Competition among Fallible Governments

by

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ABSTRACT

Should government policies be harmonized or permitted to vary among competing jurisdictions? This paper considers the welfare effect of mobility induced by competition. Jurisdictions adopting better policies experience population inflows. If congestion costs are small, then competition, in affording greater choice, promotes higher welfare levels. With significant convex congestion costs, however, this welfare ordering is reversed: competition induces so great a concentration of population in jurisdictions adopting preferred policies that average consumer welfare is lower than with harmonization. Finally, if congestion costs are reflected in congestion-related taxes or rising land prices, competition among decentralized governments may again produce higher welfare than harmonization. Hence the welfare impact of policy harmonization depends critically on the extent to which mobility is associated with significant uncorrected congestion externalities.

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1. Introduction.

Under what circumstances does a federation benefit from limiting competition among its constituent jurisdictions? It is not difficult to identify cases in which competing jurisdictions have incentives to enact policies designed to advance their own interests at the expense of others. For example, a small town might adopt lax industrial air pollution regulations if much of the harm of local pollution largely accrues to residents of distant downwind towns, and there are no mechanisms in place that permit capturing the benefits of improving air quality elsewhere. In settings with significant externalities of this type, an optimizing centralized authority can improve on the decentralized outcome by setting policies that incorporate spillover effects.

Competition among decentralized governments offers other benefits, notably including the greater range of choice that competition typically affords individuals and firms selecting among locations. Competing jurisdictions have incentives to tailor their policies to local needs and the demands of the marketplace. In competing with each other governments become more accountable for their actions than they would be otherwise, thereby quite possibly stimulating the formation and adoption of better public policies than would be forthcoming from a centralized authority. With sufficient information, policy instruments, and presence of mind a centralized government authority could replicate the outcomes produced by competing jurisdictions, and conceivably improve upon them by incorporating the costs and benefits of spillovers between jurisdictions. In practice, however, policies chosen by central governments exhibit uniformity across locations that obscures the nuances of local needs and betrays the kind of diversity that might be expected to accompany local innovation. Hence the choice between local discretion and central government fiat typically entails a choice between policies that vary across locations and those that are effectively harmonized.

The purpose of this paper is to compare the welfare properties of policies chosen by competing governments with the properties of policies that are harmonized by central authorities. While there are many aspects of such a comparison, the analysis focuses on the impact of mobility, doing so because the responsiveness of consumers and producers to jurisdictional differences carries profound implications for government competition. Jurisdictions adopting tax, education, criminal justice, environmental, social welfare, and other policies that produce high satisfaction levels for their residents become attractive places, drawing population and mobile economic resources that might otherwise have located elsewhere. While it is customary to analyze the relative merits of competition and harmonization in settings in which governments respond shrewdly to the incentives created by their strategic situations, a focus on mobility makes it worthwhile to consider settings in which governments choose policies nonstrategically – indeed, randomly.

It is a commonplace observation that governments are imperfect. In a competitive setting with numerous jurisdictions, it can be expected that many governments will adopt inefficient policies, not because they want to do so, but because they are incapable of doing any better. Governments often lack the information necessary to enact efficient policies, and they frequently operate under severe financial and bureaucratic constraints. Furthermore, the political nature of government decisionmaking often impedes sound policy development and can prevent the adoption of efficiency-enhancing policy reforms.

The inability of governments to identify and enact policies that maximize the welfare of local residents carries important implications for evaluating the impact of intergovernmental competition. In a competitive setting, consumers may be able to avoid the consequences of undesired government policies by locating elsewhere, a possibility that prompts some observers to advocate greater competition among governments. Others urge that competition between jurisdictions be restricted in order to avoid outcomes that are associated with competition; but each alternative is fraught with its own perils.

If central governments are no better or worse than local governments in selecting desirable policies, and in the absence of spillovers, so that policies in a jurisdiction affect only its own residents, then the welfare comparison of competition and harmonization turns on the impact of the induced population distribution. The analysis of random policy choices implies that if crowding costs are unimportant, then competition supports higher welfare levels than does harmonization, since competition affords residents the opportunity to select jurisdictions adopting the best policies. As crowding costs become more pronounced, the desirability of harmonization increases; if crowding costs are sufficient to ensure that all jurisdictions are occupied, then policy harmonization produces greater average welfare than does competition. To the degree that crowding costs are captured in land prices, tax charges, or other charges that rise with congestion, the relative benefits of harmonization are mitigated, so with sufficient congestion-based pricing, competition again becomes the preferred alternative.

2. Fiscal federalism.

Federalist governmental structures, such as those in the United States, Canada, and Germany, institutionalize interjurisdictional competition, consciously limiting the harmonizing influence of the central government in an effort to promote local decisionmaking and diversity among subnational governments. The desirability of such competition has been debated for ages.[1] Competition provides the opportunity for jurisdictions to experiment with policies that are new and possibly superior to what a central authority might adopt; competition also affords citizens a greater range of choice than they would face under uniform policies prescribed centrally. Against this must be weighed the costs of any resource misallocation that accompanies the competitive process, including the costs of population reallocation and the costs of any substandard policies adopted by competing governments.

Tiebout's (1956) classic treatment of local public good provision with population mobility considers the welfare properties of competition to provide goods and services to consumers with heterogenous tastes. The Tiebout model is one in which consumer/voters express their preferences with exit rather than voice; a sizable modern literature considers the impact of voice that takes the form of voting. Governments are perfect optimizers in the Tiebout model. The setting evaluated in this paper is one of pure exit, but in the absence of heterogeneous tastes. Hence it considers the role of exit in mitigating the effect of poor public policy choices on consumer welfare.

3. Fallibility and exit.

This section considers the implications of fallibility in settings in which government behavior is disciplined by population mobility. Government policies can be summarized by a vector $\boldsymbol{\theta} \equiv (\theta_1,...,\theta_n)$, the elements of which consist of the complete set of policy parameters. Thus, θ_1 might correspond to the top personal marginal income tax rate, θ_2 to average per-pupil elementary school expenditures, θ_3 to the maximum permitted size of commercial office buildings, and so on. For most analytic purposes it is sufficient, as well as convenient, to treat

[1] Oates (1999) and Wellisch (2000) offer surveys of this literature.

the $\boldsymbol{\theta}$ vector as though it has a scalar-valued single element, denoted θ. The consequences of relaxing this assumption, and treating government expenditures instead as a vector, are considered in section 5.

In order to isolate the impact of government policies, jurisdictions are taken to be identical in all respects (as suburban towns so often are), except for their chosen policies; and individual consumers are likewise taken to be identical. Individual utility is a function of θ and the size of the local population, denoted *n*, and can therefore be represented by a utility function $u(\theta,n)$. In this formulation, policies do not have direct spillover effects: an individual's utility is a function of the policies adopted by the jurisdiction in which he resides, and not the values of θ adopted by other jurisdictions. The variable θ is defined so that higher values are always better: $u(\theta',n) > u(\theta'',n) \forall \theta' > \theta''$. The policies of other jurisdictions have at most an indirect effect on utility, by influencing the allocation of the population. Jurisdictions are subject to crowding, with associated average costs that rise in a convex fashion with each additional resident. Thus, $\frac{\partial u(\theta,n)}{\partial n} \leq 0$, and $\frac{\partial^2 u(\theta,n)}{\partial n^2} \leq 0$, for all values of θ and *n*. The national population fixed, but free population mobility within a country implies that crowding will be most severe in jurisdictions choosing highly desirable public policies.

3.1 An example: two jurisdictions, binary policy choices.

The implications of the model become apparent in a simple example with just two jurisdictions and an aggregate population of six individuals who can move freely between the two locations. Governments face simple a simple discrete choice between two alternatives corresponding to different values of θ (for example, whether or not to build an expensive new sports arena) with unknown payoffs. In the absence of coordination imposed by the central government, each jurisdiction chooses its own value of θ, and the population moves in response. If crowding costs are trivial (very close to zero) and policies differ, then the entire population chooses to locate in the jurisdiction selecting the more valuable policy option; whereas if the jurisdictions choose identical policies, then the population divides itself evenly between them. If, instead, the central government were to coordinate policies among jurisdictions, requiring that both select the same θ, then even very small crowding costs imply that the population will divide itself evenly between them.

What are the welfare implications of policy harmonization imposed by the central government? The answer turns on a comparison of the distribution of the central government's choice of θ and the distribution of choices made by the subnational governments. If both select from the same distribution, that is, if a subnational government is just as likely to select the more desirable policy option as is the central government, then it follows that the expected welfare of the citizenry is greater with uncoordinated policies. The reason is simply that uncoordinated policies offer more options, and in this case, greater range of choice improves the likelihood that the set of choices available to individuals includes the best possible public policy. If governments choose the superior policy half the time, and choices are independent, then under a harmonized system citizens will enjoy the superior policy half the time, whereas under independent decisionmaking by two subnational jurisdictions, citizens will enjoy the superior policy three-quarters of the time.

The greater expected welfare produced by decentralized decisionmaking follows from the assumption that crowding costs are tiny, and carries the counterfactual implication that small differences in the quality of public policies will produce enormous swings in the distribution of the population. This is just a formalization of the notion that federalist structures enjoy the benefits of experimentation by competing subnational governments. In this case, experimentation takes the form of repeated draws from a single distribution of potential policies.

In order to evaluate the impact of crowding costs, it is useful to consider the case in which utility is separable in the value of the public policy and the cost of population crowding, and is given by:

$$u(\theta, n) = v(\theta) - n^2 , \tag{1}$$

in which $v(\theta)$ is the value of the chosen θ. Suppose that governments half the time choose a value of θ for which $v = 40$, and half the time choose a value of θ for which $v = 16$. With full knowledge of the consequences of their actions, governments would prefer to maximize utility by selecting the value of θ for which $v = 40$, but they do not have either the information or the ability to make such a choice. Free mobility implies that population levels adjust endogenously to the choices of θ.

A central government can impose policy harmonization (i.e., identical choices of θ by both jurisdictions), in which case the total population population of six people divides itself evenly between the jurisdictions, with three residents in each location. Suppose that decisionmaking by the central government is similar to that in the two jurisdictions, half the time selecting the value of θ for which $v = 40$, and half the time selecting the value of θ for which $v = 16$. Consumer utility will therefore be 40 – 9 = 31 half of the time, and 16 – 9 = 7 the other half of the time, for an expected value of 19.

Free policy choice among governments is an alternative to the centralized, and therefore coordinated, outcome just described. With jurisdictions choosing their policies independently, they will choose identical policies half the time (one quarter of the time they both choose the value of θ for which $v = 40$, and one quarter of the time they both choose the value of θ for which $v = 16$), and choose different policies half the time. The expected value of consumer utility is again 19 for the half of the time that independent selection yields identical policy choices, so the interesting comparison lies in the cases in which policies differ.

When one jurisdiction chooses a value of θ for which $v = 40$, and the other chooses a value of θ for which $v = 16$, then the population will be drawn into the jurisdiction with the superior public policy, up to the point that greater crowding eliminates the welfare advantage of locating there. Hence five residents will occupy the jurisdiction with the superior public policy, and one resident will occupy the other jurisdiction, all citizens achieving utility levels of 15 (40 – 25 = 16 – 1 = 15). Since an average utility level of 19 is available with centralized policies, decentralization entails an expected reduction in welfare. Table 1 presents these calculations in a schematic fashion.

Why does decentralization reduce expected welfare? The answer is to be found in convex crowding costs, and the result is considerably more general than a simple case with two jurisdictions and a binary policy choice, as the analysis in the following section demonstrates. Decentralization produces an inefficient allocation of the population, with excessive crowding in the jurisdiction offering better policies. Population movement offers the potential benefit of allocating more of the population to places with better policies, but this benefit is more than erased by free mobility, which produces excessive crowding costs. The equilibrium condition for population mobility is that utility is the same in every occupied jurisdiction, so population movement may not actually expose citizens to better average policies, since, if every jurisdiction is occupied, then everyone’s utility level equals the utility of a resident of a jurisdiction with below-average policies.

It is noteworthy that neither centralization nor decentralization maximizes expected consumer welfare in this example. Consider, for example, a policy in which the jurisdiction adopting the public policy valued at 40 has four residents, and the jurisdiction adopting the policy worth 16 has two residents. Individuals in the jurisdiction with better policies and more crowded streets have utilities of 24, while those occupying the other jurisdiction have utilities of 12. Expected utility is therefore 20 *[(4/6)(24) + (2/6)(12) = 20]*, which exceeds average utility with centralization (19) and average utility with decentralization (15). Expected utility is maximized by policies that entail differences between the utilities of residents of the two locations whenever policies differ, a set of outcomes that is impossible to support with free population mobility.

Figure 1 depicts average utility as a function of *m*, the population of the jurisdiction with the superior public policy. Since the total population is 6, average utility (*E(u)*) is the sum of (*m/6*) times the utility enjoyed by residents of the jurisdiction with better public policy and *(6-m)/6* times the utility available in the other jurisdiction:

(2) $$E(u) = \frac{1}{6}\left[m\left(40 - m^2\right) + (6 - m)\left(16 - (6 - m)^2\right)\right] = -20 + 22m - 3m^2 .$$

Average utility as described in equation (2) is maximized by setting the derivative with respect to *m* equal to zero, a condition that is satisfied by $m = 3\tfrac{2}{3}$, at which point average utility equals $20\tfrac{1}{3}$. Average utility is represented by a symmetric parabola with a peak at $m = 3\tfrac{2}{3}$ – which is why *m = 3*, the harmonized outcome, yields higher utility than *m = 5*, the decentralized outcome, since *3* is closer to $3\tfrac{2}{3}$ than is *5*.

3.2. Continua of policies and jurisdictions.

It is instructive to generalize from the example of binary policy choices to one in which there is a continuum of jurisdictions and consumers. Assume that individual utility is separable in the value of the public good and the cost associated with crowding:

(3) $$u(\theta, n) = v(\theta) - c(n),$$

in which $c(n)$ is the crowding cost, with $c'(n) > 0$ and $c''(n) > 0$. With a continuum of identical jurisdictions the population indicator *n* can be thought of as the population per square mile of land. Since jurisdictions are identical, *n* is a function of θ, and without loss of (much) generality, it is possible to restrict attention to cases in which the function $n(\theta)$ is continuous, and continuously differentiable, in θ. Subnational jurisdictions draw the policy variable θ from a distribution with uniform density on the interval $[0,1]$. For ease of analysis it is convenient to assume that the distribution of choices made by local governments exactly mirrors the distribution from which they draw their θs. Hence one can take the θs chosen by local governments as being distribution from which the central government selects its θ.

The (fixed) total population of $\bar{n}$ is distributed among the jurisdictions that can be sorted according to their choices of θ, the only aspect in which they differ:

(4) $$\bar{n} = \int_0^1 n(\theta) d\theta .$$

Thus, the average population density must equal $\bar{n}$, since the total land area is normalized to equal one. The average value of the utility component corresponding to public policies is denoted $\bar{v}$, defined as:

(5) $$\bar{v} \equiv \int_0^1 v(\theta) d\theta$$

The central government has the ability to compel subnational jurisdictions to harmonize their policies on a value of θ that it chooses. Suppose that the central government draws a value of θ using a density function $g(\theta)$, mandating that all subnational jurisdictions adopt the same θ. Expected utility is then $\bar{v}_g - c(\bar{n})$, in which $\bar{v}_g$ is the expected value of public policies drawn using the central government's distribution:

$$\bar{v}_g \equiv \int_0^1 v(\theta)d\theta .$$

In the absence of significant crowding costs, and with identical choice functions used by the central government and local jurisdictions, decentralization produces a higher average utility level than does centralization. This follows directly from the simple observation that the maximum of a distribution exceeds its mean. Of course, it is not necessarily the case that choice functions are identical: the central government might do a better or worse job at selecting policies than do decentralized authorities. Consider, for example, the case in which the distribution of $v(\theta)$ is uniform for choices made by local governments and the central government, but that the upper support of the distribution for the central government has a smaller range: $v(\theta)$ might vary uniformly from 0 to *z* when θ is chosen by the central government, whereas $v(\theta)$ varies uniformly from 0 to *x* when θ is chosen by subnational governments. Then the expected value of $v(\theta)$ when chosen by the central government is *z/2*, whereas with a decentralized system the population will select the best available policy, enjoying a level of $v(\theta)$ equal to *x*. If *x* > *z/2*, then welfare is higher with decentralization.

The introduction of convex crowding costs again changes the outcome quite dramatically. Taking the distributions used by the central and local governments to be identical, it follows that expected welfare in a decentralized system (W_d) equals:

(6) $$W_d = \int_0^1 n(\theta)[v(\theta) - c(n)]d\theta \, ,$$

whereas expected welfare in a centralized and harmonized system (W_h) equals:

(7) $$W_h = \int_0^1 \bar{n}[v(\theta) - c(\bar{n})]d\theta \, .$$

The difference between equations (6) and (7) is that equation (6) is an integral that is evaluated across jurisdictions – which can be thought of as states, in the American context – whereas equation (7) is an integral that is evaluated across states of the world.

The comparison of W_d and W_h is greatly facilitated by noting that the free population mobility implies that $[v(\theta) - c(n)]$ takes the same value for any realizations of θ for which $n(\theta) > 0$. If congestion costs are high enough that every jurisdiction has positive population in the decentralized equilibrium, i.e. $n(0) > 0$, then values of $[v(\theta) - c(n)]$ can be freely substituted for each other, so:

(8) $$\int_0^1 n(\theta)[v(\theta) - c(n)]d\theta = \int_0^1 \bar{n}[v(\theta) - c(n)]d\theta \, .$$

The equality expressed in equation (8) is an essential element in facilitating the comparison of W_d and W_h. It follows from (8) that:

(9) $$W_d - W_h = \int_0^1 \bar{n}v(\theta)d\theta - \int_0^1 \bar{n}c(n)d\theta - \int_0^1 \bar{n}v(\theta)d\theta + \int_0^1 \bar{n}c(\bar{n})d\theta \, ,$$

or:

(10) $$W_d - W_h = \bar{n}\int_0^1 [c(\bar{n}) - c(n)]d\theta \, .$$

The evaluation of whether it is better to centralize or decentralize decisionmaking therefore turns on the sign of $\int_0^1 [c(\bar{n}) - c(n)]d\theta$. With convex crowding costs, this term simply has to be negative, since aggregate costs are minimized by allocating the population evenly across all jurisdictions. Hence harmonized policies produce higher welfare than decentralized policies whenever congestion costs are convex, and of sufficient magnitude to ensure that there is positive population in all jurisdictions. Alternatively, if crowding costs are linear in *n*, then welfare is the same for centralized and decentralized policies; and if crowding costs rise with *n* but do so in a concave fashion, then decentralized policies produce higher average welfare.

Figure 2 depicts the population distribution for a decentralized outcome in which all jurisdictions are populated and the $v(\theta)$ function takes the form $v(\theta) = \theta$. The function $n(\theta)$ rises with θ, but does so with a declining slope that reflects the impact of convex crowding costs. As the figure indicates, welfare is lower with decentralization than it is with harmonization, since the population level exceeds $\bar{n}$ in the jurisdiction where θ takes the value for which $v(\theta) = \bar{v}$.

3.3 Equilibrium with empty jurisdictions.

The proof of the welfare superiority of policy harmonization in settings with convex costs relies on the assumption that congestion costs and population size are together sufficient to populate every jurisdiction in equilibrium. This is not necessarily the case: as $\bar{n}$ approaches zero, $c(n) \approx c(0)$ and is therefore constant for all jurisdictions, so the population will concentrate in the jurisdiction offering the highest value of $v(\theta)$. The expected utility level in the harmonized outcome is $\bar{v} - c(\bar{n})$, so if, in the decentralized outcome, the jurisdiction whose policy induces a value $v(\theta) = \bar{v}$ has a population less than $\bar{n}$, then decentralization is welfare-superior to harmonization. Figures 3a and 3b illustrate the two possibilities. In the setting depicted in Figure 3a, welfare is greater with harmonization, whereas in the setting depicted in Figure 3b, welfare is greater with decentralization.

The welfare consequences of this degree of population selection can be identified by considering separately the jurisdictions that are, and are not, populated in the decentralized outcome. Denote by μ the value of θ for which the individuals just start populating jurisdictions with decentralization; thus, the region $\theta \in [0, \mu]$ is unpopulated, whereas the region $\theta \in [\mu, 1]$ is populated. Equations (6) and (7), expressing welfare in the decentralized and harmonized outcomes, can be rewritten as:

$$(11) \qquad W_d = \left[\int_0^{\mu} d\theta + \int_{\mu}^{1} d\theta\right]\int_{\mu}^{1} n(\theta)[v(\theta) - c(n)]d\theta$$

$$(12) \qquad W_h = \int_0^{\mu} \bar{n}[v(\theta) - c(\bar{n})]d\theta + \int_{\mu}^{1} \bar{n}[v(\theta) - c(\bar{n})]d\theta .$$

Comparing (11) and (12), and using (8), it follows that:

$$(13) \qquad W_d - W_h = \bar{n}\int_{\mu}^{1} [c(\bar{n}) - c(n)]d\theta - \bar{n}\int_0^{\mu} [v(\theta) - c(\bar{n}) - \psi]d\theta ,$$

in which $\psi \equiv \int_{\mu}^{1} \left(\frac{n(\theta)}{\bar{n}}\right)[v(\theta) - c(n)]d\theta$ is the population-weighted average utility level available in populated jurisdictions under decentralization.

The right side of equation (13) has two terms. The first term is the same as in equation (10), and reflects the welfare superiority of the population allocation produced by harmonization. The second term on the right side of equation (13) expresses the selection benefits of decentralization. With a significant enough difference between the average value of θ in populated jurisdictions and the value of θ in the region $[0, \mu]$ that is unpopulated with decentralization, then decentralization again becomes the preferred outcome.

The convexity of the crowding cost function determines the difference between welfare under decentralization and harmonization, and this, in turn, depends on the size of the population. As the population rises, the convexity of the crowding function becomes more important, and harmonization becomes increasingly preferred to decentralization. This relationship can be best understood by considering the impact of population change on welfare enjoyed by residents of the jurisdiction for which, with decentralization, $n(\theta) = \bar{n}$. Denote this value of θ as $\hat{\theta}$. Greater population reduces welfare in this jurisdiction, and every jurisdiction, by imposing greater crowding costs. Since welfare is the same in every populated jurisdiction with decentralization, it is sufficient to ask whether the population in the jurisdiction for which $\theta = \hat{\theta}$ rises by more or less than the national average when *n* increases: if the population rises by more than the national average, then population growth makes decentralization worse compared to harmonization, while if the population rises by less than the national average, population growth is relatively better for decentralization.

In order to evaluate the impact of population growth it is helpful to start from the equilibrium condition that, for some constant *k*, $[v(\theta) - c(n)] = k$ for all populated jurisdictions. Population growth has the effect of reducing *k*, from which it follows that:

$$\frac{dn(\theta)}{dk} = \frac{-1}{c'(n)}. \tag{14}$$

Equation (14) implies that population accumulates primarily in the jurisdictions with little population, for which $c'(n)$ is smallest. In order to evaluate whether the jurisdiction at which

$\theta = \hat{\theta}$ is above or below this average, it is helpful to differentiate the population equilibrium condition with respect to θ, obtaining:

(15) $$\frac{dn(\theta)}{d\theta}\frac{1}{v'(\theta)} = \frac{-1}{c'(n)}.$$

Comparing equations (14) and (15), it immediately follows that the derivative of a jurisdiction's population with respect to a rise in the national population is the same as the local derivative of the population function with respect to the quality of public policies. This, together with the requirement that the population locate *somewhere* implies that rising population makes decentralization less attractive. Figure 4 describes the logic graphically, illustrating the necessity that $\frac{dn(\theta)}{dk} > \frac{\overline{n}}{\overline{\theta}}$ in order for the entire population to be distributed among decentralized jurisdictions.

4. Optimal population allocation and congestion charges.

It is useful to characterize the optimal allocation of the population in the model analyzed in section 3.2. Given the continuity assumptions, the optimum can be characterized by the first-order condition that adding a single person to the population of any jurisdiction has the same impact on total welfare. Aggregate social welfare is given by $\int w(\theta) f(\theta) d\theta$, in which $w(\theta)$ is welfare attributable to the jurisdiction with policy θ: $w(\theta) = n[v(\theta) - c(n)]$. It follows that the change in aggregate welfare from adding one more unit of population to this jurisdiction is:

(16) $$\frac{dw(\theta)}{dn} = v(\theta) - c(n) - nc'(n).$$

The first order condition for the optimal population allocation is that the right side of equation (16) is the same for all values of θ.

It is immediately clear from equation (16) why decentralization cannot produce an efficient allocation of population except in the extreme case of no congestion costs, in which case the population is concentrated at the jurisdiction featuring the highest value of θ (and the variational method used to establish that the constancy of the right side of (16) is required for the optimum is no longer valid). Free population mobility implies that $v(\theta) - c(n)$ is the same for all occupied jurisdictions, so the right side of equation (16) can take the same value for all jurisdictions only if $nc'(n)$ does not change with θ. This condition is satisfied either if n is constant (which is impossible, since n rises with $v(\theta)$), or if $c(n) = k \ln(n)$, for some constant k, a function that is not convex in n.

The optimal population allocation is one for which the value of (16) is constant for all values of θ, which implies:

$$\frac{dn}{d\theta} = \frac{v'(\theta)}{[2c'(\theta) + nc''(\theta)]}. \tag{17}$$

From equation (17) it is clear that it is not optimal to allocate the population evenly among jurisdictions, since the right side of (17) is positive. Starting from an even distribution of the population across jurisdictions, a welfare improvement is possible by allocating population toward jurisdictions with higher values of $v(\theta)$, and this comes at no additional congestion cost, since $c'(n)$ is the same everywhere. Since harmonization of government policies is equivalent to allocating population evenly across values of θ, it follows that harmonization is not optimal policy.

What policies support an optimal allocation of population? Inspection of (16) reveals that optimal congestion charges do so, as long as congestion charges equal $nc'(n)$ in equilibrium. More generally, to the extent that any pecuniary cost associated with residence in a jurisdiction rises with population concentration, population mobility is reduced and the resulting allocation of population more closely resembles the optimal pattern described by (17). Consider, for example, the case in which each jurisdiction has a single unit of land, portions of which are traded on active markets. Each resident of a jurisdiction with population *n* then consumes *1/n* units of land. Let *y* be the exogenous incomes with which consumers are endowed (this includes the value of aggregate land wealth), and let $L\left(\frac{1}{n}\right)$ be the direct utility that a consumer receives from consuming *1/n* units of land. The price of a unit of land is therefore $L'\left(\frac{1}{n}\right)$, and, if utility is additive and separable in income, a consumer enjoys satisfaction equal to:

(18) $$u(\theta,n) = y + v(\theta) - c(n) + L\left(\frac{1}{n}\right) - \left(\frac{1}{n}\right)L'\left(\frac{1}{n}\right).$$

Setting the derivative of this expression with respect to θ equal to zero yields:

(19) $$\frac{dn}{d\theta} = \frac{v'(\theta)}{c'(\theta) - \frac{1}{n^3}L''\left(\frac{1}{n}\right)}.$$

This, in turn, can be compared to the implied optimal population allocation:

(20) $$\frac{dn}{d\theta} = \frac{v'(\theta)}{2c'(\theta) + nc''(\theta) - \frac{1}{n^3}L''\left(\frac{1}{n}\right)}.$$

Examination of (19) and (20) reveals that if all congestion costs are priced, so that $c' = c'' = 0$, then decentralized land markets produce efficient outcomes – a reassuring but hardly surprising implication. Comparing (19) and (20) to their counterparts, in the absence of a land market, (15) and (17), it is clear that the introduction of priced congestion externalities, even if only partially correcting the problem, improves the welfare properties of decentralized government.

5. Extensions.

6. Conclusion.

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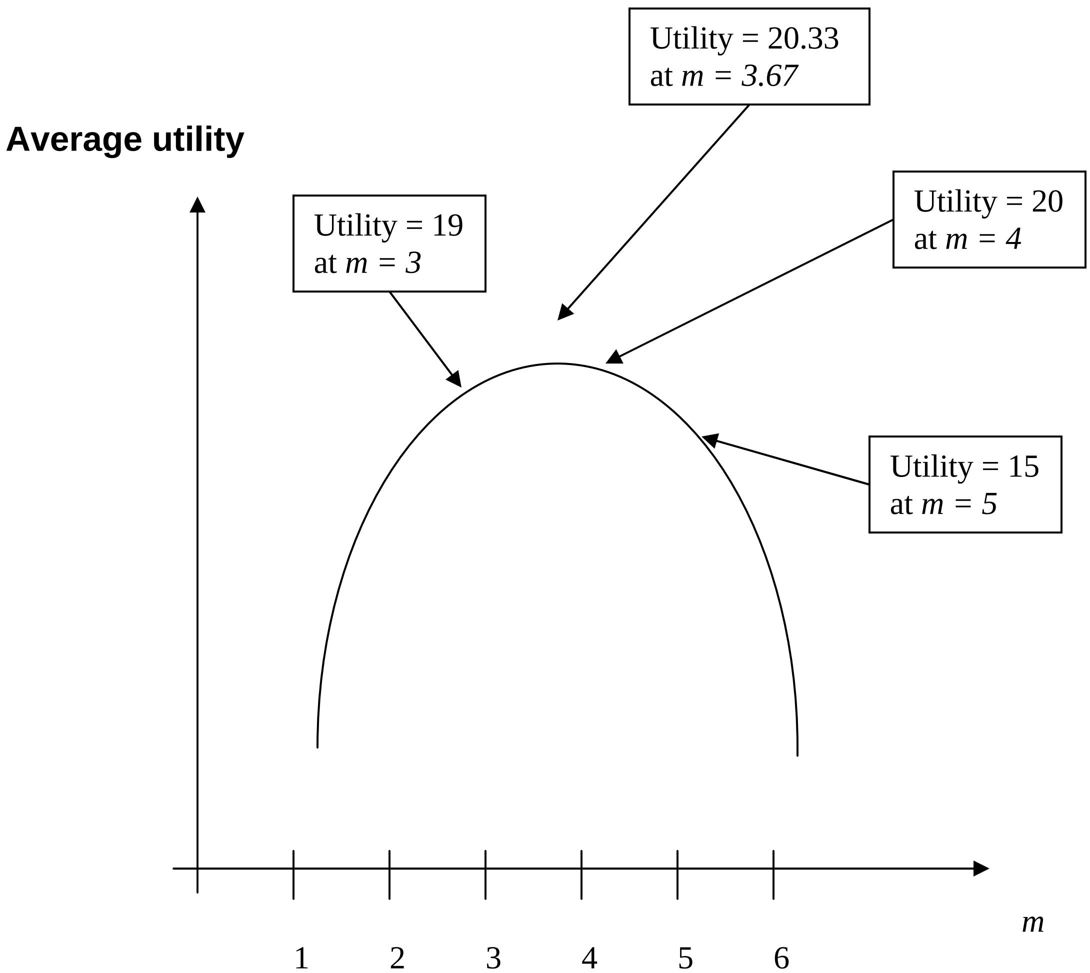
Figure 1

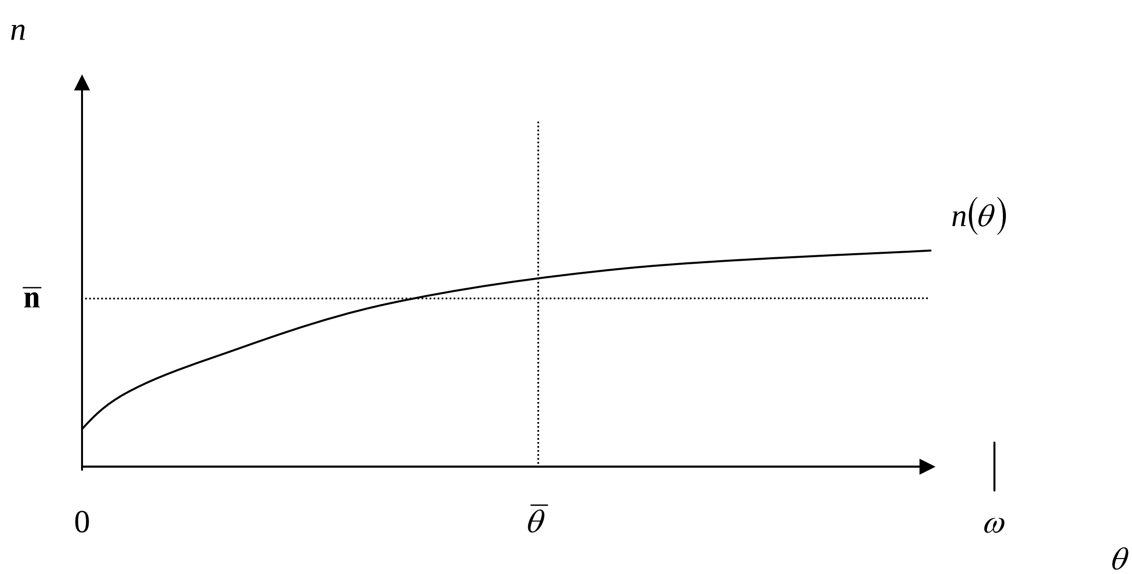
Population allocation and average welfare in the binary choice example



Note to Figure 1: The figure depicts average utility levels for consumers with utility functions given by $u(\theta,n) = v(\theta) - n^2$. The total population of six is divided between two jurisdictions, with *m* consumers in the first jurisdiction, for which $v(\theta) = 40$, and (*6 – m*) in the second jurisdiction, for which $v(\theta) = 16$.

Figure 2

Population distribution with every jurisdiction occupied



Note to Figure 2: the figure depicts the distribution.

Figure 3a

Decentralization reduces welfare even with unoccupied jurisdictions

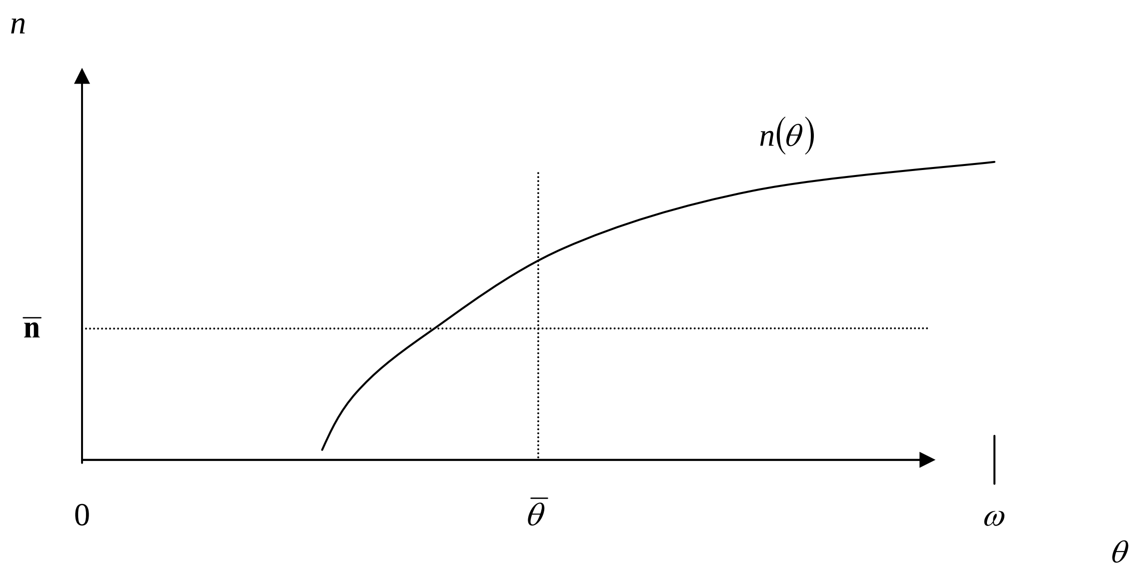
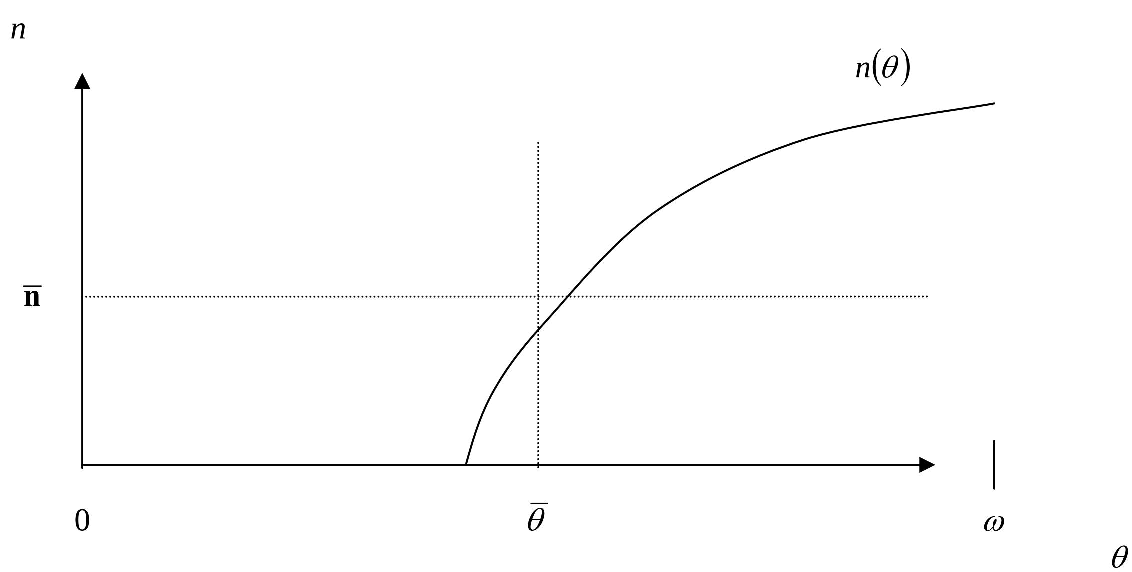


Figure 3b

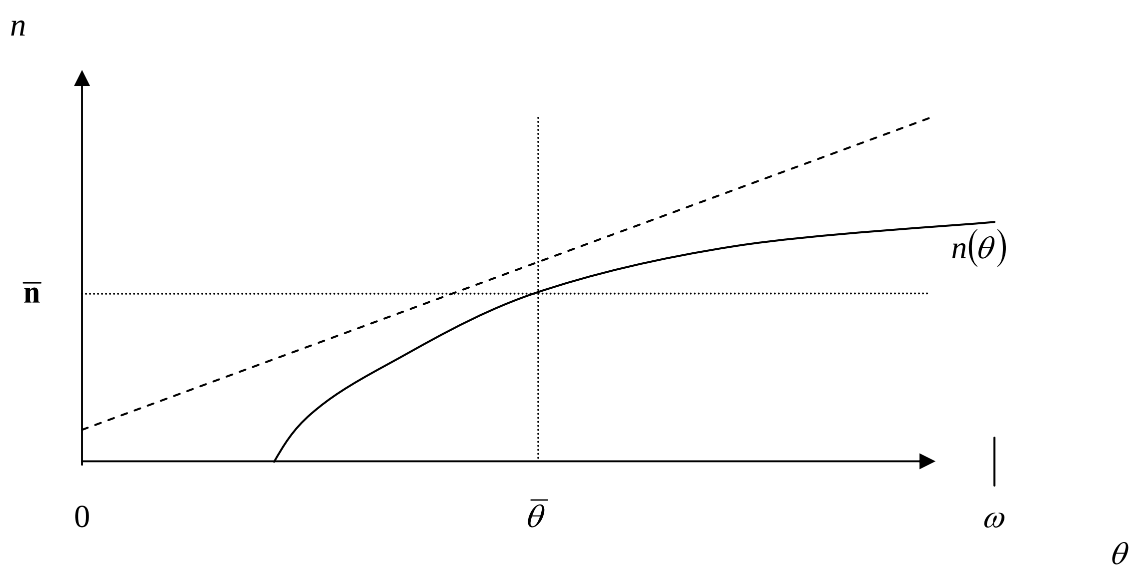
Decentralization increases welfare with unoccupied jurisdictions



Note to Figures 3a and 3b: the figure depicts the distribution.

Figure 4

The impossibility that $n'(\theta) = \bar{n}/\bar{\theta}$ ***when*** $\theta = \bar{\theta}$



Note to Figure 4: the figure depicts the distribution.

Table 1

Welfare with alternative policy regimes

	Decentralization	*Harmonization*	*An alternative*
Jurisdiction 1	$v(\theta) = 40$ m = 5 u = 40 – 25 = 15	$v(\theta) = 40$ m = 3 u = 40 – 9 = 31	$v(\theta) = 40$ m = 4 u = 40 – 16 = 24
Jurisdiction 2	$v(\theta) = 16$ n = 1 u = 16 – 1 = 15	$v(\theta) = 16$ n = 3 u = 16 – 9 = 7	$v(\theta) = 16$ n = 2 u = 16 – 4 = 12
Average welfare	15	19	20

Note to Table 1: