
Tax Competition Among Local City Governments: Its Effects on the Choice of Tax Instruments

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Abstract:

Significant variation among cities' use of various tax instruments motivated this research. The proportion of total city tax revenue derived from property tax ranges from 6% in Columbus, Ohio to 98% in Providence, Rhode Island. Sales tax constitutes 70% of total city tax revenue in Colorado Springs while it only forms 6% of total city tax revenue in Tampa, Florida. Through empirical analysis on the tax data from the Census report on "Government Finances 1999", across city levels, there is a higher degree of diversification in the tax structure, in cities which levy high amounts of taxes, possibly due to the increasing marginal cost of utilizing the same tax instrument. Tax competition plays a crucial role in deciding the tax structure. The data suggests that the smaller a city is, the more vulnerable it is to cross-border shopping and migration effects and therefore, is more reliant on the least mobility-sensitive tax instrument -- the property tax.

Section I: Introduction

Significant variation among cities' use of various tax instruments motivated this research. The proportion of total city tax revenue derived from property tax ranges from 6% in Columbus, Ohio to 98% in Providence, Rhode Island. Sales tax constitutes 70% of total city tax revenue in Colorado Springs while it only forms 6% of total city tax revenue in Tampa, Florida. The vast difference between the ways cities employ tax instruments prompts the question: why? What are the individual circumstances of each city such that it taxes the way it does?

There is a great amount of literature related to tax systems. Researchers such as Frank Ramsey, John Green and David Wildasin investigated optimum taxation rules using consumer models while Charles Tiebout, Wallace Oates and Thomas Nechyba made studies into the issues of tax competition. The main conclusion of studies made regarding tax competition is that the attempt by local governments to attract businesses has resulted in inefficiently low levels of local public goods. In Nechyba's paper (1996), he tries to answer the following two questions:

“(i) why the property tax (rather than something like an income tax) has become the primary local tax strategy...(ii) why, when confronted with political pressures against the property tax, local governments leave the response to states and stubbornly refuse to change their local tax apparatus.”

His model, in which the choice of tax systems is endogenized, draws heavily on the idea of tax competition in the presence of consumer mobility as well as the role of heterogeneous agents endowed with income that is mobile and houses that are not. He showed, through computer simulations, that due to the relative immobility of the property tax base, it is a dominant strategy for local governments to set income tax rates to zero and focus on property taxation. This explains why city governments are stubborn to changes, despite the complaints of local residents regarding high property taxes.

However, although the property tax tool is a very popular tax instrument among local governments, as mentioned in the first paragraph, there is significant variation among the proportion of total city tax revenue that property tax forms. My objective in this paper is to investigate empirically the endogenous development of local tax systems in the presence of tax competition. The mobility factor plays a crucial role in tax competition. My hypothesis is that the bigger a city is, the less vulnerable a city is to capital and labor migration and cross-border shopping issues and hence, is less reliant on the relatively mobility-insensitive tax instrument, the property tax. This paper pivots on the assumption that the government actively decides how to use the various tax instruments available. The government has to take into account the various socio-economic factors and decide how much taxes to levy in each category.

Note must be taken that this paper does *not* focus on absolute tax rates. As you read this paper, think how *heavy* and not how much, although they are related to a certain extent. How much is complicated by factors like inter-government grants and public programs. This is crucial because we are primarily interested in how the government splits the pie and not the size of the pie. High levels of taxation do not necessarily mean high reliance. For example, a city may tax heavily on sales but if the revenue derived from sales taxes forms only a small percentage of total tax revenue, the city's reliance on sales taxes is low but high on other tax instruments. The objective is to identify regularities in the way the local government diversifies its tax revenue.

This paper is divided into 6 sections. The next section presents some summary statistics of 86 cities around the 48 contiguous states. Section III provides a background on the history of the development of the tax system in the United States. Section IV talks about the general considerations when deciding the tax structure of a city and introduces the hypotheses of interests. Section V makes an empirical response to these hypotheses. Section VI concludes the paper.

Section II: History of Federal, State and Local Taxes in the US

The local tax system is undeniably not completely independent of state and federal tax policies. Although the focus of this paper is on the tax system of city governments, it might be informative to take a look at how the tax system, as a whole, evolved through history. The tax system of the US has undergone many changes in the nation's history. From not having to pay any income taxes during colonial times, one may experience an income tax rate as high as 40% now, depending on which tax bracket he falls in. Real property tax, in contrast, has a long history in the tax system of the United States.

During the colonial times, the colonial governments had only a limited need for revenue, and each of the colonies imposed different types of taxes. For example, the southern colonies taxed imports and exports, the middle colonies at times imposed a property tax and a "head" or poll tax levied on each adult male. The Massachusetts Bay Colony began taxing settlers who owned property in 1646.

After the revolution, the new American government relied on donations from the states for its revenue. Each state was a sovereign entity and could tax as it pleased. Traders from other countries found 13 sets of import tariffs, and the states even imposed taxes on goods imported from other states. When the Constitution was adopted in 1789, the Federal Government was granted the authority to raise taxes. Congress passed excise taxes on distilled spirits, tobacco and snuff, refined sugar, carriages, property sold at auctions, and various legal documents. High customs duties and the sale of public land were the main source of revenue. The states, however, retained the right to impose any type of tax except those taxes that are clearly forbidden by the United States Constitution and their own state constitution. After independence, property tax became widely-used in many states.

It was only during the civil war when congress began taxing people on their income. Personal income taxes were based on the taxpayers' ability to pay, and incomes between \$600 and \$10,000 were taxed at 3 percent, while higher incomes were taxed at 5 percent. The need for Federal revenue sharply declined after the War and most taxes were repealed. The income tax was abolished in 1872.

In 1894, a tax was passed on personal income to be effective from January 1, 1895, through January 1, 1900. Unlike the earlier income tax, which used the progressive rate system, this tax used a flat rate system of 2 percent on all taxable income. In 1895, the Supreme Court ruled that the income tax was unconstitutional because it was not apportioned according to the population in each state. High tariffs remained from 1896 until 1910. The War Revenue Act of 1899 sought to raise funds for the Spanish American War through the sale of bonds, taxes on recreational facilities used by workers, and taxes were doubled on beer and tobacco. A tax was even imposed on chewing gum. The Act expired in 1902. People were becoming more aware that high tariffs and excise taxes fell heavily on the less affluent. An income tax became more appealing to southern and western members of Congress. Their pressure led to the income tax as we know it today. By 1913, a total of 36 States ratified the 16th Amendment, making it part of the

Constitution. In October, Congress passed a new income tax law, using the progressive rate system and based on the ability to pay. Less than 1 percent of the population was required to pay income taxes then.

The entry of the United States into World War I greatly increased the need for revenue. The 1916 Revenue Act imposed taxes on estates and excess business profits. Another revenue act was passed in 1918, which taxed incomes of more than \$1 million at a rate of 77 percent. Still only 5 percent of the population had to pay income taxes.

Until the 1930s, most state and local government revenue came from taxes on property. In 1927, for example, property taxes accounted for more than 90 percent of state and local tax revenue in the state of Washington.

The Federal income tax system was significantly affected by World War II. The need for high defense spending led to passage in 1940 of two tax laws that increased individual and corporate taxes. Changes in tax laws did more than simply increase revenues. They expanded the tax base to include all but the lowest-paid workers. Between 1939 and 1945, the number of taxpayers grew from 4 million to 43 million.

Throughout the 1930s and 1940s, personal income tax and sales tax were introduced in many states because additional revenue was needed to finance public services. For instance, income tax became a regular income tax in Maryland only in 1937. As time passed, local communities took over the power to tax property.

Among the common types of taxes that many states impose are personal income tax, corporate income tax, sales tax, and real property tax. Today, property tax is usually paid to a local government, a school district, a county government, or a water district, but not to a state. However, dissatisfaction with the high property taxes brought about state caps on local property taxes in many states such as Illinois, Michigan and California. Subsequent tax reforms like the Tax Reform Act of 1986 and the recent Bush Tax cut also greatly affected the tax policies at the federal, state and local levels.

As seen from the above description, the tax structure of the United States has changed significantly over the history of the nation. From not having to pay any income tax to having to consult income tax filing firms, and the shift in the use of the property tax tool from the state to the local government, tax composition has swerved from one end of the spectrum to another. Changes arise due to political developments, social opinions and perhaps more recently, as tools to stimulate or rather to control the economy. It can be said that both historical and current political and economic factors shaped the tax structure we have today. In the next section, I will focus on the tax structure at the city level. How do city governments across the country employ the various tax instruments? Are there significant differences, if any, between them?

Section III: Data and Summary Statistics of City Taxes

The city government has 2 major means of generating revenue, namely taxes and intergovernmental transfers. The amount and proportion of revenue originating from other levels of governments varies significantly from city to city. For example, grants from the state and federal government constitutes about a quarter of total revenue of Pittsburgh (\$128,968 out of \$506,861) in 1999 while only 15% of Columbus's total revenue come from intergovernmental transfers (\$130,415 out of \$874,706) in 1999. The cities finance the remaining portion of the budget mostly via taxes. The question of interest in this paper is, with a revenue target in mind, how do city governments split this target among the various tax instruments available?

The tax shares data that are presented below are obtained from the report, "Government Finances 1999" published by the Census Bureau in September 2001. I employ the following selection criterion when choosing the cities to be included in the study. Every city has a population of 100,000 or more. Also, each city belongs to a county with a total population of 200,000 or more. The criteria ensure that the communities included in this study are relatively developed, well-populated cities. I chose the 3 most populated cities in each of the 48 contiguous states and eliminated those that did not satisfy the preceding two criteria. Although possible, the migration effects involving Alaska and Hawaii are assumed to be minimal and hence are left out of the study.

It must be noted that local government structure varies across urban areas. Cities like Pittsburgh which is part of only one county (Alleghany) may play different roles than cities like New York City which spans more than one county. Investigation of effects of governmental structure of tax composition is beyond the scope of this study.

Table 1, Summary Statistics of Tax Shares

	Mean	Median	S.D.	Min	Max	Q1	Q3
Per capita Tax (\$)	626.3	524.4	365.4	202.2	2902.0	415.8	730.0
Property Tax Share	52.87	52.58	28.51	6.54	100.00	29.39	77.82
Income Tax Share	7.81	0.00	19.00	0.00	85.31	0.00	0.00
General Sales Tax Share	17.05	0.00	24.08	0.00	80.78	0.00	29.24
Selective Sales Tax Share	12.77	10.87	11.84	0.00	54.94	2.75	17.73

Number of cities = 86

The histograms of the tax shares are shown in figure 1. Table 1 summarizes the data. Note that sales tax is divided into 2 categories – General Sales Tax and Selective Sales Tax. General Sales taxes are applicable, with only specified exceptions, to all types of goods and services whether at a single rate or at classified rates. Taxes imposed distinctly upon goods and services such as alcoholic beverages and tobacco products are categorized under Selective Sales Tax. Tax shares are calculated as a percentage of total taxes levied by the city.

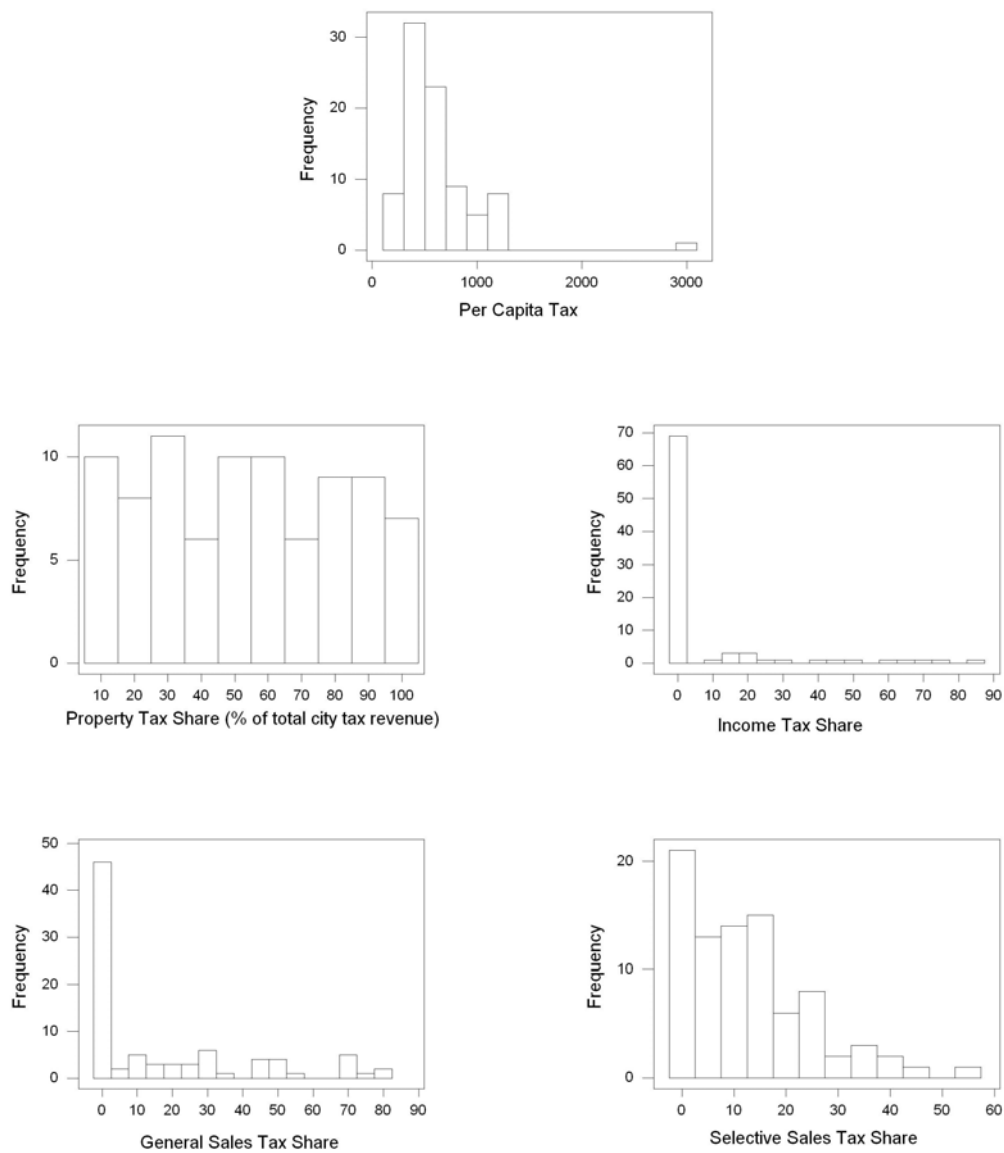


Figure 1, How city governments divide the tax structure

Looking at taxes levied at the city level, on average, each person pays about \$626.30 a year in taxes to the city government. As we can observe from the high standard deviation, there is a wide variation in the amount of taxes city government levy. The highest amount of per capita taxes (which is many times others') is being levied by the New York City government. On average, each resident paid \$2900 of taxes in the year 1999. The amount of taxes paid is primarily affected by the amount of inter-government grants and the needs of the public programs administered by the city government. These two factors however, have opposing effects on the city government budgets.

With the exception of property tax share, the distributions of the other 3 instruments (namely income tax, general sales tax and selective sales tax) are all skewed towards the left. In particular, the high concentration of tax shares at 0% for income tax share and general sales tax share shows that most cities do not levy much income and general sales taxes at a local level. Although less skewed, selective sales tax, in general, forms a fairly low (around 13%) proportion of total city tax revenue. Property tax share, however, has a rather flat distribution, indicating a wide degree of variation in the extent cities employ property taxes.

The high standard deviation observed in the various tax shares is what motivated this research. From the summary statistics, we can see that the average standard deviation for the 4 instruments is around 20%. What makes some cities different from the others? Why does a particular city tax the way it does?

The government has to take into account the various social, economic and political factors and decide how much taxes to levy in each category and yet, being able to attain the target revenue for the next fiscal year. This naturally prompts the question, how do cities tax such that the objective revenue is met? One thing for sure, the government cannot merely throw a dice and decide say, "50% of our revenue will come from property tax".

Section IV: Taxation Considerations

This section touches on the issues that the local government may be concerned with when fixing the tax structure. I categorize them into considerations related to (i) tax burden, (ii) equity, (iii) politics, (iv) administrative feasibility and (v) tax competition.

I. TAX BURDEN CONSIDERATIONS

It is a well-known fact that taxation causes deviation from the market equilibrium and distorts consumption behavior. A simple graphical analysis reveals the tax burden on the society. As shown in figure 2, the wedge in between the relative prices of the buyers and the sellers constitutes the dead-weight loss to the economy. The division of this excess burden between sellers and buyers depends on the relative magnitudes of supply and demand elasticities.

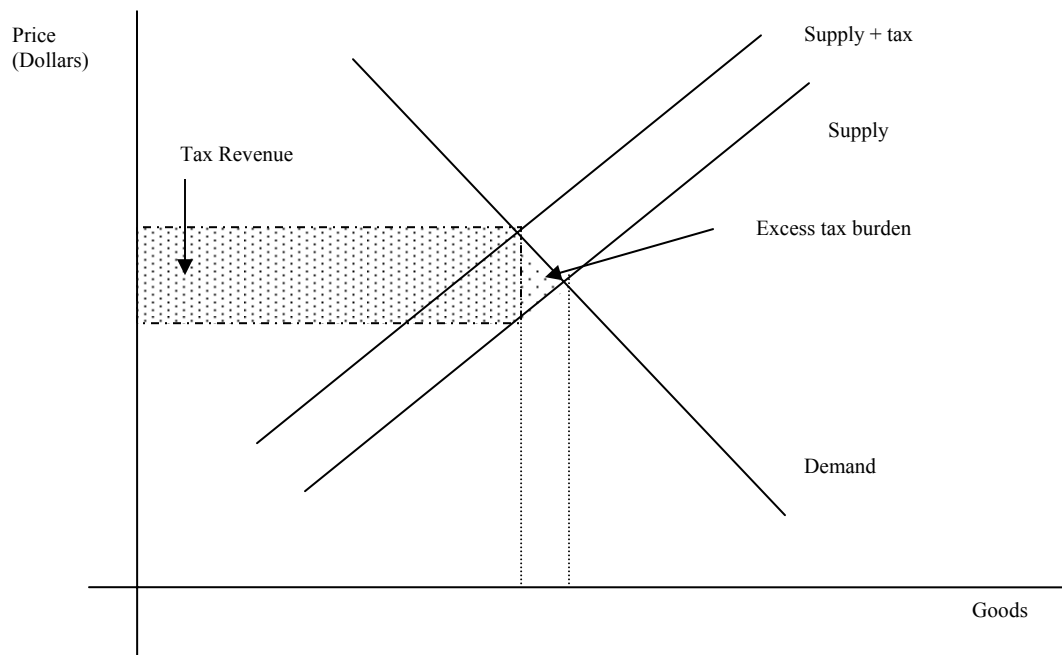


Figure 2, The Burden of Taxes

Note that regardless of the type of goods and taxes, the marginal increase in taxation level always results in a higher marginal increase in taxation-induced dead-weight loss. This is true as long as neither supply nor demand is perfectly inelastic. This gives rise to hypothesis I:

Hypothesis I

Effects of dead weight loss:

The higher the amount of the taxes generated, the more diversified the tax structure is.

All other things being equal (neglecting effects of politics), a particular instrument should be used to the point where for the same unit of increase in benefit, its marginal cost is equal to that of the other instruments available. That is to say, due to the increasing nature of the dead-weight loss with the amount taxed, when the revenue collected increases beyond a certain limit, the government will have an incentive to turn to other tax instruments to achieve an efficient equilibrium.

The remaining part of this section focuses on the effects of employing various tax instruments on the economy, in particular, production levels and investments habits.

Personal Income Tax

Like most taxes, the introduction of income tax causes distortion in choices from the efficient market equilibrium. In the remaining of this section, I will discuss the effect of income taxation on production.

Income tax undeniably makes an extra unit of leisure more attractive than it is before. However, that does not necessary mean that there would be a decrease in the individual choice of work hours. The income tax sets up both income and substitution effects, which act in opposite directions. It cannot be determined unequivocally whether there will be a loss in the number of work hours.

The decrease in per-hour opportunity cost of leisure constitutes the substitution effect. Each unit of work gives a lower return, making it less remunerative. Thus, there is incentive for the individual to substitute an extra unit of work by a unit of leisure. This represents a potential loss in output of goods and services.

On the other hand, the tax-induced decline in wages introduces the income effect. The income effect works in the opposite direction. The reason is that income tax reduces income at all levels of work. This results in a decrease in consumption of all normal goods, including leisure, which is likely to be a normal good for most people. It follows, therefore, that the number of hours worked must increase. It can be said that when the hourly wage decreases, one will work harder to maintain his previous level of income, resulting in an overall increase in labor hours.

Hence, the eventual effect on work effort depends on the relative magnitudes of substitution and income effects. If the former outweighs the latter, an individual will consume more leisure than before and we will observe an overall decline in work hours in the economy. If the income effect is stronger, there will be a loss in work hours. An empirical study done by Jerry Hausman¹ estimates that, on average, taxes on labor income cause an 8 percent reduction in hours worked. This shows that the real effect of income taxes results in an efficiency loss from productivity.

¹Jerry A. Hausman, "Labor Supply," in *How Taxes Affect Economics behavior*, eds. Henry J. Aaron and Joseph J. Pechman (Washington, D.C.: The Brookings Institution, 1981)

Depending on the elasticity of the supply and demand of labor, the employer, the employee or both may bear the burden of income taxes. As long as the supply of labor is not completely inelastic, income taxes will inevitably increase before-tax wages and decrease the after-tax wages.

The income tax is also used as a tool to reduce income disparity. Following the ability-to-pay principle, a progressive tax system makes the rich pay significantly more in income taxes than the poor. The argument is that imposing any taxation on the poorer members of the communities will generally lower both the efficiency of adults and the future efficiency of children, as mentioned in the previous section.

The Laffer curve

Since income taxes influence the incentives to work, increases in income tax rate can, therefore, reduce, rather than increase, revenues collected. Conversely, it is possible that reducing income tax rates can result in a higher amount of taxes collected.

This concept is captured by the Laffer curve, conjectured by the economist Arthur Laffer in the late 1970s. We first define the elasticity of the tax base, E_T , as the ratio of the percentage change in the tax base attributable to any given percentage change in the tax rate applied to that base:

$$E_T = (\Delta B / B) / (\Delta t / t)$$

where B is the tax base in dollars and t is the rate of taxation.

Referring to figure 3, the hypothesis underlying the curve is that before a critical point on the curve, the income tax base is inelastic with respect to the tax rate. As tax rate increases, the total amount of revenue increases. Beyond the critical point, however, the tax base becomes elastic and increases in the tax rate causes a greater than proportional decrease in the tax base, resulting in a net decrease in the amount of revenue collected.

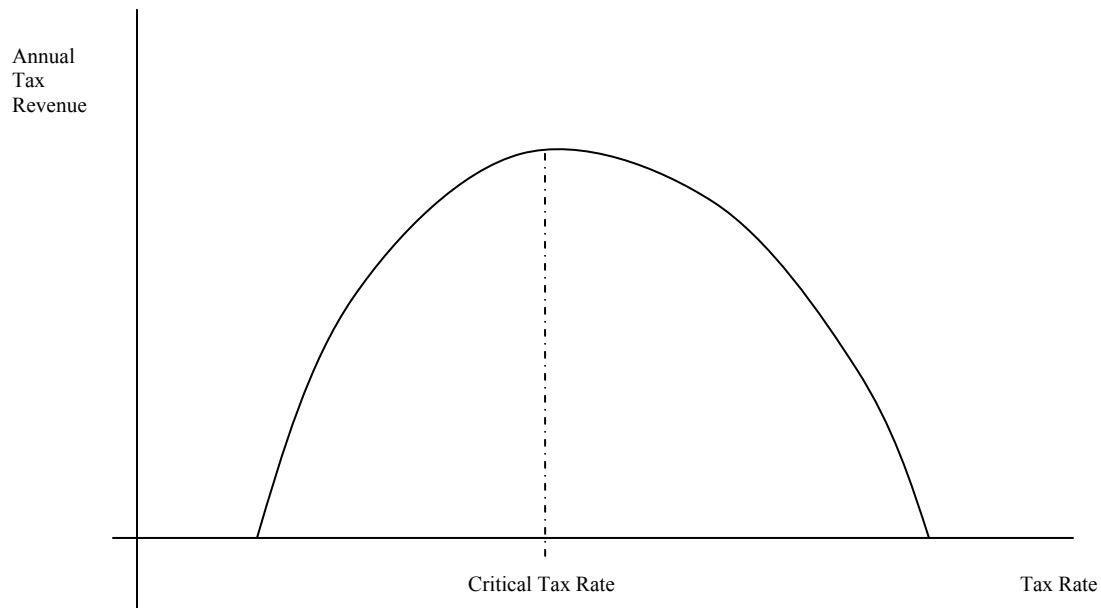


Figure 3, The Laffer Curve

Property Taxes

As we have seen in section III, all city governments included in this study employ the property tax tool and there is considerable variation in the rates of taxation among them. Property taxation has a direct impact on the land owners. Valuation of property for tax purposes normally incorporates the land value and the value of the structure built on the piece of land. Although the land is immobile, the amount of investment on the construction may vary with property tax rates.

When the supply of savings is elastic, other things being equal, local governments where property tax rates are higher than the national average can expect a reduction in local investment and vice versa. Investment would be reallocated to lower-tax regions. This may result in lower productivity and eventually lower wages.

Property tax also decreases the value of a taxed asset such that the new value reflects the discounted present value of future tax liability of its owners. This is known as tax capitalization. There is a discount in the price of the taxed assets that adjusts the annual market return of the asset to a level that is competitive with other assets not subject to the tax. One effect of this decreased return to property is the decrease in the quantity of housing supplied which would cause an increase in housing rents.

Empirical analysis suggests that property tax in the United States tend to reduce the return to capital in all uses. Local communities with property tax rates higher than the national average experience declining investments, lower land rents and lower wages but higher prices of goods and services.²

Obviously, land can't shift out of a city. Imagine an auditor working in Wall Street. Although he may save on property taxes or pay lower rents by staying outside the city, the disincentives of commuting in and out of Manhattan may be just too great to justify it. The bottom line here is that property tax base is not as sensitive to tax competition as the other tax bases, which probably explains its wide use by local city governments.

² Refer to Wallace E Oates, "The Effects of Property Taxes and Local Public Spending on Property Values: An empirical Study of Tax Capitalization and the Tiebout Hypothesis," *Journal of Political Economy* (Nov-Dec, 1969) and David E. Black, "Property Tax incidence: The Excise Tax Effect and Assessment Practices," *National Tax Journal* 30 (Dec 1977) pg 429 – 434

Sales taxes

The *ad valorem* nature of sales taxes causes the pyramiding of taxes upon taxes, which are then passed over to the consumers. A simple example can be illustrated by say, the production of an office swivel chair. The intermediate raw materials required for manufacturing the chair, like screws, plastic covers etc. are bought at an after-taxed price. At the chair-building factory, the marginal cost increases and the retail price reflects an amount that is taxed twice. This pyramiding nature of the sales tax makes tracking the effects of sales taxes an administrative challenge for the local governments.

The impact of local sales taxation may possibly be a loss of retail trade to neighboring cities, where sales tax is applied at a lower rate. The migration of retail sales can cause a reduction in employment and business profits in the taxing jurisdiction, therefore affecting the rate of growth in the local economy. This brings us back to the concept of a Laffer curve, where the tax base is elastic to the sales taxation rate. That is, increases in the rate of sales taxation may result in less revenue collected.

The sales tax is likely to distort the pattern of consumption, especially in the case of excise taxes, which are levied on certain types of consumption activities. Some excise taxes are designed to raise revenue, while others are intended to discourage particular consumption activities. Excise taxes on tires, for example, are principally designed for raising revenues while taxes on alcohol are intended to discourage liquor consumption, although they raise a significant amount of revenue. This distortion in consumption behavior results in efficiency losses to the economy, due again to the tax wedge between the relative prices.

A common criticism of the sales tax is the regressive nature with respect to income. This is based on the notion that annual expenditures, as a percentage of annual income, is higher for low-income individuals than that of the richer taxpayers. There is nevertheless much controversy with regards to the regressiveness of the sales tax. While Perchman (1985) supports this idea, Browning (1978) argued that the sales tax are not necessarily reflected in higher prices of goods and services, and that a significant proportion of the tax burden is actually borne by the sellers. In parallel to this controversy, most state and local governments also take the middle ground, selectively exempting necessities from the sales tax while taxing on other retail sales.

II. EQUITY CONSIDERATIONS

Having established the fact that government taxation causes losses in efficiency in the market, the next appropriate question to ask perhaps, is: “how should this burden be distributed?” Two principles are generally considered, namely the Benefit Principle and the Ability-to-Pay Principle.

The former argues that the means to financing public good and services should be tied to the benefits that each individual citizen receives. That is to say, each person pays according to how much they use or require. The advantage of this principle is that the cost per unit of public goods equals the marginal benefits of those goods and services. However, the full advantage can only realize if no free-loaders exist. When the government provides public goods and services collectively, it is hard to tailor the charges according to the needs of every individual. A rather extreme example would be say paying the salary to the mayor. How much are you willing to pay as an individual for the mayor’s effort in providing public goods?

The Ability-to-Pay Principle believes that taxes should be distributed according to the ability of the tax-payers to pay for them. The problem with this approach is that the entire society has to collectively come to a consensus as to what is the appropriate measure of economic capacity (and “sacrifices”) to pay for the taxes. Getting people to objectively agree to a particular standard is a big challenge when applying such a principle.

III. POLITICAL CONSIDERATIONS

Obviously, living in a democratic world like ours, deciding the tax structure is not merely a welfare or efficiency maximizing problem. A political equilibrium is achieved every election where there is an agreement on the amount of public goods to be supplied (or at least claims to be) and the taxation system among the individuals. Majority rule will produce the median-most preferred outcome. The political process is more complicated than a welfare or efficiency maximizing problem. The taxation system that results, therefore, might not be as efficient as it could be.

Besides the influence of the democratic process, the city taxation system is also vastly affected by the other levels of government. How a city taxes its citizens depends very much on how much intergovernmental transfers there are and how the state and the federal government taxes the same tax base. Also, tax caps like the ones imposed by California and Michigan might play a pivotal role in a city's tax structure. Federal agenda, such as the Bush tax cuts, may limit the local government's control on local tax systems.

IV. ADMINISTRATIVE CONSIDERATIONS

When deciding how to tax a city, there is a simple, more practical administrative consideration – tax evasion. There are basically 3 techniques of tax enforcement used in the United States. The most commonly-used technique is *voluntary tax payer compliance*. This is employed in personal income taxes, which forms a significant proportion of the government total revenue. The second technique is *auditing*, used as a means for checking on corporations. The last technique, *on-the-spot taxation* is employed in sales taxes when tax deductions are made at the moment of trade.

The tools mentioned are definitely not foolproof. If we look at the tax instruments individually, there are problems of tax evasion and tax avoidance with the current income tax filing system. The administration and policing of the property tax is not easily managed. Determining the value of wealth that is infrequently traded is one of the most difficult aspects of property taxation. Accurate assessment should closely approximate the market value of an asset but how to go about doing that is a complicated issue. Also, although the enforcement of sales tax may appear relatively simple, the regressive nature of the tax prevents it from being over-exploited.

V. TAX COMPETITION CONSIDERATIONS

Since the mid-1980s, there has been an outpouring of academic research on theories of tax competition. For the purpose of this paper, I shall concentrate on research that is applicable to competition between city governments, as opposed to international tax competition. A significant amount of research is done on tax competition between European Countries resulting in less than efficient taxation levels. For competition among local jurisdiction, which is the focus of my project, the main concern in the literature so far is that local governments, in an attempt to attract business capital, may engage in wasteful tax competition. Local officials may withhold public spending, especially on programs that do not directly benefit businesses, such that marginal benefit is greater than marginal cost. They factor into the marginal costs equation, the costs arising from the negative impact of taxation on business investment, such as lower wages and employment levels, capital losses on homes and other assets, and reduced tax bases. The existence of tax competition is revealed by cities giving subsidies to corporations, in the hope of influencing plant location decisions. There have been differing opinions, nevertheless, from the vast amount of literature, on the efficiency of tax competition.

The Tiebout Model

The first of such literature regarding the efficiency of tax competition is arguably the “Tiebout Hypothesis” conjectured by Charles Tiebout in 1956. In the Tiebout model, individual households shop for a community of residence that most closely matches their demand of public goods. The equilibrium condition from tax competition between jurisdictions is the pareto-efficient outcome where the “tax-price” is equal to the marginal cost. Each region must keep their taxes low enough to induce individuals to reside in the region, given the public goods that are being provided. This marginal-cost-pricing rule results in efficient migration decisions, analogous to competition in a conventional market.

Competition for Capital

However, Oates (1981) comments, “The pure model (the Tiebout model), however, involves a set of assumptions so patently unrealistic as to verge on the outrageous”, clearly shows his disagreement with the Tiebout model. Oates’ argument rests on the idea that when all governments engage in tax competition, no one gains a competitive edge. Thus all communities are worse off than they would have been if local officials had not factored in the negative impact of taxation into the cost function. Following Oates’ criticism on the naïve-ness of the Tiebout model, researchers like Zodrow and Mieszkowski (1986), and Wilson (1986) made studies into the effects of governments competing for business capital. The Zodrow and Mieszkowski model (in which capital is mobile while labor is not) finds that tax competition among local jurisdictions leads to under-provision of public services when financed with a tax on mobile capital.

Introduction of labor mobility

Subsequent work by Bruecker (1999) and Wilson (1995) added the element of labor mobility to their models but that did not change the conclusion that tax competition can lead to inefficiently low levels of taxation. It must be noted, however, that certain groups of individuals do benefit more when tax competition exists.

Sales Tax competition

In 1986, Mintz and Tulken developed a model where competition between two regions are linked by cross-border shopping. Public good expenditure is financed by a tax on private good consumption, but only on an origin basis. By an origin basis, they mean that the government collects a uniform tax only on the output of domestic firms. As a result, residents can escape the tax by incurring transport costs necessary to cross the border and purchase the private good in the other neighboring region. The conclusion of their study is that the equilibrium is fully efficient, provided that transport cost are high relative to tax differentials. When this condition is not fulfilled, however, they showed that the low-tax region's tax rate is inefficiently low.

Choice of Tax Instruments

A common feature of most of the models used in tax competition literature is that each government independently chooses its tax or subsidy policies to maximize the welfare of the residents within its jurisdiction, and its choice affects the size of the tax bases available to other governments. As noted in the introduction, this forms a crucial assumption for the results of this paper to be conclusive.

Degree of mobility

Although there is no formal study done on the mobility of tax bases corresponding to the various tax instruments, the history of research in tax competition insofar has provided us some insights into the mobility relationship. In studies on tax competition, researchers started investigating competition for capital and then labor (which constitutes the base of income tax) and then cross-border shopping (which constitutes the base of sales tax). Both the order and amount of academic research reveals the researchers' perception of the mobility of the various tax instruments. It can be concluded that property tax competition is much neglected simply by the virtue of fact that it is not as mobile and not as susceptible to tax competition among jurisdictions.

Mobility Increases

Property Tax Base ----> Sales Tax Base ----> Income Tax Base

Computer simulations ran by Nechyba(1996) showed that due to the relative immobility of the property tax base, it is a dominant strategy for local governments to set income tax rates to zero and focus on property taxation. In addition, Nechyba mentioned that this

property holds when there do not exist cultural or legal barriers. Deviation from this dominant strategy would result in a negative impact on the community's income, property values, wealth and public good levels. While it is conceivable that countries present such legal and cultural barriers, the effects of such barriers should diminish when we are looking at competition between city governments. If city governments are more susceptible to the effects of migration, as proposed by Nechyba, we should expect to see the use of local property tax as a dominant strategy in obtaining tax revenue.

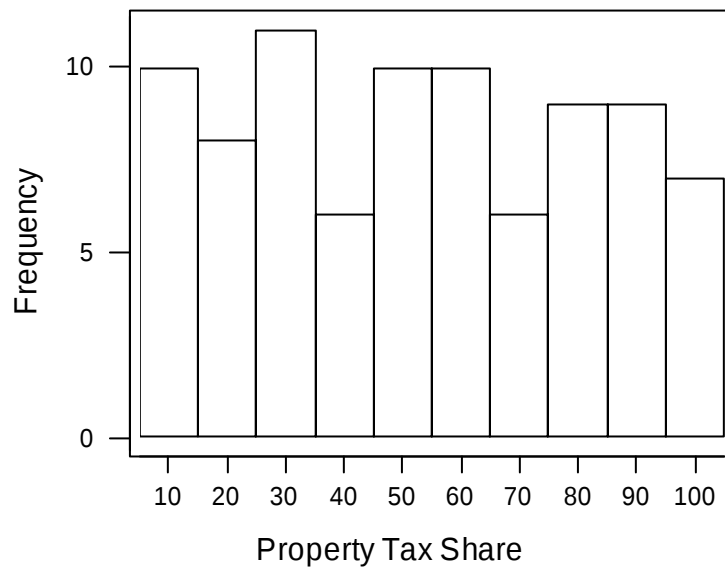


Figure 4, Distribution of Property Tax Shares of City Governments

Table 2, Descriptive Statistics of Property Tax Shares

	Mean	Median	S.D.	Min	Max	Q1	Q3
Property Tax Share	52.87	52.58	28.51	6.54	100.00	29.39	77.82

No city has a zero reliance on property tax, an observation which is in line with the strategy. Hypothesis I suggests that for efficiency, it may not be wise to depend entirely on a particular tax instrument. However, if local city tax structure were to be influenced by the threat of migration, we should expect to see a graph that is skewed slightly towards the right, at least, if cities were to follow the dominant strategy developed by Nechyba.

Instead, we obtained a moderately flat distribution across these 87 cities. Property tax revenue comprises of less than 30% of total tax revenue in almost one-third of the cities. Columbus in Ohio has only 6.54% of its revenue coming from property taxes while Paterson in New Jersey depends entirely on tax from property. Why the stark contrast? The next two hypotheses attempt to answer this question. Is there any difference between the effects of migration felt by the cities? Are some cities more tolerant to migration effects than others?

As Nechyba has mentioned in his paper, “as the costs to mobility rise, the significance of the conclusions in his paper falls.” Legal and cultural differences may set up barriers to migration. He also added that his theory would therefore be more applicable to competition among local jurisdictions. Yet, we do not observe a consistent dominant strategy among all the cities. I propose that the vulnerability of a city to the effect of migration is influenced by the size of a city and the percentage of a metropolitan area that the city resides in.

HYPOTHESIS II

Effects of city size on migration:

The smaller the city, the higher the reliance is, on the least mobility-sensitive tax—the property tax.

HYPOTHESIS III

Effects of the land and population proportion of a metropolitan area:

The bigger the proportion of a metropolitan area a city occupies, the more reliant it is on the least mobility-sensitive tax—the property tax.

Section V: Responses to the Hypotheses

HYPOTHESIS I

Effects of dead weight loss:

The higher the amount of the taxes generated, the more diversified the tax structure is.

Basic Methodology

Two approaches are used to investigate hypothesis I.

(i). the number of tax instruments used

(ii). the Herfindahl-Hirschman Index

- (i) Under the Census Bureau classification, the 5 tax instruments are income tax, property tax, general sales tax, selective sales tax and others. Figure 5 shows the distribution of the number of instruments used by the cities under study. The majority of the cities employ 3 or 4 instruments. Under the hypothesis, to minimize the amount of dead weight loss, the higher the per capita tax levied, the greater the number of instruments employed by the local government. That is, we should expect a positive correlation between per capita tax and the number of instruments used.
- (ii) The second approach, using the Herfindahl-Hirschman Index (HHI), provides a finer measure of the diversification of the tax structure. The argument against approach (i) is that the degree of diversification of a city, that uses all 5 instruments but heavily relies on only one of them, should not be evaluated as being identical to that of another city whose tax structure is equally distributed. Here, we borrow a concept that commonly used to measure market concentration. It is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. For example, for a market consisting of five firms with shares of forty, thirty, fifteen, ten and five percent, the HHI is 2850 ($40^2 + 30^2 + 15^2 + 10^2 + 5^2 = 2850$).

The HHI takes into account the relative size and distribution of the firms in a market and approaches zero when a market consists of a large number of firms of relatively equal size. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases.

For the purpose of this paper, we are primarily concerned with the disparity in size which refers, in our context, to the disparity in tax shares since the number of instruments (analogous to the number of firms) is limited between 0 and 5. As the disparity in tax shares increases, the HHI increases. A more diversified tax structure would necessarily mean a lower average disparity

among the tax shares. Hence, under hypothesis I, the higher the per capita tax, the lower the Herfindahl-Hirschman Index.

$$HHI = \sum_i (taxshare)^2 \quad \text{for every tax instrument } i.$$

By using the HHI, the second approach introduces a continuous measure of diversity as opposed to the discrete levels used by Approach (i). Figure 6 shows the distribution of HHI across the cities.

The Model

Approach (i)

$$\ln(NumTaxInstrumts) = \alpha + \beta(StateTaxCap) + \delta R' + \phi \ln(TaxIncProportion) \quad (1)$$

Approach (ii):

$$\ln(HHI) = \alpha + \beta(StateTaxCap) + \delta R' + \phi \ln(TaxIncProportion) \quad (2)$$

Regression equations (1) and (2) show the basic methodology used to identify correlation between the amount of tax burden and the degree of diversification in the tax structure. The dependent variables are the number of tax instruments employed by the city government and the HHI respectively, described in the previous section.

StateTaxCap is a dummy variable that denotes whether the state government enforces effective property tax limits on the city governments. As mentioned earlier in this paper, many states place a certain amount of control over the amount of property taxes that can be levied by the city government. Examples of these would include California's Proposition 13 and Massachusetts Proposition 2½. Different state governments impose various rules to limit local property tax levels. In the paper by Poterba and Rueben (1995) on "the Effect of Property-Tax Limits on Wages and Employment in the Local Public Sector", they define effective property-tax limits as "those that limit property-tax revenues, property-tax rates, or general revenues or expenditures". States that only limit assessed valuations or that only require publication of tax rate changes are evaluated as *not* having effective property tax limits. They found evidence of substantially lower growth rates in public sector wages in states with stringent limitation measures. Here, I am borrowing the same classification to investigate whether state-imposed caps have an effect on the tax structure of the city governments. The 11 states identified as *not* having effective limits are Connecticut, Georgia, Hawaii, Maine, Maryland, New Hampshire, South Carolina, Tennessee, Vermont, Virginia and Wisconsin. The *StateTaxCap* variable is set to 0 for cities in these states and 1 for the rest.

R is a vector of regional dummies. Conceptually, this methodology is equivalent to calculating the differences in the degree of diversification in taxes in different regions of

the country. These regional dummies account for unobserved characteristics shared by cities within a particular region. One such characteristic that may be captured is the history of the development of the tax system. As mentioned in an earlier section, the history of the taxation system can be traced back to the colonies in the New England area. Wars, independence and various tax reforms shape the tax system we have today. However, it is not inconceivable that traditional regional constitutions and the mindsets and attitudes of the people living in certain regions are still affecting local taxation systems. To see this more clearly, imagine the countries in EU forming one independent, sovereign nation. A hundred years later, even as cultural and legal barriers start wearing off, and if a similar research is done on this new nation, it might be unwise to ignore the fact that Paris and Marseille used to be French and Cologne and Berlin were German. Secondly, some regions share a common culture or economic climate that may affect people's decision to shift out of the region. Even if someone wants to shift, they might decide to remain within a certain region. This may have a great impact on the mobility of residents in a city, thereby affecting the tax structure. I will talk more about mobility in Hypothesis III. Here, I have employed a conventional demarcation of region boundaries used by the Census Bureau, namely Midwest, Northeast, South and Northwest. For the detailed classification of the cities by state, refer to APPENDIX I.

TaxIncProportion is the variable of interest in the hypothesis. It is the proportion of the total city income that is taxed away by the city government. Note that I chose this over per capita tax because it reflects the tax burden more accurately in relation to the people's wealth. A \$100 in an affluent city might not have as significant an effect as the same amount of tax in a poorer city.

Distribution of The Dependent Variables

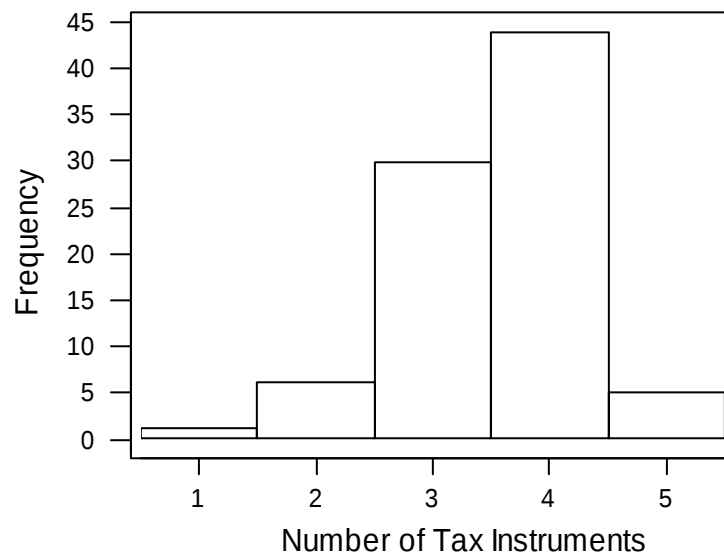


Figure 5, The distribution of the number of instruments employed by city governments

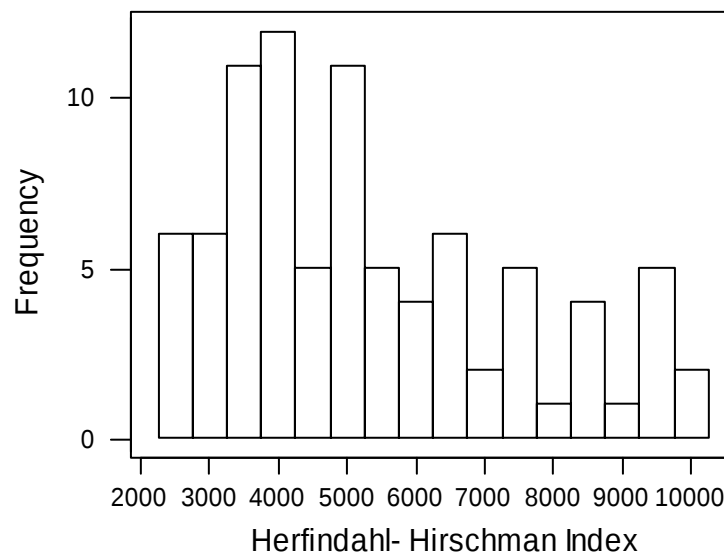


Figure 6, the distribution of the Herfindahl- Hirschman Index

Results

Table 3, Results of regression
Coefficients of regression
(T-statistics are in parenthesis)

Independent Variable	Dependent Variables	
	ln(Num of Instruments Used) (with correction for Heteroskedasticity)	ln(Herfindahl-Hirschman Index)
StateTaxCap	0.136484 (1.942998)**	-0.163697 (-1.452367)
Region – Midwest	-0.070055 (-1.265875)	0.284361 (2.796174)***
Region – NorthEast	-0.348605 (-2.834805)***	0.610836 (4.845906)***
Region – South	-0.012343 (-0.284007)	0.159500 (1.502287)
ln (TaxIncProportion)	0.210950 (3.804867)***	-0.211111 (-2.719177)***
N	86	86
Adjusted R ²	0.228559	0.214906

** significant at 6%

***significant at 1%

Response to Hypothesis I

Table 3 summarizes the results of the two regressions performed. Both the regressions conclude what is predicted by hypothesis I. The coefficient of the predictor *ln(TaxIncProportion)* is significant in both approaches (i) and (ii). Due to the increasing marginal dead weight loss of utilizing an extra unit of a particular tax instrument, it is more efficient to diversify the tax structure when a high amount of revenue is required. When the taxes levied form a high proportion of the people's income, the city governments find a need to spread the tax burden across the tax instruments available, both by using more tax instruments and using them more evenly.

While the meaning of *number of instruments* is clear, the implication of the *Herfindahl-Hirschman Index* is not as intuitive. To get a feel of what the numbers mean, we take a look at an extreme case, when the government relies solely on one particular tax, the HHI would be $100^2 + 0^2 + 0^2 + 0^2 + 0^2 = 10000$. If the tax is evenly distributed among the five tax instruments, HHI is $20^2 + 20^2 + 20^2 + 20^2 + 20^2 = 2000$. From the results of the log-linear regressions, we observed that the elasticities of the *number of tax instruments* and the *Herfindahl-Hirschman Index* are both about 0.21. That is, for a 10% increase in the *TaxIncProportion*, the “degree of diversification”, as measured by the two dependent variables, increases by 2% on the average.

Note that the coefficients of all regressors have corresponding opposite signs in regression equations (1) and (2). This is consistent with the nature of the dependent variables and the conclusion.

However, note must be taken that the effective amount of dead weight loss will be affected by the tax system of other levels of government. It is, nevertheless, informative that, disregarding taxes from other levels of government, variation in the degree of diversity across city taxation systems, can be explained by the variation in the total amount of taxes levied. That is, the more a city taxes, the more diversified its tax system becomes, probably to minimize overall tax burden on the system.

Although diversification may make the tax system more efficient, the degree of diversification may be limited by competition from other cities who are vying for the same kind of tax revenue. The following hypotheses will investigate the effects of migration on the city’s choice of tax instruments.

The next study combines hypotheses II and III with the observations from hypotheses I into a regression model. I used two measures of the size of a city, namely population and land area.

HYPOTHESIS II

Effects of city size on migration:

The smaller the city, the higher the reliance is, on the least mobility-sensitive tax—the property tax.

HYPOTHESIS III

Effects of the land and population proportion of a metropolitan area:

The bigger the proportion of a metropolitan area a city occupies, the more reliant it is on the least mobility-sensitive tax—the property tax.

The model

$$\ln(propTaxShare) = \alpha + \beta(StateTaxCap) + \delta R' + \phi \ln(TaxIncProportion) + \gamma \ln(CityLand) + \eta \ln(MetroLandProportion) \quad (3)$$

$$\ln(propTaxShare) = \varphi + \kappa(StateTaxCap) + \lambda R' + \mu \ln(TaxIncProportion) + \nu \ln(CityPop) + \sigma \ln(MetroPopProportion) \quad (4)$$

As discussed previously, among the various tax instruments, property taxation is the least susceptible to migration effects. It would thus be intuitive that if a city were to be very vulnerable to migration due to tax competition, it would rely heavily on property taxes. Hence, property tax share, the proportion of total city taxes that is derived from property taxes, is my measure of susceptibility to the effects of migration.

Cityland refers to the actual physical area of a city. *MetroLandProportion* is the proportion of the metropolitan area that the city resides in. Many changes were made in the definitions of metropolitan areas (and therefore boundaries) since the concept of “metropolitan districts” were introduced in 1910. In this paper, I used the metropolitan boundaries that were defined by the U.S. Office of Management and Budget (OMB), effective June 30, 1996. The general concept of a metropolitan area (MA) is one of a large population nucleus, together with adjacent communities that have a high degree of economic and social integration with that nucleus. Some MAs are defined around two or more nuclei. The question is: does a city’s share (in size) of a metropolitan area affect its susceptibility to tax competition? It is hypothesized that the larger a city is with respect to the surrounding metropolitan areas, the less it would depend on mobility-proof taxes.

The variables *TaxIncProportion*, *StateTaxCap* and *R'* are the same as those used in hypothesis I. They are included because they clearly are correlated with the diversification of taxes and hence, may have an effect on the property tax share. *CityPop* is simply the population measure of size of a city and *MetroPopProportion* is the proportion of the MA's population who are residents in that particular city.

It is hypothesized that the bigger the city, the less susceptible it is to effects of migration and thus has more flexibility to decide its tax structure. Referring to the figure below, implied in hypotheses II and III is that due to the small size of city A relative to its surrounding cities, it may be easier for capital and income to relocate to a neighboring city. In contrast, city B, being much bigger, is less susceptible to migration and cross-border shopping. Thus, pivotal to the investigation of the two hypotheses are two variables of interest, namely *CityLand* and *MetroLandProportion*.

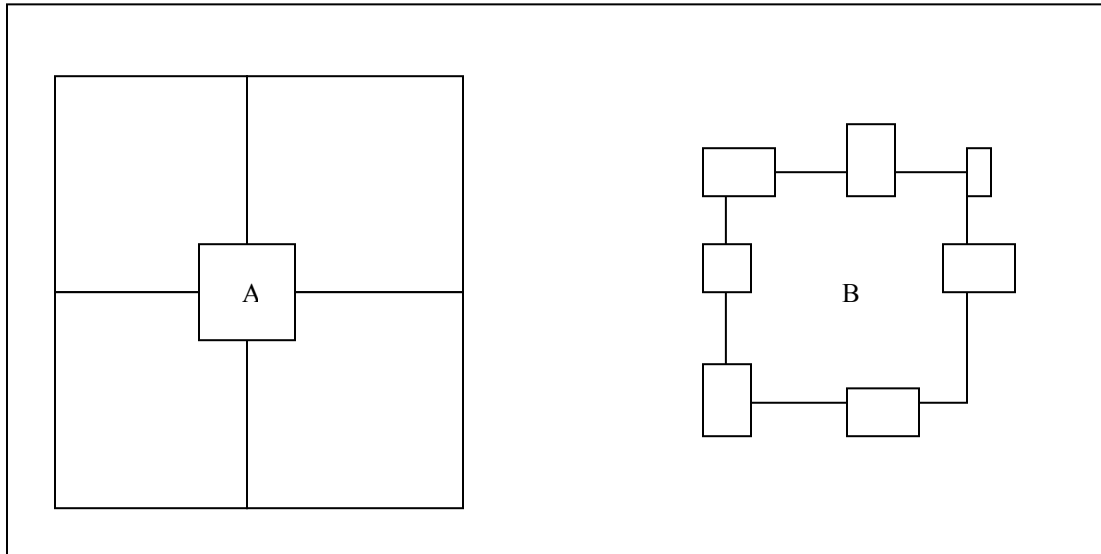


Figure 7, Difference between small city A and big city B

Regression (3) is repeated but with a different measure of size. *CityLand* is replaced by *CityPop* while *MetroLandProportion* is replaced by *MetroPopProportion*. From hypotheses II and III, it is hypothesized that all four variables of interests, *CityLand*, *CityPop*, *MetroLandProportion* and *MetroPopProportion* correlate negatively with property tax share.

Summary Statistics

Table 4, Summary Statistics

	Mean	Median	S.D.	Min	Max	Q1	Q3
Property Tax Share	52.87	52.58	28.51	6.54	100.00	29.39	77.82
TaxIncProportion (%)	3.238	2.722	1.901	0.840	12.954	1.984	3.935
CityPop	517908	256165	925345	97789	7420166	164989	478120
CityLand	131.4	94.4	124.5	3.7	607.0	52.2	153.9
MetroPopProportion (%)	27.36	23.65	21.23	0.70	118.93	11.65	40.27
MetroLandProportion (%)	3.763	2.890	3.465	0.036	14.846	1.079	4.867

Number of cities = 86

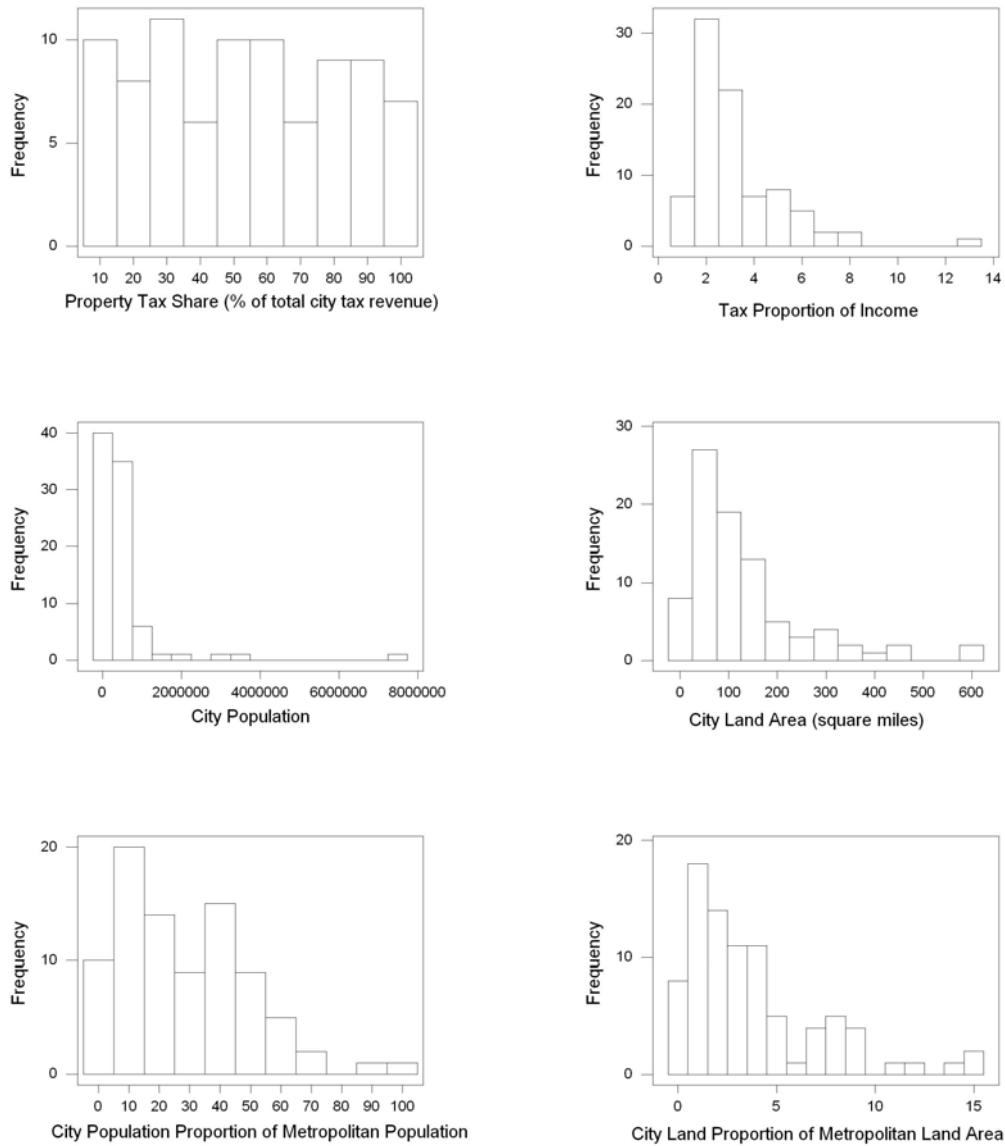


Figure 8, the distribution of the dependent variables.

Given the potential differences between the cities included in this study, it might be informative to take a closer look at the distribution of the independent variables. As seen from figure 8, with the exception of the property tax share variable, the other variables are skewed towards the left. This suggests that some cities on the right may dominate the regression. Cities like New York and Oklahoma are among those which lie on the extreme right of the distributions. For example, the population of New York City is more than twice that of the second most-populated city, Los Angeles. While the uneven distribution of the dependent variables may be disturbing, in the context of this study,

there is no legitimate reason to omit such cities as doing this might cause more complications. It is hoped that the logarithmic model used here will ease the impact of such cities on the regression results.

Results

Table 5, Results of regression, with land as a measure of size
Coefficients of regression
(T-statistics are in parenthesis)

Independent Variable	Measure of Size of a City
	Land
StateTaxCap	-0.669122 (-3.307004)***
Region – Midwest	0.050041 (0.252927)
Region – NorthEast	0.551014 (2.034907)*
Region – South	0.053817 (0.268635)
ln (TaxIncProportion)	-0.393805 (-2.750969)***
ln (CityLand)	-0.259278 (-2.301083)***
ln (MetroLandProportion)	0.049136 (0.584914)
N	86
Adjusted R ²	0.348838

* significant at 5%

***significant at 3%

Table 6, Results of regression, with population as a measure of size
Coefficients of regression
(T-statistics are in parenthesis)

Independent Variable	Measure of Size of a City
	Population
StateTaxCap	-0.687463 (-3.274575)***
Region – Midwest	0.182350 (0.966719)
Region – NorthEast	0.767844 (2.873103)***
Region – South	0.064679 (0.330109)
ln (TaxIncProportion)	-0.429959 (-2.680601)***
ln (CityPop)	-0.041050 (-0.468845)
ln (MetroPopProportion)	-0.056853 (-0.881997)
N	86
Adjusted R ²	0.307883

*** significant at 1%

Table 7, Results of Wald Joint Hypothesis Test

Equation (4) is reproduced below:

$$\ln(propTaxShare) = \varphi + \kappa(StateTaxCap) + \lambda R' + \mu \ln(TaxIncProportion) + \nu \ln(CityPop) + \sigma \ln(MetroPopProportion) \quad (4)$$

Null Hypothesis			
$H_0 : \nu = \sigma = 0$			
Chi-square	1.680151	P-value	0.431678
F-statistic	0.840076	P-value	0.435546

As seen from the results of the regressions, of the 4 variables of interests (*CityLand*, *CityPop*, *MetroLandProportion* and *MetroPopProportion*) only *CityLand* has significant negative correlation with property tax share at 99% confidence level. The regressions were repeated, with the variable *TaxIncProportion* replaced by per capita tax levied by the city government. Similar results were obtained.

The results support hypothesis II (when land is used as a measurement of size), but not hypothesis III. This suggests that the bigger the physical size of a city, the less susceptible it is to mobility effects. Conversely, the smaller cities are relying much more on the least mobility-sensitive tax—the property tax. From the results, we see that the land elasticity coefficient is -0.26, implying that for a 10% decrease in the land area of a city, the property tax share increases by 2.6% on the average. As some cities are many times the size of others, the degree of reliance on the property tax would vary significantly across the cities.

There are several possible reasons why bigger cities are less vulnerable to tax competition. Firstly, the sheer size of the city may present a barrier to cross-border shopping, such that the cost of traveling to a neighboring city is greater than the savings from lower sales taxes. Secondly, the fact that the city is big reflects its economic and social importance. Why have some cities grown to be bigger than others? A big city may mean a more vibrant economy and more opportunities. The residents and businesses may hence, have fewer incentives to relocate. Its economic climate and social importance may have shielded itself from migration effects, thereby having more liberty to decide the tax structure. However, when population is used as a measure for the size of a city, we do not observe a significant correlation. It was thought that the dependence between the variables *CityLand* and *MetroLandProportion* might have masked the significant relationship. A joint hypothesis test shown in table 6 reinforces the notion that property tax share does not correlate negatively with population size nor proportion of metropolitan population. A more in-depth investigation into the density trend of the cities would provide more insights.

It was predicted in hypothesis III that a city would face more tax competition from neighboring cities with similar socio-economic culture (derived from the definition of a metropolitan area) than from cities throughout the rest of the country. The theory is that residents and business would be more willing to shift to a closer location due to their familiarity with the region, lower costs of moving and proximity to friends and family members in the original location. This would mean that a small city surrounded by relatively bigger cities, in the same metropolitan area, faces stiff tax competition and would thus rely more on property tax share and vice versa. However, the results suggest that there is no correlation between regional metropolitan relative sizes and the percentage of city tax revenue derived from property taxes. This result is puzzling since we obtained a robust correlation in hypothesis II. A different definition of a metropolitan area may be required to reveal the relationship suggested by hypothesis III.

Section VI: Conclusion

Hypothesis I concludes that across city levels, we observe a higher degree of diversification in the tax structure in cities which levy high amounts of taxes, possibly due to the increasing marginal cost of utilizing the same tax instrument. Among the cities under study, there is a significant variation in the property tax's share of total city tax revenue. The results to hypotheses II suggests that the smaller a city is, the more vulnerable it is to migration effects and therefore, more reliant on the least mobility-sensitive tax—the property tax. The same relationship however, is not observed when population is used as a measure of size. Investigation of Hypothesis II concludes that the regional relative size of a city has no bearing on the choice of tax instruments by the city government.

Some of these results prompt more work in this area. Investigations into density relationships across cities may provide insights as to why physical land correlates with property tax share while population does not. As mentioned in section II, further classification and breakdown of the cities may be necessary to differentiate the roles and responsibilities of large and small cities.

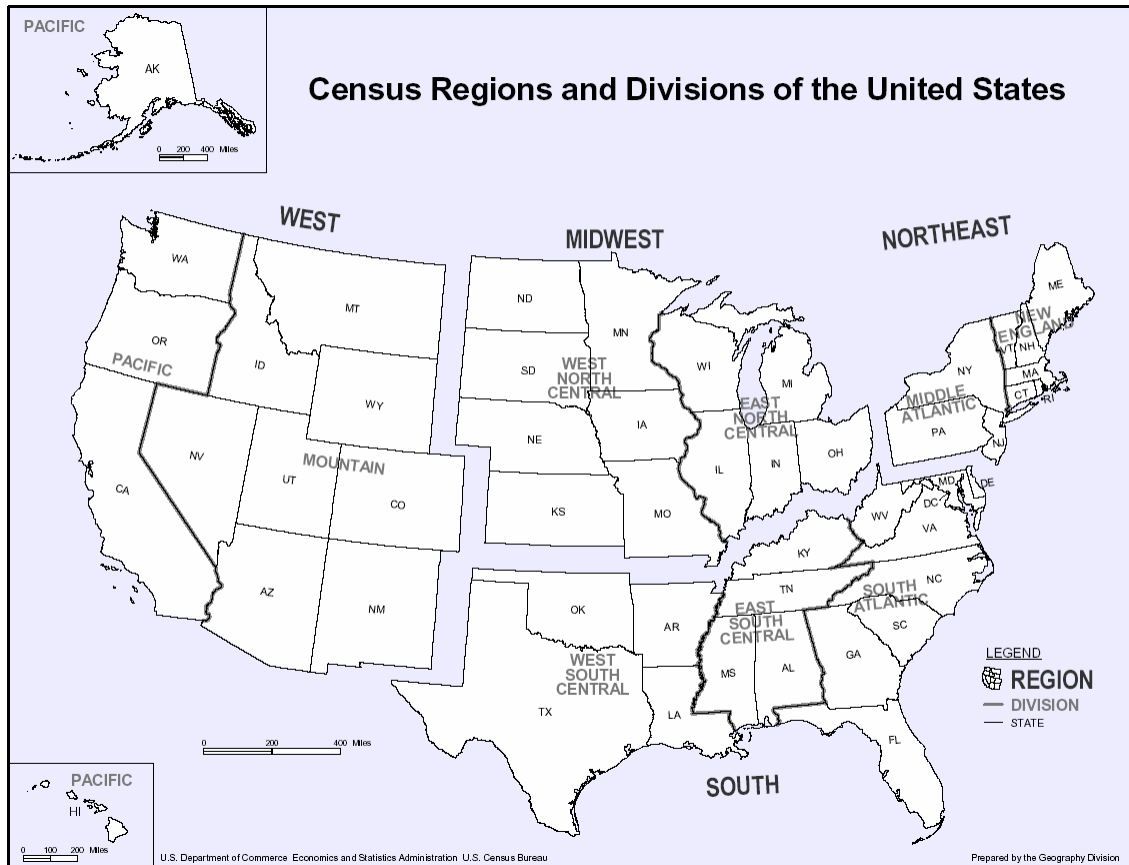
Note that the significance of the conclusions decreases as the mobility of the property tax base increases. Also, this paper pivots on the assumption that city governments have considerable liberty in choosing their tax instruments. Although this paper controls for the state-imposed property tax caps, new policies may drastically affect the conclusions of hypotheses II and III.

Hypothesis II suggests that large cities, due to their socio-economic importance, have some sort of “market power” when faced with tax competition from other jurisdictions. The regression results obtained shows that on average, for a 10% decrease in the land area of a city, the property tax share increases by 2.6%. Cities such as New York and Los Angeles are many times the size of others. This probably explains the wide variation observed in the use of property tax across the cities. Note must be taken, however, that the “market power” of a city is not merely defined by land area. Social, economic and climatic superiority play important roles in giving cities the liberty to determine their tax policies. These properties may, nevertheless, still correlate with the size of a city.

The results of this paper indicate the presence of tax competition among cities. In a conventional market, when a firm is unable to compete with huge and established companies, it goes bust and leaves the market. What happens to a city when it is ousted out of the competition? So far, there has been much research done on the impact of tax competition on levels of taxation. However, more work is required to identify the effects of tax competition on the use of tax instruments as a whole and how a “distorted tax structure” will influence the local economy.

APPENDIX I

Regions classification used in the regressions



Source: US Census Bureau

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