Individual Tax Rates and Regional Tax Revenues: A Cross-State Analysis*

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Abstract

This paper analyzes the effects of state-level personal tax rates on state tax revenue and individual welfare. The policy analysis based on a general equilibrium model suggests that tax revenues would benefit from higher wage-income, sales or property taxes, while any increase in dividend-income tax would result in a reduction of revenues. It is also shown that individuals would suffer from an increase in state-level wage-income tax, dividend-tax or sales tax, while they would benefit from an increase in property taxes. The heterogeneity across states is determined by a TaxIndex, a weighted average of initial taxes at the state level.

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1. Introduction

The Great Recession of 2007-2009 had a devastating effect on state finances in the U.S. when states took in $87 billion less in tax revenue from October 2008 through September 2009 than they collected in the previous 12 months; this corresponds to a decline of 11 percent, the steepest on record, resulted from the impact on tax collections of reduced wages and lowered economic activity (see Johnson et al., 2010). The requirement that states have balanced budgets has increased the pressure on states to deal with the unprecedented revenue shortfalls in a variety of ways; to recoup lost revenue, states have taken actions such as increasing tax rates. For example, according to the U.S. Census of Governments, the share of tax revenue in overall state revenue has increased from 38% to 42% between 2007 and 2012, on average across states.[1] However, when it comes to the policy details, *which type of tax should be modified in each state to improve the state budget? What are the implications for individual welfare and interstate migration?* These questions can only be answered by considering the economic behavior of all agents in all states such that the interaction between alternative tax types can be investigated at the state level.

Accordingly, this paper introduces a general equilibrium regional trade model with an analytical solution to investigate the effects of tax changes at the regional level. The model has been designed to consider alternative types of tax (wage-income, dividend-income, property, and sales taxes). As in Roos (2004), individuals get utility out of consumption goods and housing as well as public goods produced by the local government; the former two are purchased using wage income and dividend income, while the latter is financed by the taxes collected from individuals. The consideration of public goods in the individual utility is important, because as shown by Partridge and Rickman (1998), equalization of real wage rates that omits the consumption of regional amenities would not be enough to examine the policies to increase quality of life such as improved schools or recreation-

[1] The story is very similar to the slowdown of the U.S. economy in 2001 when many states raised taxes to balance their budgets; see Orszag and Stiglitz (2001).

related public infrastructure. In addition to Roos (2004), we have disutility of supplying labor in the utility function.

In the model, private firms produce consumption goods that are traded across regions. Although the only factor of production is labor as in Roos (2004) who considers individual migration as the only variable connecting any two regions with each other, this paper deviates by considering interregional trade on top of individual migration. As advocated by Partridge and Rickman (2010), this is important to capture the degree of openness of regional economies which are critical for regional economic development analysis. Moreover, as shown by McGregor et al. (1999), the predicted distribution of impacts depends on the interregional interactions that are essential for a cross-state analysis as in this paper.

Public good is produced by the local government by using labor only. The amount of the public good produced depends on the taxes collected as in Roos (2004) who considers public goods financed by taxes on housing only; this paper deviates by considering taxes collected by other types of tax (wage-income, dividend-income, and sales taxes) as well. Such a strategy is essential for answering one of the main questions in this paper regarding the type of tax that should be modified in each state to improve the state budget.

In equilibrium, the consumption, labor and housing markets clear, while the nontraded public good in each region is shared among individuals of that region. Although individuals migrate in the long-run until individual welfare is equalized across regions, population in each region is fixed in the short-run; these two extreme cases practically cover the overall range for possible degrees of labor mobility across regions, consistent with the evidence (in the existing literature) that original residents benefit from reduced unemployment due to migrating individuals.[2]

The model is shown to explain the state-level data from the U.S. which are also used to estimate the parameters of the model that are necessary for the policy analysis.[3] The corresponding policy

[2]See Bartik (1991,1994) and Partridge and Rickman (1999).

[3]Such an empirical strategy is consistent with studies such as by McKitrick (1998) who argues that econometric

investigation at the state level suggests that increases in wage-income, property or sales taxes would result in an increase in the state tax revenue in any state, while dividend-income taxes are harmful for any state budget. The latter result is consistent with influential studies such as by Judd (1985), Chamley (1986) or Atkeson et al. (1999), together with their followers, who have shown the optimality of a zero capital-income tax; however, it contradicts the conventional view in the public finance literature that capital income should be taxed heavily. The main reason behind this dilemma is that the conventional view in the public finance literature implies that capital income taxes do not distort economic decisions (since the portion of income consumed is fixed); however, in this paper, together with earlier studies by studies such as by Judd (1985), Chamley (1986) and Atkeson et al. (1999), dividend-income tax does distort economic decisions. The distortion in this paper is achieved by dividend-income changes that affect consumption and labor-supply decisions of individuals through the overall profitability of production firms that are imperfectly competitive, where such profits are further shared among individuals.

There is also evidence for heterogeneity across states regarding their elasticity of tax revenue with respect to state-level taxes. The model implies that a $TaxIndex$, which is a weighted average of initial taxes (of wage-income, dividend-income, property, and sales) at the state level, where weights are determined according to the individual preferences given in their utility functions, is an important determinant of this heterogeneity. In particular, states with a lower $TaxIndex$ would benefit more from an increase in their wage-income, property or sales taxes, while the harmful effects of dividend-income taxes would be higher for states with a higher $TaxIndex$.

Although individual welfare is equalized across states in the long-run (consistent with Gyourko and Tracy, 1989; Dalenberg and Partridge, 1997), state-level tax increases can still be harmful for individual welfare in the short-run, except for the increases in property taxes. In particular, the most harmful tax type for individual welfare in the short-run is the state-level wage-income tax followed by sales and dividend-income taxes. There is also evidence for heterogeneity across

estimation of general equilibrium models is superior.

states regarding the elasticity of individual welfare with respect to state-level taxes in the short-run. Once again, $TaxIndex$ is shown to be the main determinant of this heterogeneity, where individual welfare in states with a higher $TaxIndex$ would suffer more from an increase in state-level wage-income, dividend-income or sales taxes, but they would benefit less out of an increase in property taxes in states.

An important state-level policy implication is that property tax is the only tax type of which increase would boost both state tax revenue and short-run individual welfare in any state. This is due to individuals who have to supply more labor due to higher property taxes resulting in lower wages and thus higher levels of production and income at the state level, which means higher state-level tax revenues and abundance of public goods. In contrast, an increase in state-level wage-income or sales tax would result in higher state tax revenue in the cost of individual welfare. The worst alternative is to increase state-level dividend-income taxes that would result in a reduction in both state tax revenue and individual welfare for any state. The latter is due to individuals consuming less and supplying more labor after the increase in dividend-income taxes that result in higher wages together with lower production/income and thus lower state tax revenue and lower public goods. For any type of tax, these effects are shown to be magnified by the $TaxIndex$ across states.

This paper is connected to the literature investigating the effects of regional taxes on tax revenue, individual welfare and interregional migration, where the way that states use their tax revenues becomes important. For instance, Dalenberg et al. (1998) have found that U.S. states have benefited from taxes used to finance increased public infrastructure investment. In a related study, Dalenberg and Partridge (1997) have shown how individuals respond to such changes in public infrastructure investment by deciding on their location. Accordingly, this paper has considered such details under the title of public goods that are produced subject to state-specific technologies which play an important role in the welfare of individuals and thus their location decision. In this context, Seung and Kraybill (2001) and Conrad and Heng (2002) have shown that negative effects of increased taxes can be offset by better public infrastructure. It is implied that, for individuals, there is a trade-off between increasing taxes and increasing public goods. This paper has considered such linkages by including public goods in the utility function of individuals that are financed by the taxes in their budget constraint.

Regarding individual welfare and interregional migration, Cebula (1979) and Charney (1993) show that many fiscal characteristics play important roles; these include tax and expenditure policies of governments that may change income and the subsequent consumption of individuals. However, most studies are not able to capture the possibility that some individuals are attracted to higher tax burdens if the ensuing government spending is beneficial to them, while others are repelled by the higher tax burden as described in the subnational redistribution literature; one exception is by Knapp et al. (2001) who find that higher state tax liabilities encourage people to stay in their states. This paper contributes by showing that the property tax is the only tax type of which increase would encourage people to stay in the long-run, while increases in other tax types would encourage people to leave. It is implied that the tax structure determined by the tax portfolio is an important factor in each state.

The rest of the paper is organized as follows. The next section introduces the economic environment that is essential for the state-level policy analysis in Section 3. Section 4 concludes by providing policy suggestions/evaluations, while the Online Appendix provides all the technical details of the policy analysis, including the analytical solution and empirical tests of the model.

2. The Economic Environment

The U.S. economy consisting of fifty states and the District of Columbia (totally 51 regions) is modeled. The static model consists of a finite number of regions, finite number of individuals in each region, a private firm in each region, a local government producing the public good in each region, region-specific (wage-income, dividend-income, property, sales) taxes, trade of goods across regions, and migrating individuals.

The modeling strategy that we follow is not arbitrary, and it is partly to capture the economic interaction in the U.S. economy (e.g., interregional trade in consumption goods), partly to investigate dividend-income taxes (e.g., profits through monopolistically-competitive firms), and partly to obtain an analytical solution that considers migration (e.g., finite numbers of regions and individuals). The private firm in each region is perfectly specialized in the production of a good/commodity so that it has a market power to set its price with a markup over its marginal cost where the markup is a function of the elasticity of substitution across private-sector goods. The local government in each region produces a unique public good until total costs are equalized to total taxes collected in that region. The total amount of the public good in each region is equally shared/consumed among the individuals in that region; the public good is nontradable. Both private and public sectors in each state have constant returns to scale production technologies that use labor as the only factor of production and are subject to region-specific technology levels. Individuals have utilities from final goods of the private sector coming from all regions, the public good in their region, and the housing/property that they live at; they have disutility from supplying labor to the local private and public sectors. The regional taxes come into the picture in the budget constraint of the individuals. There is a local labor market in each region where the total labor demand coming from private and public sectors are matched with the labor supply coming from the individuals. The total profit of monopolistically-competitive private sector in all regions is equally shared among all individuals in all regions. Because each private firm (in each region) supplies its traded good to individuals in all regions, there are economic interactions across all regions.

The analysis is made for a typical region r which is specialized in the manufacturing of a unique good r. An individual is denoted by h, and total number of individuals in region r is H_r.

2.1. Individuals

A typical individual h in region r maximizes:

$$U_r(h) \equiv \phi^C \log\left(C_r^C(h)\right) + \phi^L \log\left(C_r^L(h)\right) + \phi^P \log\left(C_r^P(h)\right) - \phi^N \log\left(N_r(h)\right) \tag{2.1}$$

where $C_r^C(h)$ is a per capita composite index of consumption goods, $C_r^L(h)$ is per capita housing, $C_r^P(h)$ is per capita public good in region r, and $N_r(h)$ is per capita hours of labor supplied.[4] The composite index of consumption goods in region r is further defined as:

$$C_r^C(h) = \left(\sum_i (\theta_r)^{\frac{1}{\eta}} \left(C_{r,i}^C(h)\right)^{\frac{\eta-1}{\eta}}\right)^{\frac{\eta}{\eta-1}}$$

where $C_{r,i}^C(h)$ is per capita consumption in region r of good i (produced in region i). Besides labor income, each individual also receives $\Gamma(h)$ as dividend income due to her share of positive profits coming from the private-sector production and nationwide house ownership; $\Gamma(h)$ independent of the location of residence. In this context, the individual in region r maximizes Equation 2.1 subject to the following budget constraint:

$$P_r^C C_r^C(h)\left(1+t_r^C\right) + P_r^L C_r^L(h)\left(1+t_r^L\right) \leq W_r N_r(h)\left(1-t_r^W\right) + \Gamma(h)\left(1-t_r^D\right) \tag{2.2}$$

where P_r^C is the price of the composite-consumption good, t_r^C is the sales tax rate, P_r^L is the price of housing, t_r^L is the tax rate on housing (i.e., property tax), W_r is hourly nominal wage, t_r^W is the wage-income tax rate, and t_r^D is the dividend-income tax rate in region r.

The optimal allocation of any given expenditure yields the following demand function for imports of region r from region i:

$$C_{r,i}^C(h) = \theta_r \left(\frac{P_{r,i}^C}{P_r^C}\right)^{-\eta} C_r^C(h)$$

where $P_r^C \equiv \left(\sum_i \theta_r \left(P_{r,i}^C\right)^{1-\eta}\right)^{\frac{1}{1-\eta}}$ is the cost-of-living index in region r.[5]

[4] The utility shares add up to one: $\phi^C + \phi^L + \phi^P + \phi^N = 1$. The corresponding analysis should be perceived as for the average individual in any state, since we do not have any individual heterogeneity.

[5] It follows from the equations above that $\sum_i P_{r,i}^C C_{r,i}(h) = P_r^C C_r^C(h)$.

The individual maximizes utility by choosing $C_r^C(h)$, $C_r^L(h)$, and $N_r(h)$; the amount of public good is determined by the public sector. Therefore, the optimality condition for the individual is given by:

$$\frac{P_r^C C_r^C(h)\left(1+t_r^C\right)}{\phi^C} = \frac{P_r^L C_r^L(h)\left(1+t_r^L\right)}{\phi^L} = \frac{W_r N_r(h)\left(1-t_r^W\right)}{\phi^N} \tag{2.3}$$

where taxes play an important role.

2.2. Production/Endowment

There are two types of production in this economy: (i) consumption-good production by the private sector, (ii) public-good production by the public sector.

2.2.1. Private-Sector Production

The monopolistically-competitive private-sector production firm in region r produces good r by using local labor. The production is achieved according to the following constant returns to scale function:

$$Y_r^C = A_r^C L_r^C \tag{2.4}$$

where A_r^C represents good- and region-specific production technology and L_r^C represents labor. To avoid any double taxation, the production firm does not pay any taxes (because individuals pay dividend taxes instead).

The cost minimization problem results in the following marginal cost of producing consumption good r (in region r):

$$MC_r^C = \frac{W_r}{A_r^C} \tag{2.5}$$

which is region specific. Market clearing for goods produced in region r is given by:

$$Y_r^C = \sum_i H_i C_{i,r}^C(h) = \sum_i H_i \theta_i \left(\frac{P_{i,r}^C}{P_i^C}\right)^{-\eta} C_i^C(h)$$

which implies the following factory-gate price according to profit maximization:

$$P_{r,r}^C = \frac{\eta}{\eta - 1} MC_r^C$$

where the destination price in region i given by $P_{i,r}^{C}$ is connected to the factory-gate price in region r given by $P_{r,r}^{C}$ according to $P_{i,r}^{C} = P_{r,r}^{C}\tau_i$, where τ_i represents destination-specific distribution costs (e.g., retailing costs); gross markups are represented by $\frac{\eta}{\eta-1}$ in this expression. In order to close the model, the total profit of the private-sector production in all regions are equally shared among individuals in all regions (as a part of $\Gamma(h)$).

2.2.2. Public-Sector Production

The local government in region r collects the following amount of tax revenue T_r:

$$T_r = H_r \left(t_r^L P_r^L C_r^L(h) + t_r^C P_r^C C_r^C(h) + t_r^W W N_r(h) + t_r^D \Gamma(h) \right) \tag{2.6}$$

where H_r represents the population. The tax revenue is further used to produce the unique public good by using labor according to the following function in region r:

$$Y_r^P = A_r^P L_r^P \tag{2.7}$$

where A_r^P represents good- and region-specific public-good-production technology and L_r^P is labor. The cost minimization problem results in the following marginal cost of public good:

$$MC_r^P = \frac{W_r}{A_r^P} \tag{2.8}$$

The local government produces the public good as long as it can cover the total costs; therefore, the total costs of local public good is equal to the tax revenue according to:

$$T_r = \frac{Y_r^P W_r}{A_r^P}$$

2.2.3. Housing

Each region r is endowed with an available housing of Y_r^L consumed by the individuals in that region:

$$Y_r^L = C_r^L(h) H_r$$

where $C_r^L(h)$ is per capita housing in region r (as above). In order to close the model, the housing revenue coming from all regions is equally shared among individuals in all regions (as a part of $\Gamma(h)$).

2.3. Analytical Solution

In equilibrium, regional labor markets clear, and regional wage rates (W_r's) are obtained as a function of regional tax rates and technology levels. Using wage rates, per capita consumption of goods, housing, public goods and labor supply are determined; accordingly, region-specific tax revenues and individual utility/welfare are calculated. In the short-run, individuals cannot migrate, so population is fixed in each region. In the long-run, consistent with studies such as by Feldstein and Wrobel (1998) who show that there are no redistributive effects of state taxes, individuals migrate to equalize the individual utility across regions; population of each region (H_r's) adjusts accordingly where the utility shares in Equation 2.1 play an important role. All the technical details of this analytical solution is provided in the Online Appendix.

2.4. Empirical Power of the Model

The implications of the model are tested for (i) the relation between total revenue and total costs of the private sector; (ii) the ratio of population across U.S. states; (iii) the ratio of tax revenue across U.S. states; and (iv) interstate trade between U.S. states. For these empirical tests, state-level data (depicted in Appendix Table A1) from the U.S. are employed for total revenue and total costs of the manufacturing sector, population, housing, taxes, tax revenues, wages, and interstate trade. It is found that the model is consistent with the state-level data from the U.S.. Moreover, the empirical investigation results in the parameter estimates that are necessary for the policy analysis, below. All the technical details of these empirical tests, together with the data sources, are provided in the Online Appendix; we focus on the economic intuition in the main text, below.

3. State-Level Policy Analysis

Given the tax rates, the state-level policy analysis consists of investigating the effects of changes in state-level wage-income taxes, property taxes, sales taxes and dividend-income taxes on individual welfare and state tax revenue. We achieve this by focusing on each state individually; i.e., we change the tax rate of a particular state and analyze what happens to the welfare of individuals and the tax revenue in that state. In more technical terms, we are interested in the state-level elasticities of individual welfare and tax revenue with respect to the state-level tax rates, by taking into account the implications of our model. We achieve this by keeping technology levels of A_r^C's and A_r^P's, parameters (τ_r, and θ_r) and the available housing of each region (given by Y_i^L's) the same. All other technical details of the welfare analysis are given in the Online Appendix.

We measure the individual welfare by the exponential of the utility function given in Equation 2.1. In order to understand why individual welfare is affected by changes in tax rates, we also investigate what happens to the components of the individual utility function, namely per capita consumption good, per capita housing, per capita public good, and per capita hours of work. We distinguish between the short-run and long-run effects of tax rate changes, where short-run is defined as the case in which individual migration is not allowed across states, while long-run is defined as the case in which individuals can migrate across states in order to equalize individual utility across states.

It is important to emphasize that some states may have a initial state-level tax rate of zero for some tax types (e.g., state income tax or state property tax), although the federal income tax rates or country/township property tax rates are still positive. Nevertheless, the effects of an income tax change on individuals at the state level depend on how much total tax is initially paid by the individuals in that state, either at the federal, state, or county level; this is exactly how individuals decide what to do in case of a change in any tax rate. Therefore, the results below should be interpreted as the implementation of a state-level tax change in states with either zero or non-zero initial state-level tax rate (for any type of tax). The data for such initial state-level tax rates are constructed and discussed in details in the Online Appendix.[6]

3.1. Effects of Wage-Income Taxes

What happens to the individual welfare and population of a state if that state increases its wage-income tax? In the short-run, the answer to this question is given in Table 1a, where we depict the elasticity of state tax revenue, individual utility (and its components) and population with respect to the state-level wage-income tax. As is evident, state tax revenue increases with wage-income tax for any state with an average elasticity of 0.88. According to the model, for each state, the most effective chain of logic in the short-run is as follows. After an increase in wage-income taxes, individuals supply more labor in order to compensate for lower after-tax wages. This results in higher employment in equilibrium with lower wages, because migration is not possible across states in the short-run. Since the increase in hours of work is higher than the reduction in wages, the state tax revenue increases.

When we make a comparison across states, Louisiana, Hawaii and Alabama would benefit most in terms of their tax revenue out of a wage-income tax increase, while states of Iowa, South Dakota, New Hampshire and Texas would benefit less. When we search for a systematic explanation for this result, the model implies that the following $TaxIndex$ is the main determinant of the difference across regions:

$$TaxIndex_r = \frac{\phi^C t_r^C}{\phi^N \left(1 + t_r^C\right)} + \frac{\phi^L t_r^L}{\phi^N \left(1 + t_r^L\right)} + \frac{t_r^W}{1 - t_r^W} + \frac{\left(\phi^C + \phi^L - \phi^N\right) t_r^D}{1 - t_r^D}$$

which is a weighted average of *initial* taxes at the state level (for which the data are described in the Online Appendix) where weights are determined by the individual utility shares of ϕ^C, ϕ^L and

[6]Moreover, since we investigate each state individually (i.e., we change the tax rate of a particular state and analyze what happens to the welfare of individuals and the tax revenue in that state), if there are certain states where some tax types are not politically feasible, that would not affect the results based on other states.

ϕ^N (which have been estimated using state-level data from the U.S. in the Online Appendix).[7] In particular, the relation between $TaxIndex$ and the elasticity of tax revenue with respect to the wage-income tax is given in the upper left panel of Figure 1 in the short-run. As is evident, the states that have benefited more in relative terms are the ones with a lower $TaxIndex$.

As is also evident in Table 1a, for any state, increasing the wage-income tax results in an individual welfare loss of around 0.18% (on average across states) after a 1% increase of wage-income tax in the short-run. When we investigate the reasons behind this average result at the individual level, it is due to the increase in hours of work, because the increase in public goods is not enough to cover the disutility due to working more. The heterogeneity across states, though, is again due to the $TaxIndex$ as depicted in the upper left panel of Figure 2. Specifically, individuals in states with a higher $TaxIndex$ would suffer more from an increase in wage-income tax in the short-run.

When we remove the restriction on migration in the long-run, individuals move across regions to equalize their welfare due to changes in taxes; on average (across states), about 0.28% of the state population moves to other states after a 1% increase in wage-income tax. In such a case, we obtain the long-run elasticities given in Table 1b, where the average (across states) elasticity of state tax revenue is about 0.60. This elasticity is lower than the short-run version of it, because some individuals would leave the states with higher wage-income taxes. According to the model, for each state, the most effective chain of logic in the long-run is very similar to the one in the short-run; the main difference is that the population is lower in the long-run which results in lower tax revenue. When we search for a systematic explanation for the heterogeneity across states in the upper right panel of Figure 3, we again observe that the states that have benefited more in relative terms are the ones with a lower $TaxIndex$.

[7] $TaxIndex$ for each state is given in Table A1. The estimation results show that housing takes the highest share in individual utility with $\phi^L = 0.64$, followed by the disutility due to supplying labor with $\phi^N = 0.14$, consumption with $\phi^C = 0.12$, and public goods with $\phi^P = 0.10$. See the Online Appendix for further details.

3.2. Effects of Sales Taxes

The short-run effects of an increase in sales taxes in a particular state are given in Table 2a where the average (across states) elasticity of tax revenue with respect to sales taxes is about 0.20. As is evident, the tax revenue of any state would increase after an increase in its sales tax rate. According to the model, for each state, the most effective chain of logic in the short-run is as follows. The increase in sales taxes increases the price of the consumption good for individuals who would like to work more for compensation. Since the corresponding increase in the wage income is higher than the increase in the tax-related cost of consumption, each individual ends up with paying higher sales taxes, which results in higher tax revenue for each state.

In the long-run, the elasticity of tax revenue with respect to sales taxes is lower for each state as depicted in Table 2b. The reason behind this is the migration of individuals (with an elasticity of about -0.15 on average) to other states due to higher sales taxes. Hence, although the chain of logic according to the model is very similar, the only difference in the long-run is having a lower increase in the state tax revenue due to fewer individuals paying sales taxes.

Both in the short-run and the long-run, as shown in the upper right part of Figures 1 and 3, the elasticity of tax revenue with respect to sales taxes goes down with the $TaxIndex$. Therefore, states with low $TaxIndex$ such as Louisiana, Hawaii and Alabama would benefit most from an increase in sales taxes, while New Jersey, Wisconsin, Vermont and Nebraska would not have any significant changes in their tax revenues.

Although the individual welfare is equalized in the long-run through migration, it is affected negatively by an increase in sales taxes in the short-run. The average (across states) elasticity of welfare in such a case is about -0.10 as shown in Table 2a, which is, as expected, mostly due to the reduction in consumption and the increase in hours of work, where the increase in per capita public good is not enough for compensation. According to Figure 2, once again, $TaxIndex$ is an important determinant of the heterogeneity across states, where individuals in states with a higher

$TaxIndex$ would suffer more from an increase in state-level sales taxes in the short-run.

3.3. Effects of Property Taxes

An increase in state-level property taxes would also increase tax revenue of any state, both in the short-run and long-run, as depicted in Tables 3a and 3b. According to the model, for each state, the most effective chain of logic in the short-run is as follows. Especially in the short-run, since individuals cannot migrate across states, they would work more in order to compensate for higher taxes, which would result in lower wage rates and thus higher levels of production and higher income. Accordingly, although other tax rates remain the same, due to an increase in property taxes, the overall state tax revenue would increase. According to the lower left panels of Figures 1 and 3, once again, the $TaxIndex$ seems to be the main determinant of tax revenue differences across states.

One interesting result is related to the effect of property tax on individual welfare in the short-run. As is evident in Table 3a, in any state, individual welfare would increase after an increase in property taxes in the short-run. This is mostly due to higher per capita public good produced by lower wages, which even compensates for higher disutility due to supplies higher hours of labor. This result is consistent with studies such as by Seung and Kraybill (2001) and Conrad and Heng (2002) mentioned above. The heterogeneity across states is again related to the $TaxIndex$ according to the lower left panel of Figure 2. Therefore, both state tax revenue and short-run individual welfare would benefit from an increase in state-level property taxes.[8]

[8] Compared to Table 1a, which shows the effects of an increase in the wage-income tax on individual welfare, the economic implications in Table 3a (showing the effects of an increase in the property tax) are very similar: higher hours of work, lower wages, and higher public goods. However, only in the case of increased property taxes, the increase in public goods is high enough to compensate for the disutility out of supplying labor. This result is mostly due to the individual optimality conditions where the share of housing ϕ^L has a much higher estimated value compared to disutility coefficient ϕ^N due to supplying labor.

3.4. Effects of Dividend-Income Taxes

Dividend-income tax is the only tax type that results in lower state tax revenue, in both short-run (with an average elasticity of -1.29) and long-run (with an average elasticity of -1.39), according to Tables 4a and 4b. According to the model, the most effective chain of logic in the short-run is as follows. Individuals would reduce both consumption and labor supply due to their utility optimization after the increase in dividend-income taxes. This would result in higher wages in any state which would affect the overall production (and thus income) negatively. Accordingly, state tax revenue would decline in any state. Nevertheless, the reduction in tax revenue would be much lower for states with a lower $TaxIndex$ according to the lower right panel of Figures 1 and 3.

The short-run effects of an increase in dividend-income taxes would be negative on individual welfare of any state according to Table 4a. The main reasons behind this result are the reduction in per capita consumption and per capita public good; the reduction in hours of work is not enough to compensate for the reductions in consumption and public good.

4. Concluding Remarks and Discussion

Regional taxes are important public-policy tools that have implications on the distribution of tax revenue and individual welfare across regions. This paper has introduced a general equilibrium model with an analytical solution to investigate the implications of regional taxes that individuals pay by taking into account the interaction between regions through interregional trade. The model is rich enough to consider alternative tax types through a private sector, a public sector, and individual migration across regions. State-level evidence from the U.S. supports the model through regression analyses with high explanatory powers.

Based on the parameters estimated using the U.S. state-level data, the policy analysis suggests that any state in the U.S. would benefit from an increase in wage-income tax, sales tax or property tax in terms of tax revenue, while any increase in dividend-income tax would result in a reduction in tax revenue. Another result of the policy analysis is that tax revenues react differently to changes in tax rates across states. When we have further investigated the reasons behind this result, we have shown that a $TaxIndex$, which is a weighted average of initial taxes at the state level, is an important determinant to explain the differences across states. Accordingly, one state-level policy suggestion is that states with a low $TaxIndex$ would increase their tax revenue by increasing their wage-income, sales or property taxes, while states with already a high $TaxIndex$ would have a harder time increasing their tax revenues through the same tax raises.

Regarding the policy evaluation of the period after the Great Recession, although many states have changed their income and sales taxes, only a few of them have increased their property taxes (e.g., Hawaii and Rhode Island in 2010, or Connecticut, Illinois and Ohio in 2011).[9] This is interesting, because, according to the results in this paper, state property tax is the only tax type of which increase would boost both state tax revenue and short-run individual welfare. It is implied that the type of tax that will be used to increase state tax revenue mostly depends on the objective function of the state governments. For example, in the extreme case of self-interested states, wage-income tax is shown to be the best one to increase, because the elasticity of tax revenue takes its highest value (on average across states) with respect to this tax type; this is consistent with the observation for some states that have increased only their income taxes. In the other extreme case of benevolent states, property tax is shown to be the best one to increase, because both state tax revenue and short-run individual welfare are boosted by this tax type. Any state government in between would increase the overall state tax portfolios, including sales taxes (especially in the short-run), as it has been the case for many states after the Great Recession.

The results of this paper are not without any caveats. In particular, they should be evaluated based on the model introduced in order to answer specific questions such as which type of tax should be modified in each state to improve the state budget or what the implications are for individual welfare and interstate migration. Accordingly, a specific modeling strategy has been

[9] Source: The web page of Tax Foundation at http://taxfoundation.org/.

employed with the necessary ingredients such as interregional trade in consumption goods, profits through monopolistically-competitive firms, or individual migration across regions. Although we have considered cases of both migration (in the long-run) and no migration (in the short-run) for robustness, we kept other necessary ingredients in the model in order to answer the questions in hand. A richer modeling strategy would allow questioning the restrictions imposed by these ingredients, potentially while answering alternative questions. We leave such details for future research.

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5. Online Appendix

5.1. Analytical Solution of the Model

We start with the labor market equilibrium, so that we can obtain an expression for wages. The per capita labor demand in region r is given by:

$$\frac{L_r^C + L_r^P}{H_r} = \frac{Y_r^C}{H_r A_r^C} + \frac{Y_r^P}{H_r A_r^P}$$

while, according to the individual optimality, the labor supply is implied as:

$$N_r(h) = \frac{\Gamma(h)\left(1 - t_r^D\right)}{W_r\left(1 - t_r^W\right)\left(\phi^C + \phi^L - \phi^N\right)}$$

Hence, in equilibrium:

$$W_r = \frac{H_r \Gamma(h)\left(1 - t_r^D\right)}{\left(1 - t_r^W\right)\left(\phi^C + \phi^L - \phi^N\right)\left(\frac{Y_r^C}{A_r^C} + \frac{Y_r^P}{A_r^P}\right)}$$

Since $T_r = \frac{Y_r^P W_r}{A_r^P}$, wage rates are given by:

$$W_r = \frac{H_r \Gamma(h)\left(1 - t_r^D\right)}{\left(1 - t_r^W\right)\left(\phi^C + \phi^L - \phi^N\right)\left(\frac{Y_r^C}{A_r^C} + \frac{T_r}{W_r}\right)} \tag{5.1}$$

where we can solve for W_r considering the implications of the model for $\frac{Y_r^C}{A_r^C}$ and $\frac{T_r}{W_r}$.

We continue with the equilibrium of consumption goods. Accordingly, market clearing for goods produced in region r is given by:

$$Y_r^C = \sum_i H_i C_{i,r}^C(h) = \sum_i H_i \theta_i \left(\frac{P_{i,r}^C}{P_i^C}\right)^{-\eta} C_i^C(h)$$

which can be combined by $P_{i,r}^C = P_{r,r}^C \tau_i$, $P_{r,r}^C = \frac{\eta}{\eta-1} MC_r^C$, and $MC_r^C = \frac{W_r}{A_r^C}$ to have:

$$\frac{Y_r^C}{A_r^C} = \frac{1}{A_r^C}\frac{\eta}{\eta-1}\left(\frac{W_r}{A_r^C}\right)^{-\eta} \sum_i H_i \theta_i \left(\frac{\tau_i}{P_i^C}\right)^{-\eta} C_i^C(h)$$

Substituting this into the labor-market equilibrium condition in Equation 5.1 implies that:

$$W_r = \frac{H_r \Gamma(h)\left(1 - t_r^D\right)}{\left(1 - t_r^W\right)\left(\phi^C + \phi^L - \phi^N\right)\left(\frac{Y_r^C}{A_r^C} + \frac{Y_r^P}{A_r^P}\right)}$$

Using the public-good clearing condition $\left(\text{i.e., } T_r = \frac{Y_r^P W_r}{A_r^P}\right)$, together with the equilibrium condition for local housing $\left(\text{i.e., } C_r^L(h) = \frac{Y_r^L f_r^L}{H_r}\right)$ and individual optimization conditions given by:

$$P_r^C C_r^C(h) = \frac{\Gamma(h)\left(1 - t_r^D\right)\phi^C}{\left(1 + t_r^C\right)\phi^N\left(\phi^C + \phi^L - \phi^N\right)}$$

$$P_r^L C_r^L(h) = \frac{\Gamma(h)\left(1 - t_r^D\right)\phi^L}{\left(1 + t_r^L\right)\phi^N\left(\phi^C + \phi^L - \phi^N\right)}$$

$$W_r N_r(h) = \frac{\Gamma(h)\left(1 - t_r^D\right)}{\left(1 - t_r^W\right)\left(\phi^C + \phi^L - \phi^N\right)}$$

the wage rate in region r is given by:

$$W_r = A_r^C \left(\frac{\left(\phi^C + \phi^L - \phi^N\right)^2\left(1 - t_r^W\right)\frac{\eta}{\eta-1}\sum_i H_i \theta_i \left(\frac{\tau_i}{P_i^C}\right)^{-\eta} C_i^C(h)}{H_r \Gamma(h)\left(1 - t_r^D\right)\left(\phi^C + \phi^L - \phi^N - \left(1 - t_r^W\right)t_r^A\right)}\right)^{\frac{1}{\eta-1}}$$

where

$$t_r^A = TaxIndex_r = \frac{t_r^L \phi^L}{\left(1+t_r^L\right)\phi^N} + \frac{t_r^C \phi^C}{\left(1+t_r^C\right)\phi^N} + \frac{t_r^W}{1-t_r^W} + \frac{t_r^D \left(\phi^C + \phi^L - \phi^N\right)}{1-t_r^D} \tag{5.2}$$

is what we call "$TaxIndex_r$" in the main text. The ratio of tax revenue across regions r and i is implied as follows:

$$\frac{T_r}{T_i} = \frac{H_r t_r^A \left(1-t_r^D\right)}{H_i t_i^A \left(1-t_i^D\right)} \tag{5.3}$$

The ratio of wages across regions r and i is implied as follows:

$$\frac{W_r}{W_i} = \frac{A_r^C}{A_i^C}\left(\frac{H_i\left(1-t_r^W\right)\left(1-t_i^D\right)\left(\phi^C+\phi^L-\phi^N-\left(1-t_i^W\right)t_i^A\right)}{H_r\left(1-t_i^W\right)\left(1-t_r^D\right)\left(\phi^C+\phi^L-\phi^N-\left(1-t_r^W\right)t_r^A\right)}\right)^{\frac{1}{\eta-1}} \tag{5.4}$$

where the ratio of population across regions r and i given by $\frac{H_r}{H_i}$ is found by equalization of individual utilities across regions through migration.

The equalization of individual utilities across regions r and i implies that:

$$\frac{\exp U_r(h)}{\exp U_i(h)} \equiv \left(\frac{C_r^C(h)}{C_i^C(h)}\right)^{\phi^C}\left(\frac{C_r^L(h)}{C_i^L(h)}\right)^{\phi^L}\left(\frac{C_r^P(h)}{C_i^P(h)}\right)^{\phi^P}\left(\frac{N_i(h)}{N_r(h)}\right)^{\phi^N}$$

Since per capita housing is determined by the following market clearing condition:

$$C_r^L(h) = \frac{Y_r^L}{H_r}$$

and since per capita public good is given by:

$$C_r^P(h) = \frac{Y_r^P}{H_r} = \frac{T_r A_r^P}{H_r W_r}$$

and since individual optimality conditions imply:

$$\begin{aligned} C_r^C(h) &= \frac{\Gamma(h)\left(1-t_r^D\right)\phi^C}{P_r^C\left(1+t_r^C\right)\phi^N\left(\phi^C+\phi^L-\phi^N\right)} \\ &= \frac{\Gamma(h)\left(1-t_r^D\right)\phi^C}{\left(\sum_i \theta_r\left(\tau_r P_{i,i}^C\right)^{1-\eta}\right)^{\frac{1}{1-\eta}}\left(1+t_r^C\right)\phi^N\left(\phi^C+\phi^L-\phi^N\right)} \end{aligned}$$

$$C_r^L(h) = \frac{\Gamma(h)\left(1-t_r^D\right)\phi^L}{P_r^L\left(1+t_r^L\right)\phi^N\left(\phi^C+\phi^L-\phi^N\right)}$$

$$N_r(h) = \frac{\Gamma(h)\left(1-t_r^D\right)}{W_r\left(1-t_r^W\right)\left(\phi^C+\phi^L-\phi^N\right)}$$

the ratio of population across regions r and i is implied as:

$$\begin{aligned}\frac{H_r}{H_i} \equiv & \frac{Y_r^L}{Y_i^L}\left(\frac{W_r}{W_i}\right)^{\frac{\phi^N-\phi^P}{\phi^L}}\left(\frac{\left(1-t_r^D\right)\left(1+t_i^C\right)\tau_i\left(\theta_i\right)^{\frac{1}{1-\eta}}}{\left(1-t_i^D\right)\left(1+t_r^C\right)\tau_r\left(\theta_r\right)^{\frac{1}{1-\eta}}}\right)^{\frac{\phi^C}{\phi^L}} \\ & \times\left(\frac{A_r^P}{A_i^P}\frac{\left(1-t_r^D\right)t_r^A}{\left(1-t_i^D\right)t_i^A}\right)^{\frac{\phi^P}{\phi^L}}\left(\frac{\left(1-t_i^D\right)\left(1-t_r^W\right)}{\left(1-t_r^D\right)\left(1-t_i^W\right)}\right)^{\frac{\phi^N}{\phi^L}}\end{aligned} \tag{5.5}$$

Substituting this expression back into Equation 5.4 results in:

$$\frac{W_r}{W_i} = \left(\begin{array}{c}\frac{Y_i^L}{Y_r^L}\left(\frac{\left(1-t_i^D\right)\left(1+t_r^C\right)\tau_r(\theta_r)^{\frac{1}{1-\eta}}}{\left(1-t_r^D\right)\left(1+t_i^C\right)\tau_i(\theta_i)^{\frac{1}{1-\eta}}}\right)^{\frac{\phi^C}{\phi^L}}\left(\frac{A_i^P}{A_r^P}\frac{\left(1-t_i^D\right)t_i^A}{\left(1-t_r^D\right)t_r^A}\right)^{\frac{\phi^P}{\phi^L}} \\ \\ \times\left(\frac{A_r^C}{A_i^C}\right)^{\eta-1}\left(\frac{\left(1-t_r^D\right)\left(1-t_i^W\right)}{\left(1-t_i^D\right)\left(1-t_r^W\right)}\right)^{\frac{\phi^N}{\phi^L}-1}\frac{\left(\phi^C+\phi^L-\phi^N-\left(1-t_i^W\right)t_i^A\right)}{\left(\phi^C+\phi^L-\phi^N-\left(1-t_r^W\right)t_r^A\right)}\end{array}\right)^{\frac{\phi^L}{(\eta-1)\phi^L+\phi^N-\phi^P}}$$

which can be used to find the closed-form solution for all other endogenous variables in the model.

5.2. Welfare Analysis

By keeping technology levels of A_r^C's and A_r^P's, parameters (τ_r, and θ_r) and the available housing of each region (given by Y_i^L's) the same, we are interested in the effects of a change in one particular region's tax rate on that region's individual welfare given by the *exponential* of the individual utility function. Accordingly, the elasticity of individual welfare with respect to region-specific tax rates in region r relative to region i is given by:

$$\begin{aligned}\varepsilon_{r,i} &= \widehat{\exp U_r(h)} - \widehat{\exp U_i(h)} \\ &= \underbrace{\phi^C\left(\widehat{\frac{C_r^C(h)}{C_i^C(h)}}\right)}_{\text{due to per capita consumption}} + \underbrace{\phi^L\left(\widehat{\frac{C_r^L(h)}{C_i^L(h)}}\right)}_{\text{due to housing}} + \underbrace{\phi^P\left(\widehat{\frac{C_r^P(h)}{C_i^P(h)}}\right)}_{\text{due to per capita public good}} - \underbrace{\phi^N\left(\widehat{\frac{N_r(h)}{N_i(h)}}\right)}_{\text{due to labor supply}}\end{aligned}$$

where $\widehat{(\cdot)}$ represents percentage change within the whole parenthesis after 1% of an increase in tax rates, and the components of this elasticity are given as follows:

$$\widehat{\left(\frac{C_r^C(h)}{C_i^C(h)}\right)} = \widehat{\left(\frac{(1-t_r^D)}{(1-t_i^D)}\right)} + \widehat{\left(\frac{(1+t_i^C)}{(1+t_r^C)}\right)}$$

and

$$\widehat{\left(\frac{C_r^L(h)}{C_i^L(h)}\right)} = -\widehat{\left(\frac{H_r}{H_i}\right)}$$

and

$$\widehat{\left(\frac{C_r^P(h)}{C_i^P(h)}\right)} = \widehat{\left(\frac{T_r}{T_i}\right)} - \widehat{\left(\frac{H_r}{H_i}\right)} - \widehat{\left(\frac{W_r}{W_i}\right)}$$

and

$$\widehat{\left(\frac{N_r(h)}{N_i(h)}\right)} = \widehat{\left(\frac{(1-t_r^D)(1-t_i^W)}{(1-t_i^D)(1-t_r^W)}\right)} - \widehat{\left(\frac{W_r}{W_i}\right)}$$

where the relative percentage change in wages is given by:

$$\widehat{\left(\frac{W_r}{W_i}\right)} = \left(\begin{array}{c} \frac{\phi^C}{(\eta-1)\phi^L+\phi^N-\phi^P}\widehat{\left(\frac{(1-t_i^D)(1+t_r^C)}{(1-t_r^D)(1+t_i^C)}\right)} + \frac{\phi^P}{(\eta-1)\phi^L+\phi^N-\phi^P}\widehat{\left(\frac{(1-t_i^D)t_i^A}{(1-t_r^D)t_r^A}\right)} \\ \\ +\frac{\phi^N-\phi^L}{(\eta-1)\phi^L+\phi^N-\phi^P}\widehat{\left(\frac{(1-t_r^D)(1-t_i^W)}{(1-t_i^D)(1-t_r^W)}\right)} + \frac{\phi^L}{(\eta-1)\phi^L+\phi^N-\phi^P}\widehat{\left(\frac{\phi^C+\phi^L-\phi^N-(1-t_i^W)t_i^A}{\phi^C+\phi^L-\phi^N-(1-t_r^W)t_r^A}\right)} \end{array}\right)$$

the relative percentage change in population levels is given by:

$$\widehat{\left(\frac{H_r}{H_i}\right)} = \left(\begin{array}{c} \frac{\phi^N-\phi^P}{\phi^L}\widehat{\left(\frac{W_r}{W_i}\right)} + \frac{\phi^C}{\phi^L}\widehat{\left(\frac{(1-t_r^D)(1+t_i^C)}{(1-t_i^D)(1+t_r^C)}\right)} \\ \\ +\frac{\phi^P}{\phi^L}\widehat{\left(\frac{(1-t_r^D)t_r^A}{(1-t_i^D)t_i^A}\right)} + \frac{\phi^N}{\phi^L}\widehat{\left(\frac{(1-t_i^D)(1-t_r^W)}{(1-t_r^D)(1-t_i^W)}\right)} \end{array}\right)$$

the relative percentage change in tax revenues is given by:

$$\widehat{\left(\frac{T_r}{T_i}\right)} = \widehat{\left(\frac{H_r}{H_i}\right)} + \widehat{\left(\frac{1-t_r^D}{1-t_i^D}\right)} + \widehat{\left(\frac{t_r^A}{t_i^A}\right)}$$

Note that technology levels of A_r^C's and A_r^P's, parameters (τ_r and θ_r) and available housing in each region (given by Y_i^L's) are effectively cancelled out while calculating the log difference between before and after tax changes. As is evident, when data for tax rates are available, the only parameters that are necessary to calculate the elasticity of individual welfare with respect to region-specific tax rates are η, ϕ^C, ϕ^L, ϕ^P and ϕ^N; using data from the U.S., we estimate all of these parameters, below. Once such parameters are available, thanks to the general-equilibrium framework, for the counterfactual analysis, all one has to do is to include the changes in state-level tax rates into the equations introduced in this subsection.

We distinguish between the short-run and long-run effects of tax rate changes, where short-run is defined as the case in which individual migration is not allowed across states (i.e., H_r is constant for all r), while long-run is defined as the case in which individuals can migrate across states in order to equalize individual utility across states (i.e., H_r is allowed to change for all r).

5.3. Testing Implications of the Model for the Elasticity of Substitution across Goods

The model implies that the total revenue of each private-sector producer is connected to the total cost according to the following expression:

$$\underbrace{P_{r,r}^C Y_r^C}_{\text{Total Revenue}} = \underbrace{\left(\frac{\eta}{\eta-1}\right)}_{\text{Gross Markup}} \underbrace{MC_r^C Y_r^C}_{\text{Total Cost}}$$

which can be estimated using manufacturing data obtained from Economic Census Data of the U.S. Census Bureau for 2007 at the state level.

In particular, under the assumptions of CES utility functions and constant returns to scale, state level production data for total costs and total revenues in the U.S. are used to determine/estimate gross markups and thus the elasticity of substitution η. The estimation results in $\eta = 3.6$ with a standard error of 0.08 and an R-squared value of 0.97.

5.4. Testing Implications of the Model for State-Level Population

The log version of Equation 5.5 can be estimated as follows:

$$\underbrace{\log\left(\frac{H_r}{H_i}\right)}_{\text{Population}} \equiv \frac{\phi^L}{\phi^L+\phi^P}\underbrace{\log\left(\frac{Y_r^L}{Y_i^L}\right)}_{\text{Housing}} + \frac{\phi^C}{\phi^L+\phi^P}\underbrace{\log\left(\frac{\left(1-t_r^D\right)\left(1+t_i^C\right)}{\left(1-t_i^D\right)\left(1+t_r^C\right)}\right)}_{\text{Tax}}$$

$$+\frac{\phi^P}{\phi^L+\phi^P}\underbrace{\log\left(\frac{T_r}{T_i}\frac{W_i}{W_r}\right)}_{\text{Revenue/Wage Interaction}} + \frac{\phi^N}{\phi^L+\phi^P}\underbrace{\log\left(\frac{W_r}{W_i}\frac{\left(1-t_i^D\right)\left(1-t_r^W\right)}{\left(1-t_r^D\right)\left(1-t_i^W\right)}\right)}_{\text{Wage/Tax Interaction}}$$

$$\underbrace{+\log\left(\left(\frac{\tau_i\left(\theta_i\right)^{\frac{1}{1-\eta}}}{\tau_r\left(\theta_r\right)^{\frac{1}{1-\eta}}}\right)^{\frac{\phi^C}{\phi^L+\phi^P}}\left(\frac{A_r^P}{A_i^P}\right)^{\frac{\phi^P}{\phi^L+\phi^P}}\right)}_{\text{Residuals}}$$

where data for population H_r, housing (Y_r^L), and tax revenue (T_r) have been obtained from the U.S. Census Bureau, while data for wages (W_r) have been obtained from the U.S. Bureau of Labor Statistics, all for the year of 2007, except for housing which is for 2010.

The tax rates are obtained from Tax Foundation for the year of 2007. In order to take into account the nationwide taxes in the data, for each state, any tax rate is calculated as the sum of *federal*, *social security*, *medicare*, and *state* taxes, when relevant. For instance, the income taxes that are indepedent of state income taxes add up to 0.40 for the year of 2007. Such values are added on top of state income taxes in order to obtain the values given in Table A1. Since most taxes are progressive (i.e., the tax rate increases as the taxable base amount increases), we use the national average net compensation (of about \$39K) published by the Social Security Administration for the year 2007 as the taxable base amount.

The only exceptions are the state-level property tax rates which are calculated by using the *local* tax paid for the median-value house in each state. The tax paid for the median-value house in each state has been obtained by dividing the median property taxes paid on houses by the annual mortgage payment of the median-value house on a 30-year loan where the mortgage rate has been taken as 6.2% for the year 2007. As an example, consider the state of Alabama where the median property tax paid is $352 and the median house value is $115,600 for 2007. Using the mortgage rate of 6.2%, we calculate the property tax rate for Alabama using the following formulation:

$$t^L_{ALABAMA} = \frac{352}{115,600 \times (0.062/12) \times \frac{(1+0.062/12)^{360}}{(1+0.062/12)^{360}-1}} = 0.50$$

As is evident by the tax rates in each state are given in Table A1, although wage-income, dividend-income and sales taxes are somehow close to each other across states, the property taxes are more dispersed. It is important to emphasize that some states may have a tax rate of zero for some tax types (e.g., state income tax or state property tax). Nevertheless, the effects of a tax change on individiuals at the state level depend on how much total tax is initially paid by the individuals in that state, either at the federal, state, or county level; this is exactly how individuals decide what to do in case of a change in any tax rate.

Within this context, since the coefficients in front of housing and revenue/wage interaction add up to 1, we use restricted least squares as the estimation methodology. The results are given in Table A2, where all coefficients are positive and significant as expected with an R-squared value of 0.99. Combining these estimates with $\phi^C + \phi^L + \phi^P + \phi^N = 1$ results in the individual estimates for ϕ^C, ϕ^L, ϕ^P and ϕ^N in Table A2. As is evident, housing takes the highest share in individual utility with $\phi^L = 0.64$, followed by the disutility due to supplying labor with $\phi^N = 0.14$, consumption with $\phi^C = 0.12$, and public goods with $\phi^P = 0.10$. These estimates are used in the welfare/counterfactual analyses.

5.5. Testing Implications of the Model for Tax Revenue

The log version of Equation 5.3 can be estimated as follows:

$$\underbrace{\log\left(\frac{T_r}{T_i}\right)}_{\text{Tax Revenue}} = \underbrace{\log\left(\frac{H_r t^A_r \left(1 - t^D_r\right)}{H_i t^A_i \left(1 - t^D_i\right)}\right)}_{\text{Population/Tax Interaction}}$$

where the data are the same as above except for t^A_r which has been calculated according to Equation 5.2 using the results in Table A2 for the parameters of ϕ^C, ϕ^L and ϕ^N.

Since the coefficient in front of the right hand side (i.e., population/tax interaction) is equal to 1 according to the model, we use restricted least squares which results in an R-squared value of 0.93 as shown in Table A3. When we take an unrestricted approach where the coefficients in front of the right hand side is allowed to be different from 1, the results are also given in Table A3, where the coefficient is statistically very close to 1 (i.e., 0.97). Therefore, the implications of the model introduced in this paper are consistent with the available data on tax revenue, population and tax rates across U.S. states.

5.6. Testing Implications of the Model for Interstate Trade

Consider the individual optimality conditions for region k regarding the consumption goods imported from region i and region r:

$$C_{k,i}^{C}(h) = \theta_k \left(\frac{P_{k,i}^{C}}{P_k^{C}} \right)^{-\eta} C_k^{C}(h)$$

and

$$C_{k,r}^{C}(h) = \theta_k \left(\frac{P_{k,r}^{C}}{P_k^{C}} \right)^{-\eta} C_k^{C}(h)$$

where the notation is the same as in the main text. Accordingly, the ratio of imports of region k from region i versus region r is given by:

$$\frac{P_{k,i}^{C} C_{k,i}^{C}(h)}{P_{k,r}^{C} C_{k,r}^{C}(h)} = \left(\frac{P_{i,i}^{C}}{P_{r,r}^{C}} \right)^{1-\eta}$$

where we have used $P_{k,i}^{C} = P_{i,i}^{C} \tau_k$. Using the definition of factory-gate prices $\left(\text{i.e., } P_{i,i}^{C} = \frac{\eta}{\eta-1} MC_i^{C} \right)$ and marginal costs of production $\left(\text{i.e., } MC_i^{C} = \frac{W_i}{A_i^{C}} \right)$, we can write:

$$\frac{P_{k,i}^{C} C_{k,i}^{C}(h)}{P_{k,r}^{C} C_{k,r}^{C}(h)} = \left(\frac{W_i A_r^{C}}{A_i^{C} W_r} \right)^{1-\eta}$$

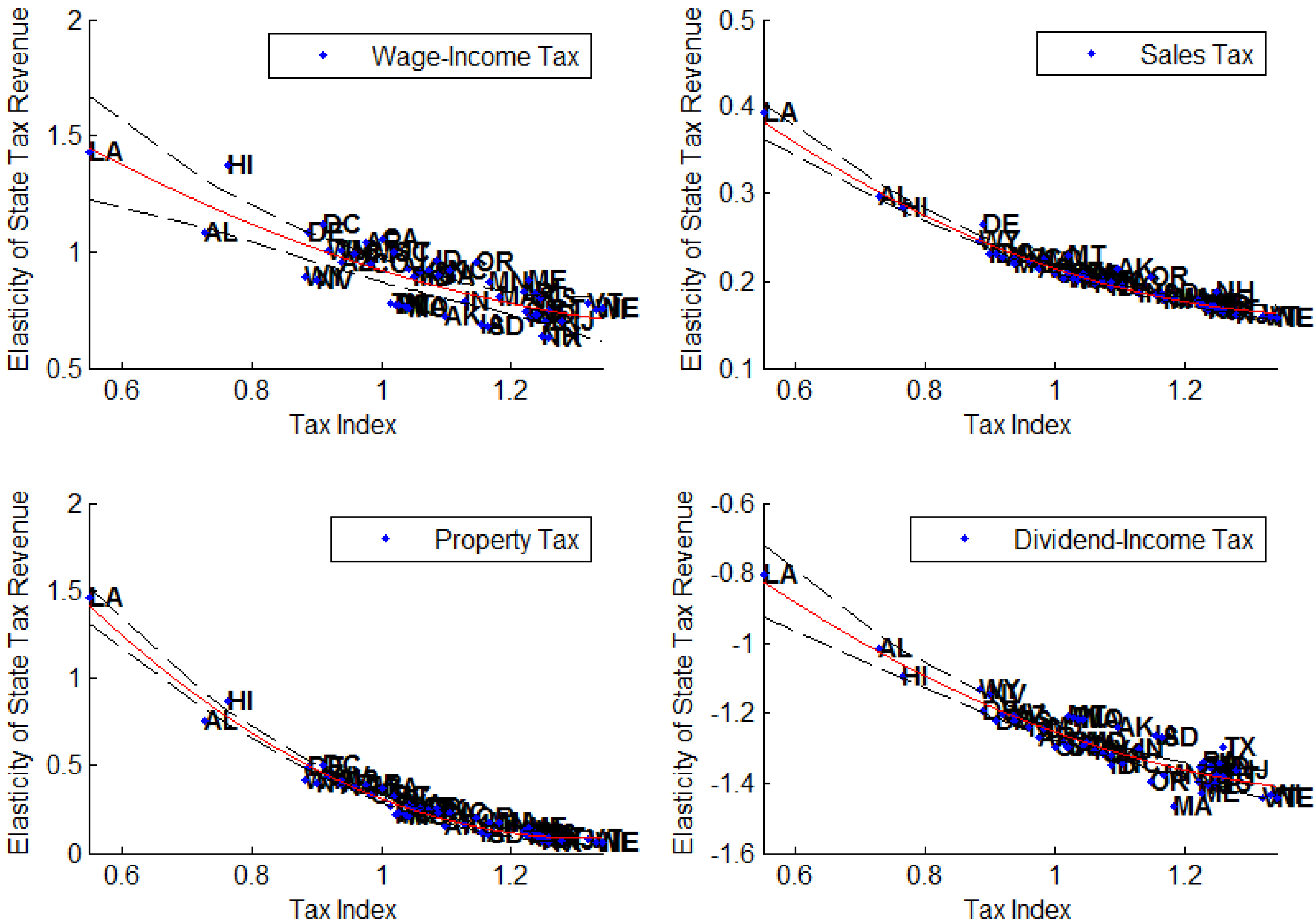
which can be rewritten in log form using Equation 5.4 as follows:

$$\underbrace{\log \left(\frac{P_{k,i}^{C} C_{k,i}^{C}(h)}{P_{k,r}^{C} C_{k,r}^{C}(h)} \right)}_{\text{Trade}} = \underbrace{\log \left(\frac{H_i}{H_r} \right)}_{\text{Population}} + \underbrace{\log \left(\frac{\left(1 - t_r^{W}\right)\left(1 - t_i^{D}\right)\left(\phi^{C} + \phi^{L} - \phi^{N} - \left(1 - t_i^{W}\right) t_i^{A}\right)}{\left(1 - t_i^{W}\right)\left(1 - t_r^{D}\right)\left(\phi^{C} + \phi^{L} - \phi^{N} - \left(1 - t_r^{W}\right) t_r^{A}\right)} \right)}_{\text{Tax}}$$

Therefore, relative imports of a destination region from two source regions depends on the population ratio and the tax ratio of the source regions. We test this implication of the model using the log version of this equation. The bilateral trade data across the U.S. states are obtained from Commodity Flow Survey (CFS) of the Bureau of Transportation Statistics for the year of 2007. To make the connection between CFS and the model, we use the overall value of shipments. Data for taxes are the same as above, and the results in Table A2 are used for the parameters of ϕ^C, ϕ^L and ϕ^N.

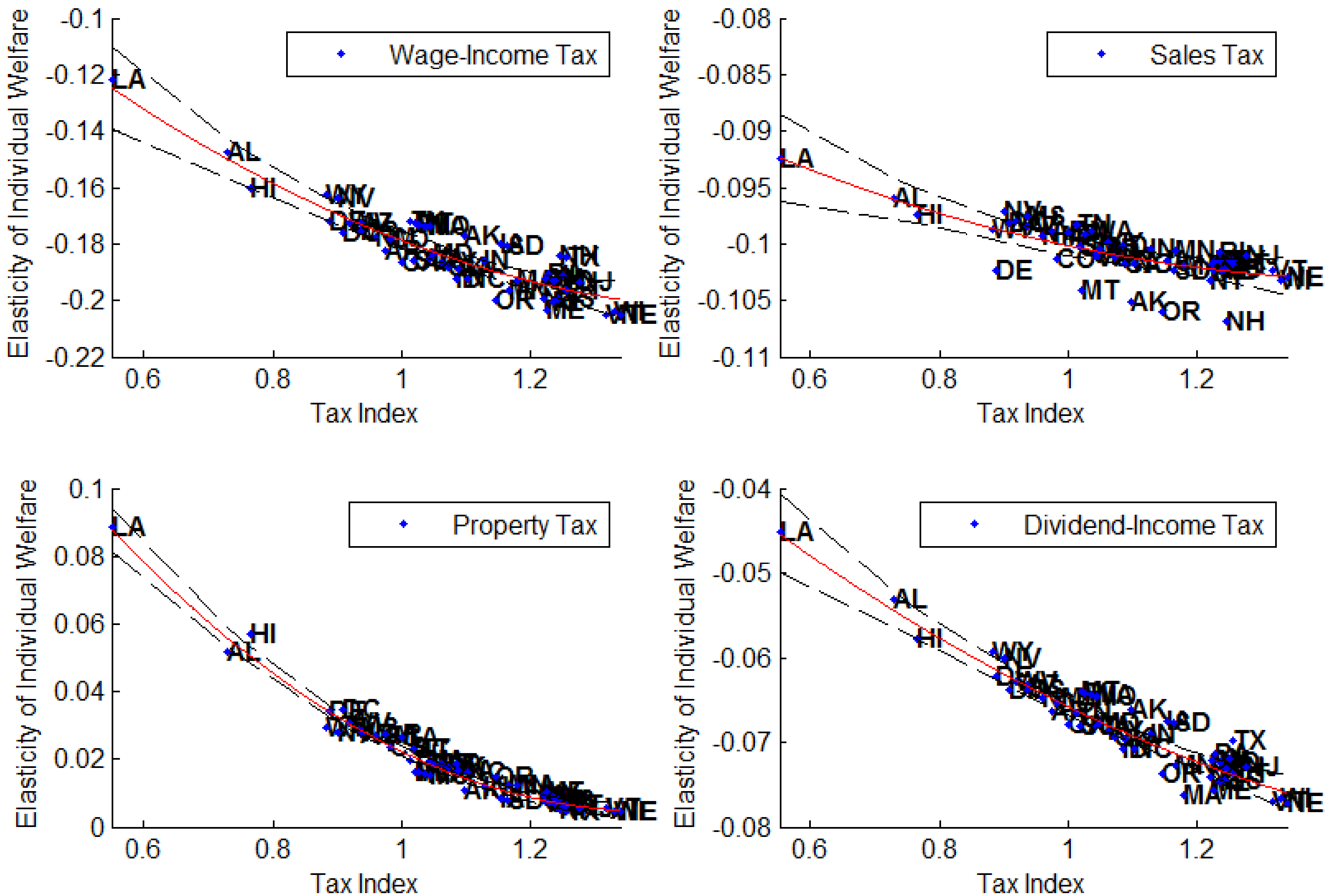
Since the coefficient in front of population and tax are both equal to 1 according to the model, we use restricted least squares which results in an R-squared value of 0.45 as shown in Table A4. When we take an unrestricted approach where the coefficients in front of population and tax are allowed to be different from 1, the results are also given in Table A4, where the coefficient in front of taxes is statistically not different from 1, while the coefficient in front of population is very close to 1 (i.e., 1.17). Therefore, in addition to the existing literature on gravity studies where variables such as population are standard, taxes enter the trade regressions positively and significantly, which shows that the implications of the model introduced in this paper are consistent with the available data on trade and taxes across U.S. states.

Figure 1 - Short-run Effects of State-Level Taxes on State-Level Tax Revenue



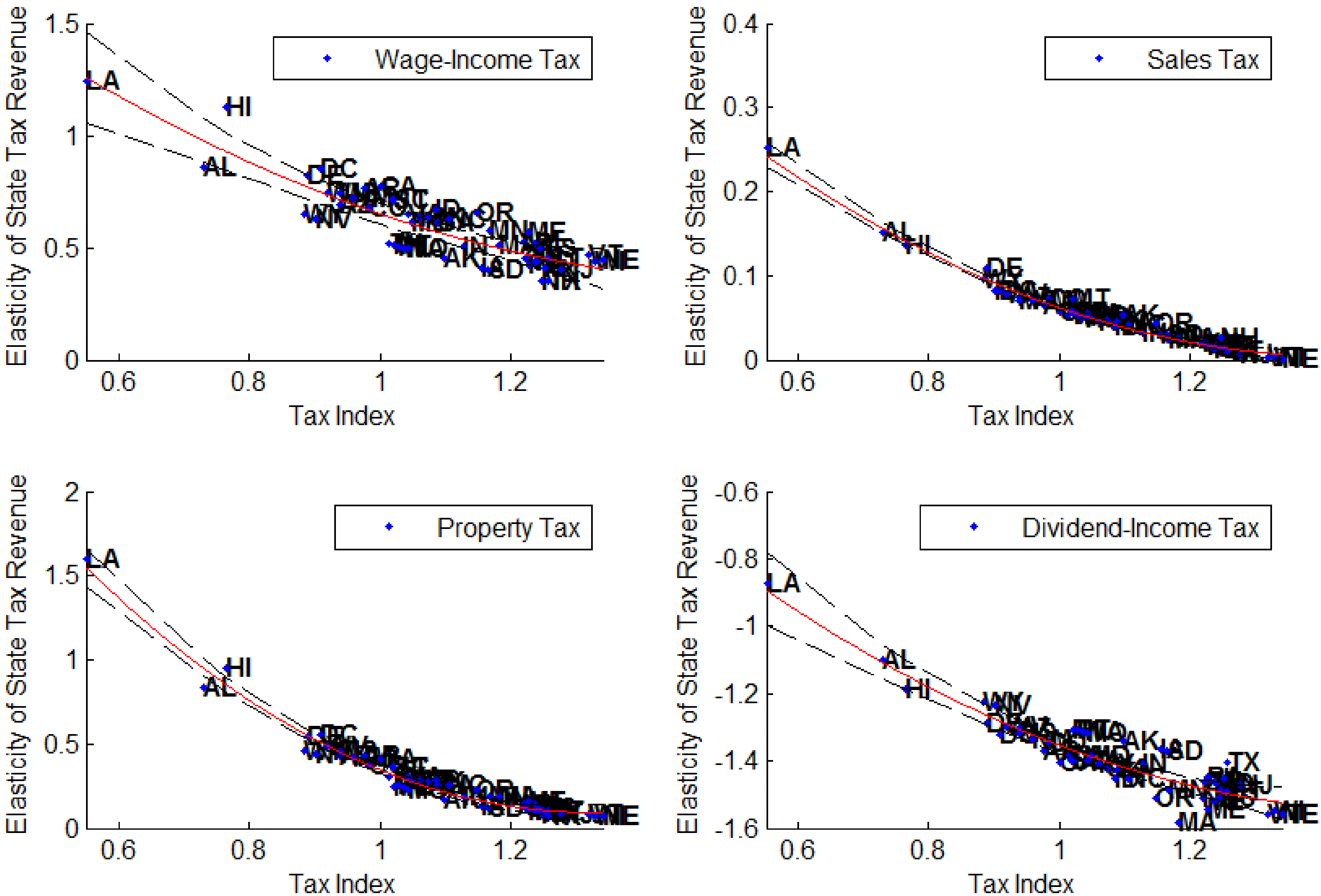
Notes: The short-run is defined as the case where individuals are not allowed to migrate. The fitted curves and the corresponding 95% confidence intervals have been calculated using a quadratic regression between the elasticity of tax revenue and the $TaxIndex$ given by $Elasticity\ of\ State\ Tax\ Revenue = \beta_0 + \beta_1 TaxIndex + \beta_2 (TaxIndex)^2$. $TaxIndex$ has been normalized such that the state of California has a value of 1.

Figure 2 - Short-run Effects of State-Level Taxes on Individual Welfare



Notes: The short-run is defined as the case where individuals are not allowed to migrate. The fitted curves and the corresponding 95% confidence intervals have been calculated using a quadratic regression between the elasticity of individual welfare and the *TaxIndex* given by $Elasticity\ of\ Individual\ Welfare = \beta_0 + \beta_1 TaxIndex + \beta_2 (TaxIndex)^2$. *TaxIndex* has been normalized such that the state of California has a value of 1.

Figure 3 - Long-run Effects of State-Level Taxes on State-Level Tax Revenue



Notes: The long-run is defined as the case where individuals are allowed to migrate. The fitted curves and the corresponding 95% confidence intervals have been calculated using a quadratic regression between the elasticity of tax revenue and the *TaxIndex* given by $Elasticity\ of\ State\ Tax\ Revenue = \beta_0 + \beta_1 TaxIndex + \beta_2 (TaxIndex)^2$. *TaxIndex* has been normalized such that the state of California has a value of 1.

Table 1a - Short-run Elasticities with respect to Wage-Income Tax Rates

	SHORT-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	1.08	-0.26	0.00	0.00	0.00	0.13	0.28	-0.15
Alaska	0.72	-0.14	0.00	0.00	0.00	0.08	0.26	-0.18
Arizona	0.95	-0.21	0.00	0.00	0.00	0.11	0.29	-0.17
Arkansas	1.04	-0.23	0.00	0.00	0.00	0.12	0.31	-0.18
California	1.06	-0.23	0.00	0.00	0.00	0.12	0.31	-0.19
Colorado	0.95	-0.20	0.00	0.00	0.00	0.11	0.29	-0.18
Connecticut	0.75	-0.15	0.00	0.00	0.00	0.09	0.28	-0.20
Delaware	1.08	-0.25	0.00	0.00	0.00	0.13	0.30	-0.17
Washington DC	1.12	-0.26	0.00	0.00	0.00	0.13	0.31	-0.18
Florida	0.77	-0.16	0.00	0.00	0.00	0.09	0.26	-0.17
Georgia	0.90	-0.19	0.00	0.00	0.00	0.11	0.29	-0.19
Hawaii	1.37	-0.36	0.00	0.00	0.00	0.17	0.33	-0.16
Idaho	0.97	-0.20	0.00	0.00	0.00	0.11	0.31	-0.19
Illinois	0.70	-0.14	0.00	0.00	0.00	0.08	0.27	-0.19
Indiana	0.79	-0.16	0.00	0.00	0.00	0.09	0.28	-0.19
Iowa	0.69	-0.13	0.00	0.00	0.00	0.08	0.26	-0.18
Kansas	0.80	-0.16	0.00	0.00	0.00	0.09	0.29	-0.20
Kentucky	0.92	-0.19	0.00	0.00	0.00	0.11	0.29	-0.19
Louisiana	1.43	-0.44	0.00	0.00	0.00	0.18	0.30	-0.12
Maine	0.88	-0.18	0.00	0.00	0.00	0.10	0.31	-0.20
Maryland	0.89	-0.19	0.00	0.00	0.00	0.10	0.29	-0.18
Massachusetts	0.81	-0.16	0.00	0.00	0.00	0.09	0.29	-0.19
Michigan	0.73	-0.14	0.00	0.00	0.00	0.08	0.28	-0.19
Minnesota	0.87	-0.18	0.00	0.00	0.00	0.10	0.30	-0.20
Mississippi	1.01	-0.22	0.00	0.00	0.00	0.12	0.29	-0.18
Missouri	0.76	-0.15	0.00	0.00	0.00	0.09	0.26	-0.17
Montana	0.78	-0.16	0.00	0.00	0.00	0.09	0.26	-0.17
Nebraska	0.75	-0.15	0.00	0.00	0.00	0.09	0.29	-0.21
Nevada	0.88	-0.19	0.00	0.00	0.00	0.10	0.27	-0.16
New Hampshire	0.63	-0.12	0.00	0.00	0.00	0.07	0.26	-0.18
New Jersey	0.70	-0.14	0.00	0.00	0.00	0.08	0.27	-0.19
New Mexico	0.99	-0.22	0.00	0.00	0.00	0.12	0.29	-0.18
New York	0.83	-0.17	0.00	0.00	0.00	0.10	0.30	-0.20
North Carolina	0.92	-0.19	0.00	0.00	0.00	0.11	0.30	-0.19
North Dakota	0.73	-0.14	0.00	0.00	0.00	0.08	0.28	-0.19
Ohio	0.75	-0.15	0.00	0.00	0.00	0.09	0.28	-0.19
Oklahoma	0.92	-0.19	0.00	0.00	0.00	0.11	0.30	-0.19
Oregon	0.96	-0.20	0.00	0.00	0.00	0.11	0.31	-0.20
Pennsylvania	0.72	-0.14	0.00	0.00	0.00	0.08	0.27	-0.19
Rhode Island	0.82	-0.16	0.00	0.00	0.00	0.10	0.30	-0.20
South Carolina	1.00	-0.22	0.00	0.00	0.00	0.12	0.30	-0.19
South Dakota	0.68	-0.13	0.00	0.00	0.00	0.08	0.26	-0.18
Tennessee	0.78	-0.16	0.00	0.00	0.00	0.09	0.26	-0.17
Texas	0.63	-0.12	0.00	0.00	0.00	0.07	0.26	-0.18
Utah	1.00	-0.22	0.00	0.00	0.00	0.12	0.30	-0.19
Vermont	0.78	-0.15	0.00	0.00	0.00	0.09	0.30	-0.21
Virginia	0.93	-0.20	0.00	0.00	0.00	0.11	0.29	-0.19
Washington	0.76	-0.16	0.00	0.00	0.00	0.09	0.26	-0.17
West Virginia	1.01	-0.22	0.00	0.00	0.00	0.12	0.29	-0.17
Wisconsin	0.75	-0.15	0.00	0.00	0.00	0.09	0.29	-0.20
Wyoming	0.90	-0.20	0.00	0.00	0.00	0.11	0.27	-0.16
Average	0.88	-0.19	0.00	0.00	0.00	0.10	0.29	-0.18

Notes: Wages, Consumption, Housing, Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the wage-income tax of the corresponding state.

Table 1b - Long-run Elasticities with respect to Wage-Income Tax Rates

	LONG-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	0.86	-0.18	-0.22	0.00	0.14	0.12	0.27	0.00
Alaska	0.45	-0.04	-0.27	0.00	0.17	0.07	0.25	0.00
Arizona	0.69	-0.11	-0.26	0.00	0.17	0.10	0.27	0.00
Arkansas	0.76	-0.12	-0.28	0.00	0.18	0.11	0.29	0.00
California	0.77	-0.12	-0.28	0.00	0.18	0.11	0.30	0.00
Colorado	0.68	-0.10	-0.27	0.00	0.17	0.10	0.27	0.00
Connecticut	0.45	-0.03	-0.30	0.00	0.19	0.08	0.27	0.00
Delaware	0.82	-0.15	-0.26	0.00	0.17	0.12	0.29	0.00
Washington DC	0.85	-0.15	-0.27	0.00	0.17	0.12	0.29	0.00
Florida	0.51	-0.06	-0.26	0.00	0.17	0.08	0.25	0.00
Georgia	0.61	-0.08	-0.29	0.00	0.18	0.09	0.28	0.00
Hawaii	1.13	-0.26	-0.24	0.00	0.16	0.16	0.31	0.00
Idaho	0.67	-0.09	-0.29	0.00	0.19	0.10	0.29	0.00
Illinois	0.41	-0.02	-0.29	0.00	0.19	0.07	0.26	0.00
Indiana	0.51	-0.05	-0.28	0.00	0.18	0.08	0.26	0.00
Iowa	0.41	-0.03	-0.27	0.00	0.18	0.07	0.24	0.00
Kansas	0.50	-0.04	-0.30	0.00	0.19	0.08	0.28	0.00
Kentucky	0.63	-0.08	-0.28	0.00	0.18	0.10	0.28	0.00
Louisiana	1.24	-0.37	-0.19	0.00	0.12	0.17	0.29	0.00
Maine	0.57	-0.06	-0.31	0.00	0.20	0.09	0.29	0.00
Maryland	0.61	-0.08	-0.28	0.00	0.18	0.09	0.27	0.00
Massachusetts	0.51	-0.05	-0.29	0.00	0.19	0.08	0.27	0.00
Michigan	0.44	-0.03	-0.29	0.00	0.19	0.07	0.26	0.00
Minnesota	0.58	-0.06	-0.30	0.00	0.19	0.09	0.28	0.00
Mississippi	0.74	-0.12	-0.27	0.00	0.17	0.11	0.28	0.00
Missouri	0.49	-0.05	-0.26	0.00	0.17	0.08	0.25	0.00
Montana	0.51	-0.06	-0.26	0.00	0.17	0.08	0.25	0.00
Nebraska	0.44	-0.03	-0.31	0.00	0.20	0.08	0.28	0.00
Nevada	0.63	-0.09	-0.25	0.00	0.16	0.09	0.25	0.00
New Hampshire	0.35	-0.01	-0.28	0.00	0.18	0.06	0.24	0.00
New Jersey	0.41	-0.02	-0.29	0.00	0.19	0.07	0.26	0.00
New Mexico	0.72	-0.11	-0.27	0.00	0.17	0.11	0.28	0.00
New York	0.53	-0.05	-0.30	0.00	0.19	0.09	0.28	0.00
North Carolina	0.63	-0.08	-0.29	0.00	0.19	0.10	0.28	0.00
North Dakota	0.44	-0.03	-0.29	0.00	0.19	0.07	0.26	0.00
Ohio	0.45	-0.03	-0.29	0.00	0.19	0.08	0.26	0.00
Oklahoma	0.63	-0.08	-0.29	0.00	0.18	0.10	0.28	0.00
Oregon	0.65	-0.08	-0.30	0.00	0.19	0.10	0.30	0.00
Pennsylvania	0.43	-0.03	-0.29	0.00	0.19	0.07	0.26	0.00
Rhode Island	0.52	-0.05	-0.30	0.00	0.20	0.08	0.28	0.00
South Carolina	0.71	-0.11	-0.28	0.00	0.18	0.11	0.29	0.00
South Dakota	0.41	-0.03	-0.27	0.00	0.18	0.07	0.24	0.00
Tennessee	0.52	-0.06	-0.26	0.00	0.17	0.08	0.25	0.00
Texas	0.35	-0.01	-0.28	0.00	0.18	0.06	0.24	0.00
Utah	0.71	-0.11	-0.28	0.00	0.18	0.11	0.29	0.00
Vermont	0.47	-0.03	-0.31	0.00	0.20	0.08	0.28	0.00
Virginia	0.65	-0.09	-0.28	0.00	0.18	0.10	0.28	0.00
Washington	0.50	-0.05	-0.26	0.00	0.17	0.08	0.25	0.00
West Virginia	0.74	-0.12	-0.26	0.00	0.17	0.11	0.28	0.00
Wisconsin	0.44	-0.03	-0.31	0.00	0.20	0.08	0.27	0.00
Wyoming	0.65	-0.10	-0.25	0.00	0.16	0.10	0.25	0.00
Average	0.60	-0.08	-0.28	0.00	0.18	0.09	0.27	0.00

Notes: Wages, Consumption, Housing, Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the wage-income tax of the corresponding state.

Table 2a - Short-run Elasticities with respect to Sales Tax Rates

STATE	SHORT-RUN ELASTICITIES							
	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	0.30	-0.19	0.00	-0.12	0.00	0.05	0.03	-0.10
Alaska	0.21	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.11
Arizona	0.22	-0.13	0.00	-0.11	0.00	0.03	0.02	-0.10
Arkansas	0.21	-0.12	0.00	-0.11	0.00	0.03	0.02	-0.10
California	0.21	-0.12	0.00	-0.11	0.00	0.03	0.02	-0.10
Colorado	0.23	-0.13	0.00	-0.12	0.00	0.03	0.02	-0.10
Connecticut	0.17	-0.09	0.00	-0.11	0.00	0.02	0.01	-0.10
Delaware	0.26	-0.16	0.00	-0.12	0.00	0.04	0.02	-0.10
Washington DC	0.23	-0.14	0.00	-0.11	0.00	0.04	0.02	-0.10
Florida	0.20	-0.11	0.00	-0.11	0.00	0.03	0.02	-0.10
Georgia	0.20	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.10
Hawaii	0.28	-0.19	0.00	-0.12	0.00	0.05	0.03	-0.10
Idaho	0.19	-0.11	0.00	-0.11	0.00	0.03	0.02	-0.10
Illinois	0.17	-0.08	0.00	-0.11	0.00	0.02	0.01	-0.10
Indiana	0.19	-0.10	0.00	-0.11	0.00	0.03	0.01	-0.10
Iowa	0.18	-0.09	0.00	-0.12	0.00	0.03	0.01	-0.10
Kansas	0.17	-0.09	0.00	-0.11	0.00	0.03	0.01	-0.10
Kentucky	0.20	-0.11	0.00	-0.11	0.00	0.03	0.02	-0.10
Louisiana	0.39	-0.32	0.00	-0.12	0.00	0.07	0.04	-0.09
Maine	0.17	-0.09	0.00	-0.12	0.00	0.03	0.01	-0.10
Maryland	0.20	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.10
Massachusetts	0.18	-0.09	0.00	-0.12	0.00	0.03	0.01	-0.10
Michigan	0.17	-0.09	0.00	-0.11	0.00	0.02	0.01	-0.10
Minnesota	0.18	-0.09	0.00	-0.11	0.00	0.03	0.01	-0.10
Mississippi	0.22	-0.13	0.00	-0.11	0.00	0.03	0.02	-0.10
Missouri	0.21	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.10
Montana	0.23	-0.12	0.00	-0.12	0.00	0.03	0.02	-0.10
Nebraska	0.16	-0.08	0.00	-0.11	0.00	0.02	0.01	-0.10
Nevada	0.23	-0.13	0.00	-0.11	0.00	0.03	0.02	-0.10
New Hampshire	0.19	-0.09	0.00	-0.12	0.00	0.03	0.01	-0.11
New Jersey	0.16	-0.08	0.00	-0.11	0.00	0.02	0.01	-0.10
New Mexico	0.22	-0.13	0.00	-0.12	0.00	0.03	0.02	-0.10
New York	0.18	-0.09	0.00	-0.12	0.00	0.03	0.01	-0.10
North Carolina	0.20	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.10
North Dakota	0.17	-0.09	0.00	-0.12	0.00	0.03	0.01	-0.10
Ohio	0.17	-0.09	0.00	-0.11	0.00	0.03	0.01	-0.10
Oklahoma	0.20	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.10
Oregon	0.20	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.11
Pennsylvania	0.17	-0.09	0.00	-0.11	0.00	0.02	0.01	-0.10
Rhode Island	0.17	-0.09	0.00	-0.11	0.00	0.02	0.01	-0.10
South Carolina	0.21	-0.12	0.00	-0.12	0.00	0.03	0.02	-0.10
South Dakota	0.19	-0.10	0.00	-0.12	0.00	0.03	0.01	-0.10
Tennessee	0.20	-0.11	0.00	-0.11	0.00	0.03	0.02	-0.10
Texas	0.17	-0.08	0.00	-0.11	0.00	0.02	0.01	-0.10
Utah	0.21	-0.12	0.00	-0.12	0.00	0.03	0.02	-0.10
Vermont	0.16	-0.08	0.00	-0.11	0.00	0.02	0.01	-0.10
Virginia	0.21	-0.12	0.00	-0.12	0.00	0.03	0.02	-0.10
Washington	0.20	-0.11	0.00	-0.11	0.00	0.03	0.02	-0.10
West Virginia	0.23	-0.13	0.00	-0.11	0.00	0.03	0.02	-0.10
Wisconsin	0.16	-0.08	0.00	-0.12	0.00	0.02	0.01	-0.10
Wyoming	0.25	-0.14	0.00	-0.12	0.00	0.04	0.02	-0.10
Average	0.20	-0.11	0.00	-0.12	0.00	0.03	0.02	-0.10

Notes: Wages, Consumption, Housing , Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the sales tax of the corresponding state.

Table 2b - Long-run Elasticities with respect to Sales Tax Rates

	LONG-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	0.15	-0.13	-0.15	-0.12	0.09	0.04	0.02	0.00
Alaska	0.05	-0.05	-0.16	-0.12	0.10	0.03	0.01	0.00
Arizona	0.07	-0.07	-0.15	-0.11	0.10	0.03	0.01	0.00
Arkansas	0.06	-0.07	-0.15	-0.11	0.10	0.03	0.01	0.00
California	0.06	-0.06	-0.15	-0.11	0.10	0.03	0.01	0.00
Colorado	0.07	-0.07	-0.15	-0.12	0.10	0.03	0.01	0.00
Connecticut	0.01	-0.03	-0.15	-0.11	0.10	0.02	0.00	0.00
Delaware	0.11	-0.10	-0.16	-0.12	0.10	0.04	0.01	0.00
Washington DC	0.08	-0.08	-0.15	-0.11	0.10	0.03	0.01	0.00
Florida	0.05	-0.05	-0.15	-0.11	0.10	0.02	0.01	0.00
Georgia	0.04	-0.05	-0.15	-0.12	0.10	0.02	0.01	0.00
Hawaii	0.14	-0.14	-0.15	-0.12	0.09	0.04	0.02	0.00
Idaho	0.04	-0.05	-0.15	-0.11	0.10	0.02	0.01	0.00
Illinois	0.01	-0.03	-0.15	-0.11	0.10	0.02	0.00	0.00
Indiana	0.03	-0.04	-0.15	-0.11	0.10	0.02	0.01	0.00
Iowa	0.03	-0.04	-0.15	-0.12	0.10	0.02	0.01	0.00
Kansas	0.01	-0.03	-0.16	-0.11	0.10	0.02	0.00	0.00
Kentucky	0.05	-0.05	-0.15	-0.11	0.10	0.02	0.01	0.00
Louisiana	0.25	-0.26	-0.14	-0.12	0.09	0.06	0.04	0.00
Maine	0.02	-0.03	-0.16	-0.12	0.10	0.02	0.00	0.00
Maryland	0.05	-0.05	-0.15	-0.12	0.10	0.02	0.01	0.00
Massachusetts	0.03	-0.04	-0.16	-0.12	0.10	0.02	0.01	0.00
Michigan	0.01	-0.03	-0.15	-0.11	0.10	0.02	0.00	0.00
Minnesota	0.02	-0.04	-0.15	-0.11	0.10	0.02	0.01	0.00
Mississippi	0.07	-0.07	-0.15	-0.11	0.09	0.03	0.01	0.00
Missouri	0.05	-0.05	-0.15	-0.12	0.10	0.03	0.01	0.00
Montana	0.07	-0.06	-0.16	-0.12	0.10	0.03	0.01	0.00
Nebraska	0.00	-0.02	-0.16	-0.11	0.10	0.02	0.00	0.00
Nevada	0.08	-0.07	-0.15	-0.11	0.09	0.03	0.01	0.00
New Hampshire	0.03	-0.03	-0.16	-0.12	0.10	0.02	0.00	0.00
New Jersey	0.01	-0.02	-0.15	-0.11	0.10	0.02	0.00	0.00
New Mexico	0.07	-0.07	-0.15	-0.12	0.10	0.03	0.01	0.00
New York	0.02	-0.03	-0.16	-0.12	0.10	0.02	0.00	0.00
North Carolina	0.04	-0.05	-0.15	-0.12	0.10	0.02	0.01	0.00
North Dakota	0.02	-0.03	-0.16	-0.12	0.10	0.02	0.00	0.00
Ohio	0.02	-0.03	-0.15	-0.11	0.10	0.02	0.00	0.00
Oklahoma	0.05	-0.05	-0.15	-0.12	0.10	0.02	0.01	0.00
Oregon	0.04	-0.05	-0.16	-0.12	0.10	0.02	0.01	0.00
Pennsylvania	0.02	-0.03	-0.15	-0.11	0.10	0.02	0.00	0.00
Rhode Island	0.01	-0.03	-0.15	-0.11	0.10	0.02	0.00	0.00
South Carolina	0.06	-0.06	-0.15	-0.12	0.10	0.03	0.01	0.00
South Dakota	0.03	-0.04	-0.16	-0.12	0.10	0.02	0.01	0.00
Tennessee	0.05	-0.05	-0.15	-0.11	0.10	0.02	0.01	0.00
Texas	0.01	-0.02	-0.15	-0.11	0.10	0.02	0.00	0.00
Utah	0.06	-0.06	-0.15	-0.12	0.10	0.03	0.01	0.00
Vermont	0.00	-0.02	-0.16	-0.11	0.10	0.02	0.00	0.00
Virginia	0.05	-0.06	-0.15	-0.12	0.10	0.03	0.01	0.00
Washington	0.05	-0.05	-0.15	-0.11	0.10	0.02	0.01	0.00
West Virginia	0.08	-0.08	-0.15	-0.11	0.10	0.03	0.01	0.00
Wisconsin	0.00	-0.02	-0.16	-0.12	0.10	0.02	0.00	0.00
Wyoming	0.10	-0.08	-0.15	-0.12	0.10	0.03	0.01	0.00
Average	0.05	-0.05	-0.15	-0.12	0.10	0.02	0.01	0.00

Notes: Wages, Consumption, Housing , Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the sales tax of the corresponding state.

Table 3a - Short-run Elasticities with respect to Property Tax Rates

	SHORT-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	0.76	-0.48	0.00	0.00	0.00	0.12	0.07	0.05
Alaska	0.15	-0.08	0.00	0.00	0.00	0.02	0.01	0.01
Arizona	0.39	-0.22	0.00	0.00	0.00	0.06	0.03	0.03
Arkansas	0.39	-0.23	0.00	0.00	0.00	0.06	0.03	0.03
California	0.37	-0.21	0.00	0.00	0.00	0.06	0.03	0.03
Colorado	0.33	-0.19	0.00	0.00	0.00	0.05	0.03	0.02
Connecticut	0.09	-0.05	0.00	0.00	0.00	0.01	0.01	0.01
Delaware	0.49	-0.30	0.00	0.00	0.00	0.08	0.04	0.03
Washington DC	0.50	-0.30	0.00	0.00	0.00	0.08	0.04	0.03
Florida	0.23	-0.12	0.00	0.00	0.00	0.03	0.02	0.02
Georgia	0.23	-0.13	0.00	0.00	0.00	0.03	0.02	0.02
Hawaii	0.87	-0.59	0.00	0.00	0.00	0.14	0.08	0.06
Idaho	0.26	-0.14	0.00	0.00	0.00	0.04	0.02	0.02
Illinois	0.08	-0.04	0.00	0.00	0.00	0.01	0.01	0.01
Indiana	0.17	-0.09	0.00	0.00	0.00	0.02	0.01	0.01
Iowa	0.12	-0.06	0.00	0.00	0.00	0.02	0.01	0.01
Kansas	0.11	-0.06	0.00	0.00	0.00	0.02	0.01	0.01
Kentucky	0.26	-0.14	0.00	0.00	0.00	0.04	0.02	0.02
Louisiana	1.46	-1.17	0.00	0.00	0.00	0.25	0.17	0.09
Maine	0.14	-0.07	0.00	0.00	0.00	0.02	0.01	0.01
Maryland	0.26	-0.14	0.00	0.00	0.00	0.04	0.02	0.02
Massachusetts	0.17	-0.09	0.00	0.00	0.00	0.03	0.01	0.01
Michigan	0.10	-0.05	0.00	0.00	0.00	0.01	0.01	0.01
Minnesota	0.17	-0.09	0.00	0.00	0.00	0.03	0.01	0.01
Mississippi	0.42	-0.24	0.00	0.00	0.00	0.06	0.03	0.03
Missouri	0.21	-0.11	0.00	0.00	0.00	0.03	0.02	0.02
Montana	0.22	-0.12	0.00	0.00	0.00	0.03	0.02	0.02
Nebraska	0.06	-0.03	0.00	0.00	0.00	0.01	0.00	0.00
Nevada	0.40	-0.22	0.00	0.00	0.00	0.06	0.03	0.03
New Hampshire	0.07	-0.04	0.00	0.00	0.00	0.01	0.01	0.01
New Jersey	0.07	-0.04	0.00	0.00	0.00	0.01	0.01	0.01
New Mexico	0.38	-0.22	0.00	0.00	0.00	0.06	0.03	0.03
New York	0.13	-0.07	0.00	0.00	0.00	0.02	0.01	0.01
North Carolina	0.23	-0.12	0.00	0.00	0.00	0.03	0.02	0.02
North Dakota	0.09	-0.05	0.00	0.00	0.00	0.01	0.01	0.01
Ohio	0.10	-0.05	0.00	0.00	0.00	0.02	0.01	0.01
Oklahoma	0.25	-0.14	0.00	0.00	0.00	0.04	0.02	0.02
Oregon	0.20	-0.11	0.00	0.00	0.00	0.03	0.02	0.01
Pennsylvania	0.09	-0.05	0.00	0.00	0.00	0.01	0.01	0.01
Rhode Island	0.12	-0.06	0.00	0.00	0.00	0.02	0.01	0.01
South Carolina	0.33	-0.18	0.00	0.00	0.00	0.05	0.03	0.02
South Dakota	0.11	-0.06	0.00	0.00	0.00	0.02	0.01	0.01
Tennessee	0.27	-0.15	0.00	0.00	0.00	0.04	0.02	0.02
Texas	0.06	-0.03	0.00	0.00	0.00	0.01	0.00	0.00
Utah	0.33	-0.18	0.00	0.00	0.00	0.05	0.03	0.02
Vermont	0.08	-0.04	0.00	0.00	0.00	0.01	0.01	0.01
Virginia	0.28	-0.15	0.00	0.00	0.00	0.04	0.02	0.02
Washington	0.22	-0.12	0.00	0.00	0.00	0.03	0.02	0.02
West Virginia	0.44	-0.25	0.00	0.00	0.00	0.07	0.04	0.03
Wisconsin	0.06	-0.03	0.00	0.00	0.00	0.01	0.00	0.00
Wyoming	0.42	-0.24	0.00	0.00	0.00	0.06	0.03	0.03
Average	0.27	-0.16	0.00	0.00	0.00	0.04	0.02	0.02

Notes: Wages, Consumption, Housing, Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the property tax of the corresponding state.

Table 3b - Long-run Elasticities with respect to Property Tax Rates

	LONG-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	0.84	-0.51	0.08	0.00	-0.05	0.12	0.07	0.00
Alaska	0.17	-0.09	0.02	0.00	-0.01	0.02	0.01	0.00
Arizona	0.43	-0.24	0.04	0.00	-0.03	0.06	0.03	0.00
Arkansas	0.43	-0.24	0.04	0.00	-0.03	0.06	0.03	0.00
California	0.41	-0.23	0.04	0.00	-0.03	0.06	0.03	0.00
Colorado	0.37	-0.20	0.04	0.00	-0.02	0.05	0.03	0.00
Connecticut	0.10	-0.05	0.01	0.00	-0.01	0.01	0.01	0.00
Delaware	0.55	-0.32	0.05	0.00	-0.03	0.08	0.04	0.00
Washington DC	0.56	-0.32	0.05	0.00	-0.03	0.08	0.05	0.00
Florida	0.25	-0.13	0.03	0.00	-0.02	0.03	0.02	0.00
Georgia	0.26	-0.14	0.03	0.00	-0.02	0.04	0.02	0.00
Hawaii	0.95	-0.62	0.09	0.00	-0.06	0.14	0.09	0.00
Idaho	0.29	-0.16	0.03	0.00	-0.02	0.04	0.02	0.00
Illinois	0.09	-0.04	0.01	0.00	-0.01	0.01	0.01	0.00
Indiana	0.19	-0.09	0.02	0.00	-0.01	0.03	0.01	0.00
Iowa	0.13	-0.07	0.01	0.00	-0.01	0.02	0.01	0.00
Kansas	0.12	-0.06	0.01	0.00	-0.01	0.02	0.01	0.00
Kentucky	0.29	-0.15	0.03	0.00	-0.02	0.04	0.02	0.00
Louisiana	1.60	-1.22	0.13	0.00	-0.09	0.26	0.17	0.00
Maine	0.16	-0.08	0.02	0.00	-0.01	0.02	0.01	0.00
Maryland	0.29	-0.15	0.03	0.00	-0.02	0.04	0.02	0.00
Massachusetts	0.19	-0.10	0.02	0.00	-0.01	0.03	0.01	0.00
Michigan	0.11	-0.05	0.01	0.00	-0.01	0.01	0.01	0.00
Minnesota	0.19	-0.10	0.02	0.00	-0.01	0.03	0.01	0.00
Mississippi	0.46	-0.26	0.04	0.00	-0.03	0.07	0.04	0.00
Missouri	0.23	-0.12	0.02	0.00	-0.01	0.03	0.02	0.00
Montana	0.25	-0.13	0.02	0.00	-0.02	0.03	0.02	0.00
Nebraska	0.07	-0.03	0.01	0.00	0.00	0.01	0.00	0.00
Nevada	0.44	-0.24	0.04	0.00	-0.03	0.06	0.03	0.00
New Hampshire	0.08	-0.04	0.01	0.00	-0.01	0.01	0.01	0.00
New Jersey	0.08	-0.04	0.01	0.00	-0.01	0.01	0.01	0.00
New Mexico	0.42	-0.24	0.04	0.00	-0.03	0.06	0.03	0.00
New York	0.14	-0.07	0.01	0.00	-0.01	0.02	0.01	0.00
North Carolina	0.25	-0.13	0.02	0.00	-0.02	0.03	0.02	0.00
North Dakota	0.10	-0.05	0.01	0.00	-0.01	0.01	0.01	0.00
Ohio	0.12	-0.06	0.01	0.00	-0.01	0.02	0.01	0.00
Oklahoma	0.28	-0.15	0.03	0.00	-0.02	0.04	0.02	0.00
Oregon	0.23	-0.12	0.02	0.00	-0.01	0.03	0.02	0.00
Pennsylvania	0.11	-0.05	0.01	0.00	-0.01	0.01	0.01	0.00
Rhode Island	0.14	-0.07	0.01	0.00	-0.01	0.02	0.01	0.00
South Carolina	0.36	-0.20	0.04	0.00	-0.02	0.05	0.03	0.00
South Dakota	0.12	-0.06	0.01	0.00	-0.01	0.02	0.01	0.00
Tennessee	0.30	-0.16	0.03	0.00	-0.02	0.04	0.02	0.00
Texas	0.07	-0.03	0.01	0.00	0.00	0.01	0.00	0.00
Utah	0.36	-0.20	0.04	0.00	-0.02	0.05	0.03	0.00
Vermont	0.08	-0.04	0.01	0.00	-0.01	0.01	0.01	0.00
Virginia	0.31	-0.16	0.03	0.00	-0.02	0.04	0.02	0.00
Washington	0.24	-0.13	0.02	0.00	-0.02	0.03	0.02	0.00
West Virginia	0.48	-0.27	0.05	0.00	-0.03	0.07	0.04	0.00
Wisconsin	0.07	-0.04	0.01	0.00	0.00	0.01	0.01	0.00
Wyoming	0.46	-0.26	0.04	0.00	-0.03	0.07	0.04	0.00
Average	0.30	-0.17	0.03	0.00	-0.02	0.04	0.02	0.00

Notes: Wages, Consumption, Housing, Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the property tax of the corresponding state.

Table 4a - Short-run Elasticities with respect to Dividend-Income Tax Rates

	SHORT-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	-1.02	0.22	0.00	-0.21	0.00	-0.12	-0.27	-0.05
Alaska	-1.24	0.42	0.00	-0.21	0.00	-0.16	-0.30	-0.07
Arizona	-1.21	0.35	0.00	-0.22	0.00	-0.15	-0.31	-0.06
Arkansas	-1.27	0.36	0.00	-0.23	0.00	-0.16	-0.32	-0.07
California	-1.30	0.37	0.00	-0.24	0.00	-0.16	-0.33	-0.07
Colorado	-1.25	0.37	0.00	-0.22	0.00	-0.16	-0.31	-0.07
Connecticut	-1.38	0.47	0.00	-0.22	0.00	-0.18	-0.33	-0.07
Delaware	-1.19	0.32	0.00	-0.23	0.00	-0.15	-0.31	-0.06
Washington DC	-1.22	0.32	0.00	-0.23	0.00	-0.15	-0.32	-0.06
Florida	-1.21	0.39	0.00	-0.21	0.00	-0.16	-0.30	-0.06
Georgia	-1.32	0.42	0.00	-0.23	0.00	-0.17	-0.33	-0.07
Hawaii	-1.10	0.17	0.00	-0.24	0.00	-0.12	-0.30	-0.06
Idaho	-1.35	0.42	0.00	-0.24	0.00	-0.17	-0.34	-0.07
Illinois	-1.34	0.46	0.00	-0.22	0.00	-0.18	-0.32	-0.07
Indiana	-1.30	0.43	0.00	-0.22	0.00	-0.17	-0.32	-0.07
Iowa	-1.26	0.43	0.00	-0.21	0.00	-0.16	-0.30	-0.07
Kansas	-1.40	0.47	0.00	-0.23	0.00	-0.18	-0.34	-0.07
Kentucky	-1.31	0.41	0.00	-0.23	0.00	-0.17	-0.32	-0.07
Louisiana	-0.80	-0.06	0.00	-0.21	0.00	-0.07	-0.23	-0.05
Maine	-1.43	0.47	0.00	-0.24	0.00	-0.18	-0.35	-0.08
Maryland	-1.28	0.40	0.00	-0.22	0.00	-0.16	-0.32	-0.07
Massachusetts	-1.47	0.47	0.00	-0.26	0.00	-0.19	-0.37	-0.08
Michigan	-1.35	0.46	0.00	-0.22	0.00	-0.18	-0.32	-0.07
Minnesota	-1.38	0.45	0.00	-0.23	0.00	-0.18	-0.34	-0.07
Mississippi	-1.22	0.35	0.00	-0.22	0.00	-0.15	-0.31	-0.06
Missouri	-1.22	0.40	0.00	-0.21	0.00	-0.16	-0.30	-0.06
Montana	-1.21	0.39	0.00	-0.21	0.00	-0.16	-0.30	-0.06
Nebraska	-1.44	0.50	0.00	-0.23	0.00	-0.19	-0.34	-0.08
Nevada	-1.14	0.34	0.00	-0.21	0.00	-0.14	-0.29	-0.06
New Hampshire	-1.38	0.48	0.00	-0.22	0.00	-0.18	-0.33	-0.07
New Jersey	-1.36	0.47	0.00	-0.22	0.00	-0.18	-0.32	-0.07
New Mexico	-1.24	0.36	0.00	-0.23	0.00	-0.15	-0.32	-0.06
New York	-1.40	0.47	0.00	-0.23	0.00	-0.18	-0.34	-0.07
North Carolina	-1.35	0.43	0.00	-0.23	0.00	-0.17	-0.33	-0.07
North Dakota	-1.36	0.46	0.00	-0.22	0.00	-0.18	-0.32	-0.07
Ohio	-1.35	0.46	0.00	-0.22	0.00	-0.18	-0.32	-0.07
Oklahoma	-1.32	0.41	0.00	-0.23	0.00	-0.17	-0.33	-0.07
Oregon	-1.40	0.44	0.00	-0.24	0.00	-0.18	-0.35	-0.07
Pennsylvania	-1.34	0.46	0.00	-0.22	0.00	-0.17	-0.32	-0.07
Rhode Island	-1.41	0.47	0.00	-0.23	0.00	-0.18	-0.34	-0.07
South Carolina	-1.30	0.39	0.00	-0.23	0.00	-0.16	-0.33	-0.07
South Dakota	-1.27	0.43	0.00	-0.21	0.00	-0.16	-0.30	-0.07
Tennessee	-1.28	0.40	0.00	-0.23	0.00	-0.16	-0.32	-0.07
Texas	-1.30	0.46	0.00	-0.21	0.00	-0.17	-0.31	-0.07
Utah	-1.30	0.39	0.00	-0.23	0.00	-0.16	-0.33	-0.07
Vermont	-1.44	0.49	0.00	-0.23	0.00	-0.19	-0.34	-0.08
Virginia	-1.29	0.40	0.00	-0.23	0.00	-0.16	-0.32	-0.07
Washington	-1.22	0.40	0.00	-0.21	0.00	-0.16	-0.30	-0.06
West Virginia	-1.20	0.34	0.00	-0.22	0.00	-0.15	-0.31	-0.06
Wisconsin	-1.43	0.49	0.00	-0.23	0.00	-0.19	-0.34	-0.08
Wyoming	-1.13	0.33	0.00	-0.21	0.00	-0.14	-0.29	-0.06
Average	-1.29	0.40	0.00	-0.22	0.00	-0.16	-0.32	-0.07

Notes: Wages, Consumption, Housing, Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the dividend-income tax of the corresponding state.

Table 4b - Long-run Elasticities with respect to Dividend-Income Tax Rates

	LONG-RUN ELASTICITIES							
STATE	Tax Revenue	Wages	Population	Consumption	Housing	Public Good	Hours of Work	Welfare
Alabama	-1.10	0.25	-0.08	-0.21	0.05	-0.12	-0.28	0.00
Alaska	-1.34	0.46	-0.10	-0.21	0.06	-0.16	-0.31	0.00
Arizona	-1.30	0.39	-0.10	-0.22	0.06	-0.15	-0.31	0.00
Arkansas	-1.37	0.40	-0.10	-0.23	0.06	-0.16	-0.33	0.00
California	-1.40	0.41	-0.10	-0.24	0.07	-0.17	-0.34	0.00
Colorado	-1.35	0.41	-0.10	-0.22	0.06	-0.16	-0.32	0.00
Connecticut	-1.49	0.51	-0.11	-0.22	0.07	-0.18	-0.34	0.00
Delaware	-1.29	0.35	-0.09	-0.23	0.06	-0.15	-0.32	0.00
Washington DC	-1.32	0.36	-0.10	-0.23	0.06	-0.15	-0.32	0.00
Florida	-1.31	0.43	-0.10	-0.21	0.06	-0.16	-0.30	0.00
Georgia	-1.43	0.46	-0.11	-0.23	0.07	-0.17	-0.33	0.00
Hawaii	-1.18	0.21	-0.09	-0.24	0.06	-0.13	-0.31	0.00
Idaho	-1.45	0.46	-0.11	-0.24	0.07	-0.17	-0.34	0.00
Illinois	-1.45	0.51	-0.11	-0.22	0.07	-0.18	-0.33	0.00
Indiana	-1.41	0.47	-0.11	-0.22	0.07	-0.17	-0.32	0.00
Iowa	-1.37	0.47	-0.10	-0.21	0.07	-0.17	-0.31	0.00
Kansas	-1.51	0.52	-0.11	-0.23	0.07	-0.19	-0.34	0.00
Kentucky	-1.41	0.45	-0.10	-0.23	0.07	-0.17	-0.33	0.00
Louisiana	-0.87	-0.03	-0.07	-0.21	0.04	-0.07	-0.24	0.00
Maine	-1.54	0.51	-0.12	-0.24	0.07	-0.19	-0.35	0.00
Maryland	-1.39	0.44	-0.10	-0.22	0.07	-0.17	-0.32	0.00
Massachusetts	-1.58	0.52	-0.12	-0.26	0.07	-0.19	-0.37	0.00
Michigan	-1.46	0.51	-0.11	-0.22	0.07	-0.18	-0.33	0.00
Minnesota	-1.49	0.49	-0.11	-0.23	0.07	-0.18	-0.34	0.00
Mississippi	-1.32	0.39	-0.10	-0.22	0.06	-0.16	-0.32	0.00
Missouri	-1.32	0.44	-0.10	-0.21	0.06	-0.16	-0.30	0.00
Montana	-1.31	0.43	-0.10	-0.21	0.06	-0.16	-0.30	0.00
Nebraska	-1.56	0.54	-0.12	-0.23	0.08	-0.19	-0.35	0.00
Nevada	-1.24	0.38	-0.09	-0.21	0.06	-0.15	-0.29	0.00
New Hampshire	-1.49	0.52	-0.11	-0.22	0.07	-0.18	-0.34	0.00
New Jersey	-1.47	0.51	-0.11	-0.22	0.07	-0.18	-0.33	0.00
New Mexico	-1.34	0.40	-0.10	-0.23	0.06	-0.16	-0.32	0.00
New York	-1.51	0.51	-0.11	-0.23	0.07	-0.18	-0.34	0.00
North Carolina	-1.45	0.47	-0.11	-0.23	0.07	-0.18	-0.34	0.00
North Dakota	-1.47	0.51	-0.11	-0.22	0.07	-0.18	-0.33	0.00
Ohio	-1.46	0.50	-0.11	-0.22	0.07	-0.18	-0.33	0.00
Oklahoma	-1.42	0.45	-0.11	-0.23	0.07	-0.17	-0.33	0.00
Oregon	-1.51	0.49	-0.11	-0.24	0.07	-0.18	-0.35	0.00
Pennsylvania	-1.45	0.50	-0.11	-0.22	0.07	-0.18	-0.32	0.00
Rhode Island	-1.52	0.51	-0.11	-0.23	0.07	-0.19	-0.35	0.00
South Carolina	-1.40	0.43	-0.10	-0.23	0.07	-0.17	-0.33	0.00
South Dakota	-1.37	0.47	-0.10	-0.21	0.07	-0.17	-0.31	0.00
Tennessee	-1.38	0.44	-0.10	-0.23	0.06	-0.17	-0.33	0.00
Texas	-1.41	0.50	-0.11	-0.21	0.07	-0.17	-0.31	0.00
Utah	-1.40	0.43	-0.10	-0.23	0.07	-0.17	-0.33	0.00
Vermont	-1.56	0.54	-0.12	-0.23	0.07	-0.19	-0.35	0.00
Virginia	-1.40	0.44	-0.10	-0.23	0.07	-0.17	-0.33	0.00
Washington	-1.31	0.44	-0.10	-0.21	0.06	-0.16	-0.30	0.00
West Virginia	-1.30	0.38	-0.10	-0.22	0.06	-0.15	-0.31	0.00
Wisconsin	-1.55	0.54	-0.12	-0.23	0.07	-0.19	-0.35	0.00
Wyoming	-1.22	0.37	-0.09	-0.21	0.06	-0.15	-0.29	0.00
Average	-1.39	0.44	-0.10	-0.22	0.07	-0.17	-0.32	0.00

Notes: Wages, Consumption, Housing, Public Good, Hours of Work and Welfare represent elasticities of per capita values, while Tax Revenue and Population represent elasticities of state-level values, all with respect to the dividend-income tax of the corresponding state.

Table A1 - Descriptive Statistics

STATE	STATE-LEVEL DATA								
	Wage Tax	Dividend Tax	Property Tax	Sales Tax	Tax Revenue (CA=1)	Wage (CA=1)	Population (CA=1)	Housing (CA=1)	Tax Index (CA=1)
Alabama	0.40	0.40	0.50	0.04	0.08	0.74	0.13	0.16	0.73
Alaska	0.40	0.40	1.73	0.00	0.01	0.87	0.02	0.02	1.10
Arizona	0.44	0.44	0.85	0.06	0.13	0.82	0.18	0.21	0.94
Arkansas	0.47	0.47	0.81	0.06	0.07	0.68	0.08	0.10	0.98
California	0.48	0.48	0.82	0.06	1.00	1.00	1.00	1.00	1.00
Colorado	0.45	0.45	0.95	0.03	0.08	0.90	0.13	0.16	0.98
Connecticut	0.45	0.45	2.29	0.06	0.12	1.15	0.10	0.11	1.26
Delaware	0.46	0.46	0.68	0.00	0.02	0.94	0.02	0.03	0.89
Washington DC	0.47	0.47	0.65	0.06	0.01	1.45	0.02	0.02	0.91
Florida	0.40	0.40	1.31	0.06	0.31	0.79	0.50	0.66	1.03
Georgia	0.46	0.46	1.23	0.04	0.17	0.83	0.26	0.30	1.09
Hawaii	0.48	0.48	0.37	0.04	0.05	0.78	0.04	0.04	0.76
Idaho	0.48	0.48	1.10	0.06	0.03	0.66	0.04	0.05	1.09
Illinois	0.43	0.43	2.50	0.06	0.25	0.94	0.35	0.39	1.25
Indiana	0.44	0.44	1.57	0.06	0.13	0.74	0.18	0.20	1.13
Iowa	0.40	0.40	2.04	0.05	0.05	0.71	0.08	0.10	1.15
Kansas	0.47	0.47	2.02	0.05	0.06	0.73	0.08	0.09	1.24
Kentucky	0.46	0.46	1.12	0.06	0.08	0.72	0.12	0.14	1.06
Louisiana	0.40	0.40	0.24	0.04	0.09	0.76	0.12	0.14	0.55
Maine	0.49	0.49	1.68	0.05	0.03	0.70	0.04	0.05	1.23
Maryland	0.45	0.45	1.15	0.05	0.13	0.95	0.16	0.17	1.05
Massachusetts	0.46	0.52	1.48	0.05	0.18	1.09	0.18	0.21	1.18
Michigan	0.44	0.44	2.25	0.06	0.21	0.86	0.28	0.33	1.24
Minnesota	0.47	0.47	1.48	0.07	0.15	0.88	0.14	0.17	1.17
Mississippi	0.45	0.45	0.78	0.07	0.06	0.64	0.08	0.09	0.94
Missouri	0.40	0.40	1.40	0.04	0.09	0.76	0.16	0.20	1.04
Montana	0.40	0.40	1.34	0.00	0.02	0.64	0.03	0.04	1.02
Nebraska	0.47	0.47	2.84	0.06	0.04	0.70	0.05	0.06	1.34
Nevada	0.40	0.40	0.87	0.07	0.05	0.83	0.07	0.09	0.90
New Hampshire	0.40	0.45	2.74	0.00	0.02	0.87	0.04	0.04	1.25
New Jersey	0.44	0.44	2.67	0.07	0.25	1.07	0.24	0.26	1.28
New Mexico	0.46	0.46	0.84	0.05	0.04	0.72	0.05	0.07	0.96
New York	0.47	0.47	1.83	0.04	0.55	1.18	0.54	0.59	1.22
North Carolina	0.47	0.47	1.23	0.04	0.20	0.77	0.25	0.32	1.10
North Dakota	0.44	0.44	2.29	0.05	0.01	0.65	0.02	0.02	1.24
Ohio	0.44	0.44	2.13	0.06	0.22	0.79	0.32	0.37	1.22
Oklahoma	0.47	0.47	1.15	0.05	0.06	0.70	0.10	0.12	1.07
Oregon	0.49	0.49	1.31	0.00	0.06	0.78	0.10	0.12	1.15
Pennsylvania	0.43	0.43	2.27	0.06	0.25	0.86	0.35	0.41	1.23
Rhode Island	0.47	0.47	1.87	0.07	0.02	0.82	0.03	0.03	1.24
South Carolina	0.47	0.47	0.93	0.05	0.08	0.70	0.12	0.16	1.02
South Dakota	0.40	0.40	2.12	0.04	0.01	0.63	0.02	0.03	1.16
Tennessee	0.40	0.46	1.12	0.07	0.09	0.77	0.17	0.21	1.01
Texas	0.40	0.40	3.00	0.06	0.30	0.88	0.66	0.73	1.26
Utah	0.47	0.47	0.93	0.05	0.05	0.73	0.07	0.07	1.02
Vermont	0.48	0.48	2.53	0.06	0.02	0.73	0.02	0.02	1.32
Virginia	0.46	0.46	1.08	0.04	0.16	0.91	0.21	0.25	1.04
Washington	0.40	0.40	1.34	0.07	0.14	0.89	0.18	0.21	1.04
West Virginia	0.45	0.45	0.76	0.06	0.04	0.67	0.05	0.06	0.92
Wisconsin	0.47	0.47	2.80	0.05	0.13	0.75	0.15	0.19	1.33
Wyoming	0.40	0.40	0.84	0.04	0.01	0.78	0.01	0.02	0.88
Average	0.45	0.45	1.49	0.05	0.13	0.82	0.16	0.19	1.08

Notes: CA=1 means that the numbers have been adjusted with respect to the State of California. All variables represent the state-level data, except for Tax Index that has been calcualted according to the model.

Table A2 - Population Regression Results

Regression Results		Implied Welfare Shares	
	Dependent Variable: Population Ratio		Due to $\phi^C + \phi^L + \phi^P + \phi^N = 1$
$\frac{\phi^C}{\phi^L + \phi^P}$	0.17 [0.16,0.17]	ϕ^C	0.12
$\frac{\phi^L}{\phi^L + \phi^P}$	0.87 [0.87,0.87]	ϕ^L	0.64
$\frac{\phi^P}{\phi^L + \phi^P}$	0.13 [0.13,0.13]	ϕ^P	0.10
$\frac{\phi^N}{\phi^L + \phi^P}$	0.19 [0.19,0.20]	ϕ^N	0.14
R-Squared	0.99		
Sample Size	65,025		

Notes: Values inside of the brackets represent 95% confidence intervals. Estimation is by restricted least squares. The regression includes a constant that is not shown here.

Table A3 - Tax Revenue Regression Results

	Dependent Variable: Tax Revenue Ratio	
	Restricted Regression	Unrestricted Regression
	(1)	(2)
Coefficient of Right Hand Side	1.00 [1.00, 1.00]	0.97 [0.96,0.97]
R-Squared	0.93	0.93
Sample Size	65,025	65,025

Notes: Values inside of the brackets represent 95% confidence intervals. Restricted regression is by restricted least squares, while unrestricted regression is by OLS. All regressions include a constant that is not shown here.

Table A4 - Trade Regression Results

	Dependent Variable: Trade Ratio					
	Restricted Regression			Unrestricted Regression		
	(1)	(2)	(3)	(4)	(5)	(6)
Coefficient of Population Ratio	1.00 [1.00, 1.00]	1.00 [1.00, 1.00]		1.17 [1.15,1.18]	1.20 [1.18,1.21]	
Coefficient of Tax Ratio	1.00 [1.00, 1.00]		1.00 [1.00, 1.00]	0.97 [0.92,1.02]		1.67 [1.61,1.74]
R-Squared	0.45	0.44	0.05	0.45	0.44	0.05
Sample Size	65,025	65,025	65,025	65,025	65,025	65,025

Notes: Values inside of the brackets represent 95% confidence intervals. Restricted regression is by restricted least squares, while unrestricted regression is by OLS. All regressions include a constant that is not shown here.