

Majority Voting and Local Public Goods Provision: Does Myopia Matter?

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The fiscal externality literature examines regional public goods provision when mobility is costless and income is dependent on the region of residence.¹ Individual homogeneity is often assumed and, as a result, a collective choice mechanism to resolve the issue of heterogeneous preferences within a community is unnecessary. Taking as given the region's population, regional authorities choose the level of the public good to maximize the utility of a representative resident. Such decentralized decision-making, however, can lead to fiscally-induced migration, distortions in the allocation of labour, and production inefficiencies. In this framework, a lump-sum interregional transfer is required to achieve an optimal allocation of labour. Some recent work challenges the assumption that regional authorities are myopic and ignore the impact of their fiscal decisions on migration. Building on earlier work by Stiglitz (1977) and Boadway (1982) these models focus on the incentives of non-myopic regional governments to make voluntary interregional transfers and whether these transfers are sufficient to ensure an optimal allocation of resources in the economy.²

Fiscal decision-making in the presence of individual heterogeneity and diverse preferences has, however, largely been ignored by this literature.

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1. See, for example, Buchanan and Goetz (1972), Flatters, Henderson and Mieszkowski (1974), Stiglitz (1977) and Boadway and Flatters (1982).
 2. In Krelove (1988, 1992) and Myers (1990), an optimal allocation is attainable as a decentralized equilibrium when authorities are non-myopic and the homogeneous population is perfectly mobile. In equilibrium, regional governments must make explicit interregional transfers or, for example, implicit transfers by regulating the interregional flow of rents. Wildasin (1994) also examines the potential for welfare-improving voluntary transfers in a model with migration and redistribution.

These issues receive some attention in Mansoorian and Myers (1993) and in Burbidge and Myers (1994). Individual heterogeneity, for example, is introduced into the familiar fiscal externality framework with non-myopic governments in Mansoorian and Myers (1993). Individuals are assumed to differ with respect to their attachment to a particular region. Since attachment is a parameter, residents' preferences for the public good are identical from the perspective of the government, negating the need to specify a particular collective choice mechanism. Burbidge and Myers (1994) introduce both individual heterogeneity and regional preferences for redistribution across residents into a fiscal externality model. In this context, a generalized social welfare function reconciles diverse preferences. When regional preferences differ, voluntary interregional transfers are no longer sufficient to correct the distortion in the allocation of labour created by decentralized decision-making. Burbidge and Myers (1994) show, however, that public goods are optimally chosen according to the Samuelson rule.

In contrast, the model presented here introduces diverse preferences and examines public goods provision when a particular collective choice mechanism, majority voting, is introduced into the fiscal externality framework. Majority decision rules for local public goods provision are derived under alternative assumptions regarding individual myopia and the results compared with those found in the related literature. There is no explicit redistribution in this model and regional government incentives to make voluntary transfers are considered elsewhere.³ Some propositions are stated and illustrated in a numerical example. The model shows that the migration equilibrium is sensitive to assumptions regarding individual myopia except when the majority in each region is comprised of perfectly mobile individuals and regional minorities are completely immobile. In addition, public goods provision and the allocation of labour are suboptimal in the myopic migration equilibrium with majority voting. The optimal allocation is not restored, however, when individual behaviour is non-myopic.

The Model

The model adopts the basic fiscal externality framework and maintains the assumption of a perfectly inelastic supply of individual labour endowments, normalized to one. Individuals have asymmetric mobility such that type A individuals are perfectly mobile while type B labour is perfectly immobile. Thus, the population constraints for the economy are:

3. Regional governments' incentives to make voluntary interregional transfers when fiscal decisions are determined by majority voting are examined, in detail, in Snoddon (1994).

$$L^A = L_1^A + L_2^A \quad (1.1)$$

and

$$L_i^B = L_i^B \quad \text{for } i = \{1, 2\} \quad (1.2)$$

where equation (1.2) reflects the immobility of type B labour.

Type A and B labour are used as separate inputs in the production of y_i , where i indicates the region of production and employment. The economy consists of two geographically distinct regions and full employment is assumed. The production function for y_i exhibits constant returns to scale and is given below as:⁴

$$y_i = F(L_i^A, L_i^B, T_i^A), \quad \text{where } F_i^k = \frac{\partial y_i}{\partial k} > 0, \quad (2)$$

$$F_i^{kk} = \frac{\partial F_i^k}{\partial k} < 0,$$

$$k = \{L_i^A, L_i^B, \text{ and } T_i\}.$$

L_i^A , L_i^B and T_i represent region i 's type A labour input and fixed endowments of type B labour and land respectively. The marginal product of input k in region i , F_i^k , is assumed to be diminishing. Interactive effects between labour types are ruled out (that is, $\partial F_i^A / \partial L_i^B = \partial F_i^B / \partial L_i^A = 0$) and, to ensure constant returns to scale, complementarity between land and labour in production, such that $\partial F_i^A / \partial T_i > 0$ and $\partial F_i^B / \partial T_i > 0$, is assumed.

In essence, these assumptions combine to yield a production function with the following form:

$$y_i = (T_i^A)^\alpha (L_i^A)^{(1-\alpha)} + (T_i - T_i^A)^\beta (L_i^B)^{(1-\beta)}$$

Output is, in effect, the sum of output produced from two separate constant

4. For majority voting to be an interesting and non-trivial social choice mechanism, individuals must differ in their demands for the fiscal package. Individual heterogeneity can be generated by differences in individual preferences, income or income sources. This specification of production allows for differences in individual income while limiting the complexity of the model. Alternatively, the assumption of heterogeneous preferences or a Cobb-Douglas production function of the form, $(T)^\alpha (L^A)^\beta (L^B)^\gamma$ could be adopted. The latter, for example, permits both differences in individual incomes and interactive effects between labour inputs.

returns to scale (CRS) production functions. Alternatively, adopting a Cobb-Douglas production function of the form, $(T)^\alpha(L^A)^\beta(L^B)^\gamma$, where $\alpha+\beta+\gamma=1$, allows for interactive effects between type A and B labour as well as land and labour complementarity. The myopic and non-myopic majority decision rules for public goods provision derived with this more generalized production technology are qualitatively the same as those derived in this paper. Hence, the model's results generalize to the case where interactive effects between labour types in production are permitted.

Profit maximization by competitive firms in both regions implies that each labour type is paid its marginal product. In addition, labour market equilibrium ensures that each region's aggregate demand for type B labour equals its fixed supply. Income, z_i^h , for type h labour includes wage earnings and an equal share of regional rents, R_i , and is written as:⁵

$$z_i^h = F_i^h + \frac{R_i}{(L_i^A + L_i^B)} \quad (3)$$

where

$$R_i = F(L_i^A, L_i^B, T_i) - F_i^A L_i^A - F_i^B L_i^B \text{ and } h \in \{A, B\}$$

Regional rent sharing is equivalent to assuming land is owned by the regional authority and rents are shared on an equal per capita basis. The Alaska Permanent Fund and the Alberta Heritage Savings Trust Fund are examples where regional rents are partly shared on a residency basis. Thus, with migration, individuals' entitlements to these rents change.

Consumption of the private good for a type A and B individual respectively is given by:

$$x_i^A = z_i^A - \tau_i \quad (4.1)$$

and

$$x_i^B = z_i^B - \tau_i \quad (4.2)$$

where τ_i is a uniform head tax. Individual preferences are identical across

5. The model's results generalize to other land ownership structures. Under national ownership, each individual owns an equal share of the economy's land and receives an equal share of total rents. Myopic and non-myopic decision rules derived under this ownership structure are not qualitatively different from those derived in the paper. In addition, propositions 1 and 2 continue to apply if mobile labour is assumed to have sole ownership of land.

labour type and are represented by the utility function:

$$U(x_i^h, G_i) \quad (5)$$

assumed to be strictly quasi-concave and continuous in both its arguments. ${}_i U_x^h$ and ${}_i U_G^h$ represent the marginal utility of x_i^h and G_i respectively for a type h resident in region i. Given this utility function, individuals' demands for the fiscal package may differ if income levels differ and if the income elasticity of demand for the public good is not equal to zero. As a result, a collective choice rule is necessary to reconcile diverse demands for the public good within the region. A simple majority voting rule is adopted here.

The labour type that forms the majority in a region also forms the regional government. The majority chooses both the public and private consumption good to maximize the utility of a representative individual from the majority. The regional government is constrained, however, to finance expenditures with a uniform head tax and to balance its budget. The budget constraint for region i's majority is:

$$G_i = \tau_i (L_i^A + L_i^B) \quad (6)$$

With head taxes, each individual contributes equally to the financing of majority-determined public expenditures. As a result, the minority is exploited through the majority's choice of the public good. With proportional income taxation, the majority may also shift a larger share of the tax burden to individuals in the minority, if minority income exceeds majority income. Since the results regarding myopia are the same under proportional income taxation, little is gained by adopting a more sophisticated tax regime.

To see the effects of majority decision-making on the migration equilibrium, we consider an individual's preferred choice of fiscal package. Each resident determines his/her desired fiscal package by choosing the levels of x_i^h and G_i to maximize $U(x_i^h, G_i)$ subject to the constraints of the model. If individuals are myopic with respect to the effects of their fiscal choices on the region's mobile population, then the relevant constraints to the above problem are equations (1.2), (2), (3) to (6), with the additional condition that L_i^A is fixed, replacing equation (1.1). Alternatively, if individuals are non-myopic, the relevant constraints are given by equations (1) to (6) plus an equal utilities constraint for type A individuals given below as:

$$U(x_1^A, G_1) = U(x_2^A, G_2) \quad (7)$$

Characterization of Equilibrium With Majority Voting

This section begins by solving for the socially optimal level of public goods provision and the optimal allocation of population. Next, the majority voting decision rules are derived under alternative assumptions regarding individual myopia. The analysis compares the case where individuals are myopic with respect to the effects of regional fiscal decisions on the region's share of the mobile population to the case where individuals act non-myopically and take into account the migration externalities. The model permits a comparison of regional public goods provision in equilibrium under the different myopia assumptions.

Social Optimum

The optimal level of public goods provision for the existing distribution of income is derived from the planner's problem to choose $x_i^A, x_j^A, x_i^B, x_j^B, G_i, G_j$ and L_i^A to maximize the following objective function:

$$\begin{aligned} L = & U(x_i^A, G_i) + \lambda \left[U(x_j^A, G_j) - \overline{U(x_j^A, G_j)} \right] \\ & + \mu_1 \left[U(x_i^B, G_i) - \overline{U(x_i^B, G_i)} \right] \\ & + \mu_2 \left[U(x_j^B, G_j) - \overline{U(x_j^B, G_j)} \right] \\ & + \psi \left[y_i + y_j - x_i^A L_i^A - x_j^A (L^A - L_i^A) - x_i^B L_i^B - x_j^B L_j^B - G_i - G_j \right] \end{aligned}$$

Using the first order conditions to the planner's problem, the following modified Samuelson condition for the optimal provision of public goods in region i can be derived:

$$\left[\frac{{}_i U_G^A}{{}_i U_X^A} \right] \frac{L_i^A}{L_i^A + L_i^B} + \left[\frac{{}_i U_G^B}{{}_i U_X^B} \right] \frac{L_i^B}{L_i^A + L_i^B} = \frac{1}{L_i^A + L_i^B} \quad \text{for } i=\{1, 2\} \quad (8)$$

Equation (8) indicates that, at the optimum, the level of the public good ensures that the weighted sum of the individual marginal rates of substitution just equals the marginal cost of provision. The optimal allocation of mobile labour must satisfy the condition:

$$\left(F_i^A - x_i^A \right) = \left(F_j^A - x_j^A \right) \quad (9)$$

also derived from the first order conditions to the planner's problem. Equation (9) states that an optimal allocation of mobile labour ensures that the marginal net social benefit of an additional worker is equated across regions. This condition is identical to the optimality condition derived in Boadway and Flatters (1982) and Myers (1990).

Myopic Decision-making and Majority Voting

Myopia implies that individuals and regional majorities act as if the region's mobile population is fixed. Assuming a type t majority in region i , the regional majority chooses the level of public good so as to maximize the utility of a representative type t individual. The first order condition to this maximization problem, taking into account the constraints given by equations (1.2), (2), (3) to (6), and the additional constraint that the regional type A population is fixed, is given below as:

$${}_i U_G^t + {}_i U_X^t \left[\frac{\partial x_i^t}{\partial G_i} \right] = 0 \quad \text{where } t \in \{A, B\} \text{ and } i=\{1, 2\} \quad (10)$$

Solving for $\partial x_i^t / \partial G_i$ using equations (3), (4) and (6) and substituting the result into equation (10) yields the myopic decision rule:

$$\frac{{}_i U_G^t}{{}_i U_X^t} = \frac{1}{(L_i^A + L_i^B)} \quad (10')$$

Equation (10') states that a type t majority in region i chooses the level of the public good such that the marginal benefit from an additional unit of the good just equals the marginal cost. This marginal cost is simply $1/n$ where n equals the total population for the region. Unless individuals in the minority have income identical to those in the majority, the majority-determined fiscal package fails to exactly satisfy the preferences of the minority. Hence, the public good is over- or under-provided from the minority's perspective.

A comparison of equations (8) and (10') shows that public goods provision under majority voting differs from the optimal level unless all residents have identical incomes. In addition to satisfying equation (10), both regions' myopic choices must be consistent with the equal utilities condition. Interregional differences in utility for mobile individuals leads to migration and this migra-

tion continues until myopic regional fiscal decisions are consistent with equation (7). The equilibrium levels of G_1 , G_2 and L_1^A are implicitly determined by the three equation system consisting of a first order condition to the utility maximization problem of each regional majority and the equal utilities condition. In general, there is no reason to expect that the allocation of mobile labour in the majority voting, migration equilibrium also satisfies the condition for the optimal distribution of population given by equation (9).

Majority decision rules when individuals are non-myopic are derived below. Myopic and non-myopic decision rules and the migration equilibria are then compared. Whether non-myopic behaviour is sufficient to restore the socially optimal level of public goods provision or distribution of population is also examined.

Non-Myopic Decision-making and Majority Voting

Non-myopic behaviour implies that individuals are aware that their fiscal decisions affect the region’s mobile population. In this case, region i ’s type t majority chooses the level of public good to maximize:

$$L = U(x_i^t, G_i) + \lambda \left[U(x_1^A, G_1) - U(x_2^A(G_2, L^A - L_1^A), G_2) \right]$$

for $i = \{1,2\}$ and $t \in \{A,B\}$,

subject to the constraints, given by equations (1.1), (1.2), (2), (3) to (6) and the equal utilities condition (7). The equal utilities condition implicitly defines L_1^A as a function of L^A , G_1 , and G_2 and substitution of this implicit function into the above yields an unconstrained maximization problem. The level of public good, G_i , is determined by the non-myopic first order condition to this unconstrained maximization problem and is given below as:

$${}_iU_G^t + {}_iU_X^t \left[\frac{\partial x_i^t}{\partial G_i} \right] + {}_iU_X^t \left[\frac{\partial x_i^t}{\partial L_1^A} \right] \left[\frac{\partial L_1^A}{\partial G_i} \right] = 0 \tag{11}$$

The first and second terms represent the direct marginal utility and marginal cost of a small change in the level of the public good for a type t resident in region i . The third term captures the indirect utility effect of fiscally-induced migration for individuals in the majority. It consists of the perceived migration response, $\partial L_1^A / \partial G_i$, that measures the effect of a change in the public good on the region’s mobile population. This fiscally-induced migration, in turn, affects majority members’ utility by changing their net income. These income effects,

$\partial x_i^A / \partial L_i^A$ and $\partial x_i^B / \partial L_i^A$, are written below as:

$$\frac{\partial x_i^A}{\partial L_i^A} = \frac{F_i^{AA} L_i^B}{L_i^A + L_i^B} - \left[\frac{R_i - G_i}{(L_i^A + L_i^B)^2} \right]$$

and

$$\frac{\partial x_i^B}{\partial L_i^A} = \frac{-F_i^{AA} L_i^A}{L_i^A + L_i^B} - \left[\frac{R_i - G_i}{(L_i^A + L_i^B)^2} \right]$$

The perceived migration response is found by totally differentiating equation (7) with respect to G_i and L_1^A , holding all other variables fixed, yielding:⁶

$$\frac{dL_1^A}{dG_1} = \frac{\partial L_1^A}{\partial G_1} = \frac{- \left[{}_1U_G^A - \frac{{}_1U_X^A}{L_1^A + L_1^B} \right]}{\left[{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A} \right]}$$

and

$$\frac{dL_1^A}{dG_2} = \frac{\partial L_1^A}{\partial G_2} = \frac{\left[{}_2U_G^A - \frac{{}_2U_X^A}{L^A - L_1^A + L_2^B} \right]}{\left[{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A} \right]}$$

When individuals are non-myopic, the form of the decision rule for public goods provision depends on the identity of the majority. When type A individuals form the majority in either region, a non-myopic decision rule can be found by substituting the expressions for $\partial L_1^A / \partial G_1$ and $\partial L_1^A / \partial G_2$ into equation (11). These decision rules are written below as:

6. The methodology used here to find $\partial L_1^A / \partial G_i$ is described in Stiglitz (1977) and developed in Boadway (1982) and Myers (1990).

$$\left[{}_1U_G^A - \frac{{}_1U_X^A}{L_1^A + L_1^B} \right] \left[\frac{-{}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A}}{{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A}} \right] = 0 \text{ for } t=A, i=1 \quad (12)$$

and

$$\left[{}_2U_G^A - \frac{{}_2U_X^A}{L^A - L_1^A + L_2^B} \right] \left[\frac{{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A}}{{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A}} \right] = 0 \text{ for } t=A, i=2 \quad (13)$$

The non-myopic decision rules for the case where a type B majority exists in either region are similarly derived and are given below as:

$${}_1U_G^B - \frac{{}_1U_X^B}{L_1^A + L_1^B} + {}_1U_X^B \left[\frac{-F_1^{AA} L_1^A}{L_1^A + L_1^B} - \frac{R_1 - G_1}{(L_1^A + L_1^B)^2} \right] \left[\frac{-\left[{}_1U_G^A - \frac{{}_1U_X^A}{L_1^A + L_1^B} \right]}{{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A}} \right] = 0 \quad (14)$$

for $t = B, i = 1$, and

$${}_2U_G^B - \frac{{}_2U_X^B}{L^A - L_1^A + L_2^B} + {}_2U_X^B \left[\frac{F_2^{AA} (L^A - L_1^A)}{L^A - L_1^A + L_2^B} + \frac{R_2 - G_2}{(L^A - L_1^A + L_2^B)^2} \right] \left[\frac{{}_2U_G^A - \frac{{}_2U_X^A}{L^A - L_1^A + L_2^B}}{{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A}} \right] = 0 \quad (15)$$

for $t = B, i = 2$.

Equilibrium levels of G_1, G_2 and L_1^A are determined by a three equation system consisting of a non-myopic decision rule for each majority, represented by one of the above four possibilities, and the equal utilities condition. Note that public goods provision, as determined by equation (11), in general, differs from provision as determined by the modified Samuelson condition or equation (8). As a consequence, the non-myopic migration equilibrium does not ensure an optimal allocation of mobile population. Thus, adopting the assumption that individual behaviour is non-myopic fails to restore the socially optimal allocation. Having derived the myopic and non-myopic decision rules and characterized a majority voting equilibrium in each case, some propositions can be stated.

Proposition 1 (Invariance Proposition): If the mobile type forms the majority in both regions, the migration equilibrium is the same whether individuals are myopic or non-myopic with respect to the migration effects of their fiscal decisions.

Proposition 1 has an intuitive interpretation. At the myopic equilibrium, the majority in each region chooses the level of the public good to maximize the utility of a representative type A resident. Thus, equation (10), the myopic decision rule, is satisfied for both regions. In this equilibrium, utility levels for type A individuals are equalized across regions. With the introduction of non-myopic behaviour, neither regional majority, although aware of the effects of their fiscal decisions on regional populations, has any incentive to change the level of the public good since the myopic choice exactly satisfies type A preferences.

To see this, we examine the perceived migration response:

$$\frac{\partial L_i^A}{\partial G_i} = \frac{-\left[{}_iU_G^A - \frac{{}_iU_X^A}{L_i^A + L_i^B} \right]}{\left[{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - {}_2U_X^A \frac{\partial x_2^A}{\partial L_1^A} \right]}, \quad i = \{1, 2\}$$

for region i . The numerator of $\partial L_i^A / \partial G_i$ is identical to the myopic first order condition and equals zero when evaluated at the myopic equilibrium. Since myopic regional decision-making satisfies type A preferences directly, the non-myopic type A majority perceives that it cannot influence the region's mobile population by adjusting the level of the public good. This is a straightforward application of the envelope theorem. As a result, public goods provision under myopic and non-myopic behaviour is identical.

In contrast, proposition 2 demonstrates that myopia assumptions matter for

the case where type B individuals form the majority in at least one region.

Proposition 2: If the immobile type forms the majority in at least one region, the migration equilibrium is dependent on whether individuals are myopic or non-myopic with respect to the migration effects of their fiscal decisions.

To see this requires a closer examination of the decision rule for a non-myopic type B majority. Substituting $-1/(L_1^A + L_1^B)$ for $\partial x_1^B / \partial G_1$ into equation (11) for the case where t equals B and i equals 1 gives:

$$\left[{}_1U_G^B - \frac{{}_1U_X^B}{(L_1^A + L_1^B)} \right] + \left[{}_1U_X^B \frac{\partial x_1^B}{\partial L_1^A} \frac{\partial L_1^A}{\partial G_1} \right] = 0 \quad (16)$$

the non-myopic decision rule for region 1's type B majority. The first bracketed term represents the direct effect of a change in the public good on the utility of a type B individual in the region and the second term captures the indirect effect of fiscally-induced migration on the utility of majority members.

At the myopic equilibrium, the first bracketed term equals zero. This is simply the first order condition to the myopic type B majority's maximization problem. As long as the indirect utility effect is non-zero, non-myopic behaviour leads to a different decision rule and level of the public good as compared to the myopic outcome. If both regions have type B majorities, then the optimal level of the public good in each region differs from the optimal myopic level and, in general, the myopic and non-myopic equilibria differ. When a type B majority exists in only one region, the non-myopic equilibrium also differs from the myopic equilibrium since the non-myopic type B majority's optimal level of public good affects the other region's share of the mobile population and, consequently, affects the type A majority's choice of public good. Thus, myopia matters if the immobile type forms the majority in at least one region.

Consider an example where type B majorities exist in both regions. Suppose in the myopic equilibrium type A individuals have higher incomes than the type B residents in region 1. Evaluating equation (16) at the myopic equilibrium, note that the first bracketed term is equal to zero. Next, consider:

$$\frac{\partial L_1^A}{\partial G_1} = \frac{- \left[{}_1U_G^A - \frac{{}_1U_X^A}{L_1^A + L_1^B} \right]}{{}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - 2U_X^A \frac{\partial x_2^A}{\partial L_1^A}}$$

If stability of the migration equilibrium is imposed, the denominator of

$\partial L_1^A / \partial G_1$ is negative and, given the assumptions of this example, the numerator is positive.⁷ Region 1's type B majority perceives that it can increase its mobile population by increasing the level of the public good.

Intuitively, an increase in the level of public good brings provision closer to type A residents' preferred level. If $\partial x_1^B / \partial L_1^A$ is positive, the majority in region 1 has an incentive to expand provision relative to the myopic level in an attempt to increase the region's share of type A labour and the majority's utility. Region 2's majority solves a similar problem and may also have an incentive to change public goods provision from its myopic level. Whether the non-myopic equilibrium choices of G_1 and G_2 are higher or lower than their respective myopic levels depends on the parameters of the model. Without additional restrictions on the model, few generalizations regarding non-myopic provision incentives can be made. The numerical example presented below helps illustrate these incentives for a particular set of parameter values.

Although proposition 2 demonstrates that the non-myopic decision rules for public goods provision, in general, differ from the rules governing myopic choices as do the myopic and non-myopic equilibria, non-myopic behaviour does not imply increased utility for all type B individuals. If both regions attempt to increase utility by increasing their shares of the mobile population, in equilibrium, only one region at most can succeed, given equation (1.1). While both regions believe utility can be increased by acting non-myopically, in the Nash equilibrium, at least one type B majority is worse off. The competition for the mobile population by non-myopic type B majorities should, however, unambiguously increase the welfare of all type A individuals, at least for small changes.

Discussion

The conclusion that myopia does not matter for public goods provision when the mobile type form the majority in both regions, rests on the existence of a perfectly immobile minority and on the assumption that the distribution of labour by type coincides with the distribution of individuals by mobility. Suppose individuals are identical and perfectly mobile. In this case, assumptions

7. Stability of the migration equilibrium ensures against a complete depopulation of type A individuals in either region and requires that:

$${}_1U_X^A \frac{\partial x_1^A}{\partial L_1^A} - 2U_X^A \frac{\partial x_2^A}{\partial L_1^A} < 0$$

For more discussion of the stability condition, see Stiglitz (1977), and Boadway and Flatters (1982).

regarding myopia do not affect public goods provision or the migration equilibrium. Under these assumptions, the model is identical to the Boadway and Flatters (1982) model. Alternatively, if all individuals are of the same labour type but only a fraction of these individuals are mobile, myopia assumptions again play no role in public goods provision. In this case, there are two population groups within each region and one equal utilities condition for mobile individuals. With uniform head taxes, mobile and immobile residents have identical incomes. Regardless of whether individuals in the majority are mobile, perceived migration responses are zero at the myopic equilibrium, and public goods provision in equilibrium is invariant to alternative myopia assumptions. If two labour types, type A and B, are introduced, and in contrast to the assumption adopted in this paper, both labour types are mobile, the model's complexity increases significantly. Again, each region contains two population groups and two equal utilities must be satisfied in the migration equilibrium.⁸ While no formal proof is offered here, it is not difficult to see that, under these conditions, myopic and non-myopic equilibria may differ even if the same mobile type forms the majority in both regions. Since there is at least one mobile minority group in each region, the perceived migration responses of non-myopic regional majorities are non-zero at the myopic equilibrium. Therefore, it is likely that non-myopic majorities have incentives to change public goods provision relative to myopic levels.

As an example, consider the case where type A individuals form the majority in both regions. In this situation, the decisions of a myopic majority of mobile type A labour, for example, may lead to migration of both labour types, including those in the minority. Myopic behaviour prevents these migration externalities from being incorporated into fiscal decision-making. The invariance proposition is derived from the fact that, when the minority is completely immobile, the type A majority's perceived migration responses equal zero and the preferences of the mobile majority in both regions are exactly satisfied. Hence, there are no incentives to move. Once individuals other than those in the majority are free to move, it is unlikely that the majorities' perceived migration responses equal zero. In very simple terms, if type A and B labour have different demands for the public good, then the myopic type A choice is suboptimal from the perspective of mobile, type B individuals in the region. With non-myopic behaviour, type A majorities believe they can influence their region's population of type B labour. Non-myopic fiscal choices are, therefore, likely to differ from myopic choices.

From the above discussion we conclude that, in general, myopia assumptions matter to fiscal decision-making. While the invariance proposition applies

8. A variant on this model would be to assume only a fraction of each labour type is mobile. While this complicates the model, the conclusions are similar to the case where both labour types are completely mobile.

in limited circumstances only, the model shows that behavioural assumptions influence regional majorities' fiscal choices and the migration equilibrium. Earlier models have demonstrated the importance of the myopia assumption when regional authorities choose the level of the public good to maximize the utility of a representative resident and all individuals are identical. Myers (1990), for example, demonstrates that regional authorities make voluntary interregional transfers sufficient to restore the optimal allocation of labour when these authorities are non-myopic with respect to the impact of their fiscal decisions on migration. Non-myopic behaviour in Myers' model also ensures that public goods provision is optimal. In contrast, majority voting leads to suboptimal public goods provision relative to the social optimum, given by the modified Samuelson condition. Boadway (1982) demonstrates that myopia can affect the provision of local public goods. In a model where regional transfers are excluded and public expenditures are financed by property taxes, myopic regional authorities have incentives to over-provide the public good relative to the Samuelson level. Contrary to the model presented here, Boadway (1982) shows that if the public good is financed by direct taxation assumptions regarding myopia leave the provision rule unchanged and the level of provision at the Samuelson level.

A Numerical Example

Two numerical examples are presented to illustrate that non-myopic behaviour can lead to higher or lower levels of public goods provision relative to the myopic equilibrium and that non-myopic behaviour need not make everyone better off. Regional production is assumed to be Cobb-Douglas in nature and is written as:

$$y_i = [S_i^A (T_i^A)^\alpha (L_i^A)^{(1-\alpha)}] + [S_i^B (T_i^B)^\beta (L_i^B)^{(1-\beta)}]$$

where $T_i = T_i^A + T_i^B$, $0 < \alpha < 1$, $0 < \beta < 1$ and S_i^A and S_i^B are technology parameters. A Cobb-Douglas utility function of the form:

$$U(x_i^h, G_i) = (x_i^h)^\rho (G_i)^{(1-\rho)}$$

is chosen to represent individual preferences. Using the above specifications for production and utility, the myopic and non-myopic decision rules can be explicitly derived. The parameter values, presented in Table 1, show that production parameters α , β , S_i^A and S_i^B and utility parameter ρ are the same in both regions. Regional endowments of land are assumed to differ with region 1 having the larger endowment. The population parameters for the model are chosen such that the type B majority in both regions are of equal size.

TABLE 1 Parameter Values

T_1	1000
$T_1^A = T_1^B$	500
T_2	800
$T_2^A = T_2^B$	400
$S_1^A = S_1^B = S_2^A = S_2^B$	50
α	0.5
β	0.25
ρ	0.75

Table 2 presents the computed equilibria for two numerical examples. For case I, the assumption of non-myopic behaviour results in a larger (smaller) type A population in region 2 (1), increased utility for all type A individuals and for type B individuals in region 2, and lower utility for type B individuals in region 1, relative to the myopic equilibrium. Public goods provision is greater in both regions in the non-myopic equilibrium. In contrast, case II shows that public goods provision is lower in both regions when individuals are non-myopic. All type A individuals have higher utility in the non-myopic equilibrium as do type B individuals in region 1. Type B individuals in region 2, however, are worse off given non-myopic behaviour.

These results highlight two important results of the model. Myopia assumptions matter for regional levels of public goods, welfare and the regional distribution of mobile labour, illustrating proposition 2. In addition, non-myopic behaviour can lead to higher or lower levels of public goods provision relative to their myopic levels. What determines whether or not the type B majority in a particular region is better or worse off in the non-myopic equilibrium? Recall, at the myopic equilibrium if we assume regional majorities are non-myopic, each type B majority perceives it can influence its mobile population. For the parameters chosen, non-myopic type B majorities always prefer more type A residents than exists at the myopic equilibrium. Thus, the question becomes how to attract more mobile individuals into the region when the only fiscal instrument available is the level of the public good.

The ability of type B majorities to influence the in-migration of mobile individuals into their region depends on the extent to which mobile individuals are dissatisfied with the myopic majority's fiscal package. The income differential between type A and B individuals in the region at the myopic equilibrium provides a measure of this dissatisfaction. Both the size and the sign of the income differential influences the perceived migration effect. Whether or not a region attempts to lure more mobile individuals into the region by changing the level of the public good is determined by the sign of the income differential. The size of the differential determines the extent to which the level of public good changes. All other things equal, the region with the greatest income differential changes the fiscal package the most and is, therefore, more

TABLE 2 Myopic and Non-myopic Equilibrium Solutions When Type B Majorities Exist in Both Regions

Variables	Case I $L_i^B = 2500$		Case II $L_i^B = 750$	
	(1) Myopic	(2) Non-Myopic	(3) Myopic	(4) Non-Myopic
L_1^A	464.91	464.79	477.72	478.36
L_2^A	335.09	335.21	322.28	321.64
G_1	26,826.20	26,861.84	15,572.72	15,283.48
G_2	24,039.26	24,204.06	12,837.66	12,670.17
$U(x_1^A, G_1) = U(x_2^A, G_2)$	155.74649	155.76039	142.27951	142.40930
$U(x_1^B, G_1)$	152.19191	152.18997	171.15181	171.15649
$U(x_2^B, G_2)$	141.03824	141.03930	156.16911	156.14549

Note: $L^A = 800$ for both cases.

likely to increase its share of the mobile population in the non-myopic equilibrium. For example, if the income differential, $(z_i^A - z_i^B)$, is positive in both regions, as in case I, all type A residents prefer a fiscal package that offers more of the public good than exists in the myopic equilibrium. Both regional type B majorities have an incentive to increase the level of the public good over the myopic level to bring provision closer to the level preferred by the type A minority. In case I, this income differential is greater in region 2 and, as a result, region 2 is more likely to be successful at increasing its type A population in the non-myopic equilibrium. The results in Table 2 demonstrate this, showing an increase in region 2's type A population over its myopic level. Although both regional majorities perceive that the region's mobile population can be increased over the myopic level, only one region is successful. Since regions prefer a larger type A population, this implies region 2's type B majority is better off in the non-myopic equilibrium.

In case II, region 1 has the larger income differential and successfully increases its mobile population in the non-myopic equilibrium. Since $z_i^A - z_i^B$ is negative for both regions, both type B majorities have incentives to provide a lower level of public good in the non-myopic equilibrium to bring public goods provision closer to the level preferred by type A residents. The type B majority that increases its mobile population in the non-myopic equilibrium also has higher utility in the non-myopic equilibrium while the unsuccessful majority has lower utility relative to the myopic equilibrium. This result is illustrated in Table 2. Note that in both numerical examples considered, all type A individuals are better off if regional majorities act non-myopically.

Conclusions

This paper develops a regional model to show how assumptions regarding individual myopia can influence the provision of regional public goods and migration when regions' fiscal decisions are made according to majority voting. When individuals are heterogeneous and public goods are financed by uniform head taxes, majority voting decisions are invariant to myopia assumptions only when mobile individuals form the majority in both regions and the minority is completely immobile. This result depends critically on the assumptions of a perfectly immobile minority and of perfect matching of labour type with mobility. The invariance proposition is unlikely to hold once either of these assumptions is relaxed.

Intraregional income differentials between individuals in the minority and majority determines the sign and the strength of the perceived migration response in both regions. Generally, the non-myopic type B majority in the region with the greatest income disparity has the greatest opportunity to change the level of public good from the myopic to non-myopic equilibrium and this, combined with the larger income differential, increases the likelihood that it can successfully increase its' members utility from the myopic level. This result also depends on the extent of labour mobility.

This research could be extended to include interregional transfers as additional regional fiscal instruments and to examine under what circumstances voluntary transfers are made by regional majorities and what the effects of these transfers might be. This possibility is explored in Snoddon (1994). Preliminary results show that voluntary transfers by non-myopic majorities do not restore optimality in either public goods provision or the allocation of labour. Centralized transfers to correct for the suboptimal allocation of labour or public goods provision, or to address equity concerns, are not considered explicitly in the model presented here, although the model can easily be extended to determine the necessary transfers. For optimality, it is likely that the central authority requires the ability to make both interregional and interpersonal transfers.

It would also be interesting to explain, from a public choice perspective, the existence of a central or federal authority in a regional model of this nature and to determine the effects of alternative federal government objectives on the migration equilibrium. A richer regional tax structure might also be a fruitful avenue to explore in the context of interregional migration and majority voting. The model could be extended to include redistribution within regions as is done in Burbidge and Myers (1994). The impact on redistribution of majority voting when incomes are endogenous could then be examined and compared to Burbidge and Myers (1994) as well as to the recent work of Epple and Romer (1991) on majority voting and redistribution when incomes are exogenous.

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