986 sub 0.099 sub same florida georgia 0.969 nbr 0.552 nbr same massachusetts new hampshire 0.951 nbr 0.024 nbr same virginia west virginia 0.913 nbr 1.018 sub different delaware new jersey 0.907 nbr 0.446 nbr same massachusetts vermont 0.864 sub 0.998 sub same new hampshire vermont 0.850 sub 0.240 nbr different new mexico texas 0.845 sub 0.308 nbr different utah wyoming 0.814 sub 0.186 sub same new york vermont 0.812 sub 0.109 sub same colorado wyoming 0.802 sub 0.129 nbr different iowa nebraska 0.791 sub 0.082 sub same michigan ohio 0.763 sub 0.636 sub same montana north dakota 0.747 nbr 0.015 nbr same missouri oklahoma 0.747 nbr 0.125 nbr same indiana ohio 0.742 nbr 0.261 sub different massachusetts new york 0.733 nbr 0.338 nbr same idaho nevada 0.713 sub 0.274 sub same iowa south dakota 0.706 nbr 0.487 nbr same alabama mississippi 0.699 sub 0.041 sub same maryland virginia 0.689 sub 0.216 sub same north carolina tennessee 0.687 sub 0.545 sub same colorado nebraska 0.682 nbr 0.158 nbr same colorado new mexico 0.678 nbr 0.402 nbr same nebraska south dakota 0.646 nbr 0.190 nbr same arkansas tennessee 0.630 sub 0.401 sub same arkansas louisiana 0.625 sub 0.340 nbr different iowa wisconsin 0.612 sub 0.029 sub same maryland pennsylvania 0.604 nbr 0.184 sub different new jersey new york ———————————————————————————