Local Government Fiscal Structure and Metropolitan Consolidation

The United States has an enormous number of local governments. Even when the focus is limited to municipalities, as it is in this paper, the number is impressive. There were 19,372 municipalities in the United States in 1997. Most large metropolitan areas in the United States are divided into a hundred or more distinct municipalities. Even metropolitan areas of moderate size typically have fifty or more distinct municipalities.

For much of the twentieth century, there appears to have been a relatively broad consensus reaching across disciplines that this multiplicity of local governments was undesirable—a manifestation of disorganization and a prescription for inefficiency in the provision of public services. This consensus spawned a metropolitan government movement that met with little success and much resistance. At about the same time the political movement for metropolitan government was beginning to run out of steam, the intellectual underpinnings also came under challenge—thanks largely to the work of Tiebout, and Ostrom, Tiebout, and Warren. The trade-offs between the benefits of decentralized choice and the potential gains from coordination have been the subject of debate ever since.

The lack of popular support for consolidation of metropolitan governments is mirrored in data affirming the permanence of municipalities. Municipal
boundaries, once drawn, are highly resistant to change. Vigdor reports that in Massachusetts, no new cities or towns have been created since 1920 and none deleted since 1938.\textsuperscript{4} In Pennsylvania between 1980 and 1990, there were only eighteen annexations or mergers, involving less than one square mile and fewer than 500 persons.\textsuperscript{5} Using data from the decennial boundary and annexation surveys of the 1970 and 1980 Census, Epple and Romer find that 98 percent of boundary changes are those in which an existing municipality adds \textit{previously unincorporated} land.\textsuperscript{6} Annexation of one municipality by another and mergers of municipalities have become increasingly rare. Nationwide there were an average of fewer than ten such consolidations per year in the decade of the 1970s.

Strong advocates of metropolitan consolidation remain, but they acknowledge that success is unlikely.\textsuperscript{7} While efforts to promote metropolitan consolidation have largely disappeared, the outcomes that emerge under the current system of highly decentralized local government garner widespread criticism. Broadly, there are two issues. One centers on the distributional consequences of the tendency toward income stratification observed in U.S. metropolitan areas. One consequence is unequal quality of public services across municipalities, with quality inversely related to income. The other concern is that independently chosen tax and expenditures lead to large distortions at the metropolitan level, when central city governments engage in taxation for both redistribution and provision of public services. These issues are well articulated by Mieszkowski and Mills. They note the practical difficulties of maintaining a separation between the allocatable and distributive activities of governments. They point to the inefficiencies associated with redistributive taxation in the central city, and they offer the judgment that “tax and government service level considerations inhibit central city redevelopment.”\textsuperscript{8}

Recent years have witnessed growth of a body of research in political economy seeking to characterize equilibrium when both the populations of local jurisdictions and their policies are endogenous.\textsuperscript{9} In these models, policy outcomes within jurisdictions are determined by “democratic federalism,” to use

\begin{itemize}
\item[Vigdor (2001).]
\item[International City Management Association (1993).]
\item[Epple and Romer (1989).]
\item[Rusk (1995, 1999).]
\item[Mieszkowski and Mills (1993, p.146).]
\item[Ellickson (1971); Westhoff (1977); Epple, Filimon, and Romer (1984); Cassidy, Epple, and Romer (1989); Nechyba (1999, 2000); Calabrese (2001); Goodspeed (1989); Fernandez and Rogerson (1996, 1998); Epple and Sieg (1999).]
\end{itemize}
the terminology coined by Inman and Rubinfeld; policies are chosen by simple majority rule.\textsuperscript{10} Because of the well-known difficulties with characterizing equilibrium with multidimensional policy choices, each of these papers focuses on a unidimensional policy space.\textsuperscript{11} Thus these models are unable to capture the tensions between public service provision and redistribution, and the associated impacts on housing markets, household location, and welfare that are at the center of the debate about the consequences of metropolitan fiscal decentralization.

Our contribution is to analyze metropolitan equilibrium when localities have multiple tax instruments and can engage in both public service and redistributive expenditures. Moreover, when voting, households consider the impact that these public policy choices have on housing prices and the population of the jurisdiction in which they reside. We do this by considering a class of preferences for which voting equilibrium exists in this multidimensional space.\textsuperscript{12} Of course, adoption of a particular class of preferences entails some loss in generality, but we believe the sacrifice is well rewarded by the implications drawn from simultaneous consideration of the set of issues that arises in practice.

We characterize equilibrium analytically when there are multiple local jurisdictions. We then use functional forms and parameters that are consistent with American data to develop computations based on the multicommunity analytical model. The computed equilibria provide additional insights about the incentives facing different local governments on the choice of tax instruments and the allocation of revenues between services and redistribution.

We also use our computational multiple jurisdiction model to investigate the distributional and welfare consequences of fiscal consolidation through annexations and mergers. In most states, a merger of two communities or an annexation of one community by another generally requires majority approval in both communities. For instance, article IX, section 8, of the Pennsylvania Constitution assigns to voters the right to change boundaries of municipalities by initiative and referendum. A merger or annexation is permitted only if a

\textsuperscript{10} Inman and Rubinfeld (1997). Altruism is assumed to motivate redistribution in models by Brown and Oates (1987); Orr (1976); Wildasin (1991); Bucovetsky (1982); Johnson (1988); and Steen (1987) study the effects of exogenous changes in local government policies.

\textsuperscript{11} Typically a single tax instrument is considered and a single type of public expenditure. The government budget constraint then reduces public policy choice to a single dimension. Plott (1967).

\textsuperscript{12} Bucovetsky (1991) develops conditions for existence of equilibrium when the set of policies is multidimensional.
majority of the voters in each municipality involved in the consolidation approve. Similarly, article 11 of the California Constitution states that except with approval by a majority of its electors voting on the question, a city may not be annexed to or consolidated into another. The Texas Constitution, in reference to local municipal integration, states if at least 15 percent of qualified voters of each of two or more municipalities petition the governing bodies of their respective municipalities to order a consolidation election, the governing body of each municipality must order an election on the proposition. In Florida, a charter for merger of two or more municipalities and associated unincorporated areas can only be adopted by passage of a concurrent ordinance by the governing bodies of each municipality affected, approved by a vote of the qualified voters in each area affected.

We explore the political feasibility and general welfare effects of local fiscal consolidation by first investigating how equilibrium in our model changes if the central city annexes or merges with one or more suburban jurisdictions. We then calculate the change in welfare of each metropolitan household associated with the consolidation, which provides the information required to assess the political support and opposition to consolidation. We also calculate the aggregate welfare changes of consolidation and determine whether consolidation can possibly lead to a potential Pareto improvement even when it does not garner the necessary political support. In the process of determining these distributional and welfare effects, we also investigate the importance of housing tenure choice (owner-occupancy and rental) on preferences for government policy and implications for consolidation. Our results make clear why the metropolitan integration movement could not gain purchase regardless of the potential aggregate welfare effects.

Our goal is to do more than write a belated obituary for the metropolitan integration movement, though that is potentially one way to interpret our analysis. Rather, our primary goal is to provide an improved understanding of municipal fiscal structure and its consequences for the efficiency and distribution of population in U.S. metropolitan areas. This in turn may help identify

13. Pennsylvania Constitution, article IX, Local Government, section 8: Consolidation, Merger, or Boundary Change.
16. Florida Constitution, title XII, chapter 171, Municipal Annexation or Contraction.
17. Pareto improvement is a reallocation of resources that makes at least one person better off without making anyone else worse off.
policy changes that higher level governments may institute to preserve fiscal decentralization while limiting its adverse consequences.

Others have developed formal models to study various aspects of coordinated metropolitan government policy. Zodrow considers metropolitan tax base sharing in a two-jurisdiction model with a homogeneous population in which there is both business and residential property. In his model, all individuals live in suburbs but consume services, such as police protection and transportation, in the central city. By contrast, our focus is on a multijurisdiction environment in which heterogeneous households reside in both central city and suburban communities, and we do not consider business taxation. Alesina, Baqir, and Hoxby consider the trade-offs arising from costly community formation on the one hand and the gains from tailoring the public goods to specialized tastes on the other. To focus on fiscal incentives, we consider an established set of communities and consider how incentives for use of tax and redistributive instruments vary with size and population characteristics, such as income. The benefits of specialization of public good provision are reflected in our specification, however, since the desired level of public good provision varies systematically with income.

Others have also investigated choice of tax instruments. Nechyba considers choice of tax instruments when myopic voters set a local property tax and a sophisticated planner sets the income tax rate. In our framework, voters choose all tax instruments and forecast the consequences of those changes employing the assumption that residents are utility-takers. Henderson develops a positive analysis of choice of revenue instruments by communities. He analyzes choice among user fees, land taxes and property taxes, comparing outcomes with profit-maximizing communities to those with communities controlled by utility-maximizing voter-residents. By allowing heterogeneity among residents in both income and tenure choice, we highlight additional forces affecting choice of revenue instruments.

We necessarily abstract from many interesting aspects of the interaction of local governments. We assume that the government or residents of a jurisdiction do not cooperate with other jurisdictions when choosing policies. As Inman and Rubinfeld observe, the overall record with respect to cooperative federalism is not impressive, lending support to modeling jurisdictions as

pursuing independent policies.22 The literature on cooperation among subnational governments contemplates cooperative arrangements that fall well short of the type of consolidation we consider here.23 However, absent consolidation or legislation of enforcement powers to an overarching governmental entity, cooperative policies would require voluntary agreement of participating municipalities. Myers provides an interesting model in which there are incentives for voluntary intergovernmental cooperation.24 In particular, with a homogeneous national population, he demonstrates that communities, acting independently, would voluntarily choose to make transfers to other communities that prove to enhance allocatable efficiency.

An interesting extension of our analysis would be to investigate whether voluntary transfers across communities would emerge with a heterogeneous population when policies of individual communities are chosen by majority rule. An attractive feature of our framework is that such transfers could be introduced as policy options for voters while preserving the existence of majority-voting equilibrium. In particular, in the income hierarchy of communities that emerges in our model, it would be quite natural to consider whether a community might choose to make such voluntary transfers to “adjacent” communities in the hierarchy. In this paper, a given municipality’s policy choices have pecuniary impacts on other municipalities, but the framework could also be expanded to allow goods provision in a given municipality to create direct externalities.

Model and Properties

The economy of the model consists of a continuum of households that differ only in their endowed income $y$. The distribution of income is represented by a 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 household occupants are renters.25 We then extend the results to the case of owner-occupants.

25. Our welfare calculations reported later take account of changes in land rent. When we analyze the preferences of voters of varying incomes, we do not explicitly allocate the rents
There are multiple local communities that may differ in land area. Each local government 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 redistribution of a lump sum grant, \( r \), to each individual in the community. The parameters of a local government's budget, that is, the tax rates, \( m \) and \( t \), and the expenditure levels, \( g \) and \( r \), are determined by a majority vote of residents of the locality. Voting is conducted simultaneously on this set of variables.\(^{26}\)

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 for each unit of housing is \( p^j \). We denote the net-of-tax price \( p^j_h \). The following identity relates the gross and net-of-tax prices: \( p^j = p^j_h(1 + t^j) \).

A household locates in the community with the tax-expenditure policy for which the household obtains the highest utility. We assume that \( g \) is separable in a household's utility from housing and numeraire consumption. This simplifying assumption implies that a household's demand for housing and the numeraire good are not directly dependent on the amount of \( g \) provided in a community. These demands are indirectly dependent on the expenditure on \( g \) through the taxes used to finance \( g \). Thus let utility be represented by the function

\[
U(g, h, b) = f(g)[u(h, b) + \varphi],
\]

where \( \varphi \) is a constant.

Majority voting equilibrium generally does not exist when voting takes place simultaneously over multiple dimensions. However, we are able to prove the existence of voting equilibrium when it is assumed \( u(h, b) \) in equation 2 is homogeneous of degree 1. This assumption is consistent with the empiri-accruing to owners of rental properties. However, to the extent that such owners comprise a relatively small proportion of the population, the voting results would be little affected by allocating such rents.

\(^{26}\) 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 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 forty-one U.S. cities between 1961 and 1986.
tical evidence on housing demand that suggests the income elasticity of housing demand is 1.27. This homogeneity assumption is widely used in the optimal taxation literature, in dynamic macroeconomic simulation models, and in a variety of other applications in economics.

Linear homogeneity assumption of $u(h, b)$ implies that the corresponding indirect utility function is linear in income:

$\text{(3)} \quad V(y) = f(g)\left[\left(y(1-m) + r\right)w(p) + \varphi\right].$

In models of local public good provision with housing markets, it is frequently assumed that the slopes of indirect indifference curves (MRS) through any point in the $(g, p)$ plane increases with income.28 This “single-crossing” assumption implies that high-income households are willing to pay a higher price for each unit of housing than lower income households in order to obtain more $g$. Thus given two communities with the same $m$ and $r$, this single-crossing assumption implies that the rich are willing to pay a higher housing price premium than the poor to live in a community with higher $g$. Our utility function in equation 3 with $\varphi < 0$ satisfies this single-crossing condition. If $\varphi > 0$, then the utility in equation 3 implies the opposite single-crossing condition. Note, however, even if $\varphi > 0$, communities with higher than average income may still provide more $g$ than lower income communities because of the multidimensionality of the set of policy alternatives. Lower income communities will likely spend more tax revenue on redistribution and less on public goods than wealthier communities. If $\varphi = 0$, then the marginal rate of substitution in the $(g, p)$ plane, $\text{MRS}_{gp}$, does not change with income.

While our framework can accommodate either direction of crossing in the $(g, p)$ plane, we opt to consider the neutral case. Thus in the analysis that follows, we focus on the case $\varphi = 0$. Hence, from this point on, household $y$’s indirect utility is represented by:

$\text{(4)} \quad V(y) = f(g)(y(1-m) + r)w(p).$

Housing is produced by competitive firms in each jurisdiction from land and nonland factors via a constant-returns neoclassical production function. The price of nonland factors is assumed fixed and uniform throughout the metropolitan area. The housing supply function in community $j$ can be represented by $H_s(p_y) = Lh_s(p_y)$, where $h_s(p_y)$ is housing per unit of land in community.

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$j(C^j)$ and $L^j$ is land area in community $j$.29 Because $u(h, b)$ 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 equilibrium in $C^j$ can thus be characterized by

$$\theta^j(\bar{y}^j(1 - m^j) + r^j)h_d(p^j) = h_y(p^j),$$

where $\theta^j$ is the relative density in the community (households for each unit of land area), $\bar{y}^j$ is the mean income in the community, and

$$p^j = \frac{p^j}{1 + \tau^j}.$$

Equilibrium in this model 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) there is a majority-rule equilibrium determining the government’s policy $(t, m, r, g)$.

2. Each community is occupied, and no one wants to move.

We refer to the first part of the definition of equilibrium above as internal equilibrium and the second condition as intercommunity equilibrium. While we do not offer a proof of existence of equilibrium, we present 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 begin by considering the 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.

**Intercommunity Equilibrium Conditions**

The results that follow present necessary conditions for intercommunity equilibrium.30


30. Formal proofs and details are presented in an earlier working paper version of this manuscript, available from the authors.
Result 1: Consider an allocation in which all communities are occupied and all households are not indifferent between any two communities. Necessary conditions for such an allocation to be an intercommunity equilibrium are:

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.

To see the intuition for this result, let \( x^j = (g^j, m^j, r^j, p^j) \) be the equilibrium-tuple characterizing community \( j \), and similarly define \( x^i \) to be the equilibrium-tuple in community \( i \). Let \( V(y, x^i) \) and \( V(y, x^j) \) be the indirect utility of household \( y \) in communities \( i \) and \( j \) respectively. From equation 4, the indirect utility function is linear in income for a given \( x \). Thus \( V(y, x^i) \) and \( V(y, x^j) \) can intersect at most once, and in general they intersect exactly once. The point of intersection divides the set of incomes into two intervals, one interval preferring \( x^i \) and the other preferring \( x^j \).

In understanding results to follow, it is useful to examine the value of the indirect utility function at \( y = 0 \) and its slope with respect to \( y \). From equation 4 they are

\[
\begin{align*}
V(0) &= f(g^j)r^jw(p^j), \\
\frac{\partial V(y)}{\partial y} &= f(g^j)(1-m^j)w(p^j).
\end{align*}
\]

Consider any two communities, \( C^j \) and \( C^k \), with average incomes \( \bar{y}^j \) and \( \bar{y}^k \) respectively. Suppose \( \bar{y}^j < \bar{y}^k \) and households with \( y = 0 \) are not indifferent between \( C^j \) and \( C^k \). Comparing \( V(0) \) for the two communities establishes the first condition below, and it then follows that the slopes in \( y \) must satisfy the second condition:

\[
\begin{align*}
(6) & \quad f(g^j)r^jw(p^j) > f(g^k)r^k w(p^k) \\
(7) & \quad f(g^j)(1-m^j)w(p^j) < f(g^k)(1-m^k)w(p^k).
\end{align*}
\]

If \( V(0) \) for both communities are equal, then in equilibrium all households must be indifferent between \( C^j \) and \( C^k \) because if they were not, one of the

32. More precisely, stratification is a generic property of equilibrium; there may be knife-edge cases such that households may be indifferent between a pair of communities.
communities would not be occupied. Thus if households with \( y = 0 \) are indifferent between \( C_j \) and \( C_k \), the conditions shown in equation 6 and equation 7 become
\[
(8) \quad f(g^j)r^jw(p^j) = f(g^k)r^kw(p^k)
\]
\[
(9) \quad f(g^j)(1-m^j)w(p^j) = f(g^k)(1-m^k)w(p^k).
\]

Property tax is the predominant tax instrument used by local communities in the United States and is the tax instrument under consideration in most positive models of local tax-expenditure policy. Thus we consider it informative and useful for comparison with other models to 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.

**Intercommunity Equilibrium Conditions without Income Tax**

If local communities can only employ property taxes, then equations 7 and 9 and reduce to
\[
(10) \quad f(g^j)w(p^j) < f(g^k)w(p^k)
\]
\[
(11) \quad f(g^j)(1-m^j)w(p^j) = f(g^k)(1-m^k)w(p^k).
\]

The following result is derived from equations 6, 8, 10, and 11:

Result 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, that is, \( \overline{y}^j < \overline{y}^k \Rightarrow r^j \geq r^k \).

(ii) If \( g^j > g^k \) then \( p^j > p^k \), and if \( g^j = g^k \) then \( p^j \geq p^k \).

(iii) If \( p^j < p^k \) then \( g^j < g^k \), and if \( p^j = p^k \) then \( g^j \leq g^k \).

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 $k$.

**Intercommunity Equilibrium Conditions with Income Tax**

Introduction of an income tax increases the set of possible orderings of tax rates, expenditure levels, and housing prices across communities. Equations 6 through 9 imply restrictions on the combinations of possible orderings. Some unlikely orderings are potentially consistent with equilibrium. For example, we would generally expect that the poorer a community, the higher the income tax rate and the level of redistribution. However, investigation of equations 6 through 9 reveals that this need not always be the case. For example, households in one community may choose a relatively low income tax rate and a relatively high per capita grant, while households in a higher income community choose a higher income tax rate, higher level of government services, and lower housing price. Many possible orderings of variables across communities are possible when communities have multiple tax and expenditure instruments.

**Internal Equilibrium**

Recall that in each community, the conditions for internal equilibrium are as follows: the housing market clears; the government’s budget is balanced; and there is a majority-rule equilibrium on the parameters of the government’s budget.

We define the set of combinations ($t, m, r, g$) perceived by voters to be feasible 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 a majority of the community’s residents do not prefer any other point on the BPF to ($t^*, m^*, r^*, g^*$).

Result 3: The MVE in each community is the outcome on the budget possibility frontier most preferred by the median-income voter in that community.\textsuperscript{34}

This result follows from the linearity of the indirect utility function in equation 4. Given any pair of policy alternatives, the indirect utility functions are straight lines that intersect once, at most. Suppose the median income in the community is to the right of the intersection point. The policy preferred by the median will, by definition, be on the higher of the two lines at the median-income level. All those to the right of the median will also prefer the same policy, and they, coupled with the median, comprise a majority. A similar argument applies if the median is to the left of the intersection.

The condition that the housing market clear is simply the requirement that demand equal supply in the housing market:

\begin{equation}
\theta^j (\bar{y}^j (1 - m^j) + r^j) h_d(p^j) = h_s(p^j).
\end{equation}

In order to complete the characterization of intracommunity 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: First, how voters perceive the effects of policy on the private market affects how they view the population to be served and the tax base. Second, voter utility depends on how voters 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 individuals are utility takers.\textsuperscript{35} 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

\begin{equation}
\theta^j (\bar{y}^j (1 - m^j) + r^j) h_d(p^j) = h_s(p^j).
\end{equation}

\textsuperscript{34} 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.

\textsuperscript{35} For an overview, see Glazer, Niskanen, and Scotchmer (1997) and references cited there. Empirical work by Epple, Romer, and Sieg (2001) rejects myopic voter perceptions such as the assumption that community tax base and population are unaffected by policy changes.
housing in his or 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, assuming policies and prices in other communities are fixed.

The income stratification result in result 1 implies that if community \( j \)’s budget is balanced, then

\[
\ell^j p^j h^j (p^j) (\bar{y}^j (1 - m^j) + r^j) + m^j \bar{y}^j = r^j + g^j.
\]

Based on this utility-taking model of voting behavior, the possible \((t, m, r, g)\) combinations for community \( j \) given \((t^j, m^j, r^j, g^j)\) are the ones in which

1. The housing market clears in community \( j \).
2. The government’s budget is balanced in community \( j \).
3. The stratification and boundary-indifference conditions of result 1 are satisfied.

### The Contrasting Preferences of Owners and Renters

So far we have treated all of a jurisdiction’s residents as renters. Suppose, by contrast, that all residents are owner-occupants. They locate in a jurisdiction and purchase housing there before participating in the voting process that determines the structure of the jurisdiction’s taxes and expenditures. There are no transactions costs in the purchase and sale of housing; households can adjust their level of housing consumption—that is, sell their current house and purchase another dwelling—in response to price changes without incurring transactions costs. As in the preceding model with rental housing, households correctly anticipate how their housing consumption will change in response to a change in the structure of the jurisdiction’s tax-expenditure policies. Households also anticipate the capital gain or loss they will incur if their jurisdiction’s tax-expenditure policy is changed and a change in the net-of-tax price of housing results.

Let \( h \) 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 his consumption bundle, the homeowner faces the budget constraint

\[
(1 - m)y + r + (p_h - p_{h, o}) h = ph + b,
\]

with \( h_0 \) and \( p_{h,0} \) fixed. The third term on the left-hand side is the capital gain or loss from selling the household’s existing dwelling.\(^{37}\)

Capital gains or losses on housing due to changes in a community’s tax-expenditure policy impact a homeowner’s budget constraint. However, because transactions occur in equilibrium, the necessary conditions for inter- and intracommunity equilibrium for the renters’ model continue to hold in the owners’ model. This is shown in the appendix. However, while results 1 through 3 apply in the owners’ case as they do in the renters’ 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 their utility will be affected by the change in the net-of-tax price of housing. Renters, by contrast, are affected by the gross-of-tax price but experience no capital gains or losses from changes in the net-of-tax price. This leads to differences in equilibrium outcomes when voters are renters compared to when voters are owner-occupants.

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 to illuminate properties of the model.

### Fiscal Structure and Integration

In this section, we develop computational or simulated equilibria based on the theoretical model above. The parameterization of the model is based on 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 United States.

The utility function is taken to be

\[
U(g, h, b) = g^{\beta} h^\alpha b^{1-\alpha}.
\]

This function is consistent with the assumption adopted above—that \( g \) is separable in a household’s utility from housing and numeraire consumption.

\(^{37}\) We assume that the capital gain from housing is not taxed by the jurisdiction, but our analysis could easily accommodate allowing such capital gains to be taxed.
Also, utility is linearly homogeneous in \( h \) and \( b \) in this function, which ensures existence of majority voting equilibrium over tax-expenditures policies in each community.

In order to obtain values for \( \beta \) and \( \alpha \), we derived the demand functions for \( g \), \( h \), and \( b \) that would emerge if \( g \) were a privately provided private good:

\[
(16) \quad h = \frac{\alpha y}{(1 + \beta)p}
\]

\[
(17) \quad b = \frac{y(1 - \alpha)}{(1 + \beta)}
\]

\[
(18) \quad g = \frac{\beta y}{(1 + \beta)}.
\]

The share of income spent on housing inclusive of property taxes is set equal to 1/3, which from equation 16 means:

\[
(19) \quad \frac{\alpha}{(1 + \beta)} = \frac{1}{3}.
\]

The share of income spent on \( g \) is set equal to 0.1, which is approximately the share of GDP spent on local public goods.\(^{38}\) Thus from equation 18,

\[
(20) \quad \frac{\beta}{(1 + \beta)} = 0.1.
\]

Based on equations 19 and 20, \( \alpha = 0.37 \) and \( \beta = 0.111 \).

The utility function in equation 15 implies the following indirect utility function for a household with income \( y \) renting in a jurisdiction \( j \) with housing price \( p \), grant \( r \), publicly provided good expenditure \( g \), and income tax rate, \( m \):

\[
(21) \quad V(p, r, g, m, y) = g^\beta \alpha^\alpha (1 - \alpha)^{(1-\alpha)} p^{-\alpha} (y(1 - m) + r).
\]

The following constant-elasticity of housing supply function is adopted:

\[
(22) \quad H_j^i(p^j) = L^i(p^j)^\lambda,
\]

\(^{38}\) Data for this approximation are from the *Economic Report of the President* (1997, pp. 300, 304, 337, 391, 394).
where \( L_j \) is the land area of community \( j \) as a proportion of total land area in the economy, and \( \mu \) is the ratio of nonland to land inputs in the production of housing. Based on available evidence regarding the share of land and non-land inputs in housing, this parameter is set equal to three. This supply function is implied by a constant returns to scale Cobb-Douglas production function.

The distribution of income is log normal with \( \ln(y) \sim N(9.8, 0.36) \). This income distribution corresponds to the distribution in U.S. urban areas in 1980.

The benchmark model for the computations is a metropolitan area with five local jurisdictions. The metropolitan area consists of a large city and four smaller suburbs that have equal land area. The large city has 40 percent of the total metropolitan land area, and each of the suburbs has 15 percent of the land area. Result 1 above indicates there is income stratification among the communities. We assume that the large city is the poorest jurisdiction.

We also assume the pivotal voter in the city is a renter and the pivotal voter in each suburb is an owner-occupant. It is the case that a much higher percentage of residents in suburbs are homeowners than are residents in large cities. Hence given a political process based on direct democracy, tax-expenditure policies in large cities will tend to be more representative of the preferences of renters, and the tax-expenditure polices in the suburbs will tend to be more representative of the preferences of home owners. Our model implies that suburban tax-expenditure policies will reflect the consequences of those policies on the net-tax price of housing and concomitant effects on capital gains or losses.39

To investigate municipal consolidation, we allow merger of the central city with one or more suburban communities. We calculate aggregate welfare changes in the usual way—aggregate compensating variation plus aggregate changes in economic rent. We also wish to investigate how individual voters are affected by consolidation. For owners, we calculate the change in utility, taking account of the capital gain or loss as shown in equation 14.

We rely on results 1 through 3 to compute the equilibria presented below. First, the computational results for the benchmark model are presented. As mentioned above, this is the case with one large city and four small suburbs. In this model, every community can levy a property tax, \( t \), and provide publicly provided goods, \( g \), and a lump-sum cash grant, \( r \). In addition, all the jurisdictions can levy an income tax, \( m \), except the richest suburb. We adopt

---

39. In ongoing work, we are studying alternative characterizations of the aggregation of preferences of owners and renters in modeling voting within municipalities.
this restriction on income taxes in the richest suburb to add an element of realism. In our model, residents of all but the richest community can escape a burdensome income tax by relocating to a wealthier community. In practice, as we noted in our introduction, there are many small suburbs in most metropolitan areas. In addition, of course, the very wealthy may opt for tax havens elsewhere in the country or the world. Hence we assume an income tax rate of zero in the richest suburb to reflect the reality that the very rich can move to escape burdensome local taxes.

This benchmark model yields striking implications regarding the tax instruments that suburban communities would choose, were there generally no limits imposed by higher-level governments. While we believe that pursuing these implications is of considerable interest in its own right, this would draw us away from our primary focus. Thus we then proceed by restricting the choice of tax instruments to accord with the tax instruments used in practice. For instance, we assume that head taxes are not permitted by state constitutions, and negative property and income tax rates are also prohibited. These restrictions result in only the large central city imposing income taxes and undertaking redistribution.40 We then explore how equilibrium changes when the central city merges with one or more of the suburbs. Based on the changes in equilibrium, we investigate the level of political support for fiscal integration and calculate the aggregate welfare effects of integration.

The Benchmark Computational Model

Column 1 of table 1 below presents the computed equilibrium results for the benchmark case with five communities and when all jurisdictions are permitted to use all the tax and expenditure instruments, except the restriction on income tax in the richest suburb. Community 1 is the poor large central city consisting of renters, and communities 2 to 5 are the suburban homeowner communities in ascending order of mean income.

In practice, while both large and small municipalities provide local public goods, expenditures for redistribution at the municipal level are undertaken

40. Under these conditions and with our chosen utility function, the stratification claim in result 1 is no longer a necessary condition for equilibrium. However, stratification would be implied if we were to append an arbitrarily small constant $\phi$ to our chosen utility function as in equation 2. The resulting computed equilibria would differ negligibly from the results we report. Thus our computational results, which assume stratification, can be thought of as having been derived incorporating a small value of $\phi$. 
### Table 1. Simulation Results

<table>
<thead>
<tr>
<th>Variable (1)</th>
<th>Benchmark model</th>
<th>Restricted model</th>
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<tr>
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<tr>
<td>( N_4 )</td>
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almost exclusively by large central cities. This accords well with our computational results. Indeed, the results in the benchmark model indicate that the small rich communities not only do not redistribute, but there is incentive for the pivotal voters in these communities to use the lump-sum instrument, \( r \), as a head tax to finance the public good. Additionally, because there is a strong preference among the wealthy communities to use a head tax to generate revenue, property tax rates, which in practice are the most commonly used local tax instrument, are very small and even negative in these computational results in the suburbs. Note also that the net-of-tax price in the city \( p_{1} = 7.43 \) is substantially lower than net-of-tax prices in the suburbs, which range from 9.78 to 10.01. This is as one would expect, given that suburban voters are owner-occupants while city voters are renters.

As noted above, we proceed by imposing restrictions on the choice of tax instruments that accord with practice. Since head taxes are not observed in practice and are probably generally politically infeasible, we constrain our computational model so that head taxes are prohibited.\(^{41}\) That is, we require \( r_{i} \) to be non-negative in all communities.

In addition, small municipalities tend to rely on property taxation, while large municipalities tend to use multiple tax instruments, including both income and property taxes. The results in our benchmark model also accord

\(^{41}\) User fees are observed for some local government services (Henderson, 1994). Our results for communities 2 through 5 indicate that, were it permissible, those communities would charge a user fee (head tax) essentially equal to the value of per capita public services. Of course, in practice, communities generally cannot charge user fees for major locally provided services such as education, police, and fire protection.

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**Table 1. Simulation Results (continued)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Benchmark model</th>
<th>Restricted model</th>
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<td>Five communities</td>
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<table>
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<th>Three communities</th>
<th>Two communities</th>
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<td>(5)</td>
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</tr>
<tr>
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<td>37,330</td>
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<td>...</td>
</tr>
<tr>
<td>( y_{5} )</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

*Note: \( L_{i} \) is community \( i \)'s share of the total land area (\( i = 1,2,3,4,5 \)). \( p^{r}_{i} \) is the gross of property tax price of housing in community \( i \). \( r^{i} \) is community \( i \)'s lump-sum grant. \( y^{r}_{i} \) is community \( i \)'s per capita expenditure on the public good. \( m^{r}_{i} \) is community \( i \)'s income tax rate. \( t^{r}_{i} \) is community \( i \)'s property tax rate. \( y^{r} \) is the highest income in community \( i \). \( N^{1} \) is community \( i \)'s share of the total population. \( y^{r}_{1} \) is the median income in community \( i \).*
with this observation. The wealthy suburban communities that can impose an income tax in our model (communities 2 to 4) impose a very small income tax rate. Hence in order to reflect typical local fiscal structures even more accurately, we constrain the computational model so that all the rich communities, and not just the richest community, do not implement income taxes. As we see below, with these restrictions, a local fiscal structure emerges in which only the large city engages in redistribution and imposes income taxes. This is a particularly natural result for a “typical” metropolitan area in the United States—one containing a large city and many small suburbs.

Restricted Model Computational Results

The results for the restricted model with five communities are presented in column 2 of table 1. Before turning to a discussion of these outcomes, it should be noted that housing prices in our model should be interpreted as annualized implicit rentals for each unit of housing. Thus property tax rates, \( t \), are expressed as a proportion of the annualized implicit rental value of housing services. Observed property taxes are, of course, expressed as a rate on the market value of housing, not on the annual value of services. If we use a real interest rate of 6 percent to compute the annual implicit rent for each unit of property value, the 33 percent rate on annual implicit rent for community 1, the large central city consisting of renters, is equivalent to a tax of 2 percent \((0.06 \times 0.33)\) on property values. This is the order of magnitude of property taxes observed in the United States.

One respect in which our computational results in table 1 are at variance with observation is the relatively high marginal income tax rate in the city. Note, however, that the net income tax payment, \((t'y - r')\), is not very high for most residents of the city. Thus the net income tax payments are not unrealistic. Nonetheless, the high marginal rate is not entirely satisfying. We think it likely that our model overstates the incentives for income taxation in the city by assuming the tax-expenditure policy represents only the preferences of renters. In practice, of course, even central cities have a mixture of owners and renters participating in the political process. In future work, we envision extending the characterization of central city voters to embody an owners-renters mix that conforms to the observed mix in the United States.

42. This is likely due not only to assuming all residents are renters, but also because we do not consider business taxation.
The five-community computational results for both the benchmark model and the restricted model indicate that the higher the income level in the community, the greater is the amount of public good per capita provided. This is as one would expect, given the positive income elasticity of demand for \( g \) coupled with the higher per capita tax base in higher-income communities.

We now turn to investigation of municipal consolidation.

**Impact of Municipal Consolidation on Local Fiscal Structure**

Columns 3 through 5 of table 1 show the computed results when the central city progressively annexes or merges with the suburbs. A natural way—although not the only way—to characterize these consolidations is, at each step in the consolidation, to have the city merge with the poorest suburb. For instance, column 3 presents the equilibrium results after the central city merges with the poorest of the original suburbs, or community 2 in the five-community simulation. The city increases its share of the total land area from 40 percent to 55 percent through this consolidation. In column 4 are the equilibrium results when the central city and two suburbs consolidate, increasing the city’s share of land area to 70 percent. Column 5 presents the equilibrium results after the third hypothetical consolidation, resulting in only two communities in the metropolitan area, a large city with 85 percent of the land area and one small suburb with 15 percent of the land area. We do not consider the case in which the city annexes all suburbs. In practice, a central city cannot establish a monopoly on all potential locations; there is always scope for residents, particularly wealthy residents, to move beyond the domain of any particular city. Retaining an independent suburb in all our simulations is a mechanism for reflecting this outside option.

We see that, after each consolidation, the highest income households in the merged suburb move into the next richest suburb. This creates a domino effect in which the richest households in each higher-income suburb move to the next richest community. To see the effect that consolidation has on the allocation of households among the communities, consider the equilibrium results for the five-community case as compared with the equilibrium after the first consolidation—the four-community equilibrium. This involves comparing the outcomes shown in column 2 with the outcomes in column 3. Originally, the city has 40 percent of the land area and 23.6 percent of the total metropolitan population consisting of all households with income below $11,719. Community 2 originally has 15 percent of the land area and 17.5 percent of
the population, consisting of all households with income in the interval $11,719 to $15,767. If the merger induced no population movement, the post-
merger income boundaries between the four communities would be $15,767, $20,830, and $29,236. Instead, we see the actual postmerger income bound-
aries are $14,756, $19,943, and $28,359. After the merger, almost a quarter
of the population previously in community 2, those with incomes between
$14,756 and $15,767, moves in order to avoid living in the city. This move-
ment affects the remaining communities. About one-fourth of the population
previously in community 3 moves to the next-wealthier community, and about
7 percent of the population previously in community 4 moves to the wealth-
liest community.

It is not surprising that the richest households in community 2 want to
escape when their community merges with the city. These households would
be the ones most burdened by the taxes used to finance redistribution and
would experience a decrease in public good provision. They escape to the
next richest suburb, driving up housing prices in this suburb. They also cause
a reduction in per capita public good provision; they lower the per capita tax
base by purchasing less than the average value of housing in the community,
and they vote for lower public good provision. Therefore, the rich in this sub-
urb have an incentive to relocate into the next richest suburb, creating the
same effects on housing prices and per capita public good provision. This
process occurs across all the suburbs. The ultimate result is that in the remain-
ing suburbs, housing prices increase and public good provision levels
decrease.

In the city, the per capita public good provision, lump-sum grant, and hous-
ing price increase, and the income tax rate decreases. In general, this trend
continues for each successive merger. An exception is after the last consoli-
dation when only a very large city and one small suburb are left. Each
successive consolidation results in addition of some higher-income residents
to the central city and some lower-income residents to the wealthier suburb.
With the last consolidation, the new, wealthier pivotal voter in the central city
prefers an increase in public good provision (to $1,656) and a decrease in the
redistributive grant (to $1,607) relative to the levels ($1,225 and $1,881) in the
central city before consolidation. Interestingly, despite the reduced income of
the pivotal voter in the remaining suburb, the pivotal voter in that suburb also
chooses a higher level of public good provision ($3,272) than before consol-
modation ($2,969). This change in the wealthiest suburb may reflect a desire by
the pivotal voter for redistribution by way of public goods provision in the
wealthiest suburb.
Political Feasibility of Fiscal Integrations

The consolidation of two or more municipalities generally requires the majority support of voters in each of the communities. As mentioned in the introduction, consolidations of municipalities in the United States have been relatively uncommon. In this section, we apply the computational model developed above to explicate possible reasons why there has been a lack of widespread popular political support for consolidations. We do this by calculating the effects of consolidation on the welfare of individual households. In this investigation we consider the importance of housing tenure choice (owner and renter) on the magnitude of these effects.

To illustrate who gains and loses from each successive consolidation shown in table 1, we first calculate the compensating variations for each household in the metropolitan area. Compensating variation measures the change in each household’s welfare due to changes in consumption caused by changes in the local governments’ tax-expenditure policies attending consolidation. In addition, each homeowner incurs a capital gain or loss when consolidation changes the price of housing in each community. Thus to fully capture a homeowner’s welfare gain or loss, we also calculate welfare changes inclusive of capital gains or losses. This includes calculation of the capital gains for the absentee landlords in community 1. These welfare effects for each household are presented in figure 1.

It is not surprising that all the original residents of the large city are made better off when the city merges with one of the suburbs. After all, the city absorbs richer households and then is able to increase per capita public good provision and redistribution with a lower income tax rate and no change in the property tax rate. The original poor inhabitants of the city are much better off after the merger even though the influx of relatively rich households slightly increases housing prices.

What is surprising is that a majority of the households in community 2 (58 percent) are made better off in terms of their compensating variation. Every household with income below approximately $14,000 has a positive compensating variation. Every one of these households remains in the former suburb after it merges with the city.43 These households mainly benefit because the lower housing prices allow them to increase their property hold-

43. To be sure, not all the households that remain in the former suburb have a positive compensating variation. All households in the income interval between $14,000 and $14,756 remain in the suburb, but incur a decrease in utility even before capital losses.
ings and private consumption without a dramatic loss in public good provision. However, the compensating variation numbers do not completely measure these homeowners’ welfare changes. Although they now face lower housing prices, this also means they incur a capital loss on their housing and property. These capital losses are significant in that the net-of-tax price for each unit of housing falls from $8.20 to $6.58. When taking into account these capital losses, the merger makes all the original residents of community 2 worse off. If the residents of community 2 are sophisticated enough to realize what will happen to the value of their property if they merge with the city, they would never support the consolidation. Thus consolidation would never garner the necessary political support in the suburb.

It should be noted that the homeowners in communities 3 to 5 incur capital gains because the merger of communities 1 and 2 leads to higher housing prices in these three other suburbs, as discussed in the previous section. However, these capital gains do not offset the negative compensating variation of residents of communities 3 to 5. The influx of poor households into these communities leads to a decrease in per capita public good provision, which results in a greater loss in welfare than the increase due to capital gains. Therefore, even if a majority of residents in each municipality involved in a possible merger supported it, there could potentially be resistance to the consolidation from other noninvolved municipalities. The merger of communities creates potential negative externalities for other communities. These other communities may have an incentive to try to block the merger by lobbying a higher
level of government that may have final jurisdiction over municipal consolidations, such as a state government.

The story revealed from examining the changes in the equilibrium results after the second consolidation summarized in table 1 is similar to the one from the first consolidation. The individual household welfare impacts for this case are summarized in figure 2. In this second consolidation, the city increases its share of total land area from 55 percent to 70 percent by merging with the poorest of the remaining three suburbs. Again, every resident of the city benefits from the merger, while almost every other household in the metropolitan area loses. Also, just as in the first consolidation, a majority of the households (53 percent) in the consolidated suburb incur positive compensating variation from the merger, but these gains are offset by capital losses on housing. Property values also increase in the other municipalities, but any benefits to the residents are offset by a less favorable municipal budget.

Figure 3 presents the welfare effects on each individual household that result from the third consolidation summarized in table 1. In this case, the city merges with the poorest of two remaining suburbs. A noteworthy difference between the outcomes of this merger compared to the other mergers is that the very poor households are actually made worse off. As figure 3 indicates, the compensating variation measures for households with income below $7,000, which make up the bottom 6 percent of the metropolitan income distribution, are negative. The consolidation does lead to higher average income and more
per capita public good provision in the city. However, the income of the pivotal voter is now so high that redistribution falls from the pre-merger level. This decrease in the lump-sum grant in combination with the increase in price of housing in the city makes the very poor worse off. Still, the merger makes all the rest of the households in the city better off, and thus a majority of the households in the city would favor consolidation. Again, the majority of households in the merged suburb are made worse off, due mainly to capital losses. Therefore, none of the three hypothetical mergers summarized in table 1 would have the necessary political support.

**Aggregate Welfare Effect**

The analysis presented directly above predicts that proposals for municipal consolidation would generally not garner enough political support in all the communities involved. The evidence accords well with this prediction in that municipal consolidations are relatively rare. However, this does not mean that consolidation could not result in an increase in aggregate social welfare. The change in aggregate welfare is measured not just by aggregating the households’ compensating variations, but also by including any change in aggregate economic rent on land due to housing price changes. In the city, the...
rents are paid to absentee landlords, who are outside the model in the sense that they are sufficiently few in number that their effects on voting outcomes can be neglected. However, we should include any changes in land rents that accrue to the absentee property owners in the calculations of the social welfare effects of consolidation. We should also include changes in economic rent that accrue to the homeowners in the suburbs. 44

In addition, as shown in the individual household welfare calculations above, the renter households in the city are usually made better off from consolidation, while suburban homeowners are made worse off. If the combined aggregate gains of the city residents and property owners offset the aggregate losses of the suburban residents, including land rents, then social welfare would increase. If this were the case, then consolidation would lead to a potential Pareto improvement for society. If the “winners” of consolidation could somehow compensate the “losers,” then everyone in all municipalities could be better off through a merger of two or more of the municipalities.

Land rents in the metropolitan area are defined as the sum over communities of the producer surplus associated with housing production. Thus because the aggregate population is normalized to one, from equation 22, per capita aggregate land rents in these simulations, \( D \), are given by

\[
D = \sum_{j=1}^{J} \int_{0}^{p_{j}} \left( \frac{p_{j}}{1 + t_{j}} \right) dp = \sum_{j=1}^{J} \left( \frac{p_{j}}{1 + t_{j}} \right) \mu + 1
\]

where \( J \) is the number of communities in the metropolitan area.

Table 2 below presents the values for the aggregate change in social welfare resulting from each consolidation. The values in table 2 should be interpreted on a per capita basis. The results in the table indicate that the first consolidation leads to lower social welfare, while the other two consolidations increase social welfare. These results arise primarily because the majority of city residents benefit from consolidation. 45 The city’s absentee landowners

44. When we derived individual household welfare effects of consolidation in the previous section, we assumed homeowners incur capital gains or losses on housing structure when consolidation changes the price of housing. Of course, a housing price decrease that confers capital losses on owner-occupants may be partially offset by benefits of lower housing prices to purchasers of housing or to renters. Thus in the aggregate welfare analysis presented in this section, we apply the standard definition of aggregate change in welfare and add the aggregate total change in economic (land) rent to aggregate compensation variation.

45. As was discussed previously, households with incomes below $7,000, or about 11 percent of the population of the city, are made worse off by the third consolidation. However, aggregate welfare in the city increases.
also benefit because consolidation causes the net-of-tax price of housing to increase in the city. Therefore, the larger the city is before consolidation, the greater the number of people that benefit. When the city increases in size from 55 percent to 70 percent of land area after the second consolidation, the benefits to the 37 percent of the total population that initially lived in the city, combined with the benefits to the city’s absentee landlords, offset the losses of the other 63 percent of the metropolitan population, including decreases in land rents. The third consolidation leads to even greater aggregate welfare gains than the second consolidation.

The results in table 2 show that municipal consolidations can create positive aggregate social welfare effects even if they are politically infeasible. In these cases, the city’s residents and landlords could, in principle, entice homeowners of a suburb to merge by offering to compensate them for their losses.46 This compensation would produce a Pareto improvement. However, even when a merger would decrease aggregate social welfare, the benefits of consolidation to the city residents and landlords could possibly be greater than the losses to the residents of the merged suburb. In these cases, compensating the residents of the suburb to induce a merger would not produce a Pareto improvement for society. For instance, the city’s residents’ and landlords’ aggregate benefits of the first consolidation are about $102. The aggregate losses caused by the first consolidation for the homeowners of community 2, including economic losses in land rents, are about $91. Therefore, the city residents and landlords could more than compensate the homeowners of community 2 for losses they would incur from a merger that would lower aggregate social welfare.

Another message from the preceding analysis is that the impacts on some households are quite large relative to the per capita effects found in table 2. For example, as figure 3 shows, the third consolidation produces losses ranging as high as $1,500 or more to owners whose properties are annexed. Thus the intensity of opposition to annexation from such households is likely to be

46. Consistent with this idea, the city absentee landowners could also attempt to manipulate the voting process by spending some of their “rents” in lobbying efforts and campaign contributions to pressure for ratification of consolidations.

Table 2. Per Capita Welfare Effects of Municipal Consolidations

<table>
<thead>
<tr>
<th>Consolidation</th>
<th>Compensating variation</th>
<th>Change in land rents</th>
<th>Change in social welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>-57.88</td>
<td>-4.86</td>
<td>-62.74</td>
</tr>
<tr>
<td>Second</td>
<td>11.77</td>
<td>-2.01</td>
<td>9.76</td>
</tr>
<tr>
<td>Third</td>
<td>92.06</td>
<td>-28.28</td>
<td>63.78</td>
</tr>
</tbody>
</table>

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very strong indeed. The gains are more widely and equally distributed, perhaps providing less motivation for organization in support of consolidation.

Conclusion

Our results highlight the importance of capturing the contending forces that determine local fiscal structure and the impact of the resulting fiscal structure on support or opposition to government consolidation. The results highlight the payoff from a framework that permits analysis of simultaneous voting on a set of community policy instruments. The overall picture that emerges from the analysis follows.

The lower a household’s income, the more attractive is redistribution relative to publicly provided goods, and the less consequential are high tax rates. For lower income households, annexation poses a tradeoff. Annexation brings into the city higher income households whose preferences lead to a shift toward more public goods relative to the level of redistribution and to relatively lower tax rates. On the other hand, the higher income households bring an increase in both property and income tax base. As we have seen, the net effect on lower income households tends to be favorable. By contrast, higher income households, especially owner-occupants, find that annexation leads to unwelcome changes. While all suburban residents tend to be adversely affected by an annexation, the adverse effects are by far the strongest for residents of the suburb being annexed. As a result, annexation efforts routinely fail when subjected to a vote by residents of the suburb targeted for annexation.

The gains from annexation that emerge in table 2 are due to reduction in tax distortions. Annexation adds relatively higher income households to the city. These households both add to the tax base and add votes against redistribution. As evident from table 1, these two offsetting influences result in relatively little change in the per capita grant when annexation occurs. This coupled with the increased tax base results in a reduction in the income tax rate. The associated reduction in tax distortions is sufficient to offset the reduced ability of communities to tailor the public good level to heterogeneous preferences of residents. Ironically, the distortions present before annexation are responsible for the large adverse impact on households in a community that is annexed. Seeking to escape the high tax rates in the city, households bid up suburban housing prices. Annexation eliminates this housing price differ-
ential for the annexed suburb, causing large capital losses in the annexed community. Thus the distortions that give rise to the potential for benefits for taxation also create the conditions that give rise to strong resistance within a suburb targeted for annexation.

Appendix

This appendix explains why the necessary conditions for equilibrium in the owner-occupancy model are the same as the renter model.

The demand function for housing for a household owner, given that utility is linear homogenous over housing and numeraire consumption and based on the budget constraint given in equation 14, is of the form

\[ h = (y(1-m) + r + (p_h - p_{h_o})h_o)h_d(p). \]

Substituting this demand function into the budget constraint and substituting both into the utility function yield the indirect utility function:

\[ V(y) = f(g)(y(1-m) + r + (p_h - p_{h_o})h_o)w(p). \]

The housing demand function for a consumer with income \( y \) given \( (p_o, r_o, g_o, m_o, p_{h,0}) \) is

\[ h_o(p_o, y(1-m) + r_o) = (y(1-m) + r_o)h_d(p_o). \]

Consider an owner \( y \) that purchased at \( (p_o, r_o, g_o, m_o, p_{h,0}) \). 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

\[ V(y) = f(g)(y(1-m) + r + (p_h - p_{h,o})(y(1-m) + r_o)h_d(p_o))w(p). \]

Thus when voting, owner \( y \) will vote for a change to \( (p, r, g, m, p_h) \) if the utility given in equation 24 is higher than it would be if the policy were unchanged and prices and tax-expenditure policy remained at \( (p_o, r_o, g_o, m_o, p_{h,0}) \). While renters care only about \( (p, r, g, m) \), it is clear from equation 24 that owners care about \( p_h \) as well.

Equation 24 above is linear in household income, \( y \). This property of owners’ utility functions can be used in a straightforward fashion to extend result
3 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.

As is standard in static models, we assume that all transactions occur in equilibrium. Thus in equilibrium, households make transactions at \((p_0, r_0, g_0, m_0, p_{h0}) = (p, r, g, m, p_h)\), and the majority voting outcome does not lead to a departure from \((p, r, g, m, p_h)\). Note that equation 24 reduces to equation 4 when \((p_0, r_0, g_0, m_0, p_{h0}) = (p, r, g, m, p_h)\). It follows that the results 1 through 3 of the renter’s case continue to hold in the owner’s case. Thus, necessary conditions for equilibrium in this owner-occupancy model are the same as in the renter’s model.
Comments

Alberto Alesina: This is an ambitious paper, which asks a very important question: What is the purpose of having so many local governments in the United States, or, to put it differently, why is it that consolidation of local governments is so difficult and relatively rare? Does this multiplication of governments lead to inefficiencies?

The paper contends that consolidation would lead to income redistribution that wealthy suburbanites would despise. So the latter oppose annexation even in cases when it would be efficient in terms of public good provision and reduction of tax distortions.

I think the paper’s contention is correct. The conclusion that rich suburbs do not want to be incorporated for fear of redistribution may not be overly surprising, but it is right. Researchers should be looking for what is accurate, not for what is surprising! In addition, there are many more results in the paper, concerning the choice of tax instruments, the amount of public goods, and so forth. The key contribution of the paper is in having both a public good and a redistributive motive in the analysis. The authors should be congratulated for addressing such a rich and complex problem.

Since I have very little to object to in the paper, what I would like to do in my comments is to make some remarks about the general topic and highlight some connections with the related literature. In doing so, I will shamelessly refer to my own work.

The paper begins by saying that there are many, perhaps too many, local governments in the United States. It would be useful to show some international comparisons. I mention this because in a recent paper, with Ed Glaeser and Bruce Sacerdote, we argue that one of the reasons why Americans choose to be governed in such a decentralized way is precisely because they dislike
redistributive policies much more than the Europeans do.\textsuperscript{1} The reason for this, we argue, lies in two main forces: a large proportion of Americans think that the poor are lazy, while Europeans think the poor are unfortunate. The second reason has to do with racial divides. Americans see redistribution as favoring (in part) members of different racial groups, so they oppose them more than they do in more homogeneous industrial countries. So, some international perspective might be useful here.

This leads to my second point: the paper by Calabrese, Cassidy, and Epple, like 90 percent of the related formal literature in urban economics, focuses on income as a determinant of local politics, and in particular, as a determinant of choice of residence and formation of jurisdictions.

In a series of papers I have written with several co-authors, I emphasize that, in fact, racial conflict may be an even stronger determinant than income of many aspects of local politics and formation of local jurisdictions. That is, individuals may be more willing to share a school, a government, and a social group with members of the same race but of a different income than vice versa. In other words, a rich white person may be more willing to share a local government with a poor white than with a rich black. My sense is that the urban economic literature has not paid enough attention to this point.

Let me publicize a bit my work in this area. Alesina, Baqir, and Easterly show that the provision of local public good is very much affected by racial fragmentation.\textsuperscript{2} In more racially fragmented counties, cities, and metropolitan areas, local public spending is less focused on “core” productive public goods, like roads and schools. Racially fragmented cities spend more on law and order and on items that are likely to be patronage.

In Alesina and La Ferrara, we show that social capital is much lower in racially fragmented communities.\textsuperscript{3} More specifically, participation in social groups is much lower in racially fragmented communities. In fact, we find that racial fragmentation is a much stronger predictor of social capital than income inequality. To put it differently, a wealthy white is much more likely to join a group that includes poor whites than wealthy blacks, even in cases when groups (like school associations) can decide on issues that have financial repercussions. In another paper we show similar results in regard to trust: trust is much higher in racially homogeneous communities.\textsuperscript{4} In fact, as other experimental evidence shows, trust does not travel well across racial lines.

\textsuperscript{1} Alesina, Glaeser, and Sacerdote (2002, forthcoming).
\textsuperscript{2} Alesina, Baqir, and Easterly (1999, 2000).
\textsuperscript{3} Alesina and La Ferrara (2000).
\textsuperscript{4} Alesina and La Ferrara (2002).
A working paper I wrote recently with Baqir and Hoxby relates most directly to the one by Calabrese, Cassidy, and Epple. In this work we look at the determinants of a number of school districts (and schools) and a number of municipalities and special districts. The idea is that there are economies of scale in having large jurisdictions. The trade-off is against heterogeneity of the population, where the latter can be measured in terms of income, race, ethnic origin, religion, age, and so forth. I quote from the abstract of that paper: "Using both cross-sectional and panel analysis, we find evidence of a significant trade-off between economies of scale and racial heterogeneity. We find a weaker trade-off between economies of scale and income or ethnic heterogeneity. That is, it appears that people are willing to sacrifice the most, in terms of economies of scale, in order to avoid racial heterogeneity in their jurisdictions."\(^5\)

**Racial cleavages lead to a multiplication of jurisdictions in two ways.** One is that people prefer to have social contact with individuals of the same race, and trust is higher among members of the same racial groups, so sharing a government is easier. The second reason is that members of different races may have different priorities about public goods and public policies.

The bottom line is that a very important factor which explains why the United States has so many local governments is because of racial fractionalization, and this point is missing from the paper. Incidentally, and this goes back to my previous point about international comparisons, if it is true that the United States has so many more local governments (and more powerful ones) than other OECD countries, then the question is: What makes the United States different? I think that racial fragmentation is the answer.

My second point concerns a similarity between some of the issues raised by the paper and issues discussed in recent literature on the size of countries, as in Alesina and Spolaore and Bolton and Roland.\(^6\) This literature discusses a trade-off between economies of scale in country size and heterogeneity of preferences and in income. In that literature as well, one finds that a one-person one-vote rule may lead to a number of governments larger than the first best. Interestingly, these papers look at whether redistributive policies can be used to enforce the optimal number and size of jurisdictions. I was not quite sure whether this point could be handled in this paper.

My third point relates to higher levels of government. Many redistributive policies take place at higher levels of government, such as the state governments and the federal government. I wonder how much higher levels of

government can undo what local governments do (or vice versa). That is, if I were a wealthy suburbanite, I would wonder how much I could escape redistributive policies, given that the federal government could always, for example, make the income tax more progressive and devote more money to federal programs that favor the poor. I would like to understand better how much the global level of redistributive policies is affected by the fact that there are so many local governments in the United States, given that these local jurisdictions operate under higher levels of government.

My last point is a methodological one and reflects my perspective on empirical work. The paper begins with a very neat and simple model. Very soon, however, specific functional forms and assumptions are needed to advance the argument. Then the model gets even more complicated when voting is introduced, and more assumptions are needed. At the end, the paper presents some functional forms that are simulated, using parameters, defined as “realistic,” based on other research. Given how many assumptions and functional forms are incorporated in the analysis, I am not sure the results become “realistic” because a couple of parameters are chosen based on empirical results of others! To put it another way, I am not sure how much weight I should put on the specific numbers in the simulations. Beyond looking at the sign, that is, the qualitative nature of the results, I would not put more emphasis.

This is, of course, a point of view on which reasonable people disagree. For instance, in macroeconomics, my “home field,” two very different traditions are present. One uses numerical simulation of complicated general equilibrium dynamic models. The other uses simple regressions. I find the former approach, which is followed also by this paper, a bit of a “black box” so that it is hard to know exactly what drives what in the results.

Nevertheless, this is an excellent paper which goes very far in answering an important question about the organization of governments in the United States. Basically, all of my comments are in the category of “issues to be addressed in future research.”

Julie Berry Cullen: This paper addresses an enduring theme in fiscal federalism. The fundamental question is which activities should be undertaken at what level of government, or under what degree of centralization or cooperation. There is an inherent trade-off between the potential gains from more decentralized provision due to the ability to better match individual tastes and the potential distortions that arise as localities compete for residents while pro-
viding both services and redistribution. In this paper, this classic tension is framed in the context of a city with surrounding suburbs. Each community provides local public goods \((g)\) and per capita transfers \((r)\) that are financed by a proportional income tax \((m)\) and an ad valorem property tax \((t)\). The authors develop a powerful model that allows them to explore the distributions of gains and losses as the central city expands through successive annexations, reducing some and exaggerating other distortions and inefficiencies as populations and policies endogenously evolve. One of the important insights provided by the accompanying simulations is the important role that capitalization plays in constraining political support for such annexations.

This paper also makes a significant contribution to the literature on political economy and local public finance. In developing the theoretical framework, the authors must tackle the thorny issues that arise with endogenous mobility and multiple policy instruments. Their goal is to characterize residential and voting equilibrium outcomes when voters choose communities based on the set of policies, and the set of policies within each community is chosen based on majority rule with attention to the potential impacts on the housing market and population. In this complicated setting, neither across- nor within-community equilibria generally exist. First, with sorting across communities based on tastes for local public goods, there is a tendency for the poor to want to live with the rich, since the rich subsidize the consumption of public goods for the poor (depending on the method of finance). To avoid cycling, where the poor move to be with the rich and the rich move to avoid the poor, previous studies have typically relied on restrictions on preferences (or explicit and implicit restrictions on tax instruments, including zoning). Second, since majority voting does not generally lead to consistent outcomes when there are multiple policy dimensions, most previous studies focus on single policies financed through a single mechanism. The authors of this paper solve both the sorting and voting problems by assuming that household preferences have a specific structure.

In their economy, there is heterogeneity across households on only one dimension: income. Households share the same preferences defined over a publicly provided good \((g)\), housing \((h)\), and consumption of a numeraire good \((b)\). The publicly provided good is separable from private consumption in the household’s utility function. Further, utility is linearly homogenous in \(h\) and \(b\). These assumptions yield an indirect utility function linear in income. For renters, indirect utility can be expressed as \(V(y) = f(g)(y(l - m) + r)w(p)\), where \(p\) is the gross of tax price of housing.
For those who are relative outsiders to this literature (including myself), it is instructive to see how stratification by income across communities arises with preferences of this form. The mechanisms are easiest to describe for communities of renters. Imagine first that there are no per capita transfers or taxes, so that $r = 0$. In this case it is clear that all households will rank policy sets $(g, m, r, t)$ and hence communities in the same way. Further, the premium that individuals would be willing to pay to purchase a unit of housing in a community with a higher level of $g$ or lower level of $m$ does not vary with income. Since all individuals are willing to sacrifice the same percentage of income to live in one community over another (and the two tax instruments impose a burden proportional to income), there are no pressures pushing this economy toward a stable sorting equilibrium. The additive term $r$ drives a wedge between willingness to pay to alter a given policy parameter for households of differing income levels. The relative value of a given increase in $g$ or lower level of $m$ does not vary with income. Since all individuals are willing to sacrifice the same percentage of income to live in one community over another (and the two tax instruments impose a burden proportional to income), there are no pressures pushing this economy toward a stable sorting equilibrium. The additive term $r$ drives a wedge between willingness to pay to alter a given policy parameter for households of differing income levels. The relative value of a given increase in $r$ is not equal across households since it is a larger share of income for low-income than for high-income households. The inclusion of the per capita transfer leads to single crossing conditions being satisfied in all of the two-dimensional policy planes (except for the $g-p$ plane). When the authors disallow these per capita grants, they assume that there is an additional linear constant ($\varphi$) that serves a similar purpose. The single crossing conditions lead households to self-segregate across communities with given sets of policies according to income.

Though the authors choose not to spend time developing the link between preferences and cross-community sorting, they do provide the intuition for how the assumed structure for preferences determines the sets of policies chosen within communities. As they describe, it is the linearity of the indirect utility function in income that guarantees the existence of a majority voting equilibrium. For any given pair of policy sets, the population can be divided

1. The way to show this more formally is to derive the slope of the indirect indifference curves (MRS) in different policy planes. For example, holding indirect utility and the other policy parameters constant, $dp/dg = (f(w)/(f'w)) > 0$. Individuals will be willing to pay more per unit of housing in a community with higher levels of public good expenditure, though the premium is independent of income. Since housing demand is proportional to income, this implies that the share of income individuals are willing to trade for higher levels of $g$ is also independent of income.

2. The MRS in different policy planes is no longer independent of income. For example, holding indirect utility and the other policy parameters constant, $dp/dr = (w/(y(1-m)+r)w') > 0$. The premium a household would be willing to pay per housing unit in a community with a higher per capita grant is decreasing in income (that is, the slope of the indirect indifference curve in the $p-r$ plane $(dp/dr)$ is steeper for lower income households).
into voters who prefer one set to the other strictly according to whether income is above or below some pivotal value. In simultaneous voting over the set of policy instruments, the set preferred by the resident with median income will be the majority vote outcome.

With these key difficulties surmounted, the authors are able to characterize populations and policies with multiple tax and policy instruments in a general equilibrium setting. The simulations based on specific functional forms and calibrated to U.S. data provide elegant results and generate many useful insights. The simplicity of the presentation and discussion is perhaps the paper’s greatest weakness. The underlying mechanisms are quite complex and not always well explained. My remaining comments are dedicated to describing a few apparent puzzles that shed light on the type of issues that merit further discussion or exploration.

**The role of per capita transfer.** I have described above the role that $r$ (or an alternative additive term) mechanically plays in leading individuals to self-segregate by income. The authors further show that per capita transfers must be at least as great or higher in lower income communities in equilibrium, and find significant redistribution through the per capita grant occurring in the central city in the simulations. While it is clear why this necessary condition must hold for stability, it is less clear how higher levels of redistribution in low-income communities result from majority voting. Whether the pivotal voter desires a positive level of transfers should be a function of relative income. The median voter would like to redistribute if the ratio of median to mean income is less than one. With a log normal distribution, we are likely to see the opposite of this in the lowest income community that houses the lower tail. It is not clear to me whether interactions with the housing market and other policy variables or something else can explain why this intuition is incorrect.

The question also remains of whether we actually do observe higher per capita expenditures on the poor in central cities. Are central cities really in the business of local redistribution? A further difficulty with evaluating how well the model matches reality is identifying what $r$ is in practice. One way to think about the per capita grant is as any service that is provided that is a perfect substitute for income. Given that local governments are involved primarily in the provision of services, this characterization may not be too inaccurate for many types of expenditures. It is then empirically difficult to distinguish between $g$ and $r$, since the per capita transfers may take the form

3. Another aspect of the simulation results that does not accord well with my expectations is the lower population density in the central city.
of publicly provided services that have private substitutes (such as recreation complexes or schooling).

The role of alternative tax instruments. The authors mention that one of their contributions is considering not only multiple policies but multiple tax instruments as well. They allow both for property and income taxation. In the absence of endogenous mobility, it is hard to explain why the median voter would ever choose to levy a property tax. Given the assumptions on preferences, demand for housing is proportional (or nearly proportional if \( r \) is non-zero) to income. This means that the property tax is equivalent to an income tax as far as the distribution of the burden of the tax is concerned. The only difference is that one distorts the allocation of resources across goods while one does not. It appears from this perspective that the property tax is dominated by the income tax. Exactly what the incentives are to levy property rather than income taxes is not obvious, though the capitalization and housing demand effects must explain why property taxes are attractive.

Commuting cost. The earlier literature in urban economics was built on models of monocentric cities. In these models, commuting costs play a key role. With differential tastes for housing by income, these costs lead to the predictions that the poor will live in the central city and the rich will live in the suburbs. When combined with commuting costs, the preferences described in this paper could generate pressures toward the opposite pattern of sorting. Commuting costs can be thought of as implying a higher income tax in outlying areas. If high-income households are willing to pay a premium for housing in communities with lower income tax rates (which is true when \( r > 0 \)), then this would tend to lead them to choose to live closer to the city. This highlights how much the predicted allocation of individuals across communities is driven by the specific functional form choices, so that realistic extensions may not be easily accommodated without disrupting the system as a whole.

The above are examples of issues that are part of the background in this paper. Future work that pushes farther in linking this model and results to underlying principles and mechanisms has the potential to greatly increase our understanding of the formation of and interactions between jurisdictions.
References


Stephen Calabrese, Glenn Cassidy, and Dennis Epple


