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Kimberley Ann Scharf

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Ignatius J Horstmann, University of Toronto
Kimberley Ann Scharf, University of Warwick and CEPR

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Centre for Economic Policy Research
90–98 Goswell Rd, London EC1V 7RR, UK
Tel: (44 20) 7878 2900, Fax: (44 20) 7878 2999
Email: cepr@cepr.org, Website: www.cepr.org

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ABSTRACT

A Theory of Distributional Conflict, Voluntarism and Segregation*

Along with the rise in income inequality in the US, there is evidence of a simultaneous move toward fiscal devolution and increased government reliance on private provision of public goods. This Paper argues that these phenomena are related. We describe a model of jurisdiction and policy formation in which the structure of government provision is endogenous and public good provision levels are determined by a political process that can exploit private motives for voluntary giving. The model predicts that an increase in income inequality leads to decentralization, with local jurisdictions becoming more income-homogeneous than the population as a whole. This reduction in local income heterogeneity, combined with a reduced tax base, results in increased reliance by government on private provision.

JEL Classification: H20 and H70
Keywords: fiscal federalism, jurisdiction formation and private provision of public goods

Ignatius J Horstmann
Rotman School of Management
University of Toronto
105 St George Street
Toronto, Ontario
M5S 3E6
CANADA
Email: ihorstmann@rotman.toronto.ca

Kimberley Ann Scharf
University of Warwick
Department of Economics
Coventry
CV4 7AL
Tel: (44 20) 76523 742
Fax: (44 20) 76523 032
Email: k.scharf@warwick.ac.uk

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1 Introduction

During the last twenty years the distribution of income in the U.S. has become progressively more unequal. At the same time as income inequality has been rising, governments have come to rely more on the private sector to provide, at least in part, services that had been previously provided exclusively by the public sector. At first sight these two trends seem contradictory. Since preferences are unobservable, taxes can only be based on income or some other observable indicator of ability to pay. In the presence of income heterogeneity, a progressive income tax system enables a low-income majority to pursue redistribution by raising taxes on high-income individuals and using the proceeds to provide public goods. As a consequence, increased distributional conflict resulting from increased income inequality should not produce increased reliance on private provision of public goods. It is, rather, differences in preferences for public goods that are not due to income differentials that should bring about private provision. If, for instance, a majority places a relatively low valuation on public goods and is unable to graduate taxes according to preferences, it may choose low levels of public provision and induce high-preference individuals to volunteer. That is, when the endogeneity of tax policies is accounted for, we should expect to observe increased reliance on private provision of public goods with increased heterogeneity in preferences not income.

These two trends can be reconciled, though, once it is recognized that the institutional structure within which public good provision choices are made is endogenous. Then, the increased tax burden that the rich face as income inequality increases creates incentives for them to restructure existing arrangements. Specifically, rather than having tax and spending decisions made by a centralized authority representing all income groups, the rich might prefer arrangements where fiscal choices are devolved to separate and distinct entities representing less income-heterogeneous groups. Because these entities have both a smaller tax base and represent individuals with more similar incomes, differences in preferences for public goods become more important. The result is increased reliance on private provision.[1]

This paper explores this theoretical link between income inequality, segregation, and private provision. We present a model of endogenous jurisdiction and policy formation, in which public good provision can be supplemented by private provision. In the model, there are four types of individuals distinguished both by their income levels (high or low), and by their intensity of preferences for a single public good (weak or strong). Individuals may choose to operate public provision within a single jurisdiction, in which

case all individuals obtain the same level of public consumption and face the same tax schedule. Alternatively, they may arrange themselves into multiple jurisdictions, each providing a local public good, and each with a (potentially) different level of taxation and public consumption. The level of taxation in a given jurisdiction is determined by a voting process involving only the individuals in the jurisdiction. Taxes can be conditioned on income but not an individual's preference for collective consumption. Individuals can, however, choose to make private, voluntary contributions towards the provision of the public good in their jurisdiction. The public good is not congestible, and multiple jurisdiction formation is costly in the sense that a fixed cost of establishing a jurisdiction must be incurred for each jurisdiction created.

Within this framework we show that, if there is more than one jurisdiction, then individuals segregate either along income lines (rich versus poor) or according to their intensity of preferences for the public good (strong versus weak). The only case in which there can be both income and preference heterogeneity within a jurisdiction is the single-jurisdiction case. If the differences in income and/or preferences are not large, then, in order to exploit scale economies in collective consumption, it pays all individuals to be in a single jurisdiction. As these differences increase, however, there will be increased distributional conflict between high- and low-income individuals and high- and low-preference individuals. In this case, it may pay individuals to incur the fixed cost of jurisdiction formation to segregate with others having similar characteristics, in order to escape an adverse tax policy outcome in a larger jurisdiction.

Voluntary provision can occur (but need not) if either there is a single jurisdiction or multiple jurisdictions segregated along income lines. In these situations, voluntary provision acts as a second-best means of conditioning an individual's payment for the public good on both income and preferences. As income inequality rises, both taxes on the rich and public provision rise in a single-jurisdiction arrangement. As a consequence, incentives for voluntary provision are attenuated—the standard result. However, incentives for the rich to segregate from the poor *increase* due to the large tax burden they face in a single-jurisdiction arrangement. With income based segregation, both the reduced tax base and reduced income heterogeneity can lead to an increased reliance on private provision. Essentially, a reduced level of public consumption and reduced ability to differentiate tax payments across individuals under income segregation make the second-best instrument (private provision) relatively more attractive to policymakers. In such a scenario, increased income inequality, by leading to a less centralized provision structure, can produce an increased reliance on private provision.

The analysis in this paper draws on two separate strands of literature: that which examines non-cooperative giving behavior and that which examines the equilibrium structure of local jurisdictions. As to the former, Bergstrom, Blume and Varian (1986), and Warr (1982, 1983) are good examples of the kind of giving behavior that we model here. These models, however, assume an exogenous fiscal structure, and thus are not able to address the distributional tensions that determine the political equilibrium and form of public provision.[2] The latter strand is motivated by Tiebout's (1956) hypothesis that individuals, by sorting themselves into communities with like individuals, will reveal their preferences for local public goods and so produce efficiency in local public good provision. Most models of jurisdiction formation typically assume that individuals differ only in income or preferences but not both.[3] Exceptions are Epple and Sieg (1997), and Epple and Platt (1997), who allow both income and preferences to vary, and find sorting by income to be incomplete. These two studies, however, do not examine the relationship between distributional tension, segregation, and private provision—the focus of our analysis here. Rather, their emphasis is on capitalization of local expenditures and taxes into property values. Glomm and Lagunoff (1998) examine how individuals would sort between two jurisdictions adopting respectively private and public provision. Unlike the present paper, however, they do not endogenize jurisdictions nor do they consider how policy choices are made and how private provision outcomes arise.

The remainder of the paper provides the details of our analysis. Section II discusses empirical evidence on the relation between inequality and private provision in the U.S. Section III develops a political-economy model of private and public provision choices and jurisdiction formation. Section IV presents results on income distribution and private provision.

2 Income Inequality and Private Giving in the U.S.

The time series data on income inequality in the U.S. shows unambiguously that income inequality has been increasing since 1969. In that year, the national income Gini coefficient was .349. By 1987, the Gini was .426, an increase of twenty-two percent; by 1997, the Gini had risen an additional 7.7 percent to .459. The share of income held by the lowest income quintile decreased from 4.2 percent in 1969 to 3.6 percent by 1997. The share of income held by the highest quintile increased by almost fifteen percent, rising from thirty-four percent in 1969 to more than forty-nine percent by 1997. Over

the period 1987-1997, the ratio of income at the 95th percentile relative to the 20th percentile rose over 8 percent from 7.49 to 8.2. Over the same period, real personal income also rose, both in aggregate and on a per-capita basis.

There is also evidence that, over the same period, that governments relied more on the private/not-for-profit sector to provide services (at least in part) previously provided by the government: food assistance, parks and recreation facilities and local environmental clean-up to name but a few. [4] A survey by the U.S. Independent Sector (1999) reports that, over the period 1987-1997, total charitable contributions by U.S. households rose by twenty-two percent, from $97.2 billion in 1987 to $127.9 billion (in 1996 dollars). The two areas in which private contributions rose most rapidly were in "social and legal services" (a forty percent increase) and "civic, social and fraternal organizations" (a fifty-three percent increase). Together, these two categories accounted for over forty percent of all private contributions to non-religious organizations. As a fraction of personal income, charitable contributions amounted to 1.75 percent of personal income in 1987; this fraction had risen to 1.9 percent by 1997.

The same period also featured some devolution of spending responsibilities from higher levels of government to lower levels. Specifically, between 1987-1997, the ratio of state and local government spending to federal non-defense spending rose from 4.75 in 1987 to 5.21 in 1997, an increase of ten percent.

While the above data provide evidence of coincidental trends in income inequality and private provision, they don't really link the two in any clear way. To get a clearer picture of the link between income inequality and reliance on private provision, we constructed a micro data set on private and governmental support to local Boys & Girls Clubs. We chose these organizations for several reasons. First, they obtain significant financial support from both public donations and government grants. In our sample, the mean level of private support in 1998 was approximately $315,000, and the mean level of government support was almost $90,000. The ratio of government to public contributions ranged from 0 to 59 with a mean of .8. Second, while the clubs provide various private goods, the good that they expressly vow to provide from the donations they receive is very much a public one: increased social responsibility and reduced delinquency and crime.[5] Third, Boys & Girls Clubs operate in over 2,800 locations throughout the U.S., providing essentially the same service in all locations. As a result, we can be assured of reasonable homogeneity in the characteristics of the public good, while allowing for considerable heterogeneity in the environment in which the good is provided (in particular, in income distribution and provision mechanism).

Also, because the clubs operate very much at the local level, the public good they provide is largely a local public good. These clubs also appear to obtain considerable financial support from the local community.[6] Finally, the public good that these clubs provide is also one for which there is not an obvious direct substitute provided by a local government program. As a result, government contributions to Boys & Girls Clubs may provide a reasonably accurate measure of government provision of this specific type of local public good.

The data we have come from the Form 990 filings by local Boys & Girls Clubs in 1998. These filings are available through the National Center for Charitable Statistics. Normally, not-for-profit organizations with more than $25,000 in gross receipts must file. The form provides information on, among other things, the amount of contributions received in the year from private sources (either direct donations or donations through organizations such as The United Way) and from government. Contributions are not broken down into corporate and individual donations, nor are they distinguished by the level of government providing support (local, state, federal). The forms also do not list transfers from Boys & Girls Clubs of America to the local club. For these reasons, we are not able to control for what part of total contributions (private or government) are from local entities.

We have a sample of clubs from different regions of the U.S. This was created by taking all clubs with scanned 990s in 1998 in the NCCS database from the following states: Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania New Jersey and Maryland (East); Virginia, Georgia, Alabama and Florida (South); Michigan, Ohio, Illinois, Indiana (Mid-West); California, Arizona and Colorado (West). The sample comprises 214 different local clubs from more than half of all scanned 990's in 1998. Because the 990s also include the address and zip code for every Boys & Girls Club, we were able to match these data with data on local income distribution from the Census.

As the data from the 2000 Census are not yet available, we used data from the 1990 Census. Given the continued rise in income inequality in the 1990s, these numbers likely underestimate inequality. However, as long as locations that had higher inequality in 1989 continue to have higher inequality in 1999, our results should not be seriously biased. Using the local income distribution data, we estimated income Gini coefficients for the location of each Boys & Girls Club in the sample. Because the Census provides only interval data and no interval means, we used an approximation method proposed by Cowell (1995, 1991) to estimate the Gini coefficient. Using this

method, the coefficients range from .21 to .41, with a mean of .31. Given an economy wide coefficient of .43, the local coefficients appear somewhat low. However, there appears to be no particular bias in the approximation process that would lead us to expect biased estimates of across-location variation in the coefficient.

Using these data, we estimated the relationship between the ratio of government to private contributions to Boys & Girls Clubs (relative relaince on private provision) and income inequality. Because there were a number of cases in which government contributions were zero, we ran both OLS and Tobit regressions. The results in both cases were quite similar and so we report only the OLS ones here. In all cases, the dependent variable was the ratio of government contributions to private contributions. Coefficient estimates are reported in Table 1, with standard errors reported in parentheses.

Column 1 reports the results from a specification that includes median income (median), total number of households, and the local Gini coefficient as regressors. Both median income and the Gini coefficient are significant at the five percent level. All else equal, an increase in either median income or in income inequality decreases the ratio of government to private contributions. Since Boys & Girls Clubs aim their services particularly at poor children, it is possible that these results, especially for median income, are picking up (at least in part) the impact that changes in income have on the numbers of poor households. To control for this effect, we included as an independent variable the fraction of household with income below $10,000 (poor). The results for this specification are shown in Column 2. Neither median income nor poor are significant now, but the coefficient on the Gini continues to be negative and significant. The inclusion of either regional dummies (Column 3) or state dummies does not alter this latter result.

The robust findings from this analysis are that: (i) there is alink between relative reliance on private provision and income inequality and (ii) Boys & Girls Clubs in areas with higher income inequality rely relatively more on private contributions than do those in areas with lower income inequality. As noted above, this latter outcome would seem inconsistent with the notion that, if individuals differ only by income level, public provision funded by taxation should be the preferred provision channel for a low-income majority. As we will see, this outcome is consistent with a theoretical setting in which greater income inequality is associated with greater sorting of individuals into more income-homogeneous decision making units. We formalize this argument in the sections that follow.

Table 1: Contributions to Boys & Girls Clubs – OLS Regression Results

Dependent Variable: Government Contributions / Private Contributions

	Specification		
Independent Variable	1	2	3
Intercept	13.19**	14.31**	16.4**
	(5.78)	(5.9)	(6.23)
Median Income ($)	−.00012**	−.00007	−.00009
	(.00005)	(.00007)	(.00007)
Income Gini Coefficient	−28.94**	−42.32**	−49.95**
	(14.48)	(20.29)	(22.18)
Number of Households (thousands)	−.00022	−.00001	.00066
	(.00129)	(.00131)	(.00133)
Number of Poor Households		10.61	9.92
		(11.27)	(12.32)
Northeast			1.19
			(.87)
South			3.01**
			(1.1)
West			1.03
			(.88)
Gini · Urban[a]			−1.5
			(2.35)
R^2	.025	.029	.075

Notes: [a]Urban is a dummy variable that takes on a value of 1 if the Boys & Girls Club serves a city/part of city and 0 if it serves a regional area.

** denotes statistical significance at the 5 percent level.

3 A Political-Economy Model of Private and Public Provision and Segregation Choices

In this section we describe a positive model of tax and public good provision choices, where private and public provision emerge as outcomes of a political process determining taxes and spending. We focus on an environment in which taxes are income based and in which tax incentives for voluntary contributions are unavailable.

3.1 The Economic Environment

Consider an economy with a population of N heterogeneous agents, each consuming a private consumption good, c, and a pure local public good, g. Agents are differentiated both by their labour endowment, ℓ, and by a preference parameter, θ. An agent's labour endowment can take on one of two possible values, $\underline{\ell}$ or $\overline{\ell} > \underline{\ell}$; likewise, $\theta \in \{\overline{\theta}, \underline{\theta}\}$. An agent type is a pair (ℓ, θ), with the set of all possible types being defined as $\{(\overline{\ell}, \overline{\theta}), (\overline{\ell}, \underline{\theta}), (\underline{\ell}, \overline{\theta}), (\underline{\ell}, \underline{\theta})\}$. The distribution of agent types is given by $\pi(\ell, \theta)$, with $0 < \pi(\ell, \theta) < 1$ and $\sum_{(\ell,\theta)} \pi(\ell, \theta) = 1$, where $\pi(\ell, \theta)$ is the fraction of the population having labor endowment ℓ and preference parameter θ. This specification allows for the possibility of endowments and the preference parameter being correlated.

Agents group themselves into jurisdictions, with jurisdiction membership determining an agent's tax liability and access to the local public good. As such, a jurisdiction defines the subset of the entire population that have taxing and spending authority for the provision of some public good. For simplicity, we assume that each agent can be a member of at most one jurisdiction. The size of the kth jurisdiction is denoted as n_k. This value represents the total number of individuals residing in jurisdiction k:

$$n_k \equiv \sum_{\ell,\theta} \beta_k(\ell, \theta)\pi(\ell, \theta)N; \tag{1}$$

where $\beta_k(\ell, \theta)$ is the fraction of individuals of type (ℓ, θ) choosing to reside in jurisdiction k. The number of individuals that are of type (ℓ, θ) and reside in jurisdiction k is defined by the variable $n_k(\ell, \theta) \equiv \beta_k(\ell, \theta)\pi(\ell, \theta)N$.

Preferences for an individual of type (ℓ, θ) residing in jurisdiction k are represented by an increasing, strictly quasiconcave utility function, $u\left(c_k(\ell, \theta), g_k; \theta\right)$, with $c_k(\ell, \theta)$ representing the consumption level of the private good by an (ℓ, θ) type residing in k, and g_k the level of the public good provided in k. An individual residing in k obtains no utility from public goods provided in other jurisdictions. Utility is normalized such

that $u(c,g;\theta) \geq 0, \forall c,g \geq 0$. Preferences are such that c and g are both essential ($u(0,g;\theta) = u(c,0;\theta) = u(0,0) = 0, \forall c,g,\theta; u(c,g;\theta) > 0, c,g > 0$) and normal goods. In addition, the willingness to pay for g, $w(c,g;\theta) = u_g(c,g;\theta)/u_c(c,g;\theta)$, is increasing in θ. Normality of c and g implies that $w(c,g;\theta)$ is increasing in c.[7]

Output in the kth jurisdiction, Y_k, is produced from labour, which is inelastically supplied. The production technology is linear in total labor inputs:

$$Y_k \equiv \sum_{\theta} [n_k(\overline{\ell},\theta)\ \overline{\ell} + n_k(\underline{\ell},\theta)\underline{\ell}]. \tag{2}$$

Output in k is used for private consumption and for the provision of the public good (i.e. $\sum_{(\ell,\theta)}[n_k(\ell,\theta)c_k(\ell,\theta) + g_k] = Y_k$.)[8] The cost, in terms of units of private consumption, of providing g_k units of the public good is given by $F + hg_k$, where $h > 0$ and $F > 0$. F may be thought of as the set-up cost of establishing a jurisdiction; both it and the marginal cost of public goods, h, are assumed independent of jurisdiction size. This specification implies that the per capita cost of providing g_k units of the public good for a community of size n_k, $(F + hg_k)/n_k$ is decreasing in n_k, and that per capita cost is minimized at $n_k = N$. This feature of the public good provision technology, along with the assumption of no congestion, means that the model is naturally biased toward a single-jurisdiction outcome and away from segregated outcomes. Thus, if segregation arises, it is not for reasons of production efficiency.

3.2 Taxation and Public Good Provision

The government has a single tax instrument at its disposal, namely, income tax. In levying income taxes, the tax authority can observe perfectly an agent's labour endowment (level of income), ℓ, but cannot observe the preference parameter, θ. As a result, income taxes can be conditioned only on the value of ℓ; that is, the value of taxes paid by type (ℓ,θ) in region k, $t_k(\ell)$, is independent of θ. It is maintained throughout that $t_k(\ell) \geq 0$, $\forall \ell$, so that there are no income subsidies.

Provision of the public good in jurisdiction k can be funded both by taxes and by voluntary contributions, $v_k(\ell,\theta)$, which, unlike income taxes, may vary both with ℓ and θ. Levels of taxation and public spending for jurisdiction k are set (and committed to) prior to any agent decisions on voluntary contributions. While our results do not depend crucially on the assumed motivation for agent contributing, we adopt the approach of Bergstrom, Blume, and Varian (1987). Specifically, we assume that agent contributions are determined in a non-cooperative fashion, given income tax levels,

with each agent's contribution chosen so as to maximize own utility. An alternative route would be to assume a 'warm-glow' utility specification as in Andreoni (1990): all of our results can be reproduced with a linear specification of warm-glow effects, $u(c + \omega z, g; \theta)$, where $0 < \omega < 1$, and z represents an individual's total contributions (voluntary and involuntary) to the public good.[9]

Under non-cooperative contributing and for given income taxes $t_k(\ell) \geq 0$ in jurisdiction k, the symmetric Nash equilibrium levels of private provision, $v_k(\ell, \theta) \geq 0$ are defined by the conditions

$$u_g(c_k(\ell,\theta), g_k; \theta)/u_c(c_k(\ell,\theta), g_k; \theta) - h \leq 0, , \quad \forall \ell, \theta, \tag{3}$$

$$[u_g(c_k(\ell,\theta), g_k; \theta)/u_c(c_k(\ell,\theta), g_k; \theta) - h]\, v_k(\ell,\theta) = 0, \quad \forall \ell, \theta, \tag{4}$$

where

$$c_k(\ell,\theta) = \ell - t_k(\ell) - v_k(\ell,\theta), \quad \forall \ell, \theta, \tag{5}$$

$$g_k = \frac{\sum_{(\ell,\theta)} n_k(\ell,\theta)\,[t_k(\ell) + v_k(\ell,\theta)] - F}{h}, \tag{6}$$

are respectively private consumption and total public good provision in jurisdiction k.

3.3 The Political System

Income tax levels in jurisdiction k are chosen after jurisdiction membership has been determined, and arise as the outcome of some political process. Because the focus of this paper is not on the political process *per se*, the details of the political system are left intentionally vague. In particular, the voting and legislative processes are not specifically modelled. Rather, we allow for the political system to be any system whose outcome satisfies certain general properties. These properties are given below.

Property 1 Anonymity of taxes. *All agents in jurisdiction k with income ℓ pay the same tax, $t_k(\ell)$.*

Property 2 Weak tax progressivity. *In any jurisdiction, k, $t_k(\underline{\ell}) \leq t_k(\overline{\ell})$.*[10]

Property 3 Non-confiscatory taxation. *In any jurisdiction, k, tax levels must be such that $\overline{\ell} - t_k(\overline{\ell}) \geq \underline{\ell} - t_k(\underline{\ell})$.*

Property 4 Imposition of preferences. *The government of jurisdiction k is defined by one of the agent types, (ℓ, θ), resident in k. Tax levels, $t_k(\ell)$, are chosen to maximize the utility of the governing agent type, subject to Properties 1-3 above.*

Property 5 Monotonicity of the election process. *All else equal, an increase in the number of agents of type (ℓ, θ) in jurisdiction k weakly increases, in the sense of first-order stochastic dominance, the probability that the election outcome in k yields a governing type that is favoured by (ℓ, θ).*[11]

Property 6 Majority voting. *If there are only two agent types in a jurisdiction, then the majority type forms the government with probability one.*

Among these properties, the first two are straightforward. Property 3 amounts to a free-disposal constraint in that an agent with income $\overline{\ell}$ could always destroy some of that income, and would have an incentive to do so, were 3 violated. This requirement can be though as a "minimal" constraint on the level of redistribution that can be attained through the tax system. Other institutional constraints placing further limits on redistribution may be present in practice; to the extent they are, distributional tensions in tax choices would be weaker than under Property 3, but they would still be present.[12]

Property 4 would be a property of a citizen candidate voting model (see Osborne and Slivinski (1996), and Besley and Coate (1997)). It would also arise in a median voter model in which there were two or fewer types in a jurisdiction. Properties 5 and 6 also would be properties of a median voter model and a citizen-candidate model in which individuals voted sincerely.

3.4 Jurisdiction Formation

Jurisdiction formation in the model occurs via a non-cooperative process in which each agent selects membership in one of a (potentially large) number of possible groups. All those agents that select the same group constitute a given jurisdiction. The set of such jurisdictions is referred to as a jurisdiction configuration. After jurisdictions are formed, the political process produces a governing type in each. The governing type in a given jurisdiction sets taxes and public good provision for that jurisdiction according to Property 4 and taking account of the equilibrium private provision decisions that will result from this choice as part of a subgame perfect equilibrium.

An equilibrium jurisdiction configuration is defined as follows. Let J denote a jurisdiction configuration, and $J_k(i)$ denote the jurisdiction to which agent i belongs in this configuration. For a given configuration, J, let $U_k(\ell, \theta; J)$ give the anticipated utility level for an individual of type (ℓ, θ) in jurisdiction k given configuration J. A configuration, J^*, is an equilibrium configuration if it satisfies three conditions:[13]

Condition 1 Feasibility. $U_k(\ell, \theta; J^*) > 0 \ \forall k, \ell, \theta$.

Condition 2 Individual rationality (Nash). *No agent can increase his utility by a unilateral move from jurisdiction $J_k^*(i)$ to jurisdiction $J_{k'}^* \neq J_k^*(i)$.*

The third condition requires an additional definition. Let $\mathcal{J}^*$ be the set of all configurations that satisfy conditions 1 and 2 above, and consider two configurations $J^*, \mathcal{J}^* \in \mathcal{J}^*$. Then $\mathcal{J}^*$ is said to *dominate* J^* if $U_k(\ell, \theta; J^*) \leq U_{k'}(\ell, \theta; \mathcal{J}^*), \forall(\ell, \theta), k, k'$.

Condition 3 Unanimity. *There exists no configuration $\mathcal{J}^*$ that satisfies Conditions 1 and 2 and dominates J^*.*

Condition 2 above is a free-entry/exit condition that restricts the set of possible equilibrium configurations to the set of subgame perfect Nash equilibria for this game. Condition 3 provides a refinement of this set. Specifically, it allows for jurisdiction configurations to be ruled out if all individuals would benefit from moving to a new configuration. At the same time, it restricts the possibilities for ruling out a given configuration by requiring that any alternative configuration must Pareto dominate it. One might interpret this unanimity requirement as a strong form of a majority voting condition for significant political or constitutional change. As a condition for a blocking coalition, it is far more restrictive than that for the core; on the other hand, existence of an equilibrium jurisdiction configuration is not an issue here.[14]

3.5 Political and Jurisdictional Equilibria

Within a given jurisdiction, public good provision is completely characterized by the tax system that arises in a political equilibrium for that jurisdiction. Under the political system described above, an equilibrium tax system must have one of two characteristics, depending on the income type that forms the government. If a type with low income ($\underline{\ell}$) forms the government, taxes on types with high income ($\overline{\ell}$) must be such that $\overline{\ell} - t_k(\overline{\ell}) = \underline{\ell} - t_k(\underline{\ell})$. If a type with high income ($\overline{\ell}$) forms the government, taxes on

types with low income ($\underline{\ell}$) must be such that $t_k(\underline{\ell}) = t_k(\overline{\ell}) = t_k$. In both instances, a political equilibrium involves the governing income type setting taxes on the other income group as high as is politically feasible. Doing otherwise would reduce, at least weakly, both the amount of public good provided in the jurisdiction and the governing type's consumption of the private good. When a type with low income forms the government, the non-confiscatory taxation property (Property 3) provides the political constraint on tax setting. When a type with high income forms the government, the weak tax progressivity property (Property2) is the constraint.[15]

Once tax levels (and so public provision levels) in jurisdiction k are determined, conditions (3)-(6) determine the levels of private provision. These conditions imply that, if a low-income type forms the government, then $v_k(\underline{\ell}, \theta') = v_k(\overline{\ell}, \theta')$, $\theta' = \underline{\theta}, \overline{\theta}$. The reason is that the equilibrium tax regime in this case gives both income types the same after-tax income ($\overline{\ell} - t_k(\overline{\ell}) = \underline{\ell} - t_k(\underline{\ell})$). Therefore, both income types engage in the same amount of private provision. If a high-income type forms the government, then $\overline{\ell}$ type individuals have higher after-tax income than $\underline{\ell}$ type individuals ($t_k(\underline{\ell}) = t_k(\overline{\ell}) = t_k$). Since both private and collective consumption are normal goods, it must be that high income types engage in (at least weakly) more private provision: $v_k(\overline{\ell}, \theta') \geq v_k(\underline{\ell}, \theta')$, $\theta' = \underline{\theta}, \overline{\theta}$.[16] In both instances, since the willingness-to-pay for the public good is increasing in θ, we have $v_k(\ell, \overline{\theta}) \geq v_k(\ell, \underline{\theta})$, $\ell = \underline{\ell}, \overline{\ell}$.

Note also that, if type (ℓ', θ') forms the government in k, this type never sets taxes such that $v_k(\ell', \theta') > 0$. By raising the tax $t_k(\ell')$ to the point at which $v_k(\ell', \theta') = 0$, the (ℓ', θ') type makes the same total payment to the public good but induces (weakly) more payments from other types (via the higher taxes on other types). This fact, in conjunction with the previous results, has three implications: (i) if all agents in jurisdiction k have the same after-tax income, private provision can only occur in equilibrium if the $\underline{\theta}$ type forms the government, and then only the $\overline{\theta}$ may contribute; (ii) private provision never occurs if all agents in jurisdiction k are of the same preference type ($v_k(\underline{\ell}, \theta') = v_k(\overline{\ell}, \theta')$ when the $\underline{\ell}$ type forms the government and $v_k(\overline{\ell}, \theta') \geq v_k(\underline{\ell}, \theta')$ when the $\overline{\ell}$ type does); (iii) if all agents reside in the same jurisdiction, private provision can only occur if a $\underline{\theta}$ type forms the government (the same argument as for (ii)).

These results on equilibrium tax and private provision regimes are summarized below:

Proposition 1 *In any equilibrium, the tax system, $(t_k(\underline{\ell}), t_k(\overline{\ell}))$, in jurisdiction k must be such that, if an $\underline{\ell}$ type forms the government $\overline{\ell} - t_k(\overline{\ell}) = \underline{\ell} - t_k(\underline{\ell})$; if an $\overline{\ell}$ type forms the government, $t_k(\underline{\ell}) = t_k(\overline{\ell}) = t_k$. Under such tax systems, private provision*

does not occur if the agents in k differ only along income lines. Otherwise, private provision can only occur if a $\underline{\theta}$ type forms the government, and then only by $\overline{\theta}$-type individuals.

The emergence of private provision in equilibrium reflects both the governing type's incentives to condition individual payments toward the public good on θ and the inability to do so directly via tax levels: private provision is an alternative (and distinctly second-best) way to condition payments on θ. When there is no preference heterogeneity in a jurisdiction, then, implicitly, the tax is conditioned on θ, and so private provision has no role to play. When there is preference heterogeneity, the best an $\overline{\theta}$ governing type can do is to force $\underline{\theta}$ type individuals to pay at least as much as $\overline{\theta}$ type individuals do, and the tax system can accomplish this: private provision again has no role to play. By contrast, an $\underline{\theta}$ governing type can force $\overline{\theta}$ type individuals to pay more than $\underline{\theta}$ type individuals; this cannot be accomplished directly through the tax system but it can be accomplished indirectly by setting a low tax that induces $\overline{\theta}$ type individuals to engage in private provision. In this case, the extent of private provision depends on the extent of preference heterogeneity and on the number and composition of individual types within the jurisdiction.

Given the above, the conditions that define the equilibrium tax and provision levels in a jurisdiction can be derived in a straightforward fashion. When either a $(\overline{\ell}, \theta)$ type forms the government or there is no income heterogeneity, there is a single tax rate. If there also is no private provision in equilibrium, then the equilibrium tax rate, with a (ℓ, θ) governing type, is defined by the conditions (refer to Property 4)

$$u_g(\ell - t_k^*, g_k^*; \theta)/u_c(\ell - t_k^*, g_k^*; \theta) = h/\alpha_k, \tag{7}$$

and

$$g_k^* = \frac{\alpha_k t_k^* - F}{h}. \tag{8}$$

If there is private provision in equilibrium, then there must be preference heterogeneity in the jurisdiction and a $\underline{\theta}$ governing type. In this case, the conditions become

$$u_g(\ell - t_k^*, g_k; \underline{\theta})/u_c(\ell - t_k^*, g_k; \underline{\theta}) = h/\left(\alpha_k + \sum_{\ell} n_k(\ell, \overline{\theta}) dv_k(\ell, \overline{\theta})/dt_k^*\right), \tag{9}$$

and

$$g_k^* = \frac{\alpha_k t_k^* + \sum_{\ell} n_k(\ell, \overline{\theta}) v_k(\ell, \overline{\theta}) - F}{h}, \tag{10}$$

where $v_k(\ell, \overline{\theta})$ and $dv_k(\ell, \overline{\theta})/dt_k^*$ are identified by conditions (3)-(6).

Similar conditions apply if there are two tax rates (so that a type $(\underline{\ell}, \theta)$ forms the government and there is income heterogeneity), except that the level of tax provision is now $\alpha_k t_k^* + n_k(\overline{\ell}, \theta)(\overline{\ell} - \underline{\ell})$.

What about jurisdiction formation? Without additional restrictions on the characteristics and distribution of agent types in the population and on the size of the jurisdiction set-up cost, F, many jurisdictional equilibria are possible. To limit the scope of these possibilities and so focus attention on the key features of the model, we impose two restrictions. The first is a restriction on the size of F:

Assumption 1 $N\pi(\ell, \theta)\ell < F,\ \ell = \underline{\ell}, \overline{\ell},\ \theta = \underline{\theta}, \overline{\theta}.$

This assumption means that configurations in which individuals of a single type live in a separate jurisdiction is not feasible in the sense of covering the costs of operation. Since complete segregation of types can never occur, distributional tensions within jurisdictions can never be fully eliminated by segregation.

The second assumption imposes an additional restriction on agent preferences so as to structure the response of a governing type to changes in jurisdiction size:

Assumption 2 *In any feasible jurisdiction configuration and for any governing type (ℓ, θ) in jurisdiction k, the equilibrium tax level, $t_k^*(\ell)$, is weakly decreasing in jurisdiction size, n_k, and is such that g_k is weakly increasing in jurisdiction size.*

In any situation in which taxes on the governing type in k are positive, an increase in jurisdiction size increases g_k, taxes constant. As a result, as long as taxes are positive, at least one of $c_k(\ell, \theta), g_k$ must increase, governing type constant. Assumption 2 requires that both increase. If preferences are homothetic, a sufficient (but not necessary) condition for Assumption 2 to hold is that c and g are gross complements. Cobb-Douglas preferences have this feature, as do CES preferences with elasticity of substitution between unity and zero.

Assumptions 1 and 2 narrow considerably the set of possible equilibrium jurisdiction configurations.[17] Specifically, we have:

Proposition 2 *The only possible equilibrium configurations are: (i) the single jurisdiction (S)—$J_1 = \{(\overline{\ell}, \overline{\theta})_D, (\underline{\ell}, \underline{\theta}), (\overline{\ell}, \underline{\theta}), (\underline{\ell}, \overline{\theta})_E\}$; (ii) two jurisdictions, income segregation (IS)—$J_1 = \{(\underline{\ell}, \underline{\theta}), (\underline{\ell}, \overline{\theta})_D\}$, $J_2 = \{(\overline{\ell}, \underline{\theta}), (\overline{\ell}, \overline{\theta})_D, (\underline{\ell}, \overline{\theta})_E\}$; (iii) two jurisdictions, preference segregation (PS)—$J_1 = \{(\underline{\ell}, \underline{\theta}), (\overline{\ell}, \underline{\theta})_D\}$, $J_2 = \{(\underline{\ell}, \overline{\theta}), (\overline{\ell}, \overline{\theta})_E\}$.*

The key feature in this result is that, in equilibrium, it never pays for individuals of the same type to reside in different jurisdictions. Doing so reduces both the tax base, and so the level of the public good, and the individuals' political power (recall Property 4). As a result, it always pays an individual in one of the jurisdictions to move to the other. Therefore, given Assumption 1, either all agents reside in a single jurisdiction, the S outcome, or they reside in two separate jurisdictions with two types each. Of these, a configuration in which the $(\overline{\ell}, \overline{\theta})$ and $(\underline{\ell}, \underline{\theta})$ reside in the same jurisdiction cannot occur. This configuration fails to be an equilibrium essentially because it clusters individuals with the highest and the lowest willingness-to-pay for collective consumption. In such a configuration, it always pays an individual of one of these two types to relocate in the other jurisdiction, which is composed of individuals having an "intermediate" willingness-to-pay for collective consumption.

It is worth stressing here that the results in Proposition 2 rely only on Conditions 1 and 2 above. Consideration of deviations by coalitions of individuals (Condition 3) is only relevant for narrowing the set of equilibrium configurations further, and can be used for selection when more than one of the above configurations satisfy Conditions 1 and 2.

How do we interpret Proposition 2? The S outcome corresponds to a situation in which tax and public provision decisions are made at the level of the entire population. If decisions are not made at this level, then they occur at levels having groups of agents that are less heterogeneous (in some dimension) than the population. Under IS, the groups are less income heterogeneous than the population; under PS, the groups are less heterogeneous in terms of their preference for the public good. The S configuration is, in principle, attractive to all agent types, because it is the least cost way of providing any level of the public good. Its drawbacks, from the point of view of the non-governing types, are that it can result in very high taxes on high-income types, if these are in a minority, and it can result in undesirably low levels of public good for the $\overline{\theta}$ types, if these are in a minority. These features produce incentives for individuals to devolve decision making to more homogeneous groups and bear the associated higher costs of public good provision.

In the next section, we explore specifically how the extent of income heterogeneity affects the level at which tax and public good provision decisions are made, and how this decision, in turn, affects the reliance on private provision.

4 Income Inequality and Private Provision

With jurisdiction formation being endogenous, changes in income inequality can affect private provision both by altering the extent of private provision within jurisdictions and by altering the configuration of jurisdictions. In what follows, we examine the impact on each in turn. Because private provision only occurs in equilibrium if the $\underline{\theta}$ type forms the government and if the jurisdiction configuration is either S or IS, we focus attention on these situations. For the $\underline{\theta}$ type to form the government under both configurations, it must be that this type is in the majority among both high- and low-income groups. We also focus specifically on those cases in which an $\underline{\ell}$ type always forms the government in the S configuration and, at least initially, $t(\underline{\ell}) > 0$. A necessary condition for the former outcome is that the $\underline{\ell}$ type individuals are in the majority; we assume in what follows that such is the case. This assumption is consistent with the observation that mean income is larger than median income.[18] Finally, in what follows we assume that changes in income inequality are due to changes in income levels only and not to changes in the fraction of rich and poor. This experiment is consistent with a definition of rich and poor based on relative standing in the income distribution – the rich are the the top x percent of the income distribution.

Consider, then, the impact of rising income inequality on private provision within the single jurisdiction configuration. Suppose that, initially, the $\overline{\theta}$ types engage in private provision. Then any change in income inequality that (i) leaves both mean income and the governing type unchanged and (ii) continues to result in positive taxes on both income types, has no effect on either private provision or total provision. To see why, imagine a rise in $\overline{\ell}$ and a fall in $\underline{\ell}$ that leaves mean income constant. In this case, the $\underline{\ell}$ governing type can lower $t(\underline{\ell})$ by an amount just equal to the fall in $\underline{\ell}$, thereby leaving disposable income for this type unchanged. By increasing $t(\overline{\ell})$ by the amount of the increase in $\overline{\ell}$, the $\underline{\ell}$ type leaves disposable income for the $\overline{\ell}$ types unchanged (and so satisfies Property 3) and, private provision constant, generates the same amount of public good provision (since the income change is mean preserving). As a result, $\overline{\theta}$ type individuals have no incentive to alter private provision. A similar argument shows that, if $t(\underline{\ell}) = 0$ either before or after the change in income inequality, then private provision falls and total provision increases. We have then:

Proposition 3 *Under the single jurisdiction configuration and holding mean income constant, a rise in income inequality weakly decreases both private provision and private provision relative to total provision.*

Without additional restrictions on preferences, little can be said about the impact of changes in income inequality that also change mean income. If, however, we assume that the utility function $u(c, g; \theta)$ is homothetic, then any mean increasing rise in income inequality weakly decreases private provision relative to total provision. To see the intuition note that, with homothetic preferences, both the $(\underline{\ell}, \underline{\theta})$ governing type and the $\overline{\theta}$ types engaging in private provision maintain constant (but different) ratios of private to public good consumption as disposable income changes. At any level of the public good, the difference between the private consumption levels of $\underline{\theta}$ and $\overline{\theta}$ types is the level of private provision by the latter. This difference is just proportional to g and so the fraction of the public good provided privately is constant. More generally, we have:

Proposition 4 *If preferences are homothetic, then under a single jurisdiction configuration, a rise in income inequality that (weakly) increases mean income weakly decreases the ratio of private to total provision.*

How do these results relate to the evidence on private provision from Section 2? Suppose that the maintained hypothesis on the data generating process is that all jurisdictions are fixed exogeneously to contain the entire local population and that any variation in government and private contributions come from within jurisdiction variations in these two. Jurisdictions differ in income distibutions. Then, the above results predict that the coefficient on the income Gini should be either zero or positive (recall that the dependent variable is government relative to private contributions). In fact, this coefficient is significantly different from zero and negative. The evidence then is not consistent with a simple model of exogenous jurisdictions.

Suppose, however, that the increase in income inequality results in a change in the jurisdictional equilibrium. In particular, suppose that, rather than a single jurisdiction, the equilibrium were to shift to the income segregated configuration. What can be said about private provision in the new configuration in comparison with the old one?

Because the $\underline{\theta}$ types have been assumed to be a majority of the population in each income group, a $\underline{\theta}$ type forms the government in each jurisdiction. If preferences are homothetic, then the ratio of private provision by any individual $\overline{\theta}$ agent, $v_k(\ell, \overline{\theta})$, to total provision, g_k, is weakly larger in at least one of the jurisdictions. If the ratio of $\overline{\theta}$ to $\underline{\theta}$ individuals in each jurisdiction is the same as in population, then $v_k(\ell, \overline{\theta})/g_k$ is weakly larger in both jurisdictions (and strictly larger unless $v_k = 0$ in all cases). To see why this latter outcome holds, note that the tax base in each jurisdiction is smaller

than in the single jurisdiction while the fraction engaging in private provision is the same. This means that the price of public provision to the $\underline{\theta}$ governing type in each jurisdiction is higher than in the single jurisdiction case. As a result, the governing type engages in less public provision and relies more heavily on private provision in the segregated case.

Whether the ratio of total private provision to total provision, v_k/g_k, in a jurisdiction increases relative to the single jurisdiction case is generally indeterminate. The problem is that, while each individual that contributes gives relatively more with income segregation, there are fewer individuals contributing. We would argue, however, that this comparison isn't the relevant one since it relates private provision behavior by a subset of the population to that by the entire population. The right comparison should be between an appropriate aggregate of private relative to total provision in the income segregated case and private relative to total provision in the single jurisdiction case. This aggregation should treat the two sub-populations in the income segregated case in an "as if" single population way. To do this we assign to each $\overline{\theta}$ type in the population a private provision level equal to the average level across jurisdictions in the income segregated case; we assign a level of public good consumption equal to the average level of the public good. We then compare overall private provision relative to average total provision in the income segregated case with the same measure in the single juirsdiction case (for the latter, this ratio is just private relative to total provision). Here we find that, as long as the distribution of $\overline{\theta}$ types across income categories is not too different, private relative to average total provision is higher in the income segregated case. We summarize our results below.

Proposition 5 *Suppose that preferences are homothetic and that, initially, the equilibrium configuration involves a single jurisdiction with the $\underline{\ell}$ type forming the government. Consider an increase in income inequality that results in an income segregated equilibrium. Then, as long as public provision levels are positive in both jurisdictions*

(i) the ratio of individual private to total provision is weakly larger in at least one of the jurisdictions than in the initial single jurisdiction configuration; if the ratio of high to low preference type individuals is the same for both income types, the ratio of individual private to total provision is weakly larger in both jurisdictions;

(ii) total private provision for the population as a whole relative to average total provision is larger than the ratio of private to total provision in the single jurisdiction as long as the ratio of high to low preference types is not too different across income groups.

This result should be contrasted to the situation in which the increase in income inequality has no impact on the jurisdiction configuration (Proposition 4). In that case, rising income inequality weakly decreases the ratio of private to total provision. When rising income inequality changes the jurisdiction configuration to one segregated along income lines, private relative to total provision increases.

Of course, the above assumes that a rise in income inequality can induce a switch in equilibrium from a single jurisdiction outcome to an income segregated one. This link between income inequality and jurisdictional outcomes still must be demonstrated. To do so we note, first, that as long as the governing type is chosen in a non-stochastic fashion, the single-jurisdiction configuration is always an equilibrium configuration regardless of the level of income inequality (provided total income is enough to cover the fixed cost of operation, F):

Proposition 6 *Suppose that the political process is non-stochastic and that the single jurisdiction configuration satsfies feasibility (Condition 1). Then, this configuration is an equilibrium.*

The income segregated configuration need not be an equilibrium, however. Specifically, if income inequality is small enough, then income segregation does not arise. Basically, with little enough income inequality, segregation generates additional set-up costs with little in the way of gains from tax sorting. Thus, we have:

Proposition 7 *There exists an $\varepsilon > 0$ such that, for all $\overline{\ell}, \underline{\ell}$ with $0 < \overline{\ell} - \underline{\ell} < \varepsilon$, the jurisdiction configuration IS is not an equilibrium configuration.*

So, for small amounts of income inequality, the single jurisdiction configuration is an equilibrium configuration while the income segregated one is not.[19] While we have no analogous result that shows that the income segregated configuration must arise as an equilibrium configuration for large enough amounts of income inequality, we do have robust sets of examples that show that such is indeed the case. Thus, an increase in income inequality is precisely the environmental change that induces the (potential) change in configuration from a single jurisdiction to an income segregated one. Proposition 5 shows that such a switch is accompanied by an increased reliance on private relative to public provision.

There remain two possible scenarios that we still have not discussed; namely, scenarios where income inequality increases starting from a situation where individuals are

already segregated along either income or preference lines. If the initial jurisdictional configuration involves two income-homogenous jurisdictions, and as long as preferences are homothetic, an increase in income inequality will have no effect on private provision relative to total provision:

Proposition 8 *Suppose that preferences are homothetic, and that, initially, the equilibrium configuration involves jurisdictions segregated along income lines. Then, an increase in income inequality leaves the ratio of private provision to total provision in each jurisdiction unchanged.*

If income inequality increases starting from a situation where individuals are segregated along preference lines but does not affect sorting, clearly it will have no effect on private provision—simply because private provision is zero in this case (Proposition 1). On the other hand, if increased income inequality triggers a switch from a preference segregated outcome to income segregation, then private provision relative to total provision could increase.[20]

What these results imply is that, as long as high-income agents remain a minority in the population and preferences do not depart significantly from homotheticity, increased income inequality can lead to increased reliance on private provision if the increased inequality triggers a change in the structure of public provision.[21] Increased reliance on private provision occurs when the increased income inequality causes jurisdictions to become relatively more income homogeneous (because of a switch from S to IS or from PS to IS). Thus, our model predicts that we should observe greater reliance on private provision in areas where there is comparatively greater income ineqaulity in the population as a whole but devolution of public good provision to sub-populations that have comparatively less inequality.

5 Concluding Remarks

This paper has provided a model of endogenous jurisdiction formation in a setting in which taxes are set by a political process and voluntary provision of a local public good is possible. In spite of being biased toward a single-jurisdiction outcome, the model generates both jurisdictional segregation of the population and increased reliance on private provision as income inequality increases. Increased income heterogeneity can lead individuals to sort themselves along income lines, forming communities where individuals have similar income levels but different intensities of preferences for public

goods. This sorting can in turn give rise to fiscal choices that result in increased private provision relative to public provision.

The key prediction from the above analysis is that greater income inequality has very different implications for reliance on private provision depending on the way in which it affects the public provision mechanism. If greater inequality is associated with public provision decisions being made at the level of groups that are less income heterogeneous than the population as a whole, then greater inequality should be associated with greater reliance on private provision. If greater inequality does not impact the level at which public provision decisions are made, then the effect on private provision should be comparatively less.

Our analysis has focused on how the distribution of income and preferences can affect private provision via segregation outcomes. The reverse linkage could also be of interest. In other words, what role does voluntarism play in jurisdiction formation? One could examine how the set of equilibrium configurations would change if voluntary provision were infeasible. In particular, does voluntarism lead to increased community cohesion, as often claimed, or may it lead to increased segregation? Except in the cases of the IS and S configurations having a $\underline{\theta}$-type policymaker, the equilibrium utility levels of the agents will be unchanged by a ban on voluntarism (or any other policy promoting or discouraging voluntary provision). In these two cases, and in certain out-of-equilibrium configurations, agent utilities may be affected. For the policymaker, utility weakly decreases when private provision is infeasible; for a $\overline{\theta}$ type (the type that potentially engages in voluntary provision), utility may increase or decrease. The net effect of voluntary provision on jurisdiction formation is, as a consequence, not immediately obvious. Thus, we cannot rule out that voluntarism could actually encourage segregation, a result that goes counter to often-heard arguments that voluntarism should be promoted as a means of community building.

Our model could also be extended in several other directions. First, other tax instruments may be included; in particular, tax incentives to private giving could be used by a low-preference majority to encourage voluntary behaviour, resulting in policy outcomes that are relatively less favourable to high-preference individuals (Scharf, 1999); this, in turn, may affect segregation incentives. It may also be important to account for heterogeneity in preferences over the composition of public consumption. When such heterogeneity exists, a majority can dictate not only the level of taxation, but also how the revenues from taxes are spent. Voluntary contributions give volunteers full control over the use of funds, an advantage which could make a private provision

outcome relatively more attractive to volunteers. Finally, it may be important to consider agglomeration motives other than scale economies in public good provision, such as technological complementarities in production (Bénabou, 1996).

Notes

[1]It is interesting to note that a trend toward increased transfer of fiscal responsibilities from federal to state governments and from these governments to local ones has paralleled the other two trends during the 1980s and 1990s. Dubbed the "devolution revolution," this trend has seen responsibility for programs such as welfare, public education and health care have, to varying degrees, been passed from higher to lower levels of government. In the U.S., for instance, President Clinton signed the "Personal Responsibility and Work Opportunity Act of 1996" (PRWORA), transferring responsibility for some income support and social services from Washington to state and local governments and the private sector. In Canada, the federal government now allows each province to decide how federal transfers will be allocated between health and public education. In Ontario, responsibility for social programs has been passed from the provincial to local government.

[2]In fact, Bergstrom, Blume and Varian point out that "It would be nice to have an explanation not only of what happens to private contributions when the government increases its contribution of a public good, but also of what causes the government to do so,"—a reflection shared by Weisbrod (1988) (pp. 160-161). One thing we do in this paper is provide an explanation for the response of fiscal choices to voluntary activities. With an endogenous tax system, we find no longer valid Bergstrom, Blume and Varian's claim that "if an economy evolves to a more equal distribution of income, we can expect the amount of public goods that would be provided voluntarily to diminish."

[3]One strand of literature in this area looks at the effect of "voting with one's feet" on the capitalization of property taxes and local public services into property values. See, for example, Oates (1969); Hamilton (1976a, 1976b); Epple, Zelenitz and Visscher (1978); Epple and Sieg (1997); Brueckner, (1979, 1982); and Hoyt and Rosenthal (1997). Goodspeed (1989, 1995), focuses on local income taxation. A separate strand of literature looks at conditions under which Tiebout style sorting leads to efficient and stable outcomes (Westhoff, 1977; Wooders, 1980; Bucovetsky, 1981; Epple, Filimon and Romer, 1984; Epple and Romer, 1991; Epple and Platt, 1996). A few recent papers have analyzed jurisdiction formation in a political-economy context, in the presence of preference or income heterogeneity and interjurisdictional factor mobility (Bolton and Roland, 1996, 1997; Alesina and Spolaore, 1997).

[4]This shift to private provision, referred to by some as the "privatization of America," was endorsed by leading politicians at the time. In a speech to the community of Monrovia, California, former President Clinton stated that "...we try to set rules within which our people can work together, in which the free market can work, in which people's creativity can work, in which communities can solve their own problems."

[5]On their web site, the Boys & Girls Clubs of America state that their mission (and the

"movement's reason for being") is: "To inspire and enable all young people, especially those from disadvantaged circumstances, to realize their full potential as responsible and caring citizens." They go on to argue that: "It takes money to run a Boys & Girls Club—on average about $200 per youth per year. But consider the alternative: keeping a young adult in jail costs taxpayers anywhere from $25,000 to $75,000 per year. Boys & Girls Clubs—a proven delinquency prevention program—are one of the best bargains in America." What individuals and government contributions generate—reduced delinquency and crime, more responsible citizens and the like—is very much a non- congestible public good.

[6]Local United Way campaigns tend to be a regular source of private support for the local clubs.

[7]Note that, for a given tax system, $c(\ell, \theta)$ is increasing in ℓ. These assumptions therefore imply that $w(c(\ell, \theta), g; \theta)$ satisfies the usual single-crossing property in ℓ and θ.

[8]This production structure is equivalent to assuming that each agent in jurisdiction k uses some fraction of her endowment for provision of g_k and consumes the remaining fraction.

[9]Noncooperative models of private provision choices predict that private contributions should vanish if the number of contributors is large. Including 'warm-glow' or altruistic motives may be necessary in order to account for the observed volume of charitable contributions in large-numbers economies.

[10]This restriction is weaker than the usual tax progressivity restriction with proportional income taxes; here the restriction could be satisfied by a proportional tax system even though tax rates are not increasing with income.

[11]Formally, let governing types be ranked from most preferred, τ_1, to least preferred, τ_4, for type (ℓ, θ). Let $p = (p_1, ..., p_4)$ be the probability distribution generated by the election process over the types $\tau_1, ..., \tau_4$ each being the governing type when $n_k(\ell, \theta) = \mathbb{b}_k$. Let $p' = (p'_1, ..., p'_4)$ be the probability distribution generated by the election process when $n_k(\ell, \theta) = \mathbb{b}_k + 1$. Then the probability distribution p' weakly first-order stochastic dominates the distribution p.

[12]In particular, informational constraint may amount to constraint on redistribution. For example, if leisure is endogenous and unobservable (or, equivalently, untaxed), redistributive taxes must be incentive compatibile.

[13]See the Appendix for a formal treatment of equilibrium jurisdiction formation.

[14]An implication of Condition 3 is that the single-jurisdiction configuration has strong stability properties that bias the results away from segregation.

[15]Formal statements of these results and proofs are contained in the Appendix.

[16]See the Appendix for a formal statement and proof of these results.

[17]We also impose a condition requiring equilibrium configurations to be robust with respect to small perturbations (see the Appendix).

[18]Looking at this case is useful for focussing attention on the case of interest: that in which rising income inequality creates incentives for high-income individuals to segregate as a way of avoiding excessive taxation.

[19]For sufficiently little preference heterogeneity, the single jurisdiction is the unique equilibrium configuration.

[20]In principle, we cannot exclude that increased income inequality could cause a preference segregated outcome to revert to the single jurisdiction, and through this channel, bring about an increase in private provision (which is zero under preference based segregation). In this case, however, we would expect increases in income inequality and private provision to be accompanied by greater centralization rather than less—which makes such a scenario a less obvious candidate for describing recent trends.

[21]Because of the extremely coarse representation of heterogeneity in our model (only two income types and two preference types), a progressive increase in income inequality cannot produce a progressive change in the provision mix through segregation; rather, the change occurs discretely. Introducing multiple income and preference types would allow for progressively moire income-segregated outcomes to arise as income inequality increases, and would thus be able to account for a gradual rather than a discrete change in the provision mix.

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Appendix

For Proposition 1, we establish a series of results that, together, prove the proposition. The first two lemmas show that the tax system must be such that either Property 2 or Property 3 is binding.

Lemma 1 Suppose that agent type $(\underline{\ell}, \theta)$ forms the government in jurisdiction k and that the jurisdiction contains some agents of type $(\overline{\ell}, \theta')$. Then, for any θ, θ', the tax regime involves two taxes, $t_k(\underline{\ell})$ and $t_k(\overline{\ell}) > t_k(\underline{\ell})$. In addition, for any $t_k(\underline{\ell})$, the value of $t_k(\overline{\ell})$ is determined by the condition $\overline{\ell} - t_k(\overline{\ell}) = \underline{\ell} - t_k(\underline{\ell})$.

Proof: Suppose not, so that $c_k(\overline{\ell}, \theta') > c_k(\underline{\ell}, \theta')$. Then, there are two possibilities: (i) $v_k(\ell, \theta) = 0$, $\forall(\ell, \theta)$; or (ii) $v_k(\ell, \theta) > 0$ for some (ℓ, θ). In the former case, equations (3)-(6) imply that an increase in $t_k(\overline{\ell})$ strictly raises g_k while leaving $c_k(\underline{\ell}, \theta)$ unchanged. As a result, the utility of type $(\underline{\ell}, \theta)$ increases. For case (ii), let Δt be the increase in $t_k(\overline{\ell})$ needed

to make $u(c_k(\overline{\ell},\theta'),g_k;\theta') = u(c_k(\underline{\ell},\theta'),g_k;\theta')$. If $v_k(\overline{\ell},\theta) > \Delta t$ for both $\overline{(}\theta)$ and $\underline{(}\theta)$, then from equations (3)-(6), an increase in $t_k(\overline{\ell})$ has no effect on g_k or on consumption of the low-income type policymaker. The policymaker, therefore, weakly prefers the tax increase. If $v_k(\overline{\ell},\theta) < \Delta t$ for some θ, then the increase in $t(\overline{\ell})$ increases that type's contribution to g_k. While other types' contributions may be lower, equations (3)-(6) and the normality of c and g imply that they cannot be so low as to reduce g_k. As a result, g_k increases with the increase in $t(\overline{\ell})$; private consumption for the policymaker is weakly increasing and so utility of the policy maker strictly increases. 2

Lemma 2 Consider an equilibrium configuration, J, and jurisdiction $J_k \in J$ such that agent type $(\overline{\ell},\theta)$ forms the government in J_k and that this jurisdiction contains some agents of type $(\underline{\ell},\theta')$. Then, for any θ,θ', the tax regime involves a single tax, $t_k(\underline{\ell}) = t_k(\overline{\ell}) = t_k$.

Proof: The proof here is essentially the same as for Lemma 1, where now the $(\overline{\ell},\theta)$ type gains by raising the tax from $t_k(\underline{\ell}) < t_k(\overline{\ell})$ to $t_k(\underline{\ell}) = t_k(\overline{\ell})$. 2

The next three lemmas establish properties of equilibrium private provision behavior.

Lemma 3 In any equilibrium jurisdiction configuration, J, and for any government of jurisdiction $J_k \in J$, $v_k(\overline{\ell},\theta) \geq v_k(\underline{\ell},\theta)$. If $(\underline{\ell},\theta)$ forms the government, then, $v_k(\underline{\ell},\theta') = v_k(\overline{\ell},\theta')$.

Proof: Suppose a type $(\overline{\ell},\theta')$ forms the government. From Lemma 2, $t_k(\overline{\ell}) = t_k(\underline{\ell})$, implying that $\overline{\ell} - t_k(\overline{\ell}) > \underline{\ell} - t_k(\underline{\ell})$. The assumption that c_k and g_k are normal goods then implies that $v_k(\overline{\ell},\theta) \geq v_k(\underline{\ell},\theta)$ for any given θ, with strict inequality if $v_k(\overline{\ell},\theta) > 0$. If the type $(\underline{\ell},\theta')$ forms the government, then from Lemma 1, $\overline{\ell} - t_k(\overline{\ell}) = \underline{\ell} - t_k(\underline{\ell})$. Equations (3)-(6) then imply that $v_k(\overline{\ell},\theta) = v_k(\underline{\ell},\theta)$. 2

Lemma 4 Consider a jurisdiction $J_k \in J$, J an equilibrium, composed solely of agents of types $(\ell,\overline{\theta})$ and $(\ell,\underline{\theta})$ for $\ell = \underline{\ell}$ or $\overline{\ell}$. If the government is formed by type $(\ell,\overline{\theta})$ then $v_k(\ell,\theta) = 0,\ \forall(\ell,\theta)$.

Proof: Because all agents have the same income, there is a single tax, $t_k(\ell) \equiv t_k$. Suppose, by way of contradiction, that $t_k = t'_k$ is set such that $v_k(\ell,\theta) > 0$ for some (ℓ,θ). The level of public good provision in this case is $g'_k = [n_k(\ell,\overline{\theta})v_k(\ell,\overline{\theta}) + n_k(\ell,\underline{\theta})v_k(\ell,\underline{\theta}) + n_k t'_k - F/h$. Now suppose that the type forming the government is $(\ell,\overline{\theta})$. ¿From (3)-(6), this type could achieve the same level of public good provision with a tax $t_k = \theta_k$ defined by $g'_k = (n_k \theta_k - F)/h$. Since the willingness-to-pay for g is increasing in θ, $v_k(\ell,\overline{\theta}) > v_k(\ell,\underline{\theta})$, implying that $\theta_k < t'_k + v_k(\ell,\overline{\theta})$. Thus, the type $(\ell,\overline{\theta})$ can achieve the same level of public good provision but a higher level of private consumption with θ_k than with t'_k. As a result, this type will always choose θ_k over t'_k. 2

Lemma 5 Consider a jurisdiction $J_k \in J$, J an equilibrium, composed solely of agents of types $(\underline{\ell},\theta)$ and $(\overline{\ell},\theta)$, for $\theta = \underline{\theta},\overline{\theta}$. Then, $v_k(\ell,\theta) = 0, \forall(\ell,\theta)$.

Proof: Suppose, first, that the type $(\overline{\ell}, \theta)$ forms the government. Then, from Lemma 2, $t_k(\overline{\ell}) = t_k(\underline{\ell}) = t_k$, while, from Lemma 3, $v_k(\overline{\ell}, \theta) \geq v_k(\underline{\ell}, \theta)$ with strict inequality if $v_k(\overline{\ell}, \theta) > 0$. Thus, the same argument as in the proof of Lemma 4 applies and t_k must be such that $v_k(\overline{\ell}, \theta) = 0$. If the type $(\underline{\ell}, \theta)$ forms the government, then from Lemma 3, with $t_k(\overline{\ell}) = t_k(\underline{\ell}) = t_k$ we have $v_k(\overline{\ell}, \theta) = v_k(\underline{\ell}, \theta)$. This implies, however, that a t_k such that $v_k(\overline{\ell}, \theta) = v_k(\underline{\ell}, \theta) = 0$ is weakly preferred to one for which $v_k(\overline{\ell}, \theta) = v_k(\underline{\ell}, \theta) > 0$. 2

Proof of Proposition 1: Follows from Lemmas 1 - 5. 2

Before proving the results on equilibrium jurisdiction configurations, we must first define the notions of location strategies and voluntary provision strategies for agents and a location-contribution game. To proceed, let $\mathcal{J} = \{J_1, J_2, ...J_K\}, K \geq N$ define the set of potential jurisdictions. A location strategy for agent i of type (ℓ, θ), $\lambda_i(\ell, \theta)$, is a selection from $\mathcal{J}$ with $\lambda_i(k; \ell, \theta)$ denoting the probability that agent i of type (ℓ, θ) locates in jurisdiction J_k. A voluntary provision strategy for agent i of type (ℓ, θ) residing in jurisdiction J_k is a function $\nu_i(\vec{n}_k; \ell, \theta) \in [0, \ell - t_k(\ell)]$ giving the level of voluntary contribution of agent i of type (ℓ, θ) in any jurisdiction k with type distribution $\vec{n}_k = [n_k(\underline{\ell}, \underline{\theta}), n_k(\underline{\ell}, \overline{\theta}), n_k(\overline{\ell}, \underline{\theta}), n_k(\overline{\ell}, \overline{\theta})]$ and political outcome $\mathcal{T}_k(\vec{n}_k)$ (a vector of taxes in J_k).

The location-contribution game involves the N agents simultaneously choosing location strategies λ_i and voluntary contribution strategies ν_i. A strategy $2N$-tuple $(\lambda^*, \nu^*) = ((\lambda_1^*, \nu_1^*), (\lambda_2^*, \nu_2^*), \ldots (\lambda_N^*, \nu_N^*))$ satisfies Condition 2 for an equilibrium configuration if it is a subgame perfect Nash equilibrium strategy $2N$-tuple for the location-contribution game and is such that $\nu_i(\vec{n}_k; \ell, \theta) = \nu_j(\vec{n}_k; \ell', \theta')$, $j \neq i$, $\forall k$, $\ell = \ell'$, $\theta = \theta'$. The $2N$-tuple (λ^*, ν^*) satisfies condition 1 if it generates positive (expected) utility for each agent.

With this game in place, we can proceed to a proof of Proposition 2. As with Proposition 1, the proof of Proposition 2 proceeds via a sequence of lemmas that, together, prove the proposition. The first two lemmas (Lemma 6 and Lemma 7) provide results for cases in which the decision on which type forms the government is non-stochastic. In both of these lemmas, we consider situations in which the political outcome in every jurisdiction produces a non-zero tax on low-income individuals. (The reason for this assumption will become apparent shortly.) The first lemma shows that, in such situations, there can be no equilibrium configuration in which agents of the same type (i) are the governing type in jurisdiction $J_{k'}$ and (ii) reside in jurisdiction $J_{k''}$.

Lemma 6 Consider a jurisdiction configuration J with elements $J_{k'}, J_{k''}$. Suppose that, with probability one, types (ℓ, θ) and (ℓ', θ') form the governments in $J_{k'}$ and $J_{k''}$, respectively, and that taxes on all agents are strictly positive in both jurisdictions. Then, $\beta_{k'}(\ell', \theta') = \beta_{k''}(\ell, \theta) = 0$ if J is an equilibrium configuration.

Proof: Suppose, by way of contradiction, that $\beta_{k'}(\ell', \theta') > 0$. Then, since a type (ℓ', θ') in $J_{k'}$ could move to $J_{k''}$ and be the type that forms the government in $J_{k''}$ with probability 1 (from Property 5), it must be that, in the candidate equilibrium configuration, $U_{k'}(\ell', \theta'; J) > U_{k''}(\ell', \theta'; J)$. This inequality follows from that fact that the movement of (ℓ', θ') from $J_{k'}$

to $J_{k^{00}}$ increases $g_{k^{00}}$, tax levels constant, and so must increase the utility of a (ℓ', θ') type in $J_{k^{00}}$. Now, consider a move by a type (ℓ', θ') from $J_{k^{00}}$ to J_{k^0}. If the move causes the (ℓ', θ') type to form the government, then, by the same argument as above and given that $U_{k^0}(\ell', \theta'; J) > U_{k^{00}}(\ell', \theta'; J)$ under the initial configuration, it must be that the move increases the utility of the (ℓ', θ') mover. Suppose, instead, that type (ℓ, θ) continues to form the government in J_{k^0} after the move. Then, Assumption 2 implies that the tax level $t^*_{k^0}(\ell)$ decreases and $g^*_{k^0}$ rises. From Lemmas 1 and 2, $t_{k^0}(\ell')$ also decreases. If either $v_{k^0}(\ell', \theta') = 0$ both prior to and after the move or $v_{k^0}(\ell', \theta') > 0$ after the move then the move must increase the utility of any (ℓ', θ') type in k'. In the former case, $c_{k^0}(\ell', \theta')$ increases as does $g_{k^0}(\ell', \theta')$ (Assumption 2). In the latter case, both $c_{k^0}(\ell', \theta')$ and $g_{k^0}(\ell', \theta')$ are also strictly increasing. This follows from equations (3)-(6)) and the fact that all individuals' willingness-to-pay for g is increasing in c and decreasing in g (the normal goods assumption). Given that $U_{k^0}(\ell', \theta'; J) > U_{k^{00}}(\ell', \theta'; J)$ initially, we have that the move from $J_{k^{00}}$ to J_{k^0} generates higher utility for a (ℓ', θ') type initially in $J_{k^{00}}$ if either it forms the government or (ℓ, θ) forms the government. If any other type forms the government, then, from Property 5, utility must be at least as large as if (ℓ, θ) forms the government. Thus, the move always pays and so there can be no equilibrium configuration in which $\beta_j(\ell', \theta') > 0$. 2

The next lemma shows that, even if agents of a given type are the governing type in no jurisdiction, those agents must still all reside in the same jurisdiction in equilibrium (with non-stochastic election outcomes).

Lemma 7 Suppose that the configuration J is an equilibrium and that, in each jurisdiction: (i) some agent type forms the government with probability one and (ii) taxes on all agents are strictly positive. Suppose, also, that type (ℓ', θ') forms the government in no jurisdiction. Then $\beta_k(\ell', \theta') = \pi(\ell', \theta')$, for some k.

Proof: Suppose not and that $\beta_j(\ell', \theta'), \beta_k(\ell', \theta') > 0$. Then, the same argument as in the proof of Lemma 6 implies that a move by (ℓ', θ') from J_j to J_j must increase the utility of the (ℓ', θ') types in J_k. Therefore, for this configuration to be an equilibrium, it must be that $U_j(\ell', \theta'; J) > U_k(\ell', \theta'; J)$. Similarly a movement of (ℓ', θ') from J_k to J_j must increase the utility of these types in J_j, implying that $U_k(\ell', \theta'; J) > U_j(\ell', \theta'; J)$. Both inequalities cannot hold simultaneously, implying that one of $\beta_j(\ell', \theta')$, $\beta_k(\ell', \theta')$ must be zero. 2

The next lemma extends the results of the previous two lemmas to the case in which the electoral outcome is possibly stochastic. The extension exploits Property 5 of the political system.

Lemma 8 In any equilibrium configuration in which taxes on all agents are strictly positive, $\beta_k(\ell, \theta) > 0$ if and only if $\beta_j(\ell, \theta) = 0,\ j \neq k.\ \forall(\ell, \theta)$.

Proof: Lemmas 6 and 7 prove the result for cases in which some type forms the government with probability one. For the other cases, Lemmas 6 and 7 also apply since these lemmas

show that, if $\beta_j(\ell,\theta), \beta_k(\ell,\theta) > 0$, then a movement by (ℓ,θ) from J_j to J_k increases utility for this type whether or not it forms the government. Condition 5 then guarantees that the probability weights attached to more favorable governments increase, thereby implying that expected utility increases. 2

Together with Assumption 1, Lemmas 6-8 imply that any equilibrium configuration having taxes on all agents strictly positive must also have either (i) all agents residing in a single jurisdiction or (ii) two jurisdictions with all of the agents of two different types residing in each. Since $t_k(\overline{\ell}) \geq t_k(\underline{\ell})$, the restriction to strictly positive taxes is a requirement that $t_k(\underline{\ell}) > 0$. The reader can check that the results above continue to hold as long as the tax on low income agents is not zero in two or more jurisdictions.

If the tax on low-income agents is zero in at least two jurisdictions, then the above results need not hold. In such a situation, it is possible for a low-income agent to move from one jurisdiction in which the tax on the agent is exactly zero to another jurisdiction with the same property. As long as this move does not change the governing type, the move has no allocational consequences. Thus, for instance, in Lemma 6 it is possible that a low-income type in jurisdiction $J_{k^{00}}$ who is not the governing type (but has zero taxes) may achieve exactly the same utility as would be achieved by a move to J_{k^0} where that type would be the governing type (and also have zero taxes). In this case, the agent has no incentive to move and so it is possible that agents of the same type reside in two different jurisdictions. Such an outcome is very much a knife-edge case, however, since it can only occur if taxes in both jurisdiction are exactly zero. With any positive tax, however small, the above results show that all agents of the same type must reside in the same jurisdiction.

To rule out these knife-edge cases, we require that any equilibrium configuration with zero taxes must be the limit of a sequence of equilibrium configurations in which the tax on low-income agents is constrained to be positive. To state this condition formally, we require the notion of a constrained equilibrium configuration. A configuration $J^*(\epsilon)$ is a constrained equilibrium configuration if it is a subgame perfect Nash equilibrium of the location/contribution game when the political outcome is constrained to have $t_k^*(\underline{\ell}) \geq \epsilon,\ \epsilon > 0$. The condition then is

Condition 4 Robustness. A jurisdiction configuration J^* is an equilibrium configuration if it is the limit as ϵ goes to zero of a sequence of constrained equilibrium configurations, $J^*(\epsilon)$.

In conjunction with Lemmas 6-8, Condition 4 implies that, regardless of tax levels, only the single jurisdiction and two jurisdiction configurations can be possible equilibrium configurations. The next lemma narrows the set further.

Lemma 9 The jurisdiction configurations $J_1 = \overset{D}{(\overline{\ell},\overline{\theta})}, \overset{E}{(\underline{\ell},\underline{\theta})}, J_2 = \overset{D}{(\overline{\ell},\underline{\theta})}, \overset{E}{(\underline{\ell},\overline{\theta})}$ is not an equilibrium configuration.

Proof: Suppose to the contrary that the configuration $J_1 = \overset{D}{(\overline{\ell},\overline{\theta})}, \overset{E}{(\underline{\ell},\underline{\theta})}, J_2 = \overset{D}{(\overline{\ell},\underline{\theta})}, \overset{E}{(\underline{\ell},\overline{\theta})}$ is an equilibrium. By definition of an equilibrium, it must be that $U_1(\underline{\ell},\underline{\theta};J) > U_2(\underline{\ell},\underline{\theta};J)$

and that $U_2(\overline{\ell},\underline{\theta};J) > U_1(\overline{\ell},\underline{\theta};J)$. Now suppose that type $(\underline{\ell},\overline{\theta})$ forms the government in jurisdiction 2. Then, from Lemma 1, $U_2(\overline{\ell},\underline{\theta};J) = U_2(\underline{\ell},\underline{\theta};J) < U_1(\underline{\ell},\underline{\theta};J) \leq U_1(\overline{\ell},\underline{\theta};J)$, contradicting the fact that the configuration is an equilibrium. The same argument applies to the case in which type $(\underline{\ell},\underline{\theta})$ forms the government in jurisdiction 1. Therefore, there can be no such equilibrium with a low-income type forming the government. Suppose next that the high-income type forms the government in both. For this to be an equilibrium, it must be that $U_1(\underline{\ell},\underline{\theta};J) > U_2(\underline{\ell},\underline{\theta};J)$, $U_1(\overline{\ell},\overline{\theta};J) > U_2(\overline{\ell},\overline{\theta};J)$ and $U_2(\underline{\ell},\overline{\theta};J) > U_1(\underline{\ell},\overline{\theta};J)$. These three inequalities cannot be satisfied simultaneously given the assumption that willingness to pay for the public good is increasing in ℓ and θ. 2

Proof of Proposition 2: This follows directly from Lemmas 6-9. 2

Proof of Proposition 3: Consider an increase in $\overline{\ell}$ and a decrease in $\underline{\ell}$ such that mean income is unchanged. If the increase in $\overline{\ell}$ is Δ, then the decrease in $\underline{\ell}$ must equal $\pi(\overline{\ell})\Delta/\pi(\underline{\ell})$, where $\pi(\overline{\ell})$ gives the fraction of the population having income $\overline{\ell}$ and $\pi(\underline{\ell})$ the fraction having income $\underline{\ell}$. If the governing type switches to $(\underline{\ell},\overline{\theta})$ after the income change, then Proposition 1 implies that private provision is zero and so the result follows immediately. Suppose, instead, that the change in income leaves the governing type unchanged (it remains the $(\underline{\ell},\underline{\theta})$ type). Then, there are essentially two cases: Case 1, in which the initial tax level, $t(\underline{\ell})$, is at least $\pi(\overline{\ell})\Delta/\pi(\underline{\ell})$ and Case 2 in which having $t(\underline{\ell}) < \pi(\overline{\ell})\Delta/\pi(\underline{\ell})$.

Case 1: Consider the following tax change by the governing type: decrease $t(\underline{\ell})$ by the amount $\pi(\overline{\ell})\Delta/\pi(\underline{\ell})$ and increase $t(\overline{\ell})$ by Δ. This tax change gives each low-income type after-tax income of $\underline{\ell} - \pi(\overline{\ell})\Delta/\pi(\underline{\ell}) - t(\underline{\ell}) + \pi(\overline{\ell})\Delta/\pi(\underline{\ell}) = \underline{\ell} - t(\underline{\ell})$, the same as in the initial income state. Likewise, each high income type's after-tax income is $\overline{\ell}+\Delta-t(\overline{\ell})-\Delta = \overline{\ell}-t(\overline{\ell})$, the same as in the initial state. Since the initial tax structure satisfied the Poperty 3, the proposed tax scheme does also. As a result, the proposed tax scheme is a feasible scheme. The level of tax revenue, on a per-capita basis, that this scheme generates is $\pi(\overline{\ell})(t(\overline{\ell}) + \Delta) + \pi(\underline{\ell})(t(\underline{\ell}) - \pi(\overline{\ell})\Delta/\pi(\underline{\ell}) = \pi(\overline{\ell})t(\overline{\ell}) + \pi(\underline{\ell})t(\underline{\ell})$, the same as under the initial income state. Given the same level of public provision and the same disposable income for all agents, private provision is also the same. As a result, this point is feasible and generates the same utility for the governing type as the pre-income change outcome. Since the set of feasible tax levels from which the low-income type can choose is smaller after the change in income levels (the largest tax level is $\underline{\ell} - \pi(\overline{\ell})\Delta/\pi(\underline{\ell})$), the maximum utility level that this type can achieve is no larger than initially. Therefore, the proposed scheme is the preferred one and so both the levels and the relative amounts of public and private provision are unchanged.

Case 2: Consider the following change by the governing type: set $t(\underline{\ell}) = 0$ and $t(\overline{\ell}) = \overline{\ell}+\Delta-\underline{\ell}+\pi(\overline{\ell})\Delta/\pi(\underline{\ell})$. If $t(\underline{\ell}) < \pi(\overline{\ell})\Delta/\pi(\underline{\ell})$, each low-income type has lower after-tax income relative to the initial state as does each high-income type. Per-capita tax revenue is $\pi(\overline{\ell})(\overline{\ell} + \Delta - \underline{\ell} + \pi(\overline{\ell})\Delta/\pi(\underline{\ell})) > \pi(\overline{\ell})t(\overline{\ell}) + \pi(\underline{\ell})t(\underline{\ell})$ given $t(\underline{\ell}) < \pi(\overline{\ell})\Delta/\pi(\underline{\ell})$. Given public provision is increased under this tax scheme and disposable income decreased, private provision falls (the normal good assumption) and so does relative private to public provision. As long as the governing agent has a unique uitility maximizing tax level, then the above argument implies that this scheme yields the constrained optimum. 2

To prove Proposition 4, it is necessary first to prove a result on the behavior of total private contributions as tax levels change. The result in the following lemma shows that, if the governing type is $(\underline{\ell},\underline{\theta})$ and preferences of all agents are homothetic, then total private contributions are linear in the tax level $t(\underline{\ell})$. This fact means that the governing type's effective budget constraint (used to determine the utility maximizing levels of c and g) is piecewise linear. With homothetic preferences, linearity of the budget constraint implies that the governing type's utility maximizing tax choice results in that type having a constant ratio of c/g as income varies.

Lemma 10 Suppose that the governing type is $(\underline{\ell},\underline{\theta})$ and that preferences of all agents are homothetic. Then, for any tax level $t(\underline{\ell}) > 0$ such that $v^*(\underline{\ell},\overline{\theta}) = v^*(\overline{\ell},\overline{\theta}) = v^*(t(\underline{\ell})) > 0$, $dv^*(t(\underline{\ell}))/dt(\underline{\ell})$ is independent $t(\underline{\ell})$.

Proof: Consider the private provision decision of an agent of type $(\underline{\ell},\overline{\theta})$. If this agent's utility function is homothetic, then the private provision decison in (3) can be written as $\psi[c(\underline{\ell},\overline{\theta})/g] = h$, implying that $c(\underline{\ell},\overline{\theta})/g = \psi^{-1}(h)$, a constant. This fact means that, for all $t(\underline{\ell}) > 0$ such that $v^*(\underline{\ell},\overline{\theta}) = v^*(t(\underline{\ell})) > 0$, $v^*(t(\underline{\ell}))$ must vary with $t(\underline{\ell})$ in such a way that the derivative of $c(\underline{\ell},\overline{\theta})/g$ is zero. Given $c(\underline{\ell},\overline{\theta}) = \underline{\ell} - t(\underline{\ell}) - v^*(t(\underline{\ell}$ and $g = [N(t(\underline{\ell}) + \pi(\overline{\ell})(\overline{\ell} - \underline{\ell}) + \pi(\overline{\theta})v^*(t(\underline{\ell}))) - F]/h$, where $\pi(\overline{\theta})$ is the fraction of the population with preference parameter $\overline{\theta}$, we have that $dv^*(t(\underline{\ell}))/dt(\underline{\ell}) = -(h + N\psi^{-1}(h))/(h + N\psi^{-1}(h)\pi(\overline{\theta}))$, which is independent of $t(\underline{\ell})$. 2

Proof of Proposition 4: If the change in income inequality results in a $\overline{\theta}$ governing type, then, by Proposition 1, private provision is zero and so the result hold. So suppose that the governing type remains a $(\underline{\ell},\underline{\theta})$ type. Given homothetic preferences and $t^*(\underline{\ell}) > 0$, this types tax choice, as defined by (9)-(10) can be written as $\phi[c(\underline{\ell},\underline{\theta})/g] = h/N[1 - \pi(\overline{\theta})(h + N\psi^{-1}(h))/(h + N\psi^{-1}(h)\pi(\overline{\theta}))]$. From Lemma 10, the denominator of the RHS is a constant for all $t(\underline{\ell})$ and so $c(\underline{\ell},\underline{\theta})/g$ is a constant given by $\phi^{-1}[h/N[1 - \pi(\overline{\theta})(h + N\psi^{-1}(h))/(h + N\psi^{-1}(h)\pi(\overline{\theta}))]]$. Since $c(\underline{\ell},\underline{\theta}) = c(\overline{\ell},\underline{\theta}) = g\phi^{-1}$ and $c(\underline{\ell},\overline{\theta}) = c(\overline{\ell},\overline{\theta}) = g\psi^{-1}$and the difference in consumption between a $\overline{\theta}$ type and a $\underline{\theta}$ type is v^*, private provision occurs if $g(\phi^{-1} - \psi^{-1}) > 0$. Relative to g, the amount of total private provision is $N\pi(\overline{\theta})(\phi^{-1} - \psi^{-1})$. Since the difference $\phi^{-1} - \psi^{-1}$is independent of income levels, relative provision is independent of income levels as long as $t^*(\underline{\ell}) > 0$.

If some change in income levels results in $t^*(\underline{\ell}) = 0$, then relative private provision declines. To see this, consider a change in $\overline{\ell}$ to $\overline{\ell}'$ and a change in $\underline{\ell}$ to $\underline{\ell}'$ such that $t^*(\underline{\ell}) > 0$ while $t^*(\underline{\ell}') = 0$. Note that if $\overline{\ell}' = \underline{\ell}'$, then $t^*(\underline{\ell}) > 0$. Let $\overline{\ell}''$ be the smallest value of $\overline{\ell}$ such that $t^*(\underline{\ell}') = 0$. Then, from above, a change in income from $(\underline{\ell},\overline{\ell})$ to $(\underline{\ell}',\overline{\ell}'')$ has no effect on relative private provision. Consider, then, change from $(\underline{\ell}',\overline{\ell}'')$ to $(\underline{\ell}',\overline{\ell}')$. Since the tax on the low income type is already zero, the only impact of this change is that $t^*(\overline{\ell})$ increases by the amount $\overline{\ell}' - \overline{\ell}''$. From (3), this tax increase results in a reduction in private provision and an increase in g. As a result, relative private provision falls. 2

Before proceeding to a proof of Proposition 5, we prove a lemma that shows that the

consumption cost of the public good is always higher in the case of income segregated jurisdictions than it is for the single jurisdiction case.

Lemma 11 Suppose that i) a $\underline{\theta}$ type agent is the governing type in the single jurisdiction configuration and in both income segregated jurisdictions; ii) private provsision occurs in all jurisdictions. Then, the consumption cost of the public good for the governing type is higher in at least one of the income segregated jurisdictions than in the single jurisdiction.

Proof: Consider a comparison of the consumption cost of g in the single jurisdiction relative to the high income juirsdiction in the IS case. For the single jurisdiction, the consumption cost is given by the expression $h/N[1-\pi(\overline{\theta})(h+N\psi^{-1}(h))/(h+N\psi^{-1}(h)\pi(\overline{\theta}))]$ while in the high income jurisdiction this cost is $h/N[\pi(\overline{\ell})-\pi(\overline{\ell},\overline{\theta})(h+N\pi(\overline{\ell})\psi^{-1}(h))/(h+N\psi^{-1}(h)\pi(\overline{\ell},\overline{\theta}))]$. The former is smaller than the latter if $\pi(\overline{\ell})[1-(h\pi(\overline{\ell},\overline{\theta})/\pi(\overline{\ell})+\pi(\overline{\ell},\overline{\theta})N\psi^{-1}(h))/(h+N\psi^{-1}(h)\pi(\overline{\ell},\overline{\theta}))<1-(h\pi(\overline{\theta})+\pi(\overline{\theta})N\psi^{-1}(h))/(h+N\psi^{-1}(h)\pi(\overline{\theta}))$. This inequality is satisfied if $\pi(\overline{\ell},\underline{\theta})/(1+N\psi^{-1}(h)\pi(\overline{\ell},\overline{\theta}))<\pi(\underline{\theta})/(1+N\psi^{-1}(h)\pi(\overline{\theta}))$; or if $0<\pi(\overline{\ell},\underline{\theta})+N\psi^{-1}(h)[\pi(\underline{\theta})\pi(\overline{\ell},\overline{\theta})-\pi(\overline{\theta})\pi(\overline{\ell},\underline{\theta})]$. A similar calculation for the low-income jurisdiction shows that the consumption cost is higher in the low-income juirsdiction if $0<\pi(\underline{\ell},\underline{\theta})+N\psi^{-1}(h)[\pi(\underline{\theta})\pi(\underline{\ell},\overline{\theta})-\pi(\overline{\theta})\pi(\underline{\ell},\underline{\theta})]$.

For any values of $\pi(\underline{\theta})$, $\pi(\overline{\theta})$, $\pi(\overline{\ell})$ and $\pi(\underline{\ell})$, both of the above conditions are satisfied is that the distribution of θ types among income classes is such that $\pi(\underline{\ell},\underline{\theta})/\pi(\underline{\ell},\overline{\theta})=\pi(\overline{\ell},\underline{\theta})/\pi(\overline{\ell},\overline{\theta})$; that is, that the relative proportions of high and low θ types in each income class is the same as in the population. Relative to this point, the actual distribution of θ types can be created by shifting mass from say $\pi(\underline{\ell},\overline{\theta})$ to $\pi(\underline{\ell},\underline{\theta})$ in the low income jurisdiction and from $\pi(\overline{\ell},\underline{\theta})$ to $\pi(\overline{\ell},\overline{\theta})$ in the high income jurisdiction. (Note that, to maintain population fractions, a shift from $\overline{\theta}$ to $\underline{\theta}$ in one jurisdiction must be combined with a shift from $\underline{\theta}$ to $\overline{\theta}$ in the other jurisdiction.). Such a shift always increases the RHS of one of the above two inequalities. Since both are satisfied at the point $\pi(\underline{\ell},\underline{\theta})/\pi(\underline{\ell},\overline{\theta})=\pi(\overline{\ell},\underline{\theta})/\pi(\overline{\ell},\overline{\theta})$, at least one must be satisfied for all distributions of types. 2

Proof of Proposition 5: i): If private provision doesn't occur in the single jurisdiction outcome, then it is trivially the case that private provision is weakly larger in the income segregated case. More importantly, in this case the consumption cost of g for the governing type is strictly higher in both income segregated jurisdictions than in the single jurisdiction. As a result private provision may be positive in the segregated case.

Suppose next that private provision is positive in both the single juirsdiction outcome and in both jurisdictions in the income segregated outcome. Given homothetic preferences, the tax choice for the $(\overline{\ell},\underline{\theta})$ governing type in the high income jurisdiction, as defined by (9)-(10), can be written as $\phi[c(\overline{\ell},\underline{\theta})/g]=h/N[\pi(\overline{\ell})-\pi(\overline{\ell},\overline{\theta})(h+N\pi(\overline{\ell})\psi^{-1}(h))/(h+N\psi^{-1}(h)\pi(\overline{\ell},\overline{\theta}))]$; similarly the choice for the $(\underline{\ell},\underline{\theta})$ governing type in the low income jurisdiction is $\phi[c(\underline{\ell},\underline{\theta})/g]=h/N[\pi(\underline{\ell})-\pi(\underline{\ell},\overline{\theta})(h+N\pi(\underline{\ell})\psi^{-1}(h))/(h+N\psi^{-1}(h)\pi(\underline{\ell},\overline{\theta}))]$. As before, the level of private provision for an individual $\overline{\theta}$ type relative to g in the high and low income jurisdictions is given by $\phi_{\overline{\ell}}^{-1}-\psi^{-1}$ and $\phi_{\underline{\ell}}^{-1}-\psi^{-1}$ respectively. From Lemma 11, at least one of $\phi_{\overline{\ell}}^{-1},\phi_{\underline{\ell}}^{-1}$ is greater than ϕ^{-1}. Aas a result, if private provision occurs in the single jurisdiction, it

must both a occur in at least one of the income segregated juirsdivctions and be such that individual private provision relative to g is higher in that jurisdiction.

Finally, total private provision relative to g is given by $(\phi_{\overline{\ell}}^{-1} - \psi^{-1})N\pi(\overline{\ell}, \overline{\theta})$ for the high income jurisdiction and $(\phi_{\underline{\ell}}^{-1} - \psi^{-1})N\pi(\underline{\ell}, \overline{\theta})$ for the low income juirsdiction. For the single jurisdiction, total private provision relative to g is $N\pi(\overline{\theta})(\phi^{-1} - \psi^{-1})$. Depending on the distribution of $\overline{\theta}$ across income types, the former values may be higher or low than the latter one. For instance, if $\pi(\overline{\ell}, \overline{\theta}) = .\pi(\overline{\theta})$, then, from above, $\phi_{\overline{\ell}}^{-1} > \phi^{-1}$ and so the high income jurisdiction has larger relative reliance on private provision while the low income juirsdiction has smaller reliance than the single juirsdiction.

ii: Suppose that $\pi(\underline{\ell}, \underline{\theta})/\pi(\underline{\ell}, \overline{\theta}) = \pi(\overline{\ell}, \underline{\theta})/\pi(\overline{\ell}, \overline{\theta})$. The, from Lemma 11, $\phi_{\overline{\ell}}^{-1}, \phi_{\underline{\ell}}^{-1} > \phi^{-1}$ and, if private provision ocurs in the single jurisdiction, it occurs in both juirsdictions in the income segregated case. For the single jurisdiction, total private provision relative to g is $N\pi(\overline{\theta})(\phi^{-1} - \psi^{-1})$. For the high income jurisdictions, total provision relative to g in that jurisdiction is $(\phi_{\overline{\ell}}^{-1} - \psi^{-1})N\pi(\overline{\ell}, \overline{\theta})$; for the low income jurisdiction, total private provision relative to g in the low income juirsdiction is $(\phi_{\underline{\ell}}^{-1} - \psi^{-1})N\pi(\underline{\ell}, \overline{\theta})$. Total private provision for the entire population relative to the average level of the public good across the two jurisdictions in the income segregated case is $[(\phi_{\overline{\ell}}^{-1} - \psi^{-1})N\pi(\overline{\ell}, \overline{\theta})g_{\overline{\ell}} + (\phi_{\underline{\ell}}^{-1} - \psi^{-1})N\pi(\underline{\ell}, \overline{\theta})g_{\underline{\ell}}]/[\pi(\overline{\ell}, \overline{\theta})g_{\overline{\ell}}/\pi(\overline{\theta}) + \pi(\underline{\ell}, \overline{\theta})g_{\underline{\ell}}/\pi(\overline{\theta})]$. This value is greater than total private provision relative to g in the single jurisdiction if $(\phi_{\overline{\ell}}^{-1} - \psi^{-1})\pi(\overline{\ell}, \overline{\theta})g_{\overline{\ell}}/[\pi(\overline{\ell}, \overline{\theta})g_{\overline{\ell}} + \pi(\underline{\ell}, \overline{\theta})g_{\underline{\ell}}] + (\phi_{\underline{\ell}}^{-1} - \psi^{-1})\pi(\underline{\ell}, \overline{\theta})g_{\underline{\ell}}/[\pi(\overline{\ell}, \overline{\theta})g_{\overline{\ell}} + \pi(\underline{\ell}, \overline{\theta})g_{\underline{\ell}}] > (\phi^{-1} - \psi^{-1})$. This inequality is satisfied given $\phi_{\overline{\ell}}^{-1}, \phi_{\underline{\ell}}^{-1} > \phi^{-1}$. The rest follows by continuity. 2

Proof of Proposition 6: Since $u(c, g; \theta) \geq 0, \ \forall g > 0$ the utility for an individual under S is non-negative. Given $F > \overline{\ell}$, a deviating individual obtains utility of $u(c, 0; \theta) = 0$. As a result, no individual can be better off by deviating from S. Finally, the policymaker's utility is increasing in the number of individuals in the jurisdiction. Since S maximizes the number of individuals in the jurisdiction, the policymaker's utility under S is larger than under any other Nash equilibrium configuration. If the policymaker is chosen in a non-stochastic fashion, then any other configuration must yield less utility for the policymaker than does S. As a result, S is undominated and so stable. 2

Proof of Proposition 7: Suppose that $\underline{\ell} = \overline{\ell}$. In this case, there are only two types of individuals. By arguments analogous to those used previously, the only configurations that can be Nash are those that have all individuals of the same type living in the same jurisdiction. As a result, if individuals of some type θ' live in both jurisdictions 1 and 2, it must be that either the condition $\hat{U}_1(\vec{n}_1; \ell, \theta') - \hat{U}_2(\vec{n}_2^i; \ell, \theta') > 0$ or $\hat{U}_2(\vec{n}_2; \ell, \theta') - \hat{U}_1(\vec{n}_1^i; \ell, \theta') > 0$ for a Nash equilibrium is violated. Without loss of generality, assume that $\hat{U}_1(\vec{n}_1; \ell, \theta') - \hat{U}_2(\vec{n}_2^i; \ell, \theta') < 0$. Finally, consider increasing income for the θ' type in jurisdiction 1 to $\ell' > \ell$. Since utilities are continuous functions of ℓ and $\hat{U}_1(\vec{n}_1; \ell, \theta') - \hat{U}_2(\vec{n}_2^i; \ell, \theta') < 0$ it must be that $\hat{U}_1(\vec{n}_1; \ell', \theta') - \hat{U}_2(\vec{n}_2^i; \ell', \theta') < 0$ for ℓ' sufficiently close to ℓ. This fact means that, for $0 < \ell' - \ell < \varepsilon$, for some ε, the conditions for S to be a Nash equilibrium are violated. 2

Proof of Proposition 8: Thge proof here is identical to that for Proposition 4 2