Institut d'Economia de Barcelona

Document de treball de l'IEB 2010/14

ON THE POLITICAL ECONOMY OF TAX LIMITS

Stephen Calabrese, Dennis Epple

Fiscal Federalism

Documents de Treball de l'IEB 2010/14

ON THE POLITICAL ECONOMY OF TAX LIMITS

Stephen Calabrese, Dennis Epple

The **IEB** research program in **Fiscal Federalism** aims at promoting research in the public finance issues that arise in decentralized countries. Special emphasis is put on applied research and on work that tries to shed light on policy-design issues. Research that is particularly policy-relevant from a Spanish perspective is given special consideration. Disseminating research findings to a broader audience is also an aim of the program. The program enjoys the support from the **IEB-Foundation** and the **IEB-UB** Chair in Fiscal Federalism funded by Fundación ICO, Instituto de Estudios Fiscales and Institut d'Estudis Autonòmics.

The **Barcelona Institute of Economics (IEB)** is a research centre at the University of Barcelona which specializes in the field of applied economics. Through the **IEB-Foundation**, several private institutions (Caixa Catalunya, Abertis, La Caixa, Gas Natural and Applus) support several research programs.

Postal Address:
Institut d'Economia de Barcelona
Facultat d'Economia i Empresa
Universitat de Barcelona
C/ Tinent Coronel Valenzuela, 1-11
(08034) Barcelona, Spain
Tel.: + 34 93 403 46 46
Fax: + 34 93 403 98 32
ieb@ub.edu
http://www.ieb.ub.edu

Documents de Treball de l'IEB 2010/14

ON THE POLITICAL ECONOMY OF TAX LIMITS*

Stephen Calabrese, Dennis Epple

ABSTRACT: We study the political economy of state limitations on the taxing powers of local governments, investigating the effects of such restriction on housing markets, community composition, and types of taxes and expenditures undertaken by local governments. We characterize equilibrium when voters choose values of multiple policy (tax and expenditure) instruments, finding that tax limitations have very substantial effects on housing prices and the composition of communities. Political support for tax limits comes from suburban voters and from a subset of central-city voters. Support for tax limits come even from residents of communities that are not constrained by the limits.

JEL Codes: D720, D780, H300, H420, H720, H730

Keywords: Tax limits, redistribution, public goods, property tax, income tax, head tax.

Stephen Calabrese
Associate Professor of Economics
Department of Economics
Tepper School of Business
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA 15213
Phone : + 412 268 6356
Fax: + 412 268 4804
E-mail: sc45@andrew.cmu.edu

Dennis Epple
Thomas Lord Professor of Economics
Department of Economics
Tepper School of Business
Carnegie Mellon University
5000 Forbes Avenue
Pittsburgh, PA, 15213
Phone: + 412 268 1536
Fax: + 412 268 8896
E-mail: epple@cmu.edu

* We thank Richard Romano for many valuable discussions of the issues in this paper, and we thank Jan Brueckner and William Hoyt for their helpful comments. Any errors are ours.

1. Introduction

States impose many restrictions on the taxing powers of local governments. Best known are the property tax limits imposed by popular referenda in California and Massachusetts. These are only the tip of the iceberg, however. Forty-six of the states place some form of restriction on local property taxes, with more than half setting a limit on the property tax rate that municipalities may impose.[1] In addition to setting upper limits on local tax rates, states also limit the instruments that localities are permitted to use. Local governments are creatures of state governments and may use only tax instruments authorized by their state governments. For instance, in most states, local governments are required to have authorization from the state legislature to impose an income or payroll tax. That authorization usually dictates the form of the tax, the permissible range of rates, and the treatment of non-residents. Only 16 states authorize some form of local income taxes, and only 8 have any municipalities that impose income taxes.[2]

We study the political economy of state limitations on the taxing powers of local governments, investigating the effects of such restriction on housing markets, community composition, and the types of expenditures undertaken by local governments. We find that tax limitations have substantial effects on housing prices and the composition of communities. Adjustments following introduction of tax limits result in changes in median incomes in all communities. The electorates of communities then adopt policies quite different from those that prevail in the absence of tax limitations. Tax limits thereby have striking effects on spending. Local expenditures on redistribution falls, and,

---

[1] Advisory Commission on Intergovernmental Relations, 1995(a), p. 23.
[2] Advisory Commission on Intergovernmental Relations, 1988, and 1995(b), Table 20, pg. 70.

in general, per capita expenditures on public good provision falls in all but possibly the richest communities.

One objective of our analysis is to investigate political support for tax limitations. It is clear that, in practice, limitations are by no means counter to the wishes of voters. Voter-supported initiatives such as Proposition 13 in California and Proposition 2 ½ in Massachusetts attest to the popularity of tax limits. This raises an apparent puzzle. Why would voters support a state referendum to limit their local government's taxing powers? One would expect local governments to be most responsive to voters, being the governments that are "closest to the people." Our results provide support for a fundamental insight of Vigdor (2001). He offers the hypothesis that support for local tax limits comes not only from voters wishing to limit the taxes their own locality imposes, but also from the desire of voters to limit tax rates in localities in which they do not reside. He observes that voters in one locality may wish to limit the tax rate in another locality because they would prefer to live in that locality if the tax rate there were lower. He presents a model with three voter types in which this motive for limiting state taxes leads to adoption of state tax limits.[3]

We find in our model that two sets of voters support tax limitations. Some who support the limit will move if the limit is adopted. Others who do not anticipate relocating to another municipality also support tax limits. The reason traces to the distortionary effects of high central-city taxes emphasized by Mieszkowski and Mills (1993). Tax limits have greatest bite in the central-city, where our model predicts that taxes will otherwise be highest. Through reductions in the distortionary effects of central-city taxes, suburban

[3] Other factors may play an key role as well. See Fishel (1989) and O'Sullivan, et. al. (1995) for alternative explanations for the popularity of California's Proposition 13.

residents benefit from tax limits. Property tax limits cause net-of-tax housing prices to rise and gross-of-tax housing prices to fall in the poorer communities. In wealthier communities property values may fall. Despite the fact that most of the residents of wealthier suburbs are homeowners, most residents of these suburbs are better off with the tax limits. Lower housing prices permit them to expand housing consumption, and the out-migration of lower-income households permits remaining residents to increase public good consumption per capita without increasing taxes. These latter two effects offset the capital loss that those homeowners experience.

Our analysis shows that, for understanding the effects of tax limits, it is essential to consider both public-good expenditures and redistributive expenditures. In addition, to understand limitations on the set of tax instruments that municipalities are permitted to use, it is clearly necessary to consider more than one tax instrument. Study of the political economy of tax and expenditure structure has been severely hampered by the well-known problem of potential non-existence of equilibrium when voting is over multidimensional choices (Plott, 1967). Thus, the preponderance of work on modeling tax and expenditures presumes use of a given tax instrument and a given form of expenditure. The voting problem is then reduced to a single dimension by imposition of the government budget constraint. While this approach has led to a vast and rich body of research,[4] it is too restrictive to permit study of choice among tax instruments and forms of expenditures. Research studying higher-dimensional voting problems typically assumes that voters consider only a restricted set of choices on any given vote, with

[4] See, for example, Westhoff, 1977, Goodspeed, 1989, Epple, Filimon, and Romer, 1984, Cassidy, Epple, and Romer, 1989, Ellickson, 1982, Fernandez and Rogerson, 1996 and 1998, Calabrese, 2001, Epple and Romano, 2003.

issues decided by multiple votes.[5] It is increasingly difficult, however, to apply this approach as the dimensionality of voting problems increases—because arbitrary choices must then be made about which tradeoffs that are considered on a given vote. The approach thus raises the concern that results may be sensitive to the tradeoffs that voters are presumed to consider when voting on a particular issue.

A contribution of our work is study of choice of tax instruments in a framework in which voting equilibrium exists when voters consider all issues simultaneously. In particular, we adopt a preference structure, consistent with empirical evidence on demand functions, for which equilibrium exists. We study the equilibrium among local jurisdictions that emerges when localities are permitted use of two or more tax instruments. We then investigate whether there will be majority support for state-level restrictions on local taxes, and we investigate the equilibrium that emerges when tax limits are imposed. While our primary focus is positive analysis of tax limits, we also undertake a welfare analysis of limits, finding that a large proportion of the population may gain from imposition of tax limits. The reduction in redistributive expenditure that follows adoption of tax limits reduces the welfare of the lowest-income households. We find, however, that a relatively modest increase in redistribution at the state level can offset the welfare loss experienced by low-income households. Thus, tax limits coupled with a modest increase in state aid to the poorest households can be Pareto improving.

[5] Reducing the problem to a single dimension does not assure existence of voting equilibrium (Denzau and MacKay, 1981), but does permit use of familiar strategies for imposing conditions on model structure such that equilibrium exists. Nechyba (1997) provides a creative application of this approach, allowing separate votes over local and state tax rates. At the local level, where both income and property taxes may potentially be used, Nechyba gives a community planner responsibility for setting one instrument while voters choose the value of the other.

As explained above, the distortionary effects of central-city taxes that arise in the absence of tax limits play an important role in our analysis. Before turning to that analysis, it is useful to cite a particular instance. Prior to the imposition of proposition 2 ½ in Massachusetts, the residential property tax rate in Boston was approximately 6.3% of property value. In thinking about the magnitude of this tax, it is useful to convert this value to a rate applied to the annual rental of housing services. If we convert property values to annualized flow using rates on the order of 7% to 9%,[6] the implied tax rate on annualized service flow is on the order of 70% (=6.3/.09) to 90%. Relative to sales tax rates typically observed on other commodities, this is an exceedingly high rate. In our model, we find a central-city tax rate of 77.6 on annualized service when there is not a property tax limit and local income tax is not used.

2. Model and Properties

The economy of the model consists of a continuum of households that differ only in their endowed income y.[7] The distribution of income is represented by the continuous distribution f(y). All households have the same preferences represented by utility function U(g,h,b), where g is expenditures on a publicly provided good, h is units of housing, and b is consumption of a numeraire bundle. We first develop properties of equilibrium for the case in which all households are renters. We then extend the results to the case of owner-occupants.

---

[6] The user cost of housing net of property taxes (Poterba, 1992) is $(1-t_y)i+\zeta$ where t_y is the income tax rate, i is the nominal interest rate, and ζ is the sum of the risk premium on housing investments, maintenance, depreciation, and inflation. Let t_y=.15 and, following Poterba, let ζ=-.02 and i=.1286. The result is a rate of 8.9% for converting property value to implicit net-of-property-tax rental rates. Using an income tax rate of .25, we obtain a rate of 7.5%. These calculations suggest conversion rates on the order of 7% to 9%.

[7] Assuming a single dimension of heterogeneity is restrictive. However, this simplification yields major benefits from the perspective of tractability while providing valuable insights about the effects of tax limits.

There are multiple local communities that may differ in land area. Each has a local government that may impose a proportional income tax, m, on the income of its residents, and an ad valorem property tax, t, on the value of housing in the jurisdiction. Total tax revenue in each community may be used to finance expenditures on a publicly provided good, g, and a lump sum redistributive grant, r, to each individual in the community. The tax rates, m and t, and expenditure levels, g and r, are determined by majority vote of residents of the locality. Voting is conducted simultaneously on this set of variables.[8]

A household with income y faces the following budget constraint if the household locates in a particular community, j:

$$y(1-m^j)+r^j = p^j h + b$$

The gross-of-tax price per unit of housing is, p^j. We denote the net-of-tax price p_h^j.

The following identity relates the gross- and net-of-tax prices: $p^j \equiv p_h^j(1+t^j)$. A household locates in the community with the tax/expenditure policy for which the household obtains the highest utility.

We adopt the following functional form for utility:

$$U(g,h,b) = v(g)[u(h,b)+\phi]$$

We assume that u(h,b) is homogeneous of degree 1. This assumption is consistent with the empirical evidence on housing demand (Harmon, 1988), which suggests that the income elasticity of housing demand is approximately one. Linear homogeneity of u(h,b)

[8] While municipalities do not literally give cash grants to local residents, they do provide a variety of services to aid the poor. Inman (1995) identifies increasing poverty-related spending as the major source of increased per capita expenditure on goods, services and supplies over the period from 1973 to the onset of Philadelphia's financial crisis in 1990. Inman (1989) also emphasizes the importance of redistributive politics as a determinant of tax policy in his study of 41 U.S cities over the period from 1961 to 1986.

implies that the corresponding indirect utility function is linear in income, a property that will prove central in our analysis of voting equilibrium:

$$V(y) = v(g)[(y(1-m)+r)w(p)+\phi] \qquad (1)$$

Turning to supply, we assume that housing is produced by price-taking firms in each jurisdiction from land and non-land factors via a constant-returns neoclassical production function. The price of non-land factors is assumed fixed and uniform throughout the metropolitan area. The housing supply function in community j can then be represented by $H_s^j(p_h^j) = L^j h_s(p_h^j)$ where $h_s(p_h^j)$ is housing per unit of land in community j and L^j is land area in community j, C^j. When $u(h,b)$ is homogeneous of degree 1, household y's housing demand in C^j can be represented by $(y(1-m^j)+r^j)h_d(p^j)$. Housing market equilibrium in C^j then requires the following, where $p_h^j = p^j/(1+t^j)$:

$$h_d(p^j)\int_{y\in C^j}(y^j(1-m^j)+r^j)f(y)dy = L^j h_s(p_h^j) \qquad (2)$$

Equilibrium is an allocation of households across communities such that:

1. Within each community:
    a) the housing market clears
    b) the government's budget is balanced
    c) majority rule determines the government's policy (t, m, r, g)
2. Each community is occupied, and no one wants to move.

The first part of the definition of equilibrium above specifies conditions for *internal equilibrium*. This together with the second condition specifies conditions for *intercommunity equilibrium.* We develop conditions that must be satisfied for an allocation to be an equilibrium. In our computational analysis, we then verify an allocation is an equilibrium by checking that the conditions for equilibrium are satisfied. We develop necessary conditions for *intercommunity equilibrium*. We then characterize Majority Voting Equilibrium, demonstrating that the median-income voter in each community is pivotal in determining that community's policy choices.

2.1 Intercommunity Equilibrium

Proposition 1 presents conditions characterizing intercommunity equilibrium.

Proposition 1: *Consider an allocation in which all communities are occupied. If*

$$\frac{r^j w(p^j)+\phi}{(1-m^j)w(p^j)} \neq \frac{r^k w(p^k)+\phi}{(1-m^k)w(p^k)} \quad \forall \quad i \neq j, \tag{3}$$

Intercommunity equilibrium is characterized by:[9]

a) **Income Stratification Among Communities:** *Each community contains households with incomes in a single interval.*

b) **Boundary Indifference:** *Order communities from lowest to highest income levels. Between each pair of adjacent communities in this ordering is a household that is indifferent between the two communities.*

c) **Ascending Bundles:** *Incomes ascend across communities in the same order as* $v(g^j)(1-m^j)w(p^j)$.

Proof: Choose any pair of communities, C^j and C^k. Using equation (1), the difference in utility between communities C^j and C^k for a household with income y is:

$$\Delta V(y) = v(g^j)[(y(1-m^j)+r^j)w(p^j)+\phi] - v(g^k)[(y(1-m^k)+r^k)w(p^k)+\phi] \tag{4}$$

[9] Proof of this proposition builds on the approach developed in Calabrese (2001).

$\Delta V(y)$ cannot be strictly positive for all y. This would imply that all households prefer C^j, contradicting the assumption that all communities are occupied. Similarly, $\Delta V(y)$ cannot be strictly negative for all y, since all would then prefer C^k.

We next demonstrate that not all households are indifferent between communities. To form a contradiction, suppose all households are indifferent. This implies that $\Delta V(y) = 0 \ \forall \ y$, and hence that ΔV(y) has both intercept and slope equal to zero:

$$\Delta V(0) = 0 \Rightarrow \quad v(g^j)[r^j w(p^j) + \phi] = v(g^k)[r^k w(p^k) + \phi] \tag{5}$$

$$\frac{\partial \Delta V(y)}{\partial y} = 0 \Rightarrow v(g^j)(1 - m^j)w(p^j) = v(g^k)(1 - m^k)w(p^k) \tag{6}$$

Dividing the above, we obtain $\dfrac{r^j w(p^j) + \phi}{(1 - m^j)w(p^j)} = \dfrac{r^k w(p^k) + \phi}{(1 - m^k)w(p^k)}$, which contradicts (3).

The preceding results coupled with the linearity of *ΔV(y)* imply that there exists a unique $\hat{y} > 0$ for which $\Delta V(\hat{y}) =$ 0. This establishes part (b) of the proposition. If *ΔV(y)* is downward sloping, all $y < \hat{y}$ prefer community j and all $y > \hat{y}$ prefer community k. The reverse is true if *ΔV(y)* is upward sloping. This establishes part (a). If communities are arrayed by ascending values of $v(g^j)(1 - m^j)w(p^j)$, then *ΔV(y)* is downward sloping, establishing part (c). ■

Remark: As income rises, the demand for g rises, and the dollar cost of an income tax also rises. In addition, as income rises, the demand for housing rises, causing the dollar cost of an increase in the unit price of housing to rise with income. The expression $v(g^j)(1 - m^j)w(p^j)$ impounds the effects of changes in the three variables (g,m,p) into a single term that is valued increasingly highly as income rises.

When $\phi<0$, our preference function satisfies the usual single crossing condition that the slope of indifference curves in the (g,p) plane increases with income. This condition plays an important role in characterizing stratification across communities when there is only one tax instrument and one type of public expenditure. For instance, based on equation 3, the conditions for stratification in Proposition 1 are met as long as ϕ and the r's in the communities are not all equal to 0. However, even if r = 0 in every community because, for example, it is assumed redistributive lump-sum grants or head taxes are prohibited, the conditions for stratification in Proposition 1 are satisfied as long as ϕ is negative, no matter how small. In other words if $\phi = 0-\varepsilon$, the conditions for stratification are satisfied even if ε is vanishingly infinitesimal. Thus, henceforth, we simplify by considering the indirect utility function in (1) with $\phi = 0$.

The value of the indirect utility function at y = 0 and its slope with respect to y are:

$$V(0) = v(g^j)r^j w(p^j)$$

$$\frac{\partial V(y)}{\partial y} = v(g^j)(1-m^j)w(p^j)$$

Consider any two communities, C^j and C^k satisfying Equation (3), with average incomes $\bar{y}^j$ and $\bar{y}^k$ respectively, $\bar{y}^j < \bar{y}^k$. Hence, the intercept for $V^j(y)$ must be greater than for $V^k(y)$, and the slope less. These conditions imply Equations (7) and (8) below.

$$v(g^j)r^j w(p^j) > v(g^k)r^k w(p^k) \tag{7}$$

$$v(g^j)(1-m^j)w(p^j) < v(g^k)(1-m^k)w(p^k) \tag{8}$$

We first develop the intercommunity equilibrium conditions when it is assumed local communities do not employ income tax to generate revenue. We then consider the equilibrium conditions when income tax is included in the model.

2.1.1 Intercommunity Equilibrium Conditions Without Income Tax

Proposition 2: *Assume local communities do not employ income tax as a revenue-generating instrument. The following conditions are necessary for an allocation to be an Intercommunity Equilibrium:*

- **i)** **Descending lump-sum grants.** The grant level is decreasing in average community income, i.e. $\bar{y}^j < \bar{y}^k \Rightarrow r^j \geq r^k$.
- **ii)** If $g^j > g^k$ then $p^j > p^k$.
- **iii)** If $p^j < p^k$ then $g^j < g^k$, and if $p^j = p^k$ then $g^j \leq g^k$.

Proof: If local communities can only employ property taxes, then equation (8) becomes:

$$v(g^j)w(p^j) < v(g^k)w(p^k) \tag{9}$$

Part (i) follows from (7) and (9), while (ii) and (iii) follow from (9).■

Condition (i) accords well with intuition—low-income households migrate to the community with the highest level of redistribution. If community j also offers higher public good provision, then clearly the price must be higher in j, as stated in (ii). Alternatively, if the price in j is lower than in k, then public good provision must be lower in j than in k. Note that the above conditions do not rule out the possibility that the price in j is higher than in k and public provision in j is lower than in k. This can happen, for example, if the redistributive grant is substantially higher in j than in k.

2.1.2 Intercommunity Equilibrium Conditions with Income Tax

When states permit localities to employ an income tax, we have:

Proposition 3: *Assume local communities are able to employ a proportional income tax as a revenue-generating instrument. Suppose WLOG that* $\bar{y}^j < \bar{y}^k$. *The following relationships are implied by Intercommunity Equilibrium:*

i) If $m^j < m^k$

- a) then $r^j > r^k$.
- b) and if $g^j \geq g^k$ then $p^j > p^k$.
- c) and if $p^k \geq p^j$ then $g^k > g^j$.

ii) If $r^j < r^k$

- a) then $m^j > m^k$.
- b) and if $g^k \geq g^j$ then $p^j < p^k$.
- c) and if $p^j \geq p^k$ then $g^j > g^k$.

Proof: Parts (ia) and (iia) follow from equations (7) and (8). Parts (ib) and (ic) follow from (8). Parts (iib) and (iic) follow from (7).■

We expect that it will generally be the case that the poorer of a pair of communities will have both a higher income tax rate and a higher level of redistribution. However, this need not always be the case. The conditions in Proposition 3 characterize restrictions on allocations in cases in which the income tax rate and the per capita grant do not have the same order. Condition (i) of Proposition 3 states that a community with a relatively low income tax rate may be occupied by poor households if the community offers a relatively high per capita grant. In this case, the higher-income households may prefer the community with the higher income tax rate if the level of government services is higher and/or the housing price is lower. Proposition 3 (ii) provides the conditions for a very unlikely equilibrium allocation in which the grant is lower and the income tax rate is higher in the low income community. An allocation satisfying these conditions can be an equilibrium only if public good provision is extremely high and/or the price of housing is extremely low in the poor community relative to the wealthy community.

2.2 Internal Equilibrium

Recall that the conditions for internal equilibrium are that, in each community: the housing market clears, the government's budget is balanced, and there is a majority-rule equilibrium determining tax and expenditure policy.

We define this set of all possible (t, m, r, g) combinations for community j as the *Budget Possibility Frontier* (BPF). The characterization of this frontier is detailed further below. For a given community, a point (t^*, m^*, r^*, g^*) is a *Majority Voting Equilibrium* (MVE) if it is on the community's BPF and there is no point on the BPF strictly preferred to (t^*, m^*, r^*, g^*) by a majority of the community's residents.

Proposition 4: The *Majority Voting Equilibrium* in a community is the outcome on the *Budget Possibility Frontier* most preferred by the community's median-income voter.[10]

Proof: Let x^* = (g^*, m^*, r^*, p^*) denote the point most preferred by the median income voter, $\tilde{y}$. To form a contradiction suppose there exists a point x = (g, m, r, p) that defeats x^*. Let $\Delta V(y)$ be the difference in utility that voter y obtains between x^* and x:

$$\Delta V(y) = v(g^*)(y(1-m^*)+r^*)w(p^*) - v(g)(y(1-m)+r)w(p) \qquad (10)$$

It cannot be the case that $\Delta V(y) < 0$ for all y. This would contradict the assumption that x^* is the point most preferred by the median-income voter. Alternatively, if $\Delta V(y) > 0$

[10] The strategy of proof of this proposition is due to Cassidy (1990) who exploits the linearity of the indirect utility function in income to study voting equilibrium in a model with a flat grant financed by a property tax.

for all y, then x^* is unanimously preferred to x. If all voters are indifferent between x^* and x (i.e., $\Delta V(y) = 0$ for all y), then we adopt the convention that x^* is chosen.

This leaves cases where some voters strictly prefer x^* to x while others strictly prefer x to x^*. For these cases, the linearity of $\Delta V(y)$ implies that there is a unique $\hat{y}$ such that $\Delta V(\hat{y}) = 0$. There are two possibilities. One is that voters preferring x to x^* have incomes less that $\hat{y}$. If x defeats x^*, these voters comprise more than half the population. This implies $\tilde{y} < \hat{y}$ which in turn implies that $\tilde{y}$ prefers x to x^*. This is a contradiction since x^* is $\tilde{y}$'s most preferred outcome. The other alternative is that voters with income greater than $\hat{y}$ prefer x to x^*. Since x defeats x^*, these voters comprise more than half the population. This implies $\tilde{y} > \hat{y}$ which implies that $\tilde{y}$ prefers x to x^*. This is again a contradiction since $\tilde{y}$ prefers x^* to x.[11] ■

In order to complete the characterization of intra-community equilibrium, we need to characterize the community Budget Possibility Frontier. This in turn requires a characterization of voters' perceptions of how the private-market equilibrium in the community will be affected by public policy choices. The latter is needed for two reasons. Voter perceptions of how the private market outcomes depend on policy affect their perceptions of the population to be served and the tax base. In addition, voter utility depends on how they expect policy changes to affect the price of housing.

There are many possible ways to characterize the BPF, depending on the degree of voter sophistication in anticipating the consequences of policy changes within a community. Our characterization of voting behavior draws on modern club theory and assumes that

---

[11] This proposition implies that the well-known Plott (1967) conditions hold for our model.

individuals are utility takers.[12] This means voters assume that the policy tuples (t, m, r, g) and housing prices in all the other communities are fixed. Employing this utility-taking assumption, voters predict how the private market equilibrium would change in response to a prospective policy change. For example, a voter assumes the price of housing in his/her community is affected by changes in the government's budget through both changes in housing demand by current residents and migration into or out of the community, taking as given policies and prices in other communities.

The income stratification result in Proposition 1 and community budget balance imply:

$$t^j p_h^j h_d(p^j)(\bar{y}^j(1-m^j)+r^j)+m^j\bar{y}^j = r^j + g^j \quad \forall j \tag{12}$$

The possible (t, m, r, g) combinations for community j given (t^{-j}, m^{-j}, r^{-j}, g^{-j}) then satisfy housing market clearance and budget balance in community j (Equations 2 and 12), and the stratification and boundary-indifference conditions of Proposition 1.

2.3 Owner Occupants

Thus far, we have treated all of a jurisdiction's residents as renters. Suppose, by contrast, that all residents are owner-occupants who locate in a jurisdiction and purchase housing there before participating in the voting process that determines the structure of the jurisdiction's budget.[13] There are no transactions costs in the purchase and sale of housing. As in the preceding model with rental housing, households anticipate how their housing consumption will change in response to a change in the price of housing induced by a change in the structure of the jurisdiction's tax-expenditure policies. Households

[12] As explained in Epple and Romer (1991, p. 837), the assumption of myopic voting over redistributive expenditures is untenable; in communities with median income less than the mean, myopic voters would attempt to expropriate and redistribute the entire property tax base.

[13] Our formulation of the preferences of owners builds on the approach of Epple and Romer (1991).

also anticipate the capital gain or loss they will incur if their jurisdiction's tax-expenditure policy is changed, resulting is a change in the net-of-tax price of housing.

Let h_o be the amount of housing purchased at price $p_{h,o}$ by a household with endowed income y. When making decisions about whether to change its consumption bundle, the household faces the budget constraint $(1-m)y + r + (p_h - p_{h,o})h_o = ph + b$ with h_o and $p_{h,o}$ fixed. The third term on the left-hand side is the capital gain or loss from selling the household's existing dwelling. Given linear homogeneity of the utility function in housing and numeraire consumption, the housing demand function is then of the form $h = (y(1-m) + r + (p_h - p_{h,o})h_o)h_d(p)$. Substituting this function into both the budget constraint and the utility function, we obtain the indirect utility function:

$$V(y) = v(g)(y(1-m) + r + (p_h - p_{h,o})h_o)w(p),$$

The housing demand function for a consumer with income y given (p_o, r_o, g_o, m_o, $p_{h,o}$) is:

$$h(p_o, y(1-m_o) + r_o) = (y(1-m_o) + r_o)h_d(p_o)$$

Consider an owner with income y who purchased at (p_o, r_o, g_o, m_o, $p_{h,o}$). When voting, such an owner may contemplate voting for a change in tax-expenditure policy that would cause prices, taxes, and expenditures to change to (p, r, g, m, p_h). If such a change were to occur, the owner's utility at (p, r, g, m, p_h) would be:

$$V(y) = v(g)(y(1-m) + r + (p_h - p_{h,o})((y(1-m_o) + r_o)h_d(p_o))w(p) \qquad (13)$$

Thus, when voting, owner y will vote for a change to (p, r, g, m, p_h) if the utility given in (13) is higher than it would be if the policy were unchanged and prices and tax-expenditure policy remained at (p_o, r_o, g_o, m_o, $p_{h,o}$). While renters care only about (p, r, g, m), it is clear from (13) that owners care about p_h as well.

Equation (13) is linear in household income, y. This property of owners' utility functions can be used in a straightforward fashion to extend Proposition 4 to the case where all households are owners. That is, the majority voting outcome when all households in a community are owners is the point (p^*, r^*, g^*, m^*, $p_h{}^*$) that maximizes the utility of the owners with median income.

We assume that all transactions occur in equilibrium. Thus, in equilibrium, households make transactions at (p_o, r_o, g_o, m_o, $p_{h,o}$) = (p, r, g, m, p_h), and the majority voting outcome does not lead to a departure from (p, r, g, m, p_h). Note that equation (13) reduces to equation (1) when (p_o, r_o, g_o, m_o, $p_{h,o}$) = (p, r, g, m, p_h). It follows that Propositions 1 through 4 of the renters case continue to hold in the owners case. Thus, necessary conditions for equilibrium in the owners' model are the same as in the renters' model.

While Propositions 1 through 4 apply in the owner's case as they do in the renter's case, the equilibrium with owners will generally differ from that with renters. The reason is as follows. A change in a jurisdiction's tax-expenditure policy will, in general, change the net-of-tax price of housing. Since owners make their purchase decisions before voting, they experience a capital gain or loss if they vote for a policy change. Thus, as detailed in (13), their utility will be affected by the change in the net-of-tax price of housing. Renters, by contrast, are indifferent to changes in the net-of-tax price. This leads to differences in equilibrium outcomes when voters are renters than when voters are owners.

2.5. Equilibrium with Both Renters and Owner-Occupants

We now extend the model to the case in which some households choose to be owner-occupants while others choose to rent. Let ρ(y) be the proportion of metropolitan residents with income y who are renters. Since transactions occur only in equilibrium, choice of jurisdiction is not affected by whether the household will own or rent. Thus, Propositions 1 through 3 hold when there are both owners and renters.

By contrast, there is no extension of Proposition 4 to the case with both owners and renters that preserves the generality of the result. The multi-dimensional nature of the set of alternatives underlies the lack of generality. To resolve this existence issue, we adopt an idealized city-council model. We believe this city-council model to be well motivated from an institutional point of view and an illuminating way to characterize the majority outcome with both owners and renters. We assume that, within a community, households sort into neighborhoods based on income. Neighborhoods are single-member districts, and each sends a representative to city-council. There are a large enough number of districts that, within districts, income heterogeneity is negligible.[14] Thus, within a neighborhood, the only difference in preferences arises because some own and others rent. The council member serves his/her own interests, which are also the interests of the type in the majority in his/her council district. In a neighborhood with income y, the councilperson is a renter if $\rho(y) > .5$ and an owner-occupant if $\rho(y) < .5$.

The composition of the council will be as follows. Let y_l and y_h be the lower and upper income boundaries of the community. The income distribution of the council will be a replica of the population income distribution, f(y), in the interval $[y_l,y_h]$. The median-income member of the council will have the median income of the community. Let y_c solve $\rho(y_c)=.5$. All council members with incomes less than y_c will be renters and all with

[14] Operationally, we assume a continuum of districts.

incomes greater than y_c will be owners. Hence, the council member with median income, $\tilde{y}$, will be a renter if $\tilde{y} < y_c$ and an owner if $\tilde{y} > y_c$.

We assume that the council in turn elects a member to implement its policy. Members cannot make binding commitments. Hence, the elected member will implement his or her most preferred policy. Our city-council thus functions under precisely the same terms as the citizenry in Besley and Coate's (1997) model of representative democracy.[15] We show in our computational model that the most-preferred policy of the median income council member is a Condorcet winner among the set of council member ideal points. If follows from Besley and Coate (Proposition 2, Corollary 1) that the policy of the median-income council member is adopted.

3. Computational Model

Development of more specific implications about the features of equilibrium requires more specific information about preferences, technology, the distributions of income and housing tenure, the number of jurisdictions and the land area of each. We therefore turn to numerical computations based on the theoretical model above to illuminate properties of the model. The parameterization utilizes functional forms and parameter values that are broadly consistent with empirical evidence on housing supply and demand functions, government expenditures, and the distribution of income in the U.S. We choose the following Cobb-Douglas utility function:

$$U(g,h,b) = g^{\beta}(h^{\alpha}b^{1-\alpha} + \phi) \tag{14}$$

[15] We are indebted to Richard Romano for suggesting this approach.

where $\phi = 0 - \varepsilon$, and ε is a very small positive number to ensure stratification even if the level of redistribution or head taxes in all communities are equal to 0. We chose values for α and β such that, if g, h, and b were all privately purchased goods, the gross-of-tax expenditure on housing would be 1/3 and the fraction spent on local public goods would be 10%.[16] This yields α = .37 and β = .111.

We adopt the following constant-elasticity of housing supply function, which is implied by a constant-returns Cobb-Douglas housing production function:

$$H_s^j(p^j) = L^j(p^j)^{\mu} \tag{15}$$

where L^j is the land area of community j as a proportion of total land area in the economy, and μ is the ratio of non-land to land inputs in the production of housing. Based on available evidence regarding the share of land and non-land inputs in housing (Epple and Romer, 1991), this parameter is set equal to three.

The distribution of income is calibrated using data from the 1999 American Housing Survey (AHS).[17] Median income reported by the AHS is $36,942. Using data for the 14 income classes reported by the AHS, we estimate mean income to be to $54,710. These and the assumption that the income distribution is lognormal imply lny ~ N(.886,10.52).

For the mixed owners-renters, we use the following function to characterize the fraction of renters at each income level:

$$\rho(y) = \begin{cases} \gamma y^{-\delta} & \text{for } y > \gamma^{1/\delta} \\ 1 & \text{for } y \le \gamma^{1/\delta} \end{cases} \tag{16}$$

---

[16] We adopt and extend the approaches to calibration in Epple and Romer (1991) and Calabrese, Cassidy, and Epple (2002).

[17] http://www.census.gov/hhes/www/housing/ahs/99dtchrt/tab2-12.html

The AHS data cited above present the number of renter- and owner-occupied housing units in the different income classes. We computed average income, $\overline{Y}$, in each income class, using the lognormal distribution of household income presented above. Regressing the log of the proportion of households who are renters, $\overline{\rho}$, against the log of $\overline{Y}$ gives estimates of γ and δ . The resulting regression, with t-statistics in parentheses is:

$$\begin{array}{c} \ln \overline{\rho} = 8.35 - .91 \times \ln \overline{Y}, \qquad R^2 = .93 \\ (9.1) \quad (10.5) \end{array} \tag{17}$$

This equation implies γ=exp(8.35)=4215, δ=.91.[18]

We consider a metropolitan area with five local jurisdictions—a large city and four smaller suburbs that have equal land area. The city has 40% of the total metropolitan land area and each of the suburbs has 15% of the land area. We assume that the city is the poorest jurisdiction. These conditions for income stratification (Proposition 1) are satisfied in all computational results reported below.

We impose minimal *a priori* constraints on tax structures, as follows. We require that income and property tax rates be non-negative and that the income tax rates be no greater than one. We permit r to be either positive or negative in the suburbs. Negative values of r correspond to head taxes while positive values correspond to a flat grant. Lump-sum head taxes are not commonly observed in practice, although impact fees and user fees, which are forms of head taxes, are observed. However, it has been shown by Hamilton (1975) that, when communities are small and internally homogeneous, zoning constraints that impose a lower bound on housing consumption have the effect of turning the

[18] In estimating this equation, we drop the highest and the three lowest income categories. The estimated function is used to calculate the income at which the fraction of households switches from being majority renter to being majority of owner occupant. Thus, fit in the interior of the income distribution is our primary concern.

property tax into a head tax. While our suburban communities are not the infinitesimal size assumed by Hamilton, we approximate by assuming that zoning constraints permit communities to effectively convert property taxes into head taxes. In the central-city, r must be non-negative due to feasibility constraints. The support of the income distribution is the positive real line; a head tax would violate the budget constraint of the poorest households.

3.2 Equilibrium when All Households are Renters

When local tax rates are not constrained by the state, equilibrium outcomes in the all-renters economy are reported in column 1 of Table 1. Consider first the results for community 1 (C^1). C^1 chooses a property tax rate of .33. As we noted above, property tax rates in our model are expressed as a proportion of the annualized implicit rental value of housing services. As we noted in the introduction, observed property taxes are expressed as a proportion of the market value of housing, not on the annual value of services. Using the 9% rate discussed in footnote 6, the 33% rate on annual implicit rent for C^1 in column (1) is equivalent to a tax rate on property value of 3% ($\cong 0.09 \times 0.33$). In addition to the property tax, C^1 also imposes an income tax at rate 12.4%. The revenues from the property and income taxes generate a total of \$3,983 per capita. These revenues are allocated to provide public services of \$1,984 per capita and a flat grant of \$1,999 per capita. Thus, in this equilibrium, revenues in the poorest community are divided almost equally between expenditures on public services and redistributive expenditures.

The remaining communities choose an income tax of zero. They fund expenditures on public services with a combination of head taxes and property taxes. As community income rises, reliance on property taxes decreases and reliance on head taxes increases. Wealthy communities choose very high public expenditure levels. As we show later, these high expenditure levels in wealthy communities are due in part to the incentives of renter households as compared to owner occupants.

With the preceding as a baseline, we now investigate state restrictions on local taxes.

3.3 The Impact of State Prohibition of Local Head Taxes

The baseline computation indicated that the median voters in each of the suburbs would choose a head tax to partially or fully finance the publicly provided good. This result is not surprising given the known efficiency results of financing public expenditures through a head tax. However, it is also well known that the distributional effects usually make head taxes politically infeasible. In this section, we study the political economy of prohibition of local head taxes. The state electorate in our analysis is the combined electorates of the city and suburbs. We determine political support by calculating the effects of prohibiting local head taxes on the welfare of individual households and deduce from this the extent of political support for such a prohibition. We also calculate the aggregate welfare effects (compensating variation plus change in economic rents).

Column 2 of Table 1 shows the equilibrium with no head taxes. An obvious result from the table is that if communities cannot use a head taxes, local government expenditures on public goods decreases significantly. Every community reduces its expenditures on public goods. The central city also reduces its lump sum grant and thus the level of income redistribution it undertakes. In general, the communities increase both property and income tax rates in an effort to offset the loss of revenue from the head tax. Without head taxes there is a reallocation of households from the two relatively poorer communities to the three wealthiest communities. This reallocation causes all the communities to experience a decrease in their tax bases as measured by average income, which contributes to the lower public good expenditures. Even in the central city, where the poorer pivotal voter should prefer a higher level of redistribution, the large decrease in the tax base counters this effect. The reallocation of households also leads to housing prices to fall in the lower income communities and increase in the higher income communities.

Even though the level of redistribution falls in the central city and public good expenditures fall in every community, almost all the poor and middle income households are made better off when head taxes are prohibited. For these households the lower price of housing in the three lower income communities offset the loss in welfare due to the lower level of public expenditures. Also, in general, more of the taxation burden is shifted to the absentee landlords because of the overall increase in metropolitan property taxes that offset head tax revenue losses. In addition, the income taxes do not increase significantly in the lower income communities. All these factors contribute to over 64% of the total metropolitan population supporting prohibition on head taxes. This result provides some explanation as to why head taxes lack political support even though they are the most economically efficient tax instrument.

3.4 The Impact of State Prohibition of Local Income Taxes

As we noted in the introduction, several states explicitly ban the use of income taxes by local municipalities either in state statutes or in constitutions and other states effectively preclude use of local income taxes through absence of authorization for localities to impose income taxes. In this section, we study the political economy of prohibition of local income taxes. We assume that head taxes are not politically feasible and no community has a head tax when local income taxes are banned.

Column 3 of Table 1 shows the equilibrium with a ban on local income taxes. In the new equilibrium, the property tax rates increase in almost all of the communities (except community 2) to offset a portion of the revenue loss from eliminating the income tax. This is especially true in the central city, which had the heaviest reliance on income taxes before the ban. The income tax ban leads to the opposite migration effect of the head tax prohibition, although the magnitude of the effect is much smaller. That is, there is some slight migration from the suburbs to the central city. All the suburbs experience a slight reduction in population, and the central city population increases from 24.3% to 26.7% of the metropolitan population. However, even with the increase in the tax base coupled with the large increase in the property tax rate cannot offset the loss in tax revenue in central city. Per capita redistributive expenditure falls about 33% in the city and expenditures on local public services also falls. The two poorest suburbs have small increases in local public service expenditure while the two richest suburbs have small decreases in the local public service expenditure even though these suburbs had the greatest increases in property tax rates.

Due to the increases in the property tax rates, gross of tax price of housing increases in all the communities. However, despite increases in the tax bases (average incomes), the net-of-tax price of housing changes only negligibly in all the communities.

Obviously the poorest households in the central city are made worse off by an income tax ban. These households receive less redistribution and public services and have to pay a much higher price per unit of housing. The ban on income tax probably does not offset the losses to the very poorest households from the lower government expenditures and higher price of housing since these low income households pay relatively little income taxes. However, it is unclear from just examining the equilibrium outcomes if the higher income households in the city and the suburban households are better off with the income tax ban. For instance, the higher income households in the city are burdened more by income taxes than the very poor households, especially if the income tax finances a redistributive lump-sum grant, and may be better off with no income tax even if public services fall. Also, households that remain in communities 2 and 3 have slightly lower tax burdens and slightly greater public service levels and housing prices, and thus it is ambiguous as to whether they are better off or not. The households that remain in communities 4 and 5 have less public services, higher housing prices and property tax rates, but are no longer burdened by income taxes. In addition, when public expenditures are financed solely by property taxes, as in communities 2 to 5, more of the burden is exported to the absentee landlords in this renters model.

In fact, compensating variation calculations indicate all the households that reside in the suburbs before the income tax ban are made better off. An income tax ban also makes a small portion of the richest households in the city better off, bringing total support for the ban to over 80% of the metropolitan population. Thus, a state government, serving both city and suburban residents, would find strong political support for a ban on local income taxation.

3.5 State Restrictions on Property Tax Rates

State restrictions on local property taxes are very common. As noted in the introduction, forty-six of the states place some form of restriction on local property taxes, with more than half setting a limit on the property tax rate that municipalities may impose. We study the political economy of state limits on local property taxes by examining the effects of a prohibition on local income taxes in conjunction with a 35% limit on property taxes as a percentage of annual implicit rent. At discount rates of 7% to 9% (see footnote 6), this limit translates to a tax rate limit on property value on the order of 2.5% to 3%. This combination of tax restrictions corresponds closely to state restrictions in Massachusetts. Thus, these restrictions are illustrative of limitations observed in practice.

Equilibrium with the property tax limit is in column (4) of Table 1. Only communities 1, 4 and 5 are restricted by this the 35% property tax rate limit. One impact of imposing this limit is that the communities that are not directly impacted, communities 2 and 3, are indirectly impacted because these communities also lower their property tax rates even though they are not required to do so.

Relatively higher income households migrate into communities 1 and 2. However, the higher income households in community 3 migrate out to community 4 when community 4 reduces its property tax rate from 50.6% to the 35% limit. This occurs even though community 3 reduces its rate from 33.7% to 28.2%. Community 4 also experiences out-migration of it highest income households into community 5 after the property tax limit is imposed.

As in the income tax ban, the very poor in the city are made worse off because the city's redistributive per capita lump-sum grant is reduced by over 50% and the public services expenditure falls by 30%. City population increases as higher income households move in, and the wealthier pivotal voter opts to allocate more of the reduced tax revenues to services. Suburban residents gain from a reduction in the price of housing, but lose from a decrease in public services per capita. However, although most of households that were city residents before the property tax limit is imposed are made worse off by the limit, all who reside in the suburbs before the property tax limit (74% of the metropolitan population) are better off because of the tax limit. These residents, combined with city residents who gain from the tax limit, result in a total of 79% of the metropolitan population favoring the tax limit.

3.6 Aggregate Welfare Effects

The welfare effects of the head tax ban, income tax ban and property tax limit are summarized in Table 2. The aggregate welfare losses associated with the head tax ban are quite substantial. This is the case even though as indicated above the distributional effects are such that over 64% of the population supports the ban. Almost all the poor and middle class support the ban. The rich (above $69,000 in income) not only prefer the head taxes, but are so significantly negatively affected by the ban that their aggregate welfare losses outweigh the gains to the other 64% of the population. This is another indication of the efficiency but political infeasibility of head taxes.

The income tax ban and the property tax limits have quite substantial positive aggregate welfare gains. These gains reflect the large distortions caused by unrestricted local taxes. The poorest households are worse off after the change, but a modest increase in redistributive expenditures by the state government would serve to compensate lower income households while avoiding the large distortions associated with local redistributive taxation.

3.7 Owner-Occupancy and State Tax Limitations

In Table 3, we study for owner occupants the same four cases considered for renters. Consider first the case without state restrictions. From a comparison of column (1) of Table 3 to column (1) of Table 1, we see that the city spends 17% more per capita on public services when all households are owner occupants than when all households are renters. In addition, in stark contrast to the equilibrium with renters, no redistribution is undertaken in the city when households are owner occupants. The city cannot have head taxes because of an infeasibility constraint for the very low income households. When all households are owner-occupants, the primary revenue instrument used by the city is the income tax, with a relatively modest property tax. The distribution of households across city and suburbs is also very different in the two cases. In the equilibrium with owner occupants, 57% of households reside in the city whereas only 44% do so in the equilibrium with all renters.

Comparison of column (1) of Table 3 to the corresponding column of Table 1 also reveals substantial differences in suburban spending between the two cases. The two wealthiest suburbs have much lower tax rates and lower per capita expenditure when all households are owner occupants. When all households are renters, a portion of any tax increase is shifted to landowners. When all households are owner occupants, taxes that drive down housing prices result in capital losses for occupants. Owners internalize the effects of taxes on property values, leading them to support lower taxes and expenditures.

We next consider the effect of a state prohibition on local head taxes. Just as in the all-renters model, banning head taxes leads to net out-migration from the city and the poorest suburb into the richer suburbs. The richest households in each of the communities (except of course the richest community) migrate into the next richest community, with the net effect being the three richest suburbs gain population and city and poorest suburb lose population. This re-allocation of households causes a reduction in the median income in all the communities. The lower income pivotal voter in the city prefers a less public service expenditures. In the suburbs the ban on head taxes causes income taxes to increase considerably. The additional revenue from the higher income taxes, though, does not offset the loss in head tax revenue, and public service expenditures fall in all the communities. The fact that in each community the new pivotal voter has less income than the previous pivotal voter also contributes to less public service expenditures.

It is not surprising that if capital losses on house consumption is not included, all the middle class and poor are made better off by the head tax ban, but the rich are made worse-off. The distributional effects based on compensating variation but not including the capital gains or losses on housing consumption is all households with income below approximately $60,000 are made worse off, which is about 70% of the metropolitan population. What is surprising is that if capital losses are included in individual household welfare effects, these losses are so large they trump the compensating variation gains for the middle class and poor households and every household in the metropolitan area is made worse-off. This result indicates if every household was an owner, local head taxes would be much more common. The efficiency losses per capita are also considerable. If households are owners, prohibiting head taxes results in a per capita welfare loss of -$2,040.

Just as we did in the all-renters model, we next consider the effect of a state prohibition on local income taxes when there are no existing local head taxes for the all owners model. Comparing columns (2) and (3) of Table 3, we see that banning the income tax results in significant increases in property taxes in all the communities. Even with these significant increases in property tax to offset the loss in income tax revenue, each community reduces expenditures per capita. These reductions range from over 12% in the poorest community to over 20% in the richest community. There are only minimal household migration effects. The compensating variation calculations indicate that every household in this all-owner model prefers banning local income taxes. However, the increase in the property taxes in each community decreases the net-of-tax price of housing to such a degree that all the households in the metropolitan area are hit with capital losses on housing that are so large that they offset any utility gains as measured by compensating variation. Hence, the model predicts if all households are owner occupants, there would be no support at the state level for banning local income taxes. Because of the large loss in rents to owner occupants, the imposition of a ban on income taxation results in a per capita welfare loss of $378.

Only the three middle income suburbs are directly affected by the imposition of the limit on property taxes in this all-owner model (table 3, column 4). The property tax limit results in a further reduction of expenditure per capita in these three suburbs. The city and the riches suburb are not constrained by the limit and there only relatively modest indirect effects in these two communities due to the minimal household migration. In contrast to the lack of support for the income tax ban, when individual household welfare is measured by compensating variation plus capital gains or losses, over 65% of the population in the metropolitan area favors the limit. Limiting property taxes increases per capita welfare by $239 when the gains in rents are included.

3.8 Owners, Renters and Tax Limits

The preceding results highlight the central role of home ownership as a determinant of local tax and expenditure policy. Those policies in turn influence the extent of popular support for state restrictions on local taxes. We now consider choice of tax policy in a metropolitan occupied by both owners and renters. To characterize policy outcomes, we employ the city-council model introduced earlier. Column (1) of Table 4 reports the outcome when there are no state restrictions on local tax policy. In this equilibrium, the median-income council member in the city is a renter. In all suburbs, the pivotal council member is an owner-occupant. We see that the city spends $4,215 per capita, with $2,128 of that expenditure devoted to public services and the remainder to provide a redistributive grant, with funding from a combination of property and income taxes. By contrast, the suburbs provide no redistributive grant and rely almost exclusively on head taxes for funding public services. Here, 48% of metropolitan residents reside in the city.

To provide further insight into the model with both owners and renters, we present in Figure 1 most-preferred tax rates and expenditures as a function of council member income. Council members from low-income districts prefer high income tax rates, high redistributive grants, and moderate expenditures on public services. As council member income rises, the preferred income tax rate and level of redistributive expenditure falls, and the preferred level of spending on government services rises. At incomes below \$21,752, the fraction of households who are renters exceeds half, hence the district councilperson is a renter; above that income, the fraction that is owners exceeds half and the district councilperson is an owner. The discrete changes observed in Figures 1 at this income level arise due to differing preferences of renters and owner occupants. Relative to renters, these higher-income owner occupants prefer lower tax rates, higher expenditures on government services, and no expenditures on redistribution.

Figure 2 shows the vote garnered when the median income (\$19,688) council members' most preferred policy is paired against the most-preferred policy of each other council member. As the figure demonstrates, the vote favoring the median ideal point exceeds 50% in all cases. This confirms that the median ideal point is a Condorcet winner against all the other ideal points. Besley and Coate (1997) demonstrate that this condition is necessary and sufficient for a single-candidate equilibrium. Thus, the most-preferred outcome of the median-income council member is implemented.[19]

Two further points are of interest with respect to the result just described. One is that this allocation does not satisfy the Plott (1967) conditions. There are feasible alternatives that defeat the policy preferred by the median-income voter. However, those alternatives are not the most-preferred policy of any voter and thus fail the credibility restriction adopted by Besley and Coate. This result illustrates the power of the Besley-Coate framework. The second observation concerns the role of our city-council formulation. Suppose candidates not nominated by their districts could nonetheless garner the resources to run. There would then be candidates whose ideal points defeat the ideal point of the median-

[19] The policy most preferred by owners with income above \$21,752 is the same for all those owners. This accounts for the horizontal segment beginning at income \$21,752 in the vote graph in Figure 2.

income council member. Such ideal points are not equilibria, however.[20] Our city-council formulation assures that such candidates do not represent their respective districts on the city-council.

We now turn to the outcome with a prohibition of local head taxes. The results are presented in column (2) Table 4. Just as in the all-renters and all-owners models, prohibiting head taxes causes dramatic migration out of the city and the poorest suburb and into the three other communities, especially the wealthiest suburb, community 5. The percent of the metropolitan population residing in community 5 increases form 5.6% to 22.6%, whereas the percentage of the population residing in the city falls from 47.8% to 24.8%. Even though the city is not constrained by the prohibition on local head taxes, the out-migration effects and the concomitant reduction in the tax base leads to more than a 25% drop in public expenditure per capita. The new lower income pivotal voter prefers a significantly greater reduction in public services than in the redistributive lump-sum grant. All the suburbs increase their income tax rates and three of the suburbs increase their property tax rates to try to offset the losses in head tax revenue. Public service expenditures fall in all the suburbs due not only to the loss of head taxes but also the lower tax bases (mean income) in all the communities.

The distributional effects on the prohibition of local head taxes are shown in Figure 3. The only households that are made better off by the ban are renters with incomes between approximately \$14,500 and \$55,500, or about 20% of the total metropolitan population. Hence, head taxes seem to have political support. Even the majority of the households in the city would not support a ban. However, a head tax would not be implemented in the city. As shown in column 1 of Table 4, and as previously mentioned, the median voter in

[20] Details documenting all claims in this paragraph are available on request.

the city prefers a positive lump-sum grant of $2,087 as opposed to head tax, which would be a negative lump-sum grant. However, all the suburbs implement head taxes, which cause many more households to reside in the city. These household are wealthier than the residents in the city when head taxes are prohibited. The associated higher tax base in the city permits provision of higher public good levels with a lower income tax rate. Hence, the relatively poorer households in the city have an incentive to permit head taxes even though a head tax will not be implemented in the city. This is because the suburbs will implement head taxes, driving migration into the city and improving the welfare of city residents. Consistent with this result, head taxes, especially in the form of impact fees and user fees, are more commonly observed in suburbs than in central cities. In addition, minimum housing consumption zoning requirements, which as mentioned above were shown by Hamilton to have effects similar to head taxes, are much more common in suburbs. Prohibiting head taxes causes a per-capita efficiency loss of $2,413 measured by compensating variation plus changes in economic rents in the housing market.

We now turn to the outcome with a prohibition of local income taxes given the same scenario as in the all-renters and all-owners models, that local head taxes had never been previously authorized by the state. The results are presented in column (3) Table 4. Expenditure per capita in the city again drops more than 25%, although unlike when only head taxes are prohibited, most of the drop is in redistributive grant, which is reduced by 34%. Expenditures in the city are funded entirely by a property tax, which increases by over 138% in response to the income tax ban. Expenditures in the suburbs also fall, but not as much as in the city. Each suburb increases property taxes to offset the loss in income tax revenue. As a consequence, there are minimal migration effects as the population in each community remains relatively stable. There is some slight migration into the city as its share of the metropolitan population increases from 24.8% to 26.1%

The distributional effects on the prohibition of local income taxes in case where there are no head taxes are shown in Figure 4. All renters with income above $16,500 are better off without local income taxes. Only owners with income from approximately $18,000 to $21,000 are made better off. This means that only 25% of the metropolitan population supports the income tax ban. Almost all renters are made better off because the ban on income taxes does not decrease public service expenditures significantly and shifts more of the burden of financing public services to landowners through increases in property taxes. The renters pay more per unit of housing, but the increase in housing prices per unit is less than the increase in the property tax. Almost all the owners are made worse off because of capital losses on housing. The net-of-tax price of housing falls in all the communities so homeowners experience capital losses, but the gross-of-tax price of hosing increases in all the communities, so they adjust to lower housing consumption. If all households were renters, prohibiting income taxes would lead to per-capita welfare gain measured by compensating variation of $349. However, rents fall on a per capita basis by $650, so there is a per capita welfare loss of $301.

Imposition of the limit on property taxes results in the outcome shown in column (4) of Table 4. Since very few states authorize local head or income taxes, we examine the effects of a state mandated limit on local property taxes when property taxes are the only tax instrument available to local communities. This is again consistent with our analysis of the all-renters and all-owners models. Under this scenario, only communities 1 (city), 3 and 4 are constrained by the property tax limit. The city is the most affected by the limit. This is expected since the city had the highest property tax rate. Expenditures fall significantly in the city. The redistributive grant drops more than 50%. In addition, the price of housing in the city falls significantly. However, these factors do not lead to a flood of rich households into the city, as one would expect. There is only a small amount of migration into the city. This is due to the low level of public services. The expenditure per capita on public services is three times as great in the poorest suburb than in the city. The relatively richer households are willing to pay an almost 30% higher price of housing to consume almost three times as much public services.

Unlike with the head tax and income tax ban, there is overwhelming political support for a metropolitan wide property tax limit. As Figure 5 indicates, only the relatively poor households in the city are made worse off by the property tax limit. These include renter households with income below \$18,000 and owner households with income below \$11,000, for a total of about 17% of the population. This result is not surprising given that only in the city did public expenditures fall significantly. This result also means that residents in communities that are not constrained by the tax limit (communities 2 and 5) support the limit to constrain other communities. This result provides support for Vigdor's (2001) hypothesis that support for local tax limits does not only come from voters wishing to limit the taxes their own locality imposes, but also from the desire of voters to limit tax rates in localities in which they do not reside

4. Conclusion

We find that tax limitations have very substantial effects on housing prices and the composition of communities. If head taxes are prohibited, adjustments following introduction of tax limits result in an increase in median incomes in all communities. The electorates of all communities, but particularly the central-city, then adopt policies different from those that prevail in the absence of tax limitations. Tax limits thereby have striking effects on spending in the city, reducing expenditures on redistribution and public good provision. Prohibiting head taxes and income taxes reduces public good expenditures all the communities; however property tax limits increases per capita expenditures on public good provision in the richest community.

Our model provides an explanation of political support for tax limitations. Our results provide support for Vigdor's (2001) hypothesis that support for local tax limits does not come only from voters wishing to limit the taxes their own locality imposes, but also from the desire of voters to limit tax rates in localities in which they do not reside. While we propose a somewhat different mechanism than Vigdor as driving support for state tax limitations, his insight that support for tax limits comes from voters wishing to constrain taxes in other communities is nonetheless fundamental. A further insight of Vigdor's is also ratified by our analysis: A property tax limit can have effects in communities that are not bounded by the limit in equilibrium. The change in community composition induced by a tax limit in turn leads to a change in the pivotal voter, and hence in the policies that voter adopts.

Finally, our analysis demonstrates the importance, when evaluating tax limits, of a framework that permits consideration of multiple policy instruments. We find that banning head taxes has the greatest impact on local public expenditures. Successive bans on local income taxes and limits on property taxes lead to large reductions in redistributive expenditures while having much more modest impact on expenditures for locally provided public goods.

Figure 1

Ideal Points as a Function of Council Member Income

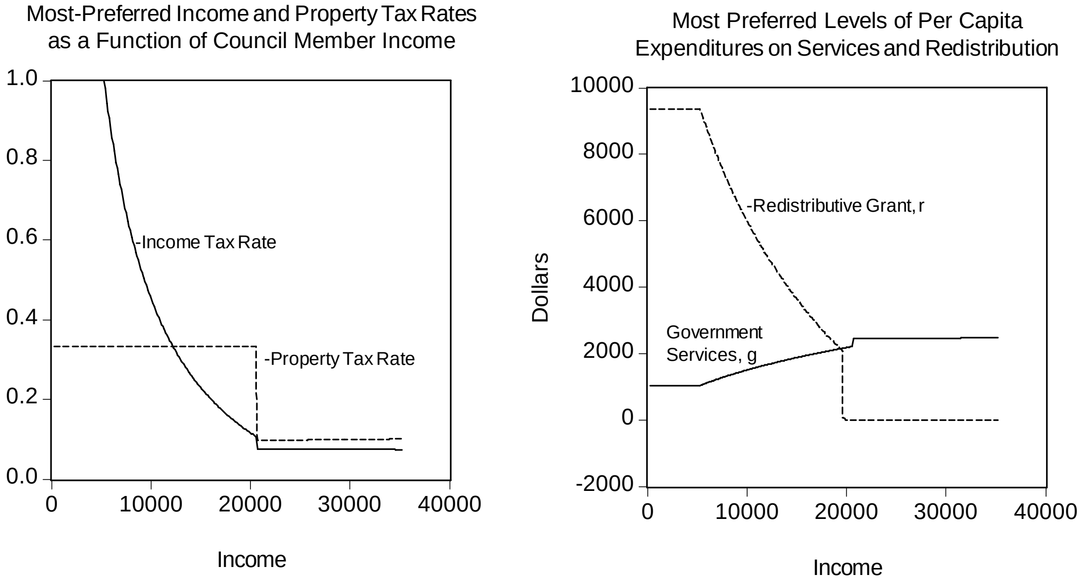

Figure 2

Vote Favoring Ideal Point of Median-Income Council Member
when Paired against Ideal Points of Other Council Members

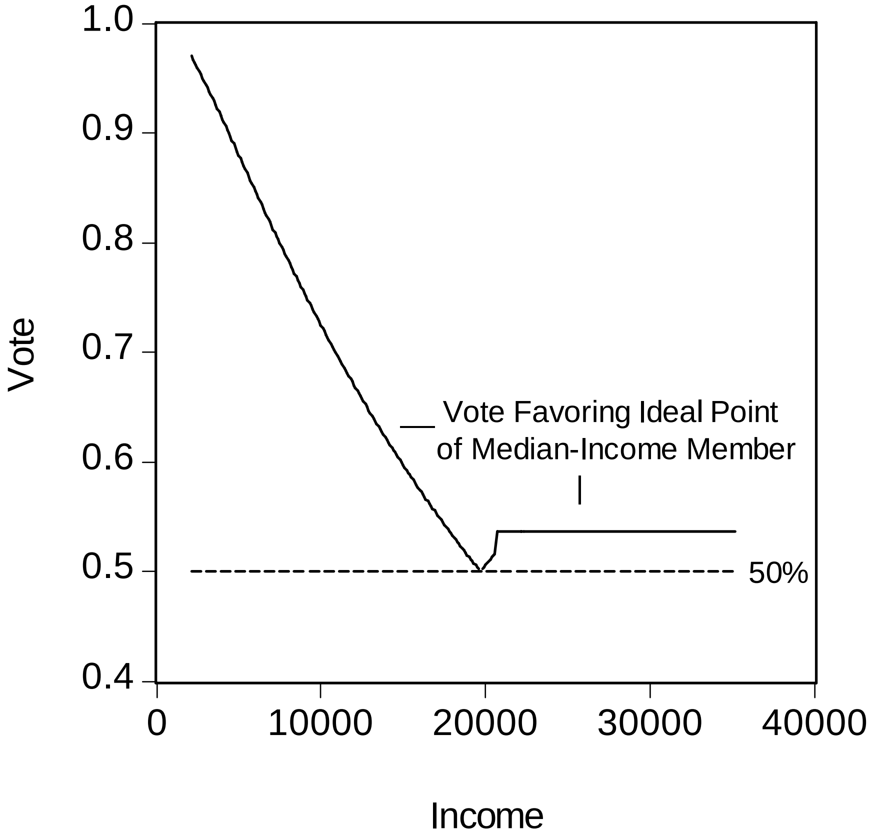

Figure 3: Welfare Effects of Prohibition of Local Head Tax

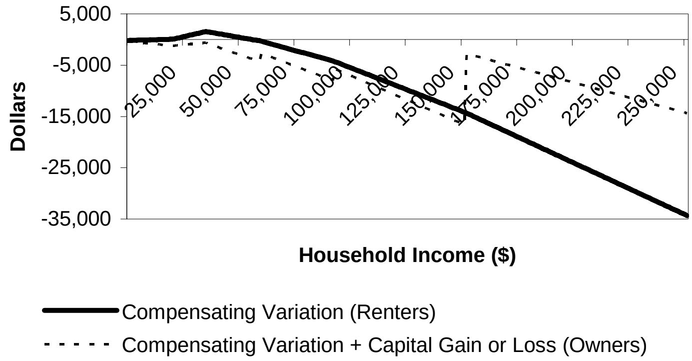

Figure 4: Welfare Effects of Prohibition of Local Income Tax when Head Taxes are Prohibited

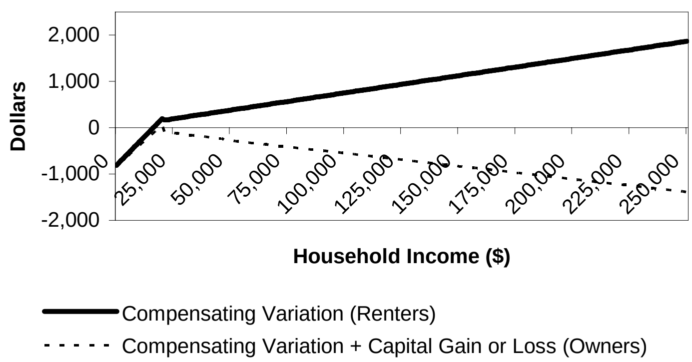

Figure 5: Welfare Effects of Imposing a Limit on Property Tax Rates when Income Taxes and Head Taxes are Prohibited

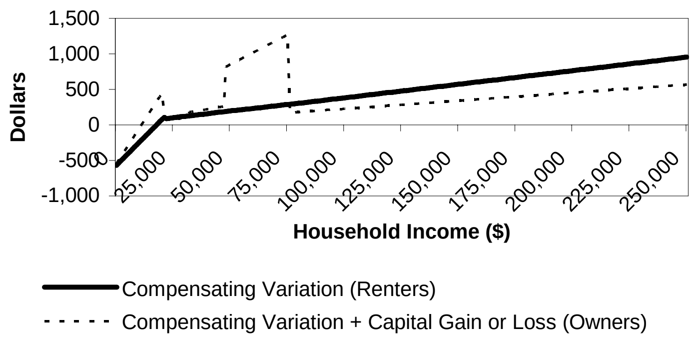

Table 1

		(1)	(2)	(3)	(4)
Property Tax Rates	t_1	0.333	0.333	0.776	0.350
	t_2	0.260	0.183	0.180	0.163
	t_3	0.010	0.333	0.337	0.282
	t_4	0.013	0.333	0.506	0.350
	t_5	0.000	0.333	0.648	0.350
Income Tax Rates	m_1	0.124	0.154	0.000	0.000
	m_2	0.000	0.0000	0.000	0.000
	m_3	0.000	0.003	0.000	0.000
	m_4	0.000	0.043	0.000	0.000
	m_5	0.000	0.076	0.000	0.000
Per Capita Expenditure On Public Services	g_1	$1,984	$1,362	$1,190	$835
	g_2	$4,942	$1,381	$1,441	$1,358
	g_3	$9,639	$3,410	$3,451	$2,991
	g_4	$18,239	$7,472	$7,202	$5,397
	g_5	$42,027	$22,003	$19,995	$12,822
Per Capita Grant Or Head Tax	r_1	$1,999	$1,765	$1,183	$559
	r_2	$-1,703	0	0	0
	r_3	$-7,229	0	0	0
	r_4	$-17,642	0	0	0
	r_5	$-42,027	0	0	0
Population Shares	N_1	43.5%	24.3%	26.7%	28.4%
	N_2	27.1%	14.3%	13.8%	12.6%
	N_3	18.1%	19.1%	18.4%	17.0%
	N_4	8.7%	20.5%	19.7%	19.3%
	N_5	2.6%	21.9%	21.4%	22.8%
Gross-of-Tax Housing Prices	p_1	$11.48	$9.04	$11.94	$9.84
	p_2	$15.43	$10.89	$10.92	$10.63
	p_3	$14.37	$14.12	$14.15	$13.43
	p_4	$12.94	$15.96	$17.61	$16.01
	p_5	$11.42	$20.03	$23.88	$20.73
Pivotal Voter Incomes	$\tilde{y}_1$	$18,507	$13,118	$13,826	$14,286
	$\tilde{y}_2$	$43,258	$24,055	$25,397	$26,041
	$\tilde{y}_3$	$76,957	$35,419	$36,684	$36,508
	$\tilde{y}_4$	$136,715	$55,736	$56,924	$55,389
	$\tilde{y}_5$	$264,795	$109,794	$111,034	$107,631

Table 2: Per Capita Welfare Effects of Income Tax Ban and Property Tax Limitations

	Per Capita Compensating Variation	Per Capita Change in Land Rents	Per Capita Change in Welfare
Head Tax Ban	-$2,495	-$489	-$2,984
Income Tax Ban	$147	-$329	$182
3.5% Property Tax Limitation after Income Tax Ban	$130	$519	$649

Table 3

		(1)	(2)	(3)	(4)
Property Tax Rates	t_1	0.083	0.133	0.333	0.333
	t_2	0.001	0.030	0.401	0.350
	t_3	0.000	0.004	0.454	0.350
	t_4	0.000	0.075	0.649	0.350
	t_5	0.083	0.000	0.242	0.243
Income Tax Rates	m_1	0.075	0.062	0.000	0.000
	m_2	0.004	0.115	0.000	0.000
	m_3	0.003	0.139	0.000	0.000
	m_4	0.004	0.153	0.000	0.000
	m_5	0.000	0.092	0.000	0.000
Per Capita Expenditure On Public Services	g_1	\$2,321	\$1,682	\$1,474	\$1,457
	g_2	\$5,351	\$4,040	\$3,328	\$2,964
	g_3	\$8,134	\$6,379	\$5,155	\$4,175
	g_4	\$12,461	\$11,424	\$9,614	\$6,258
	g_5	\$22,878	\$13,325	\$10,625	\$10,689
Per Capita Grant Or Head Tax	r_1	\$0	\$0	\$0	\$0
	r_2	-\$5,099	\$0	\$0	\$0
	r_3	-\$7,879	\$0	\$0	\$0
	r_4	-\$12,005	\$0	\$0	\$0
	r_5	-\$16,288	\$0	\$0	\$0
Population Shares	N_1	56.9%	36.7%	35.0%	34.5%
	N_2	18.1%	14.8%	15.1%	14.7%
	N_3	12.1%	14.9%	16.0%	15.7%
	N_4	8.0%	14.4%	15.5%	17.0%
	N_5	4.8%	19.2%	18.4%	18.2%
Gross-of-Tax Housing Prices	p_1	\$10.91	\$9.34	\$10.52	\$10.44
	p_2	\$12.14	\$10.34	\$13.39	\$12.89
	p_3	\$12.19	\$10.98	\$15.25	\$14.27
	p_4	\$12.22	\$12.51	\$18.36	\$16.10
	p_5	\$13.69	\$15.79	\$18.91	\$18.89
Pivotal Voter Incomes	$\tilde{y}_1$	\$22,310	\$16,604	\$16,147	\$15,985
	$\tilde{y}_2$	\$53,191	\$32,364	\$31,294	\$30,758
	$\tilde{y}_3$	\$80,585	\$45,091	\$44,277	\$43,209
	$\tilde{y}_4$	\$122,209	\$64,568	\$65,075	\$64,183
	$\tilde{y}_5$	\$212,514	\$117,350	\$119,997	\$120,642

Table 4

		(1)	(2)	(3)	(4)
Property Tax Rates	t_1	0.333	0.333	0.776	0.350
	t_2	0.002	0.056	0.314	0.316
	t_3	0.000	0.021	0.430	0.350
	t_4	0.000	0.065	0.606	0.350
	t_5	0.084	0.000	0.240	0.241
Income Tax Rates	m_1	0.122	0.153	0.000	0.000
	m_2	0.006	0.083	0.000	0.000
	m_3	0.004	0.127	0.000	0.000
	m_4	0.004	0.146	0.000	0.000
	m_5	0.000	0.092	0.000	0.000
Per Capita Expenditure On Public Services	g_1	$2,128	$1,380	$1,172	$824
	g_2	$4,564	$2,566	$2,296	$2,374
	g_3	$7,339	$5,074	$4,304	$3,749
	g_4	$11,582	$9,517	$8,312	$5,782
	g_5	$21,748	$12,312	$9,920	$10,116
Per Capita Grant Or Head Tax	r_1	$2,087	$1,773	$1,167	$546
	r_2	-$4,255	$0	$0	$0
	r_3	-$7,079	$0	$0	$0
	r_4	-$11,123	$0	$0	$0
	r_5	-$15,443	$0	$0	$0
Population Shares	N_1	47.8%	24.8%	26.1%	27.6%
	N_2	22.7%	17.3%	16.5%	15.9%
	N_3	14.6%	17.7%	18.2%	17.4%
	N_4	9.4%	17.5%	18.2%	18.9%
	N_5	5.6%	22.6%	21.0%	20.3%
Gross-of-Tax Housing Prices	p_1	$11.96	$9.13	$11.82	$9.73
	p_2	$12.36	$10.40	$12.45	$12.44
	p_3	$12.44	$11.15	$15.00	$14.25
	p_4	$12.49	$12.66	$18.25	$16.21
	p_5	$14.02	$16.14	$19.24	$19.15
Pivotal Voter Incomes	$\tilde{y}_1$	$19,688	$13,281	$13,629	$14,058
	$\tilde{y}_2$	$45,293	$25,305	$25,832	$26,592
	$\tilde{y}_3$	$72,635	$37,755	$38,342	$38,784
	$\tilde{y}_4$	$113,456	$56,782	$58,596	$59,255
	$\tilde{y}_5$	$201,363	$107,986	$112,145	$114,255

BIBLIOGRAPHY

Advisory Commission on Intergovernmental Relations, 1988. *Local revenue Diversification: Local Income Taxes. Staff report.* Washington, D.C.

Advisory Commission on Intergovernmental Relations, 1995(a). *Tax and Expenditure Limits on local Governments.* Washington, D.C.

________, 1995(b), *Significant Features of Fiscal Federalism.* Washington, D.C.

Besley, Timothy and Stephen Coate, "An Economic Theory of Representative Democracy," *Quarterly Journal of Economics*, 112,1 (February 1997): 85-114.

Bucovetsky, Sam, "Choosing Tax Rates and Public Expenditure Levels Using Majority Rule," *Journal of Public Economics*, 46 (1991): 113-131.

Calabrese, Stephen M., "Local Redistribution Financed by Income Tax," *Public Finance Review*, 29, 4, (July 2001): 259-303.

Calabrese, Stephen M., Glenn Cassidy, and Dennis Epple, "Urban Fiscal Structure and Metropolitan Consolidation," *Brookings-Wharton Papers on Urban Affairs*, 2002.

Cassidy, Glenn, *Mobility and Choice: Three Essays on the Political Economy of Local Government*, Ph.D. Dissertation, Carnegie Mellon University, 1990.

Ellickson, Bryan, "Jurisdictional Fragmentation and Residential Choice," *American Economic Review*, 61, May 1971, 334-339.

Epple, Dennis, Radu Filimon, and Thomas Romer, "Equilibrium Among Local Jurisdictions: Toward an Integrated Treatment of Voting and Residential Choice," *Journal of Public Economics*, 24, August 1984, 281-308.

Epple, Dennis and Richard Romano, "Neighborhood Schools, Choice, and the Distribution of Educational Benefits," in The Economics of School Choice (C. Hoxby, Ed.), National Bureau of Economic Research, 2003.

Epple, Dennis and Thomas Romer, "Mobility and Redistribution," *Journal of Political Economy*, 99, August 1991, 828-858.

Epple, Dennis, Thomas Romer and Holger Sieg, "Interjurisdictional Sorting and Majority Rule: An Empirical Analysis," *Econometrica*, November 2001.

Epple, Dennis and Holger Sieg, "Estimating Equilibrium Models of Local Jurisdictions," *Journal of Political Economy*, 107(4), August 1999, 645-681.

Fernandez, Raquel and Richard Rogerson, "Income Distribution, Communities, and the Quality of Public Education," *Quarterly Journal of Economics*, 111(1), February 1996, 135-164.

________________________________, "Public Education and Income Distribution: A Dynamic Quantitative Evaluation of Education-Finance Reform" *American Economic Review*, 88(4), September 1998: 813-33.

Fischel, William, "Did *Serrano* Cause Proposition 13," *National Tax* 42(4) (1989): 465-473.

Goodspeed, Timothy, "A Re-examination of the Use of Ability to Pay Taxes by Local Governments," *Journal of Public Economics*, 38(3), April 1989: 319-42.

Hamilton, Bruce, "Zoning and Property Taxation in a System of Local Governments, *Urban Studies,* v1, n2 (June 1975): 205-211.

Henderson, J. Vernon, "Community Choice of Revenue Instruments," *Regional Science and Urban Economics,* 24, 2 (April 1994): 159-183.

Inman, Robert P., "How to Have a Fiscal Crisis: Lessons from Philadelphia," *American Economic Review Papers and Proceedings*, 85, 2 (May 1995): 378-383.

__________, "The Local Decision to Tax: Evidence from Large U.S. Cities," *Regional Science and Urban Economics*, 19, 3 (August 1989): 455-491.

Mieszkowski, Peter and Edwin S. Mills, "The Causes of Metropolitan Suburbanization," *Journal of Economic Perspectives*, 7, 3 (Summer 1993): 135-148.

Mills, Edwin S., *Urban Economics*, Glenview, Illinios: Scott, Foresman and Company, 1972.

Nechyba, Thomas J., "Local Property and State Income Taxes: The Role of Interjurisdictional Competition and Collusion" *Journal of Political Economy*, 105, 2 (April 1997): 351-84

O'Sullivan, Arthur, Terri Sexton, and Steven Sheffrin, *Property Taxes and Tax Revolts,* Cambridge University Press, 1995.

Poterba, James, "Taxation and Housing: Old Questions, New Answers," *American Economic Review Papers and Proceedings*, 82 (May 1992): 237-242.

Plott, Charles, "A Notion of Equilibrium and its Possibility Under Majority Rule," *American Economic Review*, 57, 4 (September 1967): 787:806.

Vigdor, Jacob, "Median Voters, Marginal Residents, and Property Tax Limitations" Working Paper, Duke University, June 19, 2001.

Westhoff, Frank, "Existence of Equilibrium in Economies with a Local Public Good," *Journal of Economic Theory*, 14, February 1977, 84-112.

Zodrow, George, "The Incidence of Metropolitan Property Tax Base Sharing and Rate Equalization," *Journal of Urban Economics*, 15 (1984): 210-22.

2007

2007/1. Durán Cabré, J.Mª.; Esteller Moré, A.: "An empirical analysis of wealth taxation: Equity vs. tax compliance"
2007/2. Jofre-Monseny, J.; Solé-Ollé, A.: "Tax differentials and agglomeration economies in intraregional firm location"
2007/3. Duch, N.; Montolio, D.; Mediavilla, M.: "Evaluating the impact of public subsidies on a firm's performance: A quasi experimental approach"
2007/4. Sánchez Hugalde, A.: "Influencia de la inmigración en la elección escolar"
2007/5. Solé-Ollé, A.; Viladecans-Marsal, E.: "Economic and political determinants of urban expansion: Exploring the local connection"
2007/6. Segarra-Blasco, A.; García-Quevedo, J.; Teruel-Carrizosa, M.: "Barriers to innovation and public policy in Catalonia"
2007/7. Calero, J.; Escardíbul, J.O.: "Evaluación de servicios educativos: El rendimiento en los centros públicos y privados medido en PISA-2003"
2007/8. Argilés, J.M.; Duch Brown, N.: "A comparison of the economic and environmental performances of conventional and organic farming: Evidence from financial statement"

2008

2008/1. Castells, P.; Trillas, F.: "Political parties and the economy: Macro convergence, micro partisanship?"
2008/2. Solé-Ollé, A.; Sorribas-Navarro, P.: "Does partisan alignment affect the electoral reward of intergovernmental transfers?"
2008/3. Schelker, M.; Eichenberger, R.: "Rethinking public auditing institutions: Empirical evidence from Swiss municipalities"
2008/4. Jofre-Monseny, J.; Solé-Ollé, A.: "Which communities should be afraid of mobility? The effects of agglomeration economies on the sensitivity of firm location to local taxes"
2008/5. Duch-Brown, N.; García-Quevedo, J.; Montolio, D.: "Assessing the assignation of public subsidies: do the experts choose the most efficient R&D projects?"
2008/6. Solé-Ollé, A.; Hortas Rico, M.: "Does urban sprawl increase the costs of providing local public services? Evidence from Spanish municipalities"
2008/7. Sanromà, E.; Ramos, R.; Simón, H.: "Portabilidad del capital humano y asimilación de los inmigrantes. Evidencia para España"
2008/8. Trillas, F.: "Regulatory federalism in network industries"

2009

2009/1. Rork, J.C.; Wagner, G.A.: "Reciprocity and competition: is there a connection?"
2009/2. Mork, E.; Sjögren, A.; Svaleryd, H.: "Cheaper child care, more children"
2009/3. Rodden, J.: "Federalism and inter-regional redistribution"
2009/4. Ruggeri, G.C.: "Regional fiscal flows: measurement tools"
2009/5. Wrede, M.: "Agglomeration, tax competition, and fiscal equalization"
2009/6. Jametti, M.; von Ungern-Sternberg, T.: "Risk selection in natural disaster insurance"
2009/7. Solé-Ollé, A; Sorribas-Navarro, P.: "The dynamic adjustment of local government budgets: does Spain behave differently?"
2009/8. Sanromá, E.; Ramos, R.; Simón, H.: "Immigration wages in the Spanish Labour Market: Does the origin of human capital matter?"
2009/9. Mohnen, P.; Lokshin, B.: "What does it take for and R&D incentive policy to be effective?"
2009/10. Solé-Ollé, A.; Salinas, P..: "Evaluating the effects of decentralization on educational outcomes in Spain?"
2009/11. Libman, A.; Feld, L.P.: "Strategic Tax Collection and Fiscal Decentralization: The case of Russia"
2009/12. Falck, O.; Fritsch, M.; Heblich, S.: "Bohemians, human capital, and regional economic growth"
2009/13. Barrio-Castro, T.; García-Quevedo, J.: "The determinants of university patenting: do incentives matter?"
2009/14. Schmidheiny, K.; Brülhart, M.: "On the equivalence of location choice models: conditional logit, nested logit and poisson"
2009/15. Itaya, J., Okamuraz, M., Yamaguchix, C.: "Partial tax coordination in a repeated game setting"
2009/16. Ens, P.: "Tax competition and equalization: the impact of voluntary cooperation on the efficiency goal"
2009/17. Geys, B., Revelli, F.: "Decentralization, competition and the local tax mix: evidence from Flanders"
2009/18. Konrad, K., Kovenock, D.: "Competition for fdi with vintage investment and agglomeration advantages"
2009/19. Loretz, S., Moorey, P.: "Corporate tax competition between firms"

2009/20. Akai, N., Sato, M.: "Soft budgets and local borrowing regulation in a dynamic decentralized leadership model with saving and free mobility"
2009/21. Buzzacchi, L., Turati, G.: "Collective risks in local administrations: can a private insurer be better than a public mutual fund?"
2009/22. Jarkko, H.: "Voluntary pension savings: the effects of the finnish tax reform on savers' behaviour"
2009/23. Fehr, H.; Kindermann, F.: "Pension funding and individual accounts in economies with life-cyclers and myopes"
2009/24. Esteller-Moré, A.; Rizzo, L.: "(Uncontrolled) Aggregate shocks or vertical tax interdependence? Evidence from gasoline and cigarettes"
2009/25. Goodspeed, T.; Haughwout, A.: "On the optimal design of disaster insurance in a federation"
2009/26. Porto, E.; Revelli, F.: "Central command, local hazard and the race to the top"
2009/27. Piolatto, A.: "Plurality versus proportional electoral rule: study of voters' representativeness"
2009/28. Roeder, K.: "Optimal taxes and pensions in a society with myopic agents"
2009/29, Porcelli, F.: "Effects of fiscal decentralisation and electoral accountability on government efficiency evidence from the Italian health care sector"
2009/30, Troumpounis, O.: "Suggesting an alternative electoral proportional system. Blank votes count"
2009/31, Mejer, M., Pottelsberghe de la Potterie, B.: "Economic incongruities in the European patent system"
2009/32, Solé-Ollé, A.: "Inter-regional redistribution through infrastructure investment: tactical or programmatic?"
2009/33, Joanis, M.: "Sharing the blame? Local electoral accountability and centralized school finance in California"
2009/34, Parcero, O.J.: "Optimal country's policy towards multinationals when local regions can choose between firm-specific and non-firm-specific policies"
2009/35, Cordero, J,M.; Pedraja, F.; Salinas, J.: "Efficiency measurement in the Spanish cadastral units through DEA"
2009/36, Fiva, J.; Natvik, G.J.: "Do re-election probabilities influence public investment?"
2009/37, Haupt, A.; Krieger, T.: "The role of mobility in tax and subsidy competition"
2009/38, Viladecans-Marsal, E; Arauzo-Carod, J.M.: "Can a knowledge-based cluster be created? The case of the Barcelona 22@district"

2010

2010/1, De Borger, B., Pauwels, W.: "A Nash bargaining solution to models of tax and investment competition: tolls and investment in serial transport corridors"
2010/2, Chirinko, R.; Wilson, D.: "Can Lower Tax Rates Be Bought? Business Rent-Seeking And Tax Competition Among U.S. States"
2010/3, Esteller-Moré, A.; Rizzo, L.: "Politics or mobility? Evidence from us excise taxation"
2010/4, Roehrs, S.; Stadelmann, D.: "Mobility and local income redistribution"
2010/5, Fernández Llera, R.; García Valiñas, M.A.: "Efficiency and elusion: both sides of public enterprises in Spain"
2010/6, González Alegre, J.: "Fiscal decentralization and intergovernmental grants: the European regional policy and Spanish autonomous regions"
2010/7, Jametti, M.; Joanis, M.: "Determinants of fiscal decentralization: political economy aspects"
2010/8, Esteller-Moré, A.; Galmarini, U.; Rizzo, L.: "Should tax bases overlap in a federation with lobbying?"
2010/9, Cubel, M.: "Fiscal equalization and political conflict"
2010/10, Di Paolo, A.; Raymond, J.L.; Calero, J.: "Exploring educational mobility in Europe"
2010/11, Aidt, T.S.; Dutta, J.: "Fiscal federalism and electoral accountability"
2010/12, Arqué Castells, P.: "Venture capital and innovation at the firm level"
2010/13, García-Quevedo, J.; Mas-Verdú, F.; Polo-Otero, J.: "Which firms want PhDS? The effect of the university-industry relationship on the PhD labour market"

UNIVERSITAT DE BARCELONA

ieb@ub.edu
www.ieb.ub.edu

Fiscal Federalism

Document de treball de l'IEB