The Impact of Corporate Tax Policy on State Trade Flows

Austin P. Johnson

State politicians are well aware of the importance of having a robust economy in order to be reelected. The economic vote is well documented in the literature and the intuition is naturally understood among politicians (Lewis-Beck and Stegmaier 2013). "It's the economy, stupid," which harkens back to the 1992 U.S. presidential election, has become a common slogan that is reiterated on media outlets in almost every election cycle. Therefore, economic growth is of great importance to elected officials, especially executives, and most states have entire departments dedicated toward advancing economic development within their boundaries (Eisinger 1988). Business tax cuts are a direct approach to economic development, although current empirical research on this topic is mixed at the state level.

A variety of mechanisms for spurring state economic growth through tax cuts have been suggested in the literature. First, it has been argued that cutting taxes can attract business from other regions, enriching the low-tax state. A potential problem is that subsequent reciprocal tax cuts in other states to attract businesses could lead to a race-to-the-bottom (Basinger and Hallerberg 2004; Grieco 1988; Plümper, Troeger, and Winner 2009). However, there is virtually no evidence for this type of excessive fiscal competition at the

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state level during the recent financial crisis. Second, lower taxes are thought to increase the profit retention of existing resident businesses, which in turn spurs further growth-enhancing investment (Eisinger 1988). For example, retained revenues paid out in dividends can then be reinvested into debt or equity markets, aiding other businesses. Alternatively, the retained earnings can be reinvested in the business's own operations, leading to business expansion that includes increased production and a larger payroll. A third possible economic growth mechanism is that tax cuts lead to spending cuts, which could free up resources for the private sector (Browning and Johnson 1984, Friedman 1967). These mechanisms all describe ways in which tax cuts can benefit the economy, and are therefore attractive as policy instruments.

Tax cuts are also desirable from the perspective of the businesses they affect. Businesses have become increasingly capable of voting with their feet—also known as capital mobility— and moving to a state with a more favorable business climate. Capital mobility is a well-documented issue in the political economy literature, and taxation can be a potential instigator of capital mobility (Andrews 1994, Cerny 1990, Jensen 2013, and Kurzer 1993). Capital mobility frequently has a negative connotation, but the movement of capital can prove to be the salvation of businesses teetering on the edge of bankruptcy, saving numerous jobs in the process. Incentives have been found to be effective at attracting mobile capital, such as manufacturing (Head, Ries, and Swenson 1999), but there has been a lack of adequate data to empirically test how incentives alter the location of firms with much regularity (Arauzo-Carod, Liviano-Solis, and Manjón-Antolín 2010). During my review of the literature, I have found no research that has rigorously considered capital mobility in response to tax incentives at the state level. Many corporations today are capable of acquiring information and talented consultants for the purpose of restructuring business operations. Assuming they comply with their fiduciary duty to shareholders, corporations are likely to restructure their operations in such a fashion that minimizes their effective tax rate (ETR). Relatively higher business taxes may therefore trigger businesses to leave a relatively higher-tax state for a relatively lower-tax state. Finding evidence for this behavior has proven elusive at the aggregate level until now.

In the remainder of this article, I discuss the current literature on taxation and state economic growth, argue for using trade flow data

as a measure of economic activity in the United States, test for the influence of taxation on economic activity, and conclude with a discussion of the pertinent empirical findings. My findings indicate that pro-business state tax policy matters for growing existing businesses and attracting new ones.

Taxation and Economic Growth

The literature that examines how taxation influences state economies has focused on how taxation directly influences gross state product (GSP). Over the last 10 years, six articles have examined the influence of taxation on U.S. state economic growth at the aggregate level. This body of research has produced mixed findings, and it is widely acknowledged that empirical model specification and methodology are largely responsible for this variation (Reed 2009).

Specific details on the different methodological approaches for all six articles are listed in Table 1. As can be seen from the table, one of the major factors that leads to differing results relates to how tax revenues are aggregated across studies. Studies that aggregate all taxes together when calculating the total tax burden are consistent. Bania, Grey, and Stone (2007) and Reed (2008) both found that an increase in the *total tax burden,* a measure that aggregates all state-level taxes together, can harm growth. Similarly, Atems (2015) found evidence that an increase in the total tax burden of a state can harm both internal growth and the economic growth of nearby states. The consistency of the results changes after scholars begin to dissect tax revenues into their constituent components. Ojede and Yamarik (2012) segmented taxes into income, sales, and property taxes, and found that increases in the latter two categories hurts growth (income taxes were statistically insignificant). In contrast, Prillaman and Meier (2014) split tax revenues into business and nonbusiness categories and created two sets of models. One set of models was "trimmed" for outliers (Prillaman and Meier 2014: 371), and the authors found evidence that nonbusiness taxation severely hinders economic growth but business taxation supposedly increases economic growth.[1]

[1]Prillaman and Meier (2014) excluded "energy-producing states" for certain years and controlled for energy prices at the consumer level, but they did not attempt to control for upstream energy prices that benefit energy-producing states. This process may exclude the very states that are the most capable of attracting businesses.

TABLE 1
Recent Studies on Taxation and State-Level Economic Growth

Author(s)	Bania et al.	Reed	Reed	Ojede & Yamarik	Prillaman & Meier	Atems
Year Published	2007	2008	2009	2012	2014	2015
Estimator(s)	GMM	Multiple	EBA	Panel-ECM	GMM	Spatial Durbin
Taxation Variable(s)	Total	Total	Property Sales Individual Income Corporate Income	Total Individual Income Corporate Income Total Income Sales Property	Business Nonbusiness	Total
Finding(s) of Taxation on Growth	Negative	Negative	Mixed	Mixed	Null	Negative

Notes: Articles may have more than one model; GMM is general method of moments (Arellano-Bond estimator); EBA is extreme bounds analysis; OLS is ordinary least squares; FGLS is feasible generalized least squares; and ECM is error correction model. Reed (2008) found consistent results with multiple estimators: a GMM model, OLS with 2-way fixed effects model, and weighted FGLS model.

With respect to their *untrimmed* set of models, Prillaman and Meier (2014) produced largely null findings for both measures of taxation, which contradicts past literature. Reed (2009) considered a wide variety of taxation measures, and most notably found that an increase in the overall tax burden hurts economic growth, but that corporate income taxes *increase* growth in a segmented model. The author cautioned that these results could have been influenced by the degree to which corporate profits can be "exported outside the state" (Reed 2009: 697), an allusion to capital mobility.[2]

To put it simply, capital mobility with large corporations is quite real in North America. Empirically, Prillaman and Meier (2014) found some evidence for business exits in response to higher business taxes in their empirical models, and this finding should not be surprising. Businesses are started for the purpose of generating profits, and will seek to do so as effectively as possible. Publically traded corporations frequently pay management in long-term stock options, which has been found to align management's self-interest with that of shareholders during aggressive tax planning projects (Armstrong, Blouin, and Larcker 2012; Slemrod 2004). Tax planning is the strategic process of minimizing a corporation's ETR. A rapid expansion in tax planning and compliance projects can be seen in the financial statements released by one of the largest accounting firms that make this data public by region; Deloitte LLP reported that consulting and tax service revenues (not including SEC required auditing services) increased by over 19.8 percent in the United States from 2013 to 2015 (Deloitte 2015). The rise of large tax consulting firms, whose services increase the accessibility of corporate tax law and enable corporations to engage in tax planning, has given many corporations the opportunity to gain a competitive advantage by restructuring their operations to avoid regions that may lead to higher ETRs (Bonner, Davis, and Jackson 1992; Hasseldine, Holland, and van der Rijt 2011; McGuire, Omer, and Wang 2012). As an example, Google Inc. reduced its ETR from approximately 35 percent to a meager 2.4 percent through aggressive tax planning with its *global* operations (Drucker 2010). In the rapidly evolving atmosphere of interstate

[2]It is important to note that most states employ formulary apportionment systems to tax large corporations, not transfer pricing, so profits cannot merely be shifted on paper between affiliates.

business, reorganizing supply lines and business structures according to the results of tax planning has become a viable method for businesses to respond to state corporate taxation. Previous empirical literature has largely been unable to capture this widely understood phenomenon that is crucial for understanding how states can attract business.

The principle problem with the extant literature is model specification. The literature typically uses different empirical methodologies, dependent variables, years of data, and measures of taxation. The end result is that taxation is often found to influence state economies, but there is no conclusive evidence as to *how* it might matter, for better or worse. Instead of focusing on economies as independent silos, I propose that the study of *intranational* trade flows represents a better method for evaluating the health of state economies. The macroeconomy is essentially an amalgam of microeconomic transactions. While my research design still uses aggregate data, it emphasizes aggregate transactions through trade flows that occur within states and between states, rather than attempting to directly estimate GSP with exotic methodologies and overspecified models. In short, I propose that taxation is best examined spatially since state economies spill over their borders. Current literature unequivocally finds that increased trade between economies is associated with gains in real income (Noguer and Siscart 2005), and heightened internal trade clearly reflects an increase in internal economic activity. Therefore, increased trade flows are an indicator of growth due to increasing economic activity.

Research Design and Data

In this article, I utilize a set of spatial gravity models to test my theory. Gravity models are loosely based on Newton's theory of gravity. The central idea is that trade flows are a positive function of market size (i.e., market mass) and a negative function of transaction costs, namely distance (Leblang 2010).[3] My regression models reflect an

[3]Leblang (2010) calculates market mass by taking the logged product of GDP for the two regions involved in a transaction. To mitigate concerns of reverse causality and market volatility in the regression model, I emulate this approach but utilize lagged two-year averages of GSP (e.g., 2010–11 for 2012). Data on GSP were retrieved from the Bureau of Economic Analysis.

augmented specification of the gravity models utilized in the interstate home-bias literature. This literature seeks to explain why state borders in the United States influence the level of trade in America (Hillberry and Hummels 2003, Wolf 2000). To correct for the nonlinear relationship of these variables and so that ordinary least squares (OLS) regression can be utilized, the volume of trade, market mass, and distance are logged. Logging these variables is a universal practice in the literature that uses gravity models.

Dependent Variable

The trade flow data come from the economic census carried out every five years by the Census Bureau and the Bureau of Transportation Statistics. This census of U.S. economic activity involves the mass surveying of established businesses across all sectors of the economy regarding their sales transactions and associated data, such as weight and the distance traveled for goods sold. These transactions may be passing from businesses to independent parties, from parent companies to a subsidiary, from subsidiaries to parent companies, or from subsidiaries to other subsidiaries. These data are later compiled into a large dataset on trade flows in the United States, known as the commodity flow survey (CFS). The two most recent CFS datasets are used in this article since they are consistent in their measurement techniques.

The trade flow data are directional and include all 50 states that constitute America, for 2007 and 2012. Given the recent evolution of state tax policy with respect to multistate corporations, the timeframe of this dataset is ideal. The commodities from each state in the dataset have been aggregated by dollar value. These trade flows can move within the state or to one of the other 49 states in the union, for a total of 50 possible destinations for each state. This leads to a potential sample size of up to 2,500 observations per year, for a total possible sample size of 5,000 in this dataset. Due to the system of surveying and associated responses to the CFS, there are some minor instances of missing data between small states. As a result, I have 4,424 total observations for my regression models.[4]

[4]An analysis of the missing values reveals that they are due to the withholding of cash values of goods by surveyed businesses. The distribution of these missing values appears random and should not bias the models.

Control Variables

Two control variables are included in the models to adjust for the political and geographic context of the trade flow transactions, and these are consistent with past control variables that are used in the literature. To control for regulatory boundaries and home bias, a dichotomous variable is included for whether the trade flows cross a state boundary. To control for industrial clusters that overlap state boundaries, a dichotomous variable is included for whether the destination state of a trade flow is adjacent to the trade flow's state of origin. All control variables are contemporaneous with the dependent variable, although there is no possibility of reverse causality in the regression models. In other words, trade flows in the United States cannot alter state borders or the location of states, which is an important distinction to make when attempting to determine a causal relationship. Since this is an intranational study of trade and not an international study of trade, numerous control variables for different institutions (e.g., levels of democratization) are unnecessary. These simple variables are sufficient to control for confounding factors that may underlie my models.

Taxation Variables

There are two key taxation variables that test for the influence of corporate taxation on trade flows in the United States. The first variable is a type of tax burden variable and directly tests whether corporate taxes decrease the level of economic activity. A corporate tax burden variable is included for both the state of origin and the destination state, as both endpoints are analyzed. These corporate tax burden variables utilize data that are composed of lagged two-year averages (e.g., 2010–11 for 2012), and they are calculated by dividing the sum of state-level corporate taxes and fees by the relevant state's GSP. These ratio variables are based on those used in the literature to study the influence of business taxation on economic outcomes (Prillaman and Meier 2014), and the data were retrieved from the U.S. Census Bureau. The process of using lagged two-year averages mitigates problems related to economic volatility and reverse causality. As the name implies, when the burden of corporate taxation on a state economy increases, economic activity will decrease.

The second variable is the corporate tax rate spread between the origin and destination locations. The corporate tax rate spread will

capture tax incentives that aim to induce large corporations with operations in multiple states to alter their activities away from relatively high corporate tax states. As the tax rate differential increases, the higher cost of doing business in the destination state will result in a decrease in the volume of trade flows passing to that state through corporate supply chains. This reflects the activity of large corporations moving capital assets, such as wholesaling operations, out of relatively higher tax states. This second measure of taxation was calculated by subtracting the top corporate tax rate in the origin state from the top corporate tax rate in the destination state, and the state tax rate data was retrieved from the Tax Policy Center. By using the highest rates, this tax rate spread will capture incentives for *larger firms*, the businesses that are in the best position to engage in tax planning. The tax rate spread variable is contemporaneous with the dependent variable, but was legally established prior to the relevant year.

The two gravity models are specified as follows:[5]

1. $\ln (\text{Value}_{ij}) = \alpha_0 + \beta_1 \ln (\text{Market\_Mass}) + \beta_2 \ln (\text{Distance}_{ij}) + \beta_3 \text{Border} + \beta_4 \text{Adjacent\_State} + \varepsilon$
2. $\ln (\text{Value}_{ij}) = \alpha_0 + \beta_1 \ln (\text{Market\_Mass}) + \beta_2 \ln (\text{Distance}_{ij}) + \beta_3 \text{Border} + \beta_4 \text{Adjacent\_State} + \beta_6 \text{Corporate\_Tax\_Burden}_i + \beta_7 \text{Corporate\_Tax\_Burden}_j + \beta_8 \text{Tax\_Spread}_{ij} + \varepsilon$

The i subscript denotes an origin state variable. The j subscript denotes a destination state variable. The ij subscript denotes a directional variable. Model 1 above represents the base model. Model 2 extends Model 1 with the introduction of taxation variables. Summary statistics for all variables are located in Table 2.

Empirical Findings

The results for both models are depicted in Table 3. Model 1 shows that the gravity model is accurately specified. The presence of a state border reduces trade, and this could be due to regulatory compliance issues and other transaction costs. The dichotomous

[5]All variables are contemporaneous for 2012, except for three categories. GSP variables, corporate tax burden variables, and mobile capital variables are averages for 2010–11. Averaging of past values is intended to mitigate endogeneity in the models and economic volatility following the 2008 financial crisis.

TABLE 2
Summary Statistics for Variables

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
ln (Trade Transaction Values)	4,426	6.829036	1.996258	0.01479	14.18976
ln (Market Mass)	4,989	24.245040	1.453421	20.457950	29.087520
ln (Distance)	4,963	6.950687	0.883742	2.302585	9.070158
Border	4,989	0.979956	0.140165	0	1
Adjacent State	4,989	0.085789	0.28008	0	1
Origin State Tax Burden	4,989	0.377243	0.302528	0.007304	1.846524
Destination State Tax Burden	4,989	0.379506	0.308094	0.007304	1.846524
Corporate Tax Spread	4,989	0.005302	3.966293	−12	12

variable for adjacent states suggests that there could be industry clusters that overlap borders, increasing trade between states that share a common border. As the distance between the place of origin and destination of trade increases, the level of trade decreases in kind; given the cost of transportation, this is quite intuitive. In summary, specification of the gravity models has an intuitive and predictable impact on economic activity.

The findings from Model 2, with the taxation variables, display the detrimental effect that corporate taxation can have on economic activity. As the spread in the top corporate tax rate increases between the destination and origin states, there is a sharp decrease in the value of trade. According to a direct interpretation of the exponentiated coefficient in Model 2, a 1 percentage point increase in the corporate tax spread between two locations will result in approximately a 1.7 percent *decline* in trade flows. This finding provides evidence that states with relatively higher corporate tax rates may be experiencing business exits that are consistent with the findings in Prillaman and Meier (2014). This effect is compounded by how both variables for state corporate tax burdens decrease trade flows as the ratio of corporate taxes to GSP

TABLE 3
Regression Outputs for
Corporate Tax Gravity Model

Dependent Variable:	ln (Trade Transaction Values)			
	Model 1		Model 2	
	Coef.	T-Stat.	Coef.	T-Stat.
ln(Market Mass)	0.986***	(68.39)	0.976***	(68.50)
ln(Distance)	−1.085***	(−27.91)	−1.120***	(−29.34)
State Border	−1.072***	(−5.37)	−0.968***	(−4.76)
Adjacent States	0.547***	(6.44)	0.479***	(5.82)
Corporate Tax Spread	—	—	−0.017***	(−5.16)
Origin Tax Burden	—	—	−0.522***	(−5.24)
Destination Tax Burden	—	—	−0.271***	(−4.19)
Constant	−8.747***	(−21.06)	−8.046***	(−19.19)
Observations	4,424		4,424	
F-Statistic	1,420.94		946.05	
R-Squared	0.82		0.83	

Notes: * denotes p < = 0.10; ** denotes p < = 0.05; and *** denotes p < = 0.01 (reported p-values are two-tailed tests, although all hypotheses are directional). The use of two-tailed tests makes these results highly conservative, emphasizing the robustness of the findings. All models are estimated with standard errors clustered at the dyadic level with year fixed-effects, using the LSDV method. The dummy variable for 2012 is omitted from the table. These modeling techniques will correct for spatially correlated error terms, which may bias model results, and unaccounted-for intertemporal effects.

increases in all locations. For states where the corporate tax burden is equal to 1 percent of GSP, trade exports are 40.7 percent lower than an otherwise equal state with a corporate tax burden of zero. Similarly, states where the corporate tax burden is equal to 1 percent of GSP will have trade imports that are 23.7 percent lower than an otherwise equal state with a corporate tax burden of zero. Though these hypothetical comparisons represent immoderate

examples (see the summary statistics in Table 2 for the minimum and maximum observation values), the findings are nevertheless profound. In summary, the findings contained herein suggest that increased levels of state corporate taxation can be severely harmful to economic activity *everywhere* in the country.

Conclusion

My findings suggest that state politicians can be active players in promoting economic growth by cutting corporate taxes. Corporations are rational actors that are responsive to their shareholders and government incentives to invest and relocate. States with relatively lower tax rates appear to be in a strong position to benefit from their business-friendly tax policies.

States with relatively higher corporate taxes should look to corporate tax rate cuts to spur economic growth. Corporate tax rate cuts should of course be accompanied by other growth-enhancing policies, such as increasing the flexibility of a state's workforce. Pro-business policies are multidimensional and not composed of a single policy domain. However, corporate tax rate cuts are a solid starting point for improving a state's business environment.

The enactment of pro-business policies in a state will not go unnoticed. There are an abundance of well-trained consultants to help corporations find ways to retain as much revenue as possible. These consultants decrease informational asymmetries that can spur corporate responsiveness. This article provides evidence for some conventional beliefs among policymakers about spurring state economies—namely, that corporate taxation matters.

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