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Title
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Permalink
https://escholarship.org/uc/item/99r842b3

Journal
within Picciotto, Sol, ed. Taxing Multinational Enterprises as Unitary Taxation. 2017. 89-99.

Author
Clausing, Kimberly

Publication Date
2013-10-01

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Lessons for International Tax Reform from the U.S. State Experience under Formulary Apportionment

June 2014

Kimberly A. Clausing
Thormund A. Miller and Walter Mintz Professor of Economics
Reed College
3203 SE Woodstock Blvd.
Portland, OR 97202-8199
USA
email: clausing@reed.edu

Abstract: This work undertakes a comprehensive analysis of the U.S. state experience under formulary apportionment of corporate income. While formulary apportionment eliminates the possibility of shifting income across states through accounting strategies that manipulate where income is booked, it may heighten the tax responsiveness of formula factors. The present analysis uses the substantial variation in corporate tax policy decisions of U.S. states over the period 1986 to 2012 to better understand the consequences of formulary apportionment. It examines the effects of policy choices regarding tax rates, formula weights, and other parameters on economic activity, estimating the tax sensitivity of employment, investment, and sales. With the inclusion of adequate control variables, results indicate that economic activity is not particularly sensitive to U.S. state corporate tax policy choices, especially in recent years. Still, tax policy choices have important effects on corporate tax revenues. These results suggest important lessons regarding possible international adoption of formulary apportionment.

Acknowledgements: I am grateful for funding from the International Centre on Tax and Development, supported by the UK Government's Department for International Development (DFID) and the Norwegian Agency for Development Cooperation (NORAD). I am thankful to Sarah Brauner for extremely capable research assistance and Brett Collins of the U.S. Internal Revenue Service for compiling the historical data on pass-through organizations. I received helpful comments from Ruud de Mooij, participants at the National Tax Association Conference, participants in the International Centre for Tax and Development's Research Programme on Unitary Taxation of Developing Countries, and participants at seminars at UCLA, UC-Berkeley, and New York University. Finally, I would like to thank Polia Petkova for work on her senior thesis that contributed to the U.S. state tax policy data collection as well as my interest in this topic.

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I. Introduction

There is an understandable desire to improve systems for taxing international corporate income. Presently, tax systems rely on separate accounting, whereby multinational corporations account separately for income and expenses earned in each taxing jurisdiction. Numerous observers have vocally criticized this system: it is difficult to establish the true source of income, and multinational firms have become increasingly adept at shifting income from highly-taxed jurisdictions to more lightly-taxed ones.[1] Governments have often attempted to curb such income shifting behavior through regulations, yet these regulations are complicated, costly to administer, and often ineffective. Multinational corporations are also not content; they complain of high compliance costs, substantial uncertainty regarding ultimate tax burdens, and unfair tax-based competitive pressures in the global market place.

In this environment, formulary apportionment has emerged as a compelling alternative for international tax reform.[2] Under formulary apportionment, income is assigned to each taxing jurisdiction based on a simple formula. This system has the potential for large benefits in terms of simplicity, administration, and curbing tax base erosion. However, formulary apportionment may create its own practical difficulties. For example, there are accounting concerns about the measurement of the formula components and the tax base, as well as legal concerns about the definition of a consolidated business and the impact on international tax treaties.

Beyond the pragmatic details of implementation, there are also important concerns that a formulary approach will generate its own tax distortions. For example, multinational corporations may respond to formulary apportionment by moving the activities that are used to determine the assignment of income to low-tax jurisdictions.

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[1] Empirical evidence on income shifting is well known; see the survey articles of De Mooij (2005) and De Mooij and Ederveen (2008). Clausing (2009, 2011) indicates that income shifting behavior has high revenue costs for high-tax rate governments. This issue has received policy attention of late, with hearings in the U.S. Congress and the U.K. Parliament, as well as attention in recent G-8 and G-20 meetings.

[2] Formulary apportionment on an international scale has been considered by the European Union in their proposals for a common consolidated corporate tax base (CCCTB), but proposals for international adoption are a long way from fruition. Still, it should be remembered that separate accounting and formulary apportionment are intellectual ideals on a spectrum of profit allocation methods. There are aspects of commonly-used transfer pricing practices that have formulary elements, and there are possible hybrid options like formulary profit splits. Thus, one can also learn useful things about tendencies under each end of the spectrum that inform possible in-between proposals.

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Also, there are important questions about the revenue consequences of formulary apportionment.

This paper uses the U.S. state experience with formulary apportionment to inform both of these concerns. In particular, it considers the tax sensitivity of formula factors under formula apportionment, and it evaluates the determinants of corporate tax revenue under a formulary system. The empirical analysis focuses on U.S. state corporate tax policy choices over the period 1986 to 2012.

In the context of international tax policy choices, an analysis of the U.S. state experience may seem peculiar. Yet the U.S. state experience may provide insight into the dynamics of international tax competition. U.S. states are more economically integrated than countries are presently, but the extent of economic integration among U.S. states demonstrates one possible future for global economic integration.

Further, U.S. states provide a useful source of policy variation for understanding the consequences of formulary apportionment, since they retain a great deal of autonomy on corporate tax policy choices.[3] U.S. states choose tax rates, formulas, and other rules independently, and states have not shied away from policy changes. These types of policy variation are used to better understand the consequences of formulary apportionment for both economic activity and revenue.

In terms of economic activity, results demonstrate very little tax sensitivity, in contrast to some early studies of this question. The divergent findings may result in part from the longer time period under investigation in the present study. For example, as more and more states have engaged in tax competition by increasing sales factor weights and making other rules more favorable, the effect of individual state policy choices may have been muted. There is evidence in the early literature that states that increased sales weights gained employment at other states' expense. However, in the recent period, as more and more states have increased sales weights, there is no evidence of these effects persisting.

In terms of tax revenues, this analysis suggests that tax policy decisions are important. States that increase sales weights or allow elective features of their tax policy

[3] Still, a common (and economically significant) federal layer of taxation exists for U.S. states.

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environment have lower tax revenues, while higher tax rates and throwback rules are associated with higher corporate tax revenues.

Together with the results on activity, this result suggests important policy lessons for potential international adoption of formulary apportionment. In particular, under formulary apportionment, countries will likely remain tempted by tax policy competition. Efforts to assure harmonized formulas and to protect the corporate tax base from erosion will still be important.

II. What Can We Learn from U.S. States?

U.S. states have a long experience with formulary apportionment of corporate income. After the U.S. corporate income tax was adopted in the early twentieth century, U.S. states realized the difficulty of separate accounting for income and expenses in each state in an environment when business activity is well-integrated across states. Thus, by mid-century, U.S. states allocated national income to state jurisdictions by formula.[4]

At first, the common formula employed by U.S. states was based on three factors: the share of a firm's payroll, assets, and sales in a particular state.

$$\text{Tax}_i = t_i \, \Pi_{US} \left[\frac{1}{3} \left(\frac{A_i}{A_{US}} + \frac{S_i}{S_{US}} + \frac{P_i}{P_{US}} \right) \right] \qquad (1)$$

where the subscript i indicates a particular state and the subscript US indicates the United States, t_i is the state tax rate, Π_{us} is U.S. profit, A is assets, S is Sales, and P is payroll. Observers have noted that a formulary system creates an implicit tax on the factors used in the formula, thus discouraging assets and employment in high-tax locations.[5]

[4] A detailed history is provided in Hellerstein and Hellerstein (1998).

[5] One possible confusion should be cleared up. While a formulary approach acts as an implicit tax on the factors in the formula for profitable firms, it is *not equivalent* to a tax on the factors in the formula, typically assets, payroll, or sales. Why not? The essential difference is that the tax is proportionate to corporations' worldwide profits, net of deductible expenses. Thus, if a corporation does not earn profits, it will not incur tax liability, no matter how large their sales, assets, or employment.

Similarly, there are no cascading effects with the sales factor, as there might be with a sales tax. If a firm has more steps in their production process, that will generate tax liabilities based on the *profits* of each step of the production process. Thus, consolidating the firm to be vertically-integrated will not affect the resulting tax liability beyond the effect of the different distribution of the final products' sales from the intermediate products' sales.

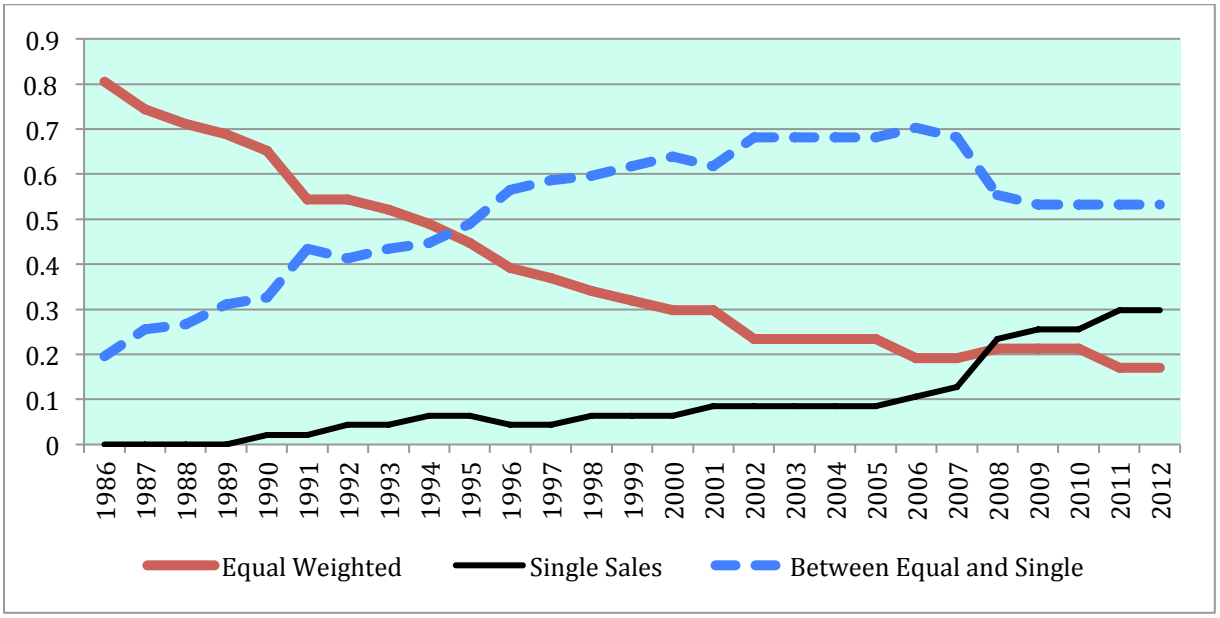
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In part due to these concerns, as well as business lobbying, many states have increased the weight on their sales factor in recent decades, often doubling it relative to weights on other factors. Some states have even adopted sales-only formulas, where tax liabilities are calculated as:

$$\text{Tax}_i = t_i \, \Pi_{US} \left(\frac{S_i}{S_{US}} \right) \qquad (2)$$

Indeed, over the period of the study (1986-2012), there have been many changes in state formulas for allocating corporate income. In 1986, 80% of states that taxed corporate income used an equal-weighted formula, and 20% had higher weights on sales. By 2012, in contrast, only 17% of states that taxed corporate income used an equal weighted formula; the rest had formulas with a larger weight on sales. In recent years, there has been a spurt of states adopting single-sales formulas, where the entire weight is on the sales factor. Figure 1 shows this experience.

Figure 1: Share of States Using Different Formulas



Note: The figure shows the share of states with a 1/3 weight on sales (equal weighted formula with sales, assets, and payroll), with heavier weights on sales (between equal and single), and with single-factor sales formulas. Data on formulas were compiled from various sources, including *Multistate Corporate Tax Almanac* (1986-1989), *Significant Features of Fiscal Federalism* (1990-1994), *Multistate Corporate Tax Guide* (1995-2000) Commerce Clearing House *State Tax Handbook* (2001-2008), and Commerce Clearing House *Master Multistate Corporate Tax Guide* (2009-2013).

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There is also substantial variation among states in other corporate tax policy rules: whether combined reporting is required, whether there are "throwback rules" that tax "nowhere" income, whether options are offered among formula types or reporting requirements, and so on. Further, states have frequently experimented with changes in corporate tax rates as well, although for the average of all states, corporate tax rates are relatively stable over time, averaging 7.2% in 1986, and 6.6% in 2012.

While the U.S. state experience provides a valuable and diverse set of corporate tax policy experiences under formulary apportionment to study, there are also important caveats to bear in mind. U.S. states typically choose low tax rates, and the response of economic activity to tax rate differences is likely to be larger and more apparent at higher tax rates.

Also, U.S. states exist within a common federal system, and there is no analogous supranational body in most cases.[6] A common federal system makes it easier to determine the tax base to which the formula should apply, since most U.S. states begin with the federal definition of income as their baseline tax base. Still, the common federal system itself heightens tax competition pressures, since it facilitates economic mobility of all types. Footloose firms have an easier time relocating across states than across national boundaries, and domestic product competition is fiercer than its international counterpart, as prices are more uniform and comparable, there are no possibilities for exchange rate fluctuations, information is more available, and goods mobility is more seamless. For these reasons, one would expect tax competition to be fiercer *within* countries than *between* countries, so this may also reduce the applicability of the U.S. state experience.

III. Prior Work

This work will build on the insights of past work on formulary apportionment both internationally and at the state level. Prior work on the international implications of formulary system includes Avi-Yonah and Clausing (2008), Avi-Yonah, Clausing, and Durst (2009), De Waegenaere and Sansing (2008), Devereux and Loretz (2008a, 2008b), Eichner and Runkel (2008), Fuest (2007), Hines (2010), and Pethig and Wagener (2007).

[6] One possible pending exception would be the European Union, although the role of the E.U. government is substantially smaller than the U.S. federal government, and it is likely to remain so for the foreseeable future.

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Regarding the U.S. state experience, state incentives to change formulas are well known: Anand and Sansing (2000), Edminston (2002), and Pinto (2007) generate models of formula choice, and Omer and Shelley (2004) empirically document the trend toward higher sales factor weights. Recently, Chirinko and Wilson (2010) consider the role of political contributions and state tax policy competition over the period 1988 to 2006. They find that policy-makers are sensitive to campaign contributions, and their results document the nature of tax competition among states. Results also indicate the importance of including state-specific fixed effects in specifications; without this inclusion, some of the results are perverse.

Mintz and Smart (2004) have a clear and compelling study of the effects of formulary apportionment on income shifting incentives, making use of the Canadian example. Some, but not all, multijurisdictional firms are required to allocate income to Canadian provinces by formula. Using data from the Canadian Customs and Revenue Agency over the period 1986-1999, they find that taxable income is far less sensitive to tax rates, indicating less income shifting, for firms that are required to allocate income by formula.

The effects of formula choices on economic activity has also received some attention, and three studies employ cross-state level data to consider the relationship between formula choice and employment, sales, and investment.[7] First, Goolsbee and Maydew (2000) consider employment effects over the period 1978 to 1994; they find evidence that employment is sensitive to the weight on employment in the formula, and there is evidence of tax competition among states, whereby states gain employment at the expense of other states.

Second, Gupta and Hoffman (2003) consider the impact of formula choices, tax rates, and other policy choices such as investment incentives on capital expenditure effects over the period 1983 to 1996. In the specifications that employ fixed effects, the effects of tax policy measures are smaller than in other specifications, but still statistically

[7] There is also some promising recent work on German formulary apportionment of the trade tax at the municipality level. Early work by Thomsen, Ullman, and Watrin (2013) indicates that labor decisions are sensitive to differences in the trade tax rate across German municipalities. Fuest, Peichl, and Siegloch (2013) also provide related evidence on the wage effects of German municipality taxation.

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significant.[8] They note that the revenue losses associated with lower tax burdens are likely more consequential than the effects on investment magnitudes.

Third, Klassen and Shackelford (1998) consider the effect of sales weights in the apportionment formula on manufacturing revenue, their measure of sales, over the period 1983 to1991. They find that in throwback states, but not in others, manufacturing revenues are sensitive to the tax rate applied to sales. Their analysis is confined to separate estimates of cross-sections of states for each year in their sample; they do not employ panel data techniques.

All three of these studies focus on a period that excludes the recent time period of rapid policy changes, so they necessarily utilize less time variation.[9] The present analysis extends the sample period by 16-21 years. The recent decades are a particularly important period to examine, since they have been marked by a much more widespread adoption of higher sales-factor weights, as Figure 1 demonstrates. As the following analysis will address, the dynamics of tax competition are likely to change as it becomes more widespread. In particular, "first-mover" states may experience different economic consequences from heavy sales weights in their formulas than do states that change their policies later.

There has been some promising work on state corporate tax revenues, including Gupta et al (2009), Cornia et al (2005), Fox and Luna (2005), and Mazerov (2001). Gupta et al (2009) is the most fully developed analysis. The authors undertake a study of the determinants of state corporate tax revenues over the period 1982 to 2002; their data set allows controls for most important considerations. They find that states that increase sales factor weights have lower corporate revenues, but revenues increase with the tax rate. Throwback rules and broader definitions of business income increase revenues, but combined reporting has no effect. The authors note that the policy environment has continued to evolve rapidly in the years since their study, so including an additional

[8] Results imply that states with a property burden (the multiple of their tax rate and the formula weight on property) one percentage point higher are associated with 0.09 percent lower new capital expenditures. There is some evidence that there is greater tax rate sensitivity in states that employ throwback rules or unitary taxation, but in general, these effects are quite modest.

[9] In this analysis, I will check results from baseline specification for early years in the sample, finding that some results are sensitive to the time period studied; economic activity appears more tax sensitive in early years. Possible reasons for this finding are discussed below.

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decade of data in the present study is likely useful.

Both the economic activity and the revenue studies discussed above focus on earlier periods, and the present study will allow a consideration of both recent changes and longer-run effects from early changes. Further, the present work will benefit from taking a comprehensive approach that considers the effects of both formula choices and other tax policy choices on a wide range of economic outcomes. More control variables are considered, and it is easier to take full account of the structural features of state economies, macroeconomic fluctuations, and the full spectrum of policy parameters with a longer sample period. Control variables include both a full panoply of other tax policy choices (such as combined reporting requirements, throwback rules, and choice features of the tax code) and variables measuring state-level economic growth, unemployment, workforce educational attainment, demographic variables, and other controls.

There will also be essential methodological improvements over prior work. For example, not all prior studies employ state-specific fixed effects, yet this important in order to prevent spurious statistical correlations that could easily result from omitted variables. For example, if states that are particularly business friendly are also more likely to heavily weight the sales factor in their formulas, and one does not include state fixed effects, then one would risk attributing increases to economic activity solely to the increase in the sales factor, when other aspects of states' policies may be far more important. Finally, many robustness checks are considered, and alternate specifications are employed that consider how tax policy changes may affect real economic decisions with a substantial lag.

IV. Specifications

The present analysis will undertake an investigation of how policy decisions by U.S. states under formulary apportionment affect U.S. state government corporate income tax revenues as well as economic activities across U.S. states. Dependent variables are defined and summarized in Table 1. They fall into four categories: measures of employment, investment, sales, and government revenues.

The basic specifications relate the dependent variables to the explanatory variables as in the following equations, where P are a vector of tax policy choices, E and

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S are vectors of control variables capturing the macroeconomic conditions of states and the structure of the state economy, and where i indicates states and t indicates years.

$$Employment\ Measure_{it} = \sum_i \alpha_i + \sum_P \beta_p P_{it} + \sum_E \beta_e E_{it} + \sum_S \beta_s S_{it} + \varepsilon_{it} \quad (3)$$

$$Investment\ Measure_{it} = \sum_i \alpha_i + \sum_P \beta_p P_{it} + \sum_E \beta_e E_{it} + \sum_S \beta_s S_{it} + \varepsilon_{it} \quad (4)$$

$$Sales\ Measure_{it} = \sum_i \alpha_i + \sum_P \beta_p P_{it} + \sum_E \beta_e E_{it} + \sum_S \beta_s S_{it} + \varepsilon_{it} \quad (5)$$

$$\text{Re}venue\ Measure_{it} = \sum_i \alpha_i + \sum_P \beta_p P_{it} + \sum_E \beta_e E_{it} + \sum_S \beta_s S_{it} + \varepsilon_{it} \quad (6)$$

For this investigation, state level policy choices are of most interest. It is hypothesized the policy choices will typically affect revenues and economic activity in opposite directions; policies that increase tax burdens typically raise revenue but also discourage economic activity. For example, higher tax rates increase revenue as long as Laffer curve effects do not predominate, which is unlikely at the low levels of taxation of U.S. states.[10] But, higher tax rates also raise the tax burden on any factors that are in the formula, presumably discouraging such activities in U.S. states.

For example, following Goolsbee and Maydew (2000), the firm's marginal tax rate is the sum of the state tax rates over the states in which it operates. If all firms are taxed according to an equal-weighted formula, as in Equation 1, and states are indexed by i, this becomes:

$$\mathrm{T} = \frac{1}{3}\left[\sum_i t_i \frac{A_i}{A_{us}} + \sum_i t_i \frac{S_i}{S_{us}} + \sum_i t_i \frac{P_i}{P_{us}}\right] \quad (7)$$

If the firm moves workers from high-tax to low-tax states, it will reduce its marginal tax rate. Assuming that the total Payroll is unchanged, moving payroll toward a particular low tax state (j) changes the firm's marginal tax rate as follows:

[10] Revenues will fall with increases in the tax rate if the elasticity of the tax base with respect to the tax rate is sufficiently large. Clausing (2007, 2008) finds that the revenue-maximizing corporate tax rate is likely higher than the rates found in typical OECD countries.

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$$\frac{\partial \mathrm{T}}{\partial P_j} = \left(\frac{1}{3P_{us}}\right)\left[t_j - \sum_{i \neq j} t_i \frac{P_i}{\sum_{i \neq j} P_i}\right] \quad (8)$$

As long as the tax rate in the state with increased jobs is lower than the weighted average of other states' tax rates, the firm's marginal tax rate on U.S. income declines.

U.S. states have often increased the sales factor weights in recent decades. Indeed, the weight on the sales factor directly lessens the burden on other factors, and so one would expect tax-sensitive firms to be more likely to locate productive factors (assets and employment) in high sales-factor states. However, a higher sales weight will reduce corporate revenues for states where their asset and employment activity shares are higher than their sales shares. Indeed, dominant productive firms in local economies often lobby for increases in the sales factor in the formula.

In theory, if states consume roughly in line with their production, and if all states moved to a sales-only formula, the overall tax burden would be unchanged for firms, and state revenues would also be unchanged. But since firms often lack nexus in a particular state, not all sales generate associated corporate tax revenues under the present system. Further, since states vary in their formula choices, firms may be able to lower their overall tax burden by taking advantage of these differences and altering the location of their activities accordingly.

Discretionary features of the corporate tax policy environment may also lighten tax burdens on corporations as well as revenues. When firms are allowed to choose among different formulas, or to choose whether to utilize combined reporting, they are likely to make informed choices that lessen their tax burden.

Some states attempt to counter these revenue-reducing tax competition pressures. For example, some states employ throwback rules. States that use throwback rules require firms to pay tax on income that is untaxed in another state. Also, some U.S. states require combined reporting; this can help ensure that large multi-jurisdiction firms do not avoid taxation by splitting themselves into separate corporations and manipulating transactions within the overall corporate group. In the present analysis, dummy variables are used to

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capture such features of the state corporate tax code.[11]

Control variables will allow for the effects of the health of the state economy, structural features of the state economy, and time-specific and state-specific effects. All variables are described and summarized in Table 1; the data sources are described in detail in Appendix 1.

V. Results

Employment Activity

Results from the employment specifications are in Table 2. Specifications (1) to (3) employ state fixed effects; column (1) is the most basic model, and columns (2) and (3) add more explanatory variables. Columns (4) to (6) repeat these specifications, adding year fixed effects in addition to state fixed effects.

In all cases aside from the first specification, the payroll burden variable, which is the simple multiple of the payroll weight and the tax rate, is either statistically insignificant or unexpectedly positive. In the first (and most barebones) specification, however, it is both negative and statistically significant.

Throwback rules and combined reporting requirements are negatively associated with employment in some specifications, though their empirical magnitudes are zero or very small in the full specifications. The variable that indicates corporate license fees relative to GDP is also negatively associated with employment, though given the extremely low mean of this variable, its' empirical magnitude is also very small.[12]

Most control variable results are as expected. Economic conditions are associated with employment in the hypothesized direction. When national unemployment rates are high, that is associated with lower employment in states; this variable is dropped from the time-effects specifications due to lack of state-level variation. State level gross-domestic product is positively associated with employment.

Several variables are used to capture structural features of the economy; in equations (2) and (5), higher GSP per-capita states also have higher employment. In

[11] I do not control for tax features that do not vary across states, such as the payroll tax burden on firms, since this tax is determined at the federal level of government.

[12] Increasing license fees by 25% of the mean value for this variable is associated with one-tenth of 1% lower employment. Personal income tax rates are positively associated with employment.

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equations (3) and (6), this variable changes sign, but several other control variables are introduced, including the share of the population with a college degree (positively associated with employment in equation 6), the ratio of workers that are in manufacturing (positively associated with employment levels), and the share of young (18 and under) and old (65 and over) in the population, both of which are negatively associated with employment.

Appendix 2 shows the same specifications without fixed effects. Throughout the paper, these results are not included in the text, since statistical tests overwhelming indicate that fixed state effects are required. Further, the exclusion of state fixed effects risks biasing the coefficients due to spurious correlations between tax policy variables and other features of a state. The inclusion of fixed effects has an important effect on the results, as Appendix 2 indicates.[13]

Investment Activity

Table 3 considers how tax policy variables affect investment across U.S. states, using data on capital expenditures from the Annual Survey of Manufacturers. Again, fixed state effects are necessary, and columns (1) to (3) shows fixed state effects, while columns (4) to (6) include both state and year fixed effects.

The main tax policy variable of interest is the measure of tax burden on assets, the multiple of the corporate tax rate and the weight on assets in the formula allocation. In the first specification, without additional controls, there is a statistically significantly negative relation between this tax burden and capital expenditures; however, all other empirical models shown in columns (2) to (6) show unexpectedly positive relationships between asset tax burdens and capital expenditures, even after a full set of control variables is included.

[13] For comparison, the Table A1 shows regular pooled regressions (specifications 1-3) and regressions with region fixed effects (specifications 4-6), following the region designations of Crone (2005). These specifications show a large and negative statistically significant effect of the payroll tax burden, although the effect gets smaller when the full set of controls are included. In specification (6), a standard deviation increase in the payroll tax burden (equal to 50% of the mean burden) would reduce employment by 0.6 percent. The control variables are broadly consistent with results in the main specifications, though throwback rules and combined reporting requirements are sometimes positively associated with employment. The mid-Atlantic states are the omitted region; other regions typically have higher employment in the full specification, reported in column 6.

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This is puzzling, yet easy explanations do not clarify this result. For example, it is not due to a time trend in capital expenditures, whereby capital expenditures decrease over time, at the same time sales weights are increasing (and thus asset weights decreasing). In general, capital expenditures are *increasing* over this time period. Instead, I suspect the result stems from idiosyncratic features of the data. If one compares the subsample of states that are increasing their sales weights, thus lowering their asset weights, with the subsample of states that are not changing their formula weights, capital expenditures simply grow less rapidly for states that do not increase their sales weights (and lower their assets weights). The average year over year growth rate in capital expenditures is 0.5% for states that change weights and 7.5% for states that do not change weights.

Other tax policy measures (the throwback rule, required combined reporting, the personal income tax, and corporate license fees) are typically statistically insignificant, with the exception of one positive effect of throwback rules in column (3) and one negative effect of personal income taxes in column (6).

Economic control variables have the expected associations with capital expenditures, with state-wide unemployment associated with lower capital expenditure and gross state product associated with increased capital expenditure. Structural control variables indicate a positive relationship between GSP per-capita and investment, and between the manufacturing ratio in the economy and investment. There is a negative relationship between the share of the population with a college degree and investment, and demographic variables have mixed effects. Again, appendix table A2 reports ordinary pooled regressions as well as pooled regressions with region-specific effects.[14]

Sales Activity

Table 4 reports regressions on sales across U.S. states, following similar specification choices as above. Columns 1-3 report state fixed effects, and columns 4-6 report specifications with both state and year fixed effects. An additional policy variable is considered here, the interaction between the sales burden and the throwback rule

[14] As is the case throughout the paper, pooled results are not included in the text, since statistical tests overwhelming indicate that fixed state effects are required. In Table A2, the full model of columns (3) and (6) show no statistically significant relationship between asset tax burdens and capital expenditures, but the simpler empirical models of columns (1), (2), (4), and (5) do show the expected negative relationship between asset tax burdens and capital investment.

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dummy variable. This is intended to capture the fact that sales burdens will be more burdensome if states are also taxing income that is earned in another state. According to the Uniform Division of Income for Tax Purposes Act (UDITPA), sales may be "thrown back" to the state from which the sales are shipped if the seller is not taxable in the destination state or if the buyer is the U.S. government.

In most specifications, the sales burden variable is statistically insignificant, and the only exception is an anomalous positive sign in equation (1). Throwback rules have a negative effect on sales in equation (5) but are otherwise statistically insignificant. The throwback/sales burden interaction term always has a negative sign, but it is never statistically significant.

Control variables are typically as expected. Lower unemployment or higher gross state product increase sales, and states with higher per-capita GSP and manufacturing ratios tend to have higher sales. Corporate license fees have a negative association with sales; in equation (6), an increase in license fees of 25% of the mean value for this variable reduces sales by 1.1%. Although fixed state effects are clearly indicated, appendix table A3 shows the results for pooled and region effects specifications for reference.[15]

Discussion of Activity Results

The above results indicate very few negative tax burden effects on employment, investment, or sales. What is one to make of this finding? It may simply be the case that at low tax rates, economic activity is not that responsive to the tax burdens associated with formulary apportionment. Employment and investment decisions may be determined by more important considerations, and sales are determined by where customers are.

It is important to remember that this evidence comes from the U.S. state experience, where corporate tax rates are low, averaging 7 percent during this sample period. It is likely that real economic activity is more responsive to tax burdens at higher tax rates, and this consideration would imply a larger tax response at the international level than one finds among U.S. states. At the same time, it is also the case that employment and investment mobility is likely far easier (i.e., more footloose) *within*

[15] Here, tax effects are typically minimal. There is no negative effect associated with corporate license fees or sales corporate tax burdens. In one case (column 2), throwback rules have a negative effect, and in one case (column 3) the interaction between the sales burden and the throwback rule has a negative effect.

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countries than *between* countries. So, on the other hand, this consideration implies smaller tax responses at an international level than one would find at a subnational level.

The present results contrast with some, but not all, prior work on U.S. states. Goolsbee and Maydew (2000) find that employment is responsive to tax burden differences across states, Gupta and Hoffman (2003) find small capital expenditure responses in some specifications, and Klassen and Shackelford (1998) find that sales are sensitive to tax burdens in throwback states. However, as noted earlier, these studies all employ data that end by the mid-1990s, 16 to 21 years before the end of the present study. Also, some specifications do not include adequate controls, such as state-specific effects.

Therefore, I also analyzed subsamples of the data, focusing on the early and later time periods. There are reasons to expect that tax responsiveness could change over time. For example, one hypothesis is that first-mover states that increased the sales factor weights during a period when other states were largely using the traditional formula would have gained a larger competitive advantage vis a vis other states, in comparison to late-mover states that changed their formulas in a context where many other states had already adopted formulas with disproportionately heavy sales weights.

There are some important changes in the results when the sample is limited to early years (ending in 1995). For the analysis of employment, there are more negative and/or statistically significant effects of payroll tax burdens. For the capital expenditure analysis regressions, the asset tax burden loses its (perversely) positive effect on investment, and it instead becomes statistically indistinguishable from zero. For the sales regressions, there are some negative tax effects for throwback states. These results offer some limited support for the first-mover hypothesis above, where states that alter formulas are more likely to gain at the expense of other states before tax competition becomes pervasive.

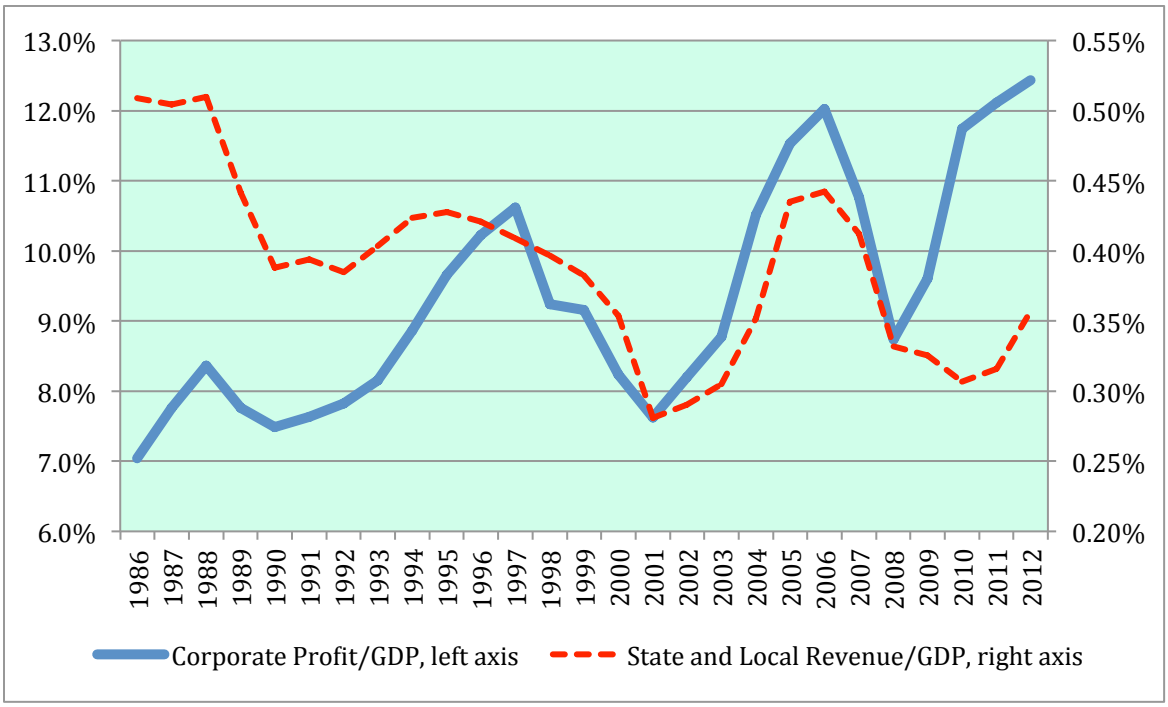
Government Corporate Tax Revenue

This time period has experienced a large increase in the importance of corporate profits. Figure 2 shows corporate profits as a share of GDP for the U.S. as a whole (left axis), as well as U.S. state and local corporate tax revenues relative to GDP (right axis). Over the past quarter century, corporate profits have increased from 7% of GDP to over

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12% of GDP; though they fluctuate with the cyclical position of the economy, there is a clear upward trend. State and local corporate tax revenues also fluctuate with the state of the economy, but if anything, there is a small downward trend over this time period.

Figure 2: Corporate Profits and State Corporate Tax Revenues as a Share of GDP



Note: Data are from the Bureau of Economic Analysis (BEA) as reported in the 2013 *Economic Report of the President*. 2012 data are preliminary; revenue data for 2012 are from the BEA and the Office of Management and Budget.

Table 5 reports regressions considering determinants of state government corporate tax revenues as a share of GSP; columns (1) to (3) include state fixed effects and columns (4) to (6) include state and year fixed effects. Policy choices have important effects on revenue. Tax rates are positively and statistically significantly associated with revenues in all specifications. A tax rate one percentage point higher is typically associated with a share of corporate tax revenue in GSP that is about 5% higher.[16]

Higher sales weights lower revenues in equations (1), (4), (5), and (6) with 95% confidence, in equation (2) with 89% confidence, and always have a negative sign.

[16] As the average tax coefficient in this table is 1.644, a tax rate one percentage point higher increases the ratio of tax revenue to GSP by about .0164. The mean corporate tax revenue to GSP ratio is 0.34, so the revenue to GSP ratio increases by 4.8%.

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Taking the average sales weight coefficient from this table, this implies that moving from an equal-weighted formula to one that double-weights sales will be associated with a share of corporate tax revenue in GSP that is about 2.5% lower.[17] States with throwback rules have higher revenues, and other tax policy variables often have statistically insignificant coefficients.

Control variables are as expected. Higher state unemployment is associated with lower corporate tax revenues, and higher corporate profits, measured by operating surplus, are associated with higher revenues. As the share of business returns that are pass-through entities increases, corporate tax revenues decrease. As above, Appendix Table A4 reports results from pooled and region-effect specifications.[18]

Extensions

Several extensions and robustness checks were considered. Results are summarized briefly here but all tables are available from the author upon request. First, as noted above, subsamples of the data set focusing on the early and later time periods were analyzed. Indeed, there are some important changes in the results when the sample is limited to early years (ending in 1995). As noted above, activity, and especially employment, appears to be more negatively related to tax burdens in the early time period. In addition, in the revenue regressions, in both pooled and fixed effects specifications, the sales weight term no longer has a negative effect on tax revenues, when the sample is restricted to early years. One plausible explanation for this set of findings is that, as tax competition became more pervasive, it resulted in far lower "bang for the buck" for states raising their formula sales weights in an attempt to encourage job creation and investment in their home state. Positive effects on jobs and investments disappeared, and instead, states simply lost corporate tax revenue.

Second, all of the above analyses were done on specifications that deliberately excluded Alaska, Hawaii and the District of Columbia, as is the tradition in much state-

[17] The average sales weight coefficient in this table is -0.0498, including the two statistically insignificant results as 0. A sales weight 17 percentage points higher decreases the ratio of tax revenue to GSP by about .17 * -0.0498, or .0083. The mean corporate tax revenue to GSP ratio is .34. So the revenue to GSP ratio decreases by 2.5%.

[18] In these results, tax rates continue to be positively associated with revenues, and sales weights continue to be negatively associated with revenues, with a much more sizable negative impact. Both throwback rules and required combined reporting are associated with higher revenues.

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level empirical research. Still, all results were checked without this exclusion, and this exclusion does not affect any of the main policy conclusions.

Third, I included alternate measures of the dependent variables, when possible. For employment, there are other BEA series that show non-farm, private payroll and manufacturing employment. There are also measures from surveys of foreign multinational firms with U.S. affiliates that show employment and manufacturing employment. Finally, a measure of labor force participation can be constructed by taking the ratio of the labor force to the working age population. In most cases, the tax policy results were broadly quite similar. The one exception was labor force participation, which showed a persistent negative relationship to payroll burdens in fixed effects specifications.

For capital expenditure, one may also consider a series on property, plant and equipment investments by foreign multinational firms; like capital expenditure, these were not negatively related to asset burdens in the fixed effects specifications. For sales, the Census reports a retail sales figure every five years. While this entails fewer observations than the Annual Survey of Manufacturers sales data, the tax policy variable results were similar.[19]

Finally, I considered the likely possibility that real economic activities like employment, investment, and sales likely respond to changes in tax treatment with a lag. In particular, even if tax policy changes are partially anticipated, it may take some time for companies to alter the location of economic activity in response. Therefore, I constructed a five-year average factor tax burden that averaged the current year's tax burden and the four prior years' burdens. In these specifications, the overall flavor of the results is similar, though there are a few changes. In the capital expenditure regressions, the perversely positive coefficients on the asset tax burden variable becomes statistically indistinguishable from zero. Also, in two of the employment regressions, columns (3) and

[19] Fourth, I ran the activity regressions (employment, assets, and sales) with the inclusion of corporate revenues as a share of GSP as a control, as suggested by one commentator. This might be warranted since it would control for the overall burden of corporate taxes, independent of particular formula factor tax rates. However, this inclusion did not affect any of the important results, and the control variable itself was rarely statistically significant.

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(6), the tax burden variable becomes statistically negative, though very small in magnitude. All other results are similar.

Policy Endogeneity Concerns

Studies on the consequences of tax policy are often plagued by concerns of endogenous relationships between policy parameters and dependent variables. For example, if state policy makers choose sales weights and tax rates with the hope of improving disappointing economic conditions, we may find a negative relationship between employment and lower sales weights due to that policy impetus, even if the lower sales weight eventually boosts employment. Or, perhaps some policy environments are inherently more business-friendly, and in these environments, states adopt lower tax rates and payroll/asset weights in their formulas but also undertake myriad other policy changes that also affect underlying economic fundamentals. In both cases, we would be concerned of biased results, although the nature of the bias is in the opposite direction in these two examples.

In several respects, the above analyses are responsive to these concerns. For example, variables are typically included that reflect the underlying economic conditions of the state (gross state product, unemployment, etc.). Also, the key tables in the text all include state-specific fixed effects, which should address some of the "business climate" concerns. Many specifications also include year effects that should capture macroeconomic shocks as well as other time-specific phenomena.

However, it is also useful to examine possible determinants of policy changes. Therefore, I examined two probit analyses, considering the determinants of state decisions to increase the sales weight in their apportionment formulas (appendix table A5) or to lower corporate tax rates (appendix table A6). Over the entire sample, in 8% of observations, states increase the sales weight in their apportionment formulas, and in 3% of observations, states lower their corporate tax rate by at least nine-tenths of one percentage point. (Occasionally, states undertake very mild or gradual rate reductions, and I exclude these instances from the analysis.)

Tables A5 and A6 both show specifications that include more independent variables as you move rightward across the table. The baseline specification (column 1)

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models the policy change as depending on the mean policy of other states, the state unemployment rate, Republican control over both legislative and executive branches of state government, Democratic control over both branches (with the omitted category being split control), and whether it is an election year. Column 2 also includes other tax policies and state GSP per-capita, column 3 includes the debt/GSP and federal aid/GSP ratios for states as well as the share of the population that is young (18 and under) or old (65 and older), and column 4 includes lags of prior values for other states' policies, tax rates, gross state product, unemployment, and political outcomes.

The remarkable feature of the probit regressions is how few statistically significant determinants of policy changes are apparent in the results. Across four sales weight specifications, the only variable that is associated with higher sales weights is the mean weight in other states (in two columns) and the lag of the mean rate of the sales weight in other states (in column four). Across four tax rate change specifications, there is only one statistically significant coefficient, the mean tax rate in other states (in equation 4 only). These results provide substantial evidence that tax policy changes are not explained well by seemingly plausible observable variables, thus reducing possible policy endogeneity concerns.

VI. Conclusions and Policy Implications

U.S. states have a long experience with the formulary apportionment of corporate income. In comparison to separate accounting, formulary apportionment substantially reduces concerns regarding the shifting of income from high-tax to low-tax states. In particular, corporations have no incentive to alter the location of paper profits across state boundaries, since corporate tax liabilities are based on *national* income and the factors in the formula, factors that reflect the underlying real economic activities. Indeed, Mintz and Smart (2004) provide evidence of reduced income shifting under formulary apportionment.

Under separate accounting, firms have more flexibility in how they account for where income is earned, and a long body of empirical research demonstrates that corporations are eager to reduce their tax liabilities by utilizing such flexibility. Indeed,

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due to tax-motivated transfer pricing and income shifting, the booking of global income is quite sensitive to tax rate differences across countries.[20]

Still, this does not mean that tax competition disappears under formulary apportionment. Indeed, it has long been recognized that firms face tax incentives to distort the location of formula factors in order to reduce their tax burdens. In U.S. states, policy-makers have responded to business lobbying by systematically lowering the weight on assets and payroll in their apportionment formulas, and raising the sales weight, in an attempt to lure tax-sensitive jobs and investments to their states. In 1986, the beginning of this study, 80 percent of states used an equal-weighted formula, but by 2012, only 17 percent of states that taxed corporate income had an equal-weighted formula, choosing instead formulas with higher weights on sales.

There is evidence, particularly in Goolsbee and Maydew (2000), that state policy-makers were initially successful in attracting jobs from other states with such strategies, although evidence indicates that these policies were "beggar thy neighbor", since states that gained employment did so at the expense of other states.[21] However, in the time period of this study, 1986 to 2012, there is scant evidence that state employment, investment, or sales are sensitive to corporate tax policy parameters, once an adequate set of control variables are included in the analysis. These findings suggest some cautious optimism for advocates of international formulary apportionment. Formulary apportionment has the potential to reduce income shifting incentives without generating accompanying large tax responses in economic activity such as employment and investment.

It is important to note that tax rates in U.S. states are typically lower than those found at the national level, so tax responsiveness of real activity may be higher internationally, in the presence of higher tax rates. On the other hand, tax competition is also likely to be fiercer *within* countries than *between* countries, due to the greater mobility of capital and labor, easier corporate relocation, and more intense product price competition due to seamless goods mobility, more perfect information, and the absence of exchange rate fluctuations.

[20] See De Mooij (2005) and De Mooij and Ederveen (2008) for reviews.

[21] "Beggar thy neighbor" tax policy competition is distinguished from tax policy changes that simply affect local economic activity or revenues, without having adverse effects on other jurisdictions.

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The absence of economic activity responses to tax burdens under formulary apportionment in this analysis of U.S. states may also be related to the extended time period of this study. While early states that changed formulas may have gained employment at the expense of other states, as more states changed their formulas, the relative competitive advantage diminished. This suggests that the dynamics of tax competition under formulary apportionment are likely to change over time. If countries have the flexibility to adopt distinct formulas, there may be a temptation to pursue beggar-thy-neighbor policy choices in an attempt to lure economic activity from other jurisdictions, but if these strategies are adopted by many jurisdictions, they may prove ineffective over time.

The analysis also provides evidence that tax competition pressures are harmful to government revenues, as findings indicate that tax revenues are sensitive to tax policy choices regarding tax rates, sales weights, and throwback rules. This particular finding suggests that international coordination to choose harmonized formulas – and to harmonize other aspects of tax base definition – is particularly desirable. Not only would this reduce the potential for double-taxation (and double-non-taxation), but it would also reduce tax competition pressures, and ultimately, tax base erosion.

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Table 1: Variable Descriptions, Definitions, and Summary Statistics

Name	Definition	Source	No.	Mean	St.Dev.
Dependent Variables:					
Employment (lnem)	Thousands of Jobs, incl. full and part time employees, sole proprietors, partners	Bureau of Economic Analysis	1326	3,063	3,322
Capital Expenditures (lnkexp)	Total Capital Expenditures for Plant and Equipment, in mil. $	Annual Survey of Manufacturers	1273	2,495	2,985
Sales (lnsales)	Value of Shipments of all Products, in mil. $	Annual Survey Manufacturers	1275	76,800	87,300
Corporate Tax Revenue	Taxes on Income of Corporations and Businesses, as share of GSP (in %)	U.S. Census Bureau	1325	0.340	0.250
Explanatory Variables: Tax Policy Parameters					
Payroll Burden (payburden)	Multiple of Corporate Tax Rate and Payroll Weight in Formula	Various (appendix)	1244	.0189	.0096
Asset Burden (assetbur)	Multiple of Corporate Tax Rate and Asset Weight in Formula	Various (appendix)	1244	.0189	.0096
Salesburden	Multiple of Corporate Tax Rate and Sales Weight in Formula	Various (appendix)	1244	.0383	.0199
Throwback	Dummy Variable for State Throwback Rule	Various (appendix)	1245	.560	.497
Combrep	Dummy Variable for State Requiring Combined Reporting	Various (appendix)	1237	.379	.485
Pitax	Personal Income Tax, Top Rate	Various (appendix)	1352	.059	.031

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Licgsp	Corporate License and Other Fees as a Share of GSP	U.S. Census Bureau	1325	.064	.165
Throwsb	Multiple of Throwback Dummy and Sales Burden	Constructed	1231	.0192	.0207
Forchoice	Dummy if Corporations have a choice of formula	Various (appendix)	1249	.085	.279
Crchoice	Dummy if firms have choice of combined reporting	Various (appendix)	1237	.150	.358
Rate	Corporate Tax Rate, top rate	Various (appendix)	1368	.070	.029
Salesw	Weight on Sales in Formula	Various (appendix)	1249	.505	.205
Explanatory Variables: Economic Conditions Parameters					
Natlunem	National (U.S.) Unemployment Rate	Bureau of Labor Statistics	1377	.061	.015
Unem	State Unemployment Rate	Bureau of Labor Statistics	1377	.057	.019
GSP (lngsp)	Gross State Product, mil. $	Bureau of Ec. Analysis	1326	182,875	241,182
GSPPC (lngsppc)	Gross State Product per capita, $/person	Population data, Census	1326	33,430	16,150
Osurplus (lnosurplus)	Business Income of Private Enterprises, mil. $	Bureau of Ec. Analysis	1326	65,850	90,100
Explanatory Variables: Structure of State Economy					
BA	Share of State Population with a Bachelor's Degree (as %)	U.S. Census Bureau	1377	24.1	5.89
Manufratio	Ratio of Total Employment in the Manufacturing Sector	Bureau of Ec. Analysis	1324	.1005	.0458
Youngshare	Share of Population 18 and Under	U.S. Census	1300	.255	.023

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Oldshare	Share of Population 65 and Over	U.S. Census	1300	.126	.020
Region Dummies	Dummies for States from Various Regions	From Crone (2005)	1515	Varies	Varies
Share	Share of Business Tax Returns that are Flow-Through Entities	U.S. Internal Revenue Service	1150	.680	.096
Other Variables Used for Policy Probits					
Meansalesw	Mean sales weight in state formulas, by year	Constructed	1377	.503	.089
Meanrate	Mean corporate tax rate of states, by year	Constructed	1377	.070	.002
Rep	Dummy if Republicans Control State Legislative and Executive Branches	Klarner Politics Dataset (appendix)	1271	.196	.397
Dem	Dummy if Democrats Control State Legislative and Executive Branches	Klarner Politics Dataset (appendix)	1271	.243	.429
Elecyr	Dummy Variable if Election Year in State	U.S. Statistical Abstract	1316	.273	.446
Debtgsp	State Debt as a Share of GSP	State Government Finances	1286	.071	.040
Aidgsp	State Federal Aid as a Share of GSP	U.S. Census	1214	.034	.013

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Table 2:
Employment Regressions, State Fixed Effects (1-3), State and Year Fixed Effects (4-6)

Dependent Variable: Ln of Employment

	(1)	(2)	(3)	(4)	(5)	(6)
payburden	-10.94*	1.191*	-0.153	0.765*	1.221*	-0.201
	(0.566)	(0.313)	(0.118)	(0.338)	(0.315)	(0.111)
natlunem	-0.956*	-0.812*	-1.082*			
	(0.217)	(0.0978)	(0.0411)			
throwback		-0.0273*	-0.00464		-0.0275*	-0.00856*
		(0.00765)	(0.00287)		(0.00772)	(0.00272)
combrep		-0.0139*	-0.000428		-0.0156*	-0.00218
		(0.00406)	(0.00157)		(0.00414)	(0.00149)
lngsppc		0.369*	-0.690*		0.365*	-0.681*
		(0.00573)	(0.0155)		(0.0353)	(0.0176)
pitax			0.180*			0.158*
			(0.0629)			(0.0605)
licgsp			-6.808*			-9.248*
			(1.881)			(1.771)
lngsp			0.859*			0.866*
			(0.0111)			(0.0105)
ba			0.000402			0.00101*
			(0.00045)			(0.00048)
manufratio			0.928*			0.711*
			(0.0481)			(0.0556)
youngshare			-1.419*			-1.777*
			(0.0801)			(0.0840)
oldshare			-0.248			-0.767*
			(0.127)			(0.143)
Fixed Effects?	yes	yes	yes	yes	yes	yes
Year Effects?	no	no	no	yes	yes	yes
N	1122	1102	1032	1122	1102	1032
R^2	0.258	0.853	0.981	0.832	0.857	0.984

Standard errors in parentheses
* $p < 0.05$

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Table 3:
Capital Expenditure Regressions, State Fixed Effects (1-3), State, Year Fixed Effects (4-6)

Dependent Variable: Ln of Capital Expenditures

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
assetbur	-16.04*	5.575*	4.640*	4.966*	6.078*	4.567*
	(1.641)	(1.707)	(1.652)	(1.521)	(1.511)	(1.517)
unem	-6.235*	-5.821*	-3.809*	-6.358*	-4.262*	-2.713*
	(0.566)	(0.479)	(0.551)	(0.736)	(0.817)	(0.887)
throwback		0.0407	0.0844*		-0.0148	0.0351
		(0.0409)	(0.0393)		(0.0366)	(0.0367)
combrep		-0.00321	0.0189		-0.0315	0.00504
		(0.0210)	(0.0208)		(0.0190)	(0.0195)
lngsppc		0.682*	0.539*		1.290*	0.149
		(0.0319)	(0.221)		(0.178)	(0.251)
pitax			0.150			-1.839*
			(0.884)			(0.836)
licgsp			28.00			-19.76
			(25.71)			(23.83)
lngsp			0.704*			0.604*
			(0.155)			(0.144)
ba			-0.0194*			-0.0203*
			(0.00600)			(0.00636)
manufratio			7.365*			4.731*
			(0.724)			(0.802)
youngshare			3.544*			-1.480
			(1.101)			(1.126)
oldshare			7.959*			-3.978*
			(1.730)			(1.940)
Fixed Effects?	yes	yes	yes	yes	yes	yes
Year Effects?	no	no	no	yes	yes	yes
N	1084	1064	998	1084	1064	998
R^2	0.149	0.417	0.503	0.540	0.561	0.601

Standard errors in parentheses
* $p < 0.05$

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Table 4: Sales Regressions, State Fixed Effects (1-3), State and Year Fixed Effects (4-6)

Dependent Variable: Ln of Sales

	(1)	(2)	(3)	(4)	(5)	(6)
salesburden	9.556*	0.0364	-0.0885	-0.255	0.0125	-0.0847
	(0.726)	(0.526)	(0.487)	(0.414)	(0.483)	(0.465)
unem	-2.222*	-2.109*	-0.888*	-4.406*	-1.561*	0.764
	(0.495)	(0.252)	(0.258)	(0.445)	(0.451)	(0.435)
throwback		-0.0220	-0.0145		-0.0626*	-0.0342
		(0.0327)	(0.0285)		(0.0308)	(0.0277)
throwsb		-0.493	-0.209		-0.300	-0.402
		(0.637)	(0.554)		(0.593)	(0.532)
combrep		-0.00710	0.00766		-0.0187	0.00651
		(0.0111)	(0.00976)		(0.0105)	(0.00949)
lngsppc		0.818*	0.793*		1.481*	0.803*
		(0.0152)	(0.103)		(0.0987)	(0.122)
pitax			-0.485			-1.219*
			(0.428)			(0.421)
licgsp			-47.84*			-66.11*
			(12.73)			(12.26)
lngsp			0.403*			0.387*
			(0.0727)			(0.0701)
ba			-0.0281*			-0.0244*
			(0.00283)			(0.00314)
manufratio			4.161*			3.246*
			(0.342)			(0.393)
youngshare			-1.448*			-3.394*
			(0.515)			(0.547)
oldshare			4.162*			1.249
			(0.813)			(0.947)
Fixed Effects?	yes	yes	yes	yes	yes	yes
Year Effects?	no	no	no	yes	yes	yes
N	1084	1064	998	1084	1064	998
R^2	0.146	0.787	0.858	0.782	0.825	0.877

Standard errors in parentheses

* $p < 0.05$

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Table 5: Corporate State Income Tax Revenue/GSP Regressions
State Fixed Effects (1-3), State and Year Fixed Effects (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
rate	1.648*	1.622*	1.494*	1.591*	1.799*	1.710*
	(0.298)	(0.332)	(0.336)	(0.264)	(0.292)	(0.293)
salesw	-0.133*	-0.0426	-0.0334	-0.0510*	-0.0627*	-0.0524*
	(0.0199)	(0.0266)	(0.0266)	(0.0215)	(0.0234)	(0.0232)
unem	-1.553*	-1.355*	-1.446*	-2.527*	-1.934*	-2.310*
	(0.173)	(0.184)	(0.186)	(0.255)	(0.312)	(0.317)
lnosurplus		0.0724*	0.0592*		0.0122	-0.0177
		(0.0274)	(0.0279)		(0.0295)	(0.0299)
share		-0.393*	-0.337*		-0.420*	-0.388*
		(0.116)	(0.118)		(0.168)	(0.171)
throwback			0.0620*			0.0456*
			(0.0162)			(0.0142)
combrep			-0.00894			-0.0258*
			(0.00802)			(0.00733)
forchoice			0.00347			0.00466
			(0.0138)			(0.0122)
crchoice			-0.00784			-0.0215*
			(0.00902)			(0.00910)
Fixed Effects?	yes	yes	yes	yes	yes	yes
Year Effects?	no	no	no	yes	yes	yes
N	1122	959	947	1122	959	947
R^2	0.147	0.144	0.162	0.390	0.364	0.388

Standard errors in parentheses
* $p < 0.05$

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Appendix 1: Data Sources

In general, data were collected for the fifty states as well as the District of Columbia over the period 1986 to 2012, although in most reported regression analyses, some states were excluded, as described in the text.

Data on U.S. state corporate tax policies, including both tax rates and various rules, come from several sources. These include *The Book of the States* by the Council of State Governments (1986 to 2001), *Significant Features of Fiscal Federalism* (1986 to 1994) by the Advisory Commission on Intergovernmental Relations, and the Commerce Clearing House publications *The Multistate Corporate Tax Almanac* (1986-1989), the *Multistate Corporate Tax Guide* (1995-2000), the *State Tax Handbook* (2001-2008) and the *U.S. Master Multistate Corporate Tax Guide* (2006-2013).

Data on the share of corporate returns that are pass-through organizations are from a special tabulation from the IRS, based on data reported in publications 6149. This variable is defined as the number of returns filed by partnerships and S corporations relative to the total number of corporate tax returns.

Data on employment are from the U.S. Bureau of Economic Analysis [BEA]. For manufacturing employment, data for 1986 to 1990 are based on SIC industry codes, and data for 1990-2012 are based on NAICS codes. For manufacturing, the 1990 ratio of SIC to NAICS manufacturing data are used to adjust the late 1980s data to NAICS equivalents.

The BEA also provides data on total income, earnings, wages, corporate gross operating surplus, and gross state product, GSP. The GSP series are also affected by the change from SIC to NAICS codes, so the late 1980s data are similarly adjusted.

The BEA provides data on foreign direct investment into U.S. states, including the gross property, plant and equipment of affiliates, the number of affiliates, the employment of affiliates, and the manufacturing employment of affiliates. For the period 1986-2006, data are for all nonbank affiliates. Data for 2007 to 2010 are not strictly comparable, since they also include banks, but these data are adjusted to be comparable by using data on ratios of comparable series.

Data from the Annual Survey of Manufacturers is collected from several sources of the U.S. Census Bureau including CDs (1987-1991), publications on the Annual Survey of Manufacturers (1992-1996), web pages (2002-2011), and an excel spreadsheet emailed from a Census Bureau employee (1997-2001). These data include information on manufacturing employment, payroll, materials costs, shipments, value added, and capital expenditures.

The U.S. Census Bureau was the source of data on corporate tax revenues, corporate license fees, state populations, and the share of the population with a bachelor's degree or higher. For the bachelor's degree share data, data are inputed for the years 1986-1989 based on an average of the growth rates in this share between the years 1980 and 1990 and the years 1990 to 1998. For the years 1991 to 1997, data are inputed based on the growth rate over the period 1990 to 1998.

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Missing data for 2001 are based on an average of 2000 and 2002, and data for 2012 are extrapolated based on 2011 data and the growth rate for the prior year.

The U.S. Bureau of Labor Statistics gives data on the unemployment rate and the labor force.

Data on political control variables comes from the online database of Klarner Politics. See *http://www.indstate.edu/polisci/klarnerpolitics.htm*.

Data on individual income tax rates were based on the top bracket. Data are from *The Book of the States* by the Council of State Governments in most years, though some years were not available. For the years 1987, 1989, 1991, 1993, rates came from *Significant Features of Fiscal Federalism* by the Advisory Commission on Intergovernmental Relations, for 1999, the *State Tax Handbook* by the Commerce Clearing House, for 2001 and 2013, the Tax Policy Center, and for 2012, the Tax Foundation. Missing data were interpolated in cases where the tax rate in prior and subsequent years was the same. For states where tax due is a fraction of the federal liability, the tax rate was imputed based on the federal top rate in the same year.

Data on state election years, the age distribution of the state population, federal aid to the states, and state debt levels were generously shared from a dataset of Jon Rork. The original sources of these data were the U.S. Statistical Abstract (for election years) the U.S. Census (for age distribution and federal aid), and *State Government Finances (*for debt).

Further information about the details of data acquisition and more detailed variable definitions are available from the author upon request.

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Appendix 2: Results for Pooled (OLS) and Region Effects Specifications

Table A1: Employment Regressions, Pooled Estimates (1-3) and Region Effects (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
payburden	-39.74*	-31.84*	-1.602*	-27.61*	-16.00*	-0.685*
	(2.963)	(3.031)	(0.252)	(2.774)	(3.039)	(0.216)
natlunem	-3.224	-3.190	-1.330*	-2.255	-2.487	-1.155*
	(1.757)	(1.693)	(0.126)	(1.422)	(1.393)	(0.0984)
throwback		-0.390*	0.0165*		-0.114*	-0.00107
		(0.0525)	(0.00417)		(0.0505)	(0.00361)
combrep		-0.134*	0.0264*		-0.0248	0.0217*
		(0.0536)	(0.00418)		(0.0467)	(0.00340)
lngsppc		0.343*	-0.887*		0.489*	-0.933*
		(0.0772)	(0.0116)		(0.0693)	(0.00957)
pitax			0.289*			0.125
			(0.0912)			(0.0801)
licgsp			0.556			5.448*
			(1.245)			(1.130)
lngsp			0.965*			0.981*
			(0.00253)			(0.00251)
ba			0.00821*			0.0112*
			(0.00063)			(0.00059)
manufratio			0.562*			1.006*
			(0.0551)			(0.0603)
youngshare			-0.406*			-1.344*
			(0.137)			(0.119)
oldshare			0.0826			-0.495*
			(0.162)			(0.142)
newe				-1.168*	-1.052*	0.0117
				(0.0828)	(0.0886)	(0.00791)
southeast				-0.307*	-0.0639	0.0326*
				(0.0765)	(0.0809)	(0.00645)
glake				-0.183*	0.0771	0.0323*
				(0.0831)	(0.0888)	(0.00707)
plain				-0.911*	-0.616*	0.143*
				(0.0973)	(0.104)	(0.00803)
rocky				-1.724*	-1.464*	0.169*
				(0.100)	(0.112)	(0.00985)
swest				-0.675*	-0.423*	0.0841*
				(0.0863)	(0.0955)	(0.00819)
west				0.214*	0.440*	0.0287*
				(0.100)	(0.109)	(0.00833)
N	1122	1102	1032	1122	1102	1032
R^2	0.14	0.21	0.99	0.44	0.47	0.99

Standard errors in parentheses
* $p < 0.05$

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Table A2: Capital Expenditure Regressions, Pooled (1-3) and Region Effects (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
assetbur	-46.51*	-37.58*	-2.143	-29.31*	-14.28*	-1.351
	(3.367)	(3.454)	(1.323)	(3.097)	(3.353)	(1.447)
unem	5.260*	5.195*	-2.002*	-1.698	-1.333	-2.013*
	(1.597)	(1.538)	(0.554)	(1.321)	(1.274)	(0.574)
throwback		-0.332*	0.0730*		-0.0359	0.0172
		(0.0599)	(0.0222)		(0.0557)	(0.0243)
combrep		-0.291*	-0.00407		-0.127*	-0.0114
		(0.0605)	(0.0218)		(0.0507)	(0.0223)
lngsppc		0.431*	0.341*		0.709*	0.259*
		(0.0912)	(0.0631)		(0.0792)	(0.0654)
pitax			-0.158			-0.210
			(0.494)			(0.547)
licgsp			-3.379			8.612
			(6.608)			(7.558)
lngsp			0.889*			0.902*
			(0.0140)			(0.0172)
ba			-0.0411*			-0.0377*
			(0.00335)			(0.00395)
manufratio			7.295*			7.665*
			(0.300)			(0.421)
youngshare			0.0184			-1.200
			(0.736)			(0.801)
oldshare			-6.843*			-6.594*
			(0.864)			(0.959)
neweng				-0.996*	-0.885*	0.162*
				(0.0926)	(0.0979)	(0.0531)
southeast				0.0288	0.324*	0.0755
				(0.0856)	(0.0893)	(0.0433)
glake				0.329*	0.638*	0.183*
				(0.0929)	(0.0980)	(0.0474)
plain				-0.762*	-0.411*	0.174*
				(0.110)	(0.117)	(0.0544)
rocky				-1.877*	-1.566*	0.196*
				(0.112)	(0.124)	(0.0661)
swest				-0.463*	-0.181	0.282*
				(0.0960)	(0.105)	(0.0548)
west				0.376*	0.647*	0.211*
				(0.113)	(0.120)	(0.0555)
N	1084	1064	998	1084	1064	998
R^2	0.17	0.23	0.92	0.48	0.52	0.92

Standard errors in parentheses
* $p < 0.05$

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Table A3: Sales Regressions, Pooled Estimates (1-3) with Region Effects (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
salesburden	10.51*	0.747	3.640*	9.819*	1.842	1.035*
	(1.583)	(1.882)	(0.472)	(1.344)	(1.591)	(0.446)
unem	10.24*	8.958*	-0.496	2.230	2.016	0.600
	(1.718)	(1.593)	(0.378)	(1.342)	(1.222)	(0.340)
throwback		-0.675*	0.173*		-0.185	-0.0194
		(0.136)	(0.0335)		(0.113)	(0.0318)
throwsb		7.182*	-3.255*		3.271	0.0937
		(3.184)	(0.732)		(2.497)	(0.679)
combrep		-0.314*	0.00963		-0.101*	0.0194
		(0.0630)	(0.0150)		(0.0489)	(0.0134)
lngsppc		0.889*	0.629*		1.045*	0.471*
		(0.0948)	(0.0418)		(0.0721)	(0.0388)
pitax			-0.335			0.503
			(0.344)			(0.332)
licgsp			5.658			19.80*
			(4.392)			(4.539)
lngsp			0.920*			0.938*
			(0.00971)			(0.0104)
ba			-0.0530*			-0.0405*
			(0.00225)			(0.00241)
manufratio			7.157*			8.123*
			(0.208)			(0.261)
youngshare			-0.464			-2.927*
			(0.519)			(0.482)
oldshare			-5.488*			-5.439*
			(0.627)			(0.591)
newengland				-1.230*	-1.047*	0.0342
				(0.0945)	(0.0959)	(0.0325)
southeast2				0.244*	0.468*	0.134*
				(0.0877)	(0.0819)	(0.0259)
glake2				0.431*	0.728*	0.182*
				(0.0918)	(0.0904)	(0.0280)
plain2				-0.373*	0.0152	0.486*
				(0.109)	(0.111)	(0.0316)
rocky2				-2.034*	-1.607*	0.258*
				(0.115)	(0.120)	(0.0397)
swest2				-0.312*	-0.116	0.349*
				(0.0980)	(0.0985)	(0.0330)
west2				0.201	0.490*	0.0746*
				(0.115)	(0.117)	(0.0333)
N	1084	1064	998	1084	1064	998
R^2	0.07	0.22	0.96	0.48	0.58	0.97

Standard errors in parentheses
* $p < 0.05$

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Table A4: Corporate State Income Tax Revenue/GSP Regressions
Pooled Estimates (1-3) with Region Effects (4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
rate	2.267*	2.209*	2.095*	0.824*	0.916*	1.221*
	(0.233)	(0.249)	(0.255)	(0.251)	(0.266)	(0.272)
salesw	-0.163*	-0.123*	-0.124*	-0.185*	-0.123*	-0.0992*
	(0.0232)	(0.0265)	(0.0264)	(0.0224)	(0.0261)	(0.0268)
unem	-0.216	-0.0717	-0.0568	-0.679*	-0.594*	-0.654*
	(0.253)	(0.267)	(0.264)	(0.233)	(0.245)	(0.244)
lnosurplus		0.00636	0.0120*		-0.000133	0.00178
		(0.00523)	(0.00542)		(0.00576)	(0.00578)
share		-0.246*	-0.245*		-0.228*	-0.256*
		(0.0553)	(0.0558)		(0.0514)	(0.0526)
throwback			0.0343*			0.0462*
			(0.0106)			(0.0110)
combrep			0.0237*			0.0240*
			(0.0105)			(0.00979)
forchoice			-0.0832*			-0.00559
			(0.0170)			(0.0168)
crchoice			0.000941			-0.00308
			(0.0140)			(0.0126)
newengland				-0.00143	-0.00623	-0.0355
				(0.0164)	(0.0189)	(0.0201)
southeast2				-0.106*	-0.0949*	-0.0959*
				(0.0161)	(0.0169)	(0.0170)
glake2				0.0554*	0.0582*	0.0342
				(0.0164)	(0.0173)	(0.0181)
plain2				-0.147*	-0.147*	-0.181*
				(0.0190)	(0.0209)	(0.0220)
rocky2				-0.0588*	-0.0291	-0.0779*
				(0.0199)	(0.0242)	(0.0259)
swest2				-0.181*	-0.164*	-0.188*
				(0.0180)	(0.0191)	(0.0207)
west2				-0.0219	-0.0207	-0.0603*
				(0.0200)	(0.0207)	(0.0228)
N	1122	959	947	1122	959	947
R^2	0.11	0.13	0.17	0.31	0.33	0.35

Standard errors in parentheses
* $p < 0.05$

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Appendix 3: Policy Probit Specifications

Table A5: Probit Regressions on Probability of Raising Apportionment Weight on Sales

	(1)	(2)	(3)	(4)
meansalesw	1.379	1.003	**5.140***	**36.03***
	(0.708)	(1.540)	**(2.547)**	**(7.131)**
unem	4.880	5.546	6.022	4.504
	(3.041)	(3.458)	(3.797)	(7.750)
rep	0.128	0.0777	0.00606	0.500
	(0.140)	(0.152)	(0.167)	(0.301)
dem	-0.189	-0.161	-0.177	-0.203
	(0.145)	(0.148)	(0.155)	(0.270)
elecyr	0.00486	-0.0155	-0.00289	-0.206
	(0.127)	(0.132)	(0.135)	(0.167)
lngsppc		0.122	-0.677	-0.856
		(0.370)	(0.596)	(0.809)
rate		-1.726	1.400	14.69
		(3.185)	(3.775)	(11.54)
pitax		-2.949	-2.253	-6.513
		(2.666)	(3.158)	(15.47)
debtgsp			-2.453	-2.286
			(2.381)	(2.974)
aidgsp			-15.57	-9.506
			(8.511)	(9.458)
youngshare			-2.775	-1.924
			(4.769)	(5.611)
oldshare			-6.505	-8.317
			(5.854)	(6.693)
L.meansalesw				**-24.64***
				(8.317)
L2.meansalesw				-6.710
				(7.466)
L.rate				-11.75
				(15.21)
L2.rate				-0.572
				(11.31)
L.pitax				7.318
				(21.57)
L2.pitax				-2.633
				(15.35)
L.unem				5.262
				(11.49)
L2.unem				1.284
				(9.371)

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L.lngsp				4.792
				(3.284)
L2.lngsp				-4.634
				(3.271)
L.rep				-0.343
				(0.411)
L2.rep				-0.427
				(0.323)
L.dem				-0.189
				(0.362)
L2.dem				0.0450
				(0.279)
N	1055	987	946	885

Standard errors in parentheses
* $p < 0.05$

Table A6: Probit Regressions on Probability of Lowering Corporate Tax Rate

	(1)	**(2)**	**(3)**	**(4)**
meanrate	-7.343	-27.85	-62.69	**-319.6***
	(35.35)	(53.02)	(59.41)	**(111.9)**
unem	0.0835	-1.132	3.114	9.957
	(4.229)	(4.571)	(4.834)	(11.76)
rep	-0.0868	-0.0504	-0.0326	-0.0889
	(0.193)	(0.201)	(0.222)	(0.403)
dem	-0.283	-0.300	-0.298	-0.184
	(0.204)	(0.209)	(0.217)	(0.405)
elecyr	-0.153	-0.155	-0.161	-0.221
	(0.180)	(0.184)	(0.189)	(0.223)
lngsppc		-0.192	-0.330	-0.963
		(0.349)	(0.414)	(0.674)
salesw		-0.0251	-0.0111	-2.061
		(0.465)	(0.502)	(1.933)
pitax		0.0701	3.796	-20.25
		(3.228)	(3.692)	(14.89)
debtgsp			-0.986	-1.061
			(2.505)	(3.351)
aidgsp			-12.59	-0.143
			(8.505)	(10.55)

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youngshare			-3.659	-5.587
			(6.669)	(8.161)
oldshare			7.485	4.103
			(6.979)	(8.433)
L.meanrate				243.0
				(134.4)
L2.meanrate				88.07
				(126.2)
L.salesw				0.00943
				(2.712)
L2.salesw				2.050
				(1.954)
L.pitax				36.39
				(21.38)
L2.pitax				-10.44
				(16.08)
L.unem				-12.37
				(18.58)
L2.unem				6.343
				(15.58)
L.lngsp				-0.636
				(4.443)
L2.lngsp				0.904
				(4.441)
L.rep				-0.612
				(0.538)
L2.rep				0.755
				(0.399)
L.dem				-0.00833
				(0.488)
L2.dem				-0.460
				(0.379)
N	1165	993	952	880

Standard errors in parentheses
* $p < 0.05$

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