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Working Papers

WHY CITIES SHOULD NOT BE SUBSIDIZED

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CESifo Working Paper No. 546

August 2001

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ISSN 1617-9595

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Abstract

The paper deals with the question of whether fiscal transfers received by cities can be justified by a higher cost of producing publicly provided goods. In the model, increasing the population density implies both a higher output per capita due to agglomeration economies and a higher cost of the publicly provided good due to congestion. It is shown that introducing fiscal transfers to be paid by the region with the lower population density will generally reduce welfare. This result is obtained since the city is already beyond the level of optimum agglomeration.

Keywords: interjurisdictional transfers, congestion, publicly provided goods.

JEL Classification: D62, H40, H73, H77.

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1 Introduction

In several countries throughout the world we find systems of fiscal equalization among jurisdictions. Transfers between jurisdictions on the same level are used to equalize the fiscal power of government budgets. It is not unusual that small jurisdictions with a high income per capita receive transfers from less wealthy, larger jurisdictions. Such a scheme is in place, for example, in Germany, where the city states Berlin, Bremen, and Hamburg receive transfer payments from larger states as Bavaria or Hesse. The current fiscal equalization system assumes that all three city states have additional requirements per inhabitant in comparison to the larger Bundesländer. This is taken into account by the fact that in the equalization of the Länder tax-raising power, the inhabitants of the city states are weighted at 135% whereas the inhabitants of the larger Länder are weighted at 100%. Without this inhabitant weighting, Berlin would have received DM 4.2 billion less in 1999, Bremen DM 0.8 billion less, and Hamburg would have paid DM 1.7 billion more.[1]

A similar preferential treatment of regions with a high population density can be found in Austria, Australia and the Canadian provinces. The Austrian *Finanzausgleichsgesetz 2001* mandates that the population of cities with more than 50,000 inhabitants (e.g. Vienna) is weighted at 233% before interregional transfers are calculated according to the population key. In Australia, the federal system entails cost equalization which compensates those state governments that face high prices in providing public services (Williams, 1995, p. 139). The federal grants are distributed according to the population in the states, which is weighted by the Commonwealth Grants Commission. The high density population in the Australian Capital Territory with Canberra is weighted at 110% (Commonwealth Grants Commission, 2000). In the Canadian provinces, fiscal equalization systems are used to equalize municipal expenditure. The expenditure needs are measured as a function of population density in order to allocate unconditional grants among municipalities. The federal equalization system equalizes the per capita tax burden among provinces, but there is a debate aimed at reforming the present system by explicitly recognizing relative expenditure needs of the Canadian provinces in the equalization formula (Shah, 1996).

[1]For a closer description of the German transfer system to city states and an empirical evaluation, see Baretti et al. (2001).

Different justifications can be given for the practice of fiscal equalization. A well-known argument is that public goods provided in city states are often also consumed by citizens of neighboring states.[2] Setting aside this line of reasoning, we focus on analyses that presuppose differences in the unit cost of producing local public goods across regions. Flatters, Henderson and Mieszkowski (1974) demonstrate that the free residential choice of individuals may lead to fiscal externalities and therefore yields an inefficient allocation. If public expenditure must be financed by residence-based taxes and if the per capita cost of supplying local public goods differs across regions, there are fiscal reasons to relocate. The authors propose a system of direct interregional transfers from regions with low per capita expenditure on local public goods to regions with high per capita expenditure. This would equate the per capita tax burden and avoid the fiscal externalities. Boadway and Flatters (1982) come to a similar conclusion extending the analysis to allow for impure public goods. Petchey (1995) deals with public provision of a private good where production functions are specific to regions. While efficiency always requires equating the marginal products of labor, the optimal transfer may flow to the region producing at a lower cost. Richter and Wellisch (1993; 1996) incorporate mobile firms to analyze differences between consumption and production decisions with regard to fiscal equalization. Rather than considering regions that maximize the land rent accruing to immobile residents, the objective of regional authorities is the optimization of the welfare of all immobile local residents. This leads them to investigate the welfare implications of incomplete land rent absorption in the regions. Richter and Wellisch show that fiscal transfers between regions are efficient if a share of the regional land is in possession of immobile residents in other regions.

In contrast to this literature exploring the efficiency of equalization transfers between regions with the same land endowment, our model examines two regions of different size in land endowment and different population density in the migration equilibrium: a small region, called the city, and a large region, labeled the country. We investigate the assertion that transfers have to be paid to city because densely populated jurisdictions are subject to a higher per capita cost in the provision of public services.[3] The claim that expenditure per capita for local public goods increases with higher population

[2]For this spillover argument, see Inman and Rubinfeld (1997) and Oates (1972).

[3]See Oates (1988) for a discussion of empirical measurements for congestion costs.

density is known in the older public finance literature as "Brecht's Law".[4] The validity of this hypothesis is controversial (Peffekoven, 1987). A good example of a public good where the cost of provision increases in population density is public security. For various reasons, crimes are often concentrated in densely populated areas. The empirical evidence presented in Craig (1987) suggests that safety is close to a pure public good for low numbers of inhabitants in the area under consideration. The data also shows that the marginal cost of providing security with respect to a changing population size passes the average cost at some threshold level, and further increases thereafter. It is therefore unsurprising that city states usually end up with a lower provision of this public good.

The structure of our model is similar to the model of two islands of unequal size in Stiglitz (1977) that deals with the provision of local public goods. It also takes up some ideas of Hochman's (1981) city-country framework without imposing region-specific production functions. Our assumptions on the production technology and the cost function of the publicly provided good reflect widely believed or well-known features of the differences between cities and regions with a low population density. External economies of scale allow the factor prices for labor and land to be higher in jurisdictions with a high population density than in the less densely populated areas. This captures the stylized fact that wages and rents are usually larger in cities than in regions with a low population density. Furthermore, we take for granted what is supposed by the legislator of the fiscal equalization system: the unit cost of the provision of public services rises with increasing population.[5] These two factors can explain why we observe a stable scheme of cities surrounded by areas with a lower population density. While a symmetrically distributed population would not exploit the advantages of agglomeration, the growth of cities is limited by problems of congestion. The idea that the growth of cities is driven by economies of scale and scope but limited by congestion is not new. In fact, it can be traced back to analyses of optimum city sizes by

[4]Brecht (1932) put forward the inductive rule that local expenditure increase more than proportionally with the number and density of population. He claimed that this structure mirrors a unit cost for the provision of local public goods lying above average in high density areas.

[5]The increasing cost per capita is put down to a growing rivalry between the users of the public goods. Hence, the provision cost increases more than proportional to the population in order to guarantee an equal supply (Wellisch (2000); Wildasin (1986), chapter 2).

the ancient Greek philosophers Plato and Aristotle (see Papageorgiou and Pines, 2000, and the references cited therein).

We show that cities should not receive transfers on the grounds of a higher cost of provision if emigration does not increase the welfare of those left behind in regions with a lower population density. In this situation, the city must already be beyond the level of optimum agglomeration, where further immigration would reduce the welfare of the people due to sharply increasing costs of congestion.

The remainder of the paper is organized as follows. Section 2 introduces the model. The concepts of equilibrium and stability are discussed in section 3. The following two sections 4 and 5 deal with the choice of tax rates and fiscal equalization on the regional and national level, respectively. Section 6 discusses the main findings.

2 The Model

We consider two regions, namely the city, labeled by an index i, and the country, denoted by an index o. The two regions differ with respect to their land endowment L_j, where $L_o > L_i > 0$ holds. The total number of inhabitants is N with $N = N_i + N_o$, where N_j denotes the population of region j. Each individual has to decide whether she would like to live in the country or in the city. She supplies one unit of labor in her preferred region j and receives the net wage $(1-t)w_j$. While the gross wage rate w differs across regions, the payroll tax rate t, set by the central government, is uniform. An individual living in region j consumes x_j units of the ordinary private good and z_j units of the publicly provided goods in the same region. Her utility function $U(x_j, z_j)$ is strictly increasing in both arguments and strictly concave. It is convenient to interpret the publicly provided good as a private good. Alternatively, it can also be seen as an impure public good, where the cost of provision increases in the number of people living in the region. Each individual owns the same amount of land in both regions and earns a net rent $\frac{(1-\tau_i)\rho_i L_i + (1-\tau_o)\rho_o L_o}{N}$, where ρ_j is the gross rent per unit of land in region j, while τ_j represents the region-specific rent tax rate. An individual spends her income on private consumption:

$$x_j = (1-t)w_j + \frac{(1-\tau_i)\rho_i L_i + (1-\tau_o)\rho_o L_o}{N}. \quad (1)$$

Firms produce the ordinary private good X and the publicly provided good Z by using labor N and land L. The total output of a representative firm in region j is given by

$$Y_j = A(n_j)F(N_j, L_j).$$

The neoclassical production function F exhibits constant returns to scale and diminishing marginal products. Moreover, there exists an external agglomeration advantage captured by A. This externality depends on the labor-land ratio in production, $n_j \equiv \frac{N_j}{L_j}$, where $A' > 0$ and $A'' < 0$ holds. Among others, the agglomeration advantage can be caused by improved communication and an increasing variety of goods and inputs. Black and Henderson (1997) line out some reasons for local economies of population density. Having more firms in the same industry in a city improves the efficiency of each firm because the information exchange between firms about inputs, product lines and organization is better. A higher accessibility to education facilities in a city enhances a firm's efficiency over time by local human capital accumulation (Glaeser and Maré, 2001). Several alternative explanations for the existence of agglomeration economies are discussed by Krugman (1991), Fujita and Thisse (1996), and Capella and Camagni (2000). The production function can be rewritten in the intensive form as

$$y_j \equiv \frac{Y_j}{L_j} = A(n_j)f(n_j),$$

where $f' > 0$ and $f'' < 0$ hold. The firm views itself as having a constant returns to scale production function. This preserves exhaustion of firm revenue by factor payments. Hence, each factor is paid according to its respective marginal productivity where changes in the scale parameter A are not taken into account. We have

$$w_j = A(n_j)f'(n_j) \quad (2)$$

and

$$\rho_j = A(n_j)\left[f(n_j) - n_j f'(n_j)\right]. \quad (3)$$

The stylized fact that factor prices are higher in the region with higher density of population is captured by the assumption

$$\frac{\partial w_j}{\partial n_j} = A'(n_j)\, f'(n_j) + A\,(n_j)\, f''\,(n_j) > 0, \tag{4}$$

while

$$\frac{\partial \rho_j}{\partial n_j} = A'(n_j)\,(f\,(n_j) - n_j f'(n_j)) - A\,(n_j)\, n_j f''\,(n_j) > 0$$

always holds. The rent is supposed to be elastic with respect to the population density, that is

$$\frac{\partial \rho_j}{\partial n_j}\frac{n_j}{\rho_j} = \frac{n_j\,(A'(n_j)\,(f\,(n_j) - n_j f'(n_j)) - A\,(n_j)\, n_j f'(n_j))}{A(n_j)(f(n_j) - n_j f'(n_j))} > 1. \tag{5}$$

The unit cost of producing the public good, c, depends on the population density of the region, n_j, with $\frac{dc(n_j)}{dn_j} > 0$ and $\frac{d^2c(n_j)}{dn_j^2} > 0$. This indicates that congestion increases the marginal cost of the publicly provided good. Total production in region j is divided into production of the ordinary private good X_j and production of the publicly provided good Z_j. Thus, $Y_j = X_j + c(n_j)Z_j$ is valid. Since individuals are identical, we have

$$\begin{aligned} X_j &= N_j x_j, \\ Z_j &= N_j z_j. \end{aligned}$$

The publicly provided goods are financed by the collected tax revenue and a transfer S_j by the central government, where $S_i + S_o = 0$:

$$c(n_j)Z_j - tw_j N_j - \tau_j \rho_j L_j - S_j = 0. \tag{6}$$

The indirect utility function of an individual living in region j is given by

$$\begin{aligned} & V\,(w_j, \rho_i, \rho_o, t, \tau_i, \tau_o, S_j, N_j) \\ = \;& U\left((1-t)\,w_j + \sum_k (1-\tau_k)\,\rho_k \frac{L_k}{N};\; \frac{tw_j + \frac{\tau_j \rho_j}{n_j} + \frac{S_j}{N_j}}{c\,(n_j)}\right). \end{aligned} \tag{7}$$

The sequence of events is as follows. First, the central government decides on the wage tax t and the transfer S_i. Next, the two regional authorities simultaneously set the rent tax rates τ_i and τ_o. At given policy parameters the individuals then decide where to live, work, and consume.

3 Existence and Stability of Equilibria

The concepts of migration equilibrium and stability follow the classic treatment in Stiglitz (1977).

Definition: *A migration equilibrium is an allocation with $V_j \geq V_k$ should some individuals live in region j. A migration equilibrium is called stable if $\frac{\partial V_i}{\partial N_i} < \frac{\partial V_o}{\partial N_i}$ is valid at the equilibrium. It is unstable should $\frac{\partial V_i}{\partial N_i} > \frac{\partial V_o}{\partial N_i}$ hold.*

In a migration equilibrium no individual can increase her utility by changing her residence. A migration equilibrium is stable if in any situation close to the equilibrium the migration incentive directs the economy towards the migration equilibrium. Given a symmetry of policy parameters, i.e. $\tau_i = \tau_o$ and $S_i = S_o = 0$, a symmetric migration equilibrium with identical population density ($n_i = n_o$) obviously always exists. However, it is not necessarily stable. A symmetric equilibrium is unstable if

$$\frac{\partial V_i}{\partial N_i} - \frac{\partial V_o}{\partial N_i} = \frac{\partial U}{\partial x}\left[\frac{\partial x_i}{\partial N_i} - \frac{\partial x_o}{\partial N_i}\right] + \frac{\partial U}{\partial z}\left[\frac{\partial z_i}{\partial N_i} - \frac{\partial z_o}{\partial N_i}\right] > 0. \tag{8}$$

Using the assumption $\frac{\partial w_j}{\partial n_j} > 0$, the sign of $\frac{\partial x_i}{\partial N_i} - \frac{\partial x_o}{\partial N_i}$ is positive:

$$\frac{\partial x_i}{\partial N_i} - \frac{\partial x_o}{\partial N_i} = (1-t)\left(\frac{1}{L_i} - \frac{1}{L_o}\right)\left(A'(n)\, f'(n) + A\,(n)\, f''\,(n)\right) > 0. \tag{9}$$

The term $\frac{\partial z_i}{\partial N_i} - \frac{\partial z_o}{\partial N_i}$ is given by:

$$\frac{\partial z_i}{\partial N_i} - \frac{\partial z_o}{\partial N_i} = \left(\frac{1}{L_i} - \frac{1}{L_o}\right)\left[\frac{t\frac{\partial w}{\partial n} + \frac{\tau}{n}\left(\frac{\partial \rho}{\partial n} - \frac{\rho}{n}\right)}{c\,(n)} - \frac{tw + \tau\frac{\rho}{n}}{(c\,(n))^2}\frac{\partial c}{\partial n}\right]. \tag{10}$$

This expression is positive if the change of the unit cost of the publicly provided good with respect to the population density is negligible at the symmetric equilibrium and, in addition, the land rent is elastic with respect to this density, that is $\frac{\partial \rho}{\partial n}\frac{n}{\rho} > 1$.

The symmetric equilibrium will generally not be stable if strong scale economies prevent the wage rate from falling with an increasing labor force. At the same time, congestion represents no problem. In other words, both regions are below the level of optimum agglomeration.

Let the structure of the utility function be such that the level of $c\left(\frac{N}{L_i}\right)$ is sufficiently high to generate $\lim_{N_i \to N} V_i(N_i) < \lim_{N_i \to N} V_o(N_i)$. Consumption per capita of the ordinary private good in the region with the higher population density must exceed the respective level in the other region. The inequality will hold if (i) a high marginal cost implies a low provision per capita in the city state should the population be concentrated in this region, and (ii) the publicly provided good has a high weight in the utility function. If the inequality holds, and if we have an unstable symmetric equilibrium, a stable migration equilibrium with $n_i > n_o$ must exist.

Insert Figure 1 about here

Figure 1 depicts a situation with an unstable symmetric migration equilibrium at $N_i = N_0$ and two stable migration equilibria at $N_i = 0$ and at $N_i = N_1$. In the following we will confine our attention to a stable asymmetric equilibrium characterized by a higher population density in the city. We ignore the possibility of a stable migration equilibrium with a higher population density in the country. This approach seems to be reasonable if the country is too large to exploit economies of scale to a substantial extent. In other words, we suppose that the country must necessarily remain below the point of optimum agglomeration.

4 Regional tax rates

Both regions determine their rent taxes rates so as to maximize utility of its citizens. The first-order condition for the optimum rent tax rate of the city is

$$\begin{aligned} \frac{dU_i}{d\tau_i} &= U_x^i \frac{dx_i}{d\tau_i} + U_z^i \frac{dz_i}{d\tau_i} + U_{N_i}^i \frac{dN_i}{d\tau_i} \\ &= -U_x^i \frac{\rho_i L_i}{N} + U_z^i \frac{\rho_i / n_i}{c(n_i)} + U_{N_i}^i \frac{dN_i}{d\tau_i} \left\{ \begin{array}{l} \leq 0 \text{ if } \tau_i^* = 0, \\ = 0 \text{ if } \tau_i^* \in (0,1), \\ \geq 0 \text{ if } \tau_i^* = 1. \end{array} \right\} \end{aligned} \tag{11}$$

Increasing the rent tax rate reduces private consumption, but raises the production of the publicly provided good. Since ordinary private consumption is reduced in both regions by the same amount, the higher tax rate causes an inflow of workers.

Without migration response we have the usual overprovision of the publicly provided good:

$$\frac{U_z^i}{U_x^i} = \frac{N_i}{N} c(n_i) < c(n_i).$$

The marginal rate of substitution between the two goods falls short of the marginal rate of transformation. This result is due to the fact that foreigners have to pay taxes while they do not share the benefits of the public provision. However, the chosen tax rate need not be equal to its maximum $\tau = 1$. First, a high rent tax rate may be associated with a low level of ordinary private consumption, in particular if t, the tax rate on labor income, is high. Second, induced immigration can be detrimental for the natives if congestion offsets positive externalities in production. The migration equilibrium is given by

$$\begin{aligned} & U\left((1-t) w_i + \sum_j (1-\tau_j) \rho_j \frac{L_j}{N}; \frac{t w_i + \tau_i \rho_i / n_i + S_i / N_i}{c(n_i)} \right) \\ = \; & U\left((1-t) w_o + \sum_j (1-\tau_j) \rho_j \frac{L_j}{N}; \frac{t w_o + \tau_o \rho_o / n_o + S_o / N_o}{c(n_o)} \right). \end{aligned} \tag{12}$$

The migration response to a changing rent tax can be found by totally differentiating this equilibrium condition.

$$\frac{dN_i}{d\tau_i} = \frac{U_x^i \frac{\rho_i L_i}{N} - U_x^o \frac{\rho_i L_i}{N} - U_z^i \frac{\rho_i / n_i}{c(n_i)}}{U_{N_i}^i - U_{N_i}^o}. \tag{13}$$

Since $U_{N_i}^i - U_{N_i}^o < 0$ has to hold for any stable migration equilibrium in which the two regions are populated, it follows that $\frac{dN_i}{d\tau_i} > 0$ if $U_x^o \geq U_x^i$ is valid.

Proposition 1 *In a stable asymmetric equilibrium the city sets its rent tax rate equal to zero if the marginal utility of consumption in the country is higher than in the city state and emigration does not increase the utility levels of those left behind in the country.*

Proof. Inserting (13) into (11) shows that the city state will set $\tau_i^* = 0$ if

$$\begin{aligned} & \left(U_x^i \frac{\rho_i L_i}{N} - U_x^o \frac{\rho_i L_i}{N} - U_z^i \frac{\rho_i / n_i}{c(n_i)} \right) U_{N_i}^i \\ > \quad & \left(U_{N_i}^i - U_{N_i}^o \right) \left(U_x^i \frac{\rho_i L_i}{N} - U_z^i \frac{\rho_i / n_i}{c(n_i)} \right), \end{aligned} \tag{14}$$

which is equivalent to

$$U_{N_i}^o \left(U_x^i \frac{c(n_i) L_i}{N} - U_z^i \frac{1}{n_i} \right) - U_{N_i}^i U_x^o \frac{c(n_i) L_i}{N} > 0. \tag{15}$$

By using the assumption $U_x^o > U_x^i$, the following inequality holds:

$$U_x^o \frac{c(n_i) L_i}{N} > U_x^i \frac{c(n_i) L_i}{N} - U_z^i \frac{1}{n_i}. \tag{16}$$

Recalling the sufficient condition for an asymmetric stable migration equilibrium, $U_{N_i}^o > U_{N_i}^i$, the second assumption $U_{N_i}^o < 0$ yields

$$U^o_{N_i}\left(U^i_x\frac{c\,(n_i)\,L_i}{N}-U^i_z\frac{1}{n_i}\right)>U^i_{N_i}U^o_x\frac{c\,(n_i)\,L_i}{N}, \tag{17}$$

which implies inequality (14). □

The intuition for this result is as follows. The tax export effect which tends to raise the rent tax rate in the city is more than offset by the negative congestion effect of increasing rent taxes. As the migration response shows, a rising rent tax rate would induce further migration to the city which is already overpopulated. This migration internalizes the externalities of the tax export. The condition $U^o_x \geq U^i_x$ will generally hold. Since consumption per capita of the ordinary private good x in the city will always exceed the corresponding level in the country, the condition would be satisfied if, for example, the utility function exhibits additive separability. The second assumption, $U^o_{N_i} < 0$, states that marginal indirect utility with respect to population in the country is positive. Put differently, the country is below its point of optimum agglomeration.

5 Wage tax and fiscal equalization

The central authority maximizes the utility level of the individuals with respect to both its instruments, the wage tax rate t and the transfers $S_i = -S_o$. Taking into account the envelope theorem and recalling that $\tau_i = 0$, the first-order condition for the optimum wage tax rate in case of an interior solution is given by

$$\frac{\partial U_o}{\partial t}=-U^o_x w_o+U^o_z\frac{w_o}{c(n_o)}+U^o_{N_i}\frac{\partial N_i}{\partial t}, \tag{18}$$

where

$$\frac{\partial N_i}{\partial t}=\frac{[-U^i_x+\frac{U^i_z}{c(n_i)}]w_i-[-U^o_x+\frac{U^o_z}{c(n_o)}]w_o}{U^o_{N_i}-U^i_{N_i}} \tag{19}$$

can be derived from the migration equilibrium condition (12). A higher wage tax rate reduces consumption of the private good in the city state to a larger extent than in the country. At the same time, expenditure per capita of the publicly provided good in the city increases by a higher amount than in the country. This reallocation induces migration, as expressed by $\frac{\partial N_i}{\partial t}$. The

direction of migration remains open and depends on the absolute values of the opposite incentives.

Now we turn to the welfare implications of the fiscal transfers between the states. Starting in a situation with no fiscal transfers ($S_i = S_o = 0$) the marginal utility of the country with respect to the fiscal equalization transfer to the city is given by:

$$\frac{dU_o}{dS_i} = U_z^o \frac{\partial z_o}{\partial S_i} + U_{N_o}^o \frac{\partial N_o}{\partial S_i} + (U_x^o \frac{\partial x_o}{\partial \tau_o} + U_z^o \frac{\partial z_o}{\partial \tau_o} + U_{N_o}^o \frac{\partial N_o}{\partial \tau_o}) \frac{\partial \tau_o}{\partial S_i} \tag{20}$$

provided that both regions remain populated. Note that $\frac{\partial \tau_o}{\partial S_i} = 0$ holds if either $\tau_o \geq 0$ or $\tau_o \leq 1$ are binding, while $U_x^o \frac{\partial x_o}{\partial \tau_o} + U_z^o \frac{\partial z_o}{\partial \tau_o} + U_{N_o}^o \frac{\partial N_o}{\partial \tau_o} = 0$ is valid in the opposite case. Increasing the transfer to the city reduces the supply of the publicly provided good in the country and raises the provision of this good in the city. Consequently, migration towards the city will occur. Totally differentiating the migration equilibrium condition (12) shows that

$$\frac{\partial N_o}{\partial S_i} = -\frac{U_z^i \frac{1}{N_i c(n_i)} + U_z^o \frac{1}{N_o c(n_o)}}{U_{N_o}^i - U_{N_o}^o} < 0, \tag{21}$$

with $S_i = -S_o$ and $U_{N_o}^i - U_{N_o}^o > 0$ in a stable migration equilibrium.

Proposition 2 *If emigration does not increase the utility levels of those left behind in the country, introducing a transfer to be paid by the city enhances welfare.*

Proof. Introducing a transfer to be paid by the city state is beneficial if and only if

$$\frac{dU_o}{dS_i} = -U_z^o \frac{1}{N_o c(n_o)} - U_{N_o}^o \frac{U_z^i \frac{1}{N_i c(n_i)} + U_z^o \frac{1}{N_o c(n_o)}}{U_{N_o}^i - U_{N_o}^o} < 0 \tag{22}$$

holds at $S_i = 0$. This condition is equivalent to

$$-U_{N_o}^i U_z^o \frac{1}{N_o c(n_o)} < U_{N_o}^o U_z^i \frac{1}{N_i c(n_i)}. \tag{23}$$

Recalling that $U^i_{N_o} > U^o_{N_o}$ is valid at any stable migration equilibrium, $U^o_{N_o} \geq 0$ ensures that the condition is met. □

The condition of the proposition states that the country must be below the point of optimum agglomeration before fiscal equalization is introduced. Noting that the country exhibits a lower population density than the city state in the asymmetric migration equilibrium considered here, the condition is not very restrictive. A stable migration equilibrium then requires that the city state is already beyond the level of optimum agglomeration. If the city state pays a small transfer to the country, some people will leave the city. The individuals in the country will be better off due to the transfer. At the same time, their utility levels will not be reduced by immigration. Since the migration equilibrium condition ensures that utility is the same irrespective of the residence of the individual, the people remaining in the city will also experience a gain.

Proposition 2 has far-reaching implications. The argument that city states should receive transfers due to a higher unit cost of producing publicly provided goods is clearly wrong. The higher cost is not only a sign of congestion. Given that individuals are mobile, the city state must already be overcrowded in any stable migration equilbrium. If cities do receive transfers in such a situation, congestion in the city becomes stronger, while states with a lower population density lose capacities to exploit economies of scale.

6 Conclusions

It has been shown that a fiscal equalization scheme, implying a transfer from regions with a low marginal cost of producing publicly provided goods to jurisdictions with a higher marginal cost will generally lead to a deterioration of welfare. The transfer will induce some migration towards the receiving jurisdiction. If the reason for the higher marginal cost of provision in the city state is some type of congestion, overcrowding becomes worse, thus further increasing the cost of provision. Given that those left behind in the region displaying the lower population density lose due to both outmigration and the transfer, and given that the resulting allocation constitutes a migration equilibrium, all individuals must lose. If only differences in the cost of provision justify fiscal equalization, welfare can be enhanced by requiring city states to pay transfers to other states.

Obviously, our study does not imply that fiscal equalization schemes in which city states receive transfers to be paid by larger states are generally inefficient. It may still by the case that a substantial extent of consumption of public goods and publicly provided private goods in cities by citizens of neighboring states justifies paying a positive transfer to the city. The analysis suggests, however, that the cities should not be fully compensated for these externalities.

The proposition that a federal authority is not needed in order to achieve the efficient fiscal transfer, brought forward by Myers (1990), should also apply in our framework. If the city state takes the migration responses into account, its interest to limit its population will induce the acceptance of a transfer towards the low density state. Noting the other arguments in favor of transfers in the opposite direction, the ongoing resistance of cities against cutting their privileges does not necessarily contradict this theorem.

A limitation of our model is the assumption of equal land distribution among all individuals. Although the common ownership assumption can often be found in the literature,[6] this somewhat socialistic setting is unrealistic. Since the model predicts higher net earnings in the city, wealth will not be equally distributed. In equilibrium, the value of land possessed by an inhabitant of the city should exceed the value of land owned by a representative individual in the country. Modeling the interaction between the distribution of land ownership and regional taxation decisions would be a complicated task, however.

Another question that arises is why a city state should ever grow beyond the optimum level of agglomeration provided that a similar city of optimum size can be created in a larger state. Leaving aside the possibility that such a structure does not serve the interests of the individuals living in the larger state, the big city may just not be replicable. As Papageorgiou and Pines (2000) point out, cities are often located at very favorable geographical sites. Hence, creating a city of the same size somewhere else will generally not be associated with similar advantages of agglomeration.

[6] See e.g. Flatters et al. (1974) and Wellisch (2000, chapter 6).

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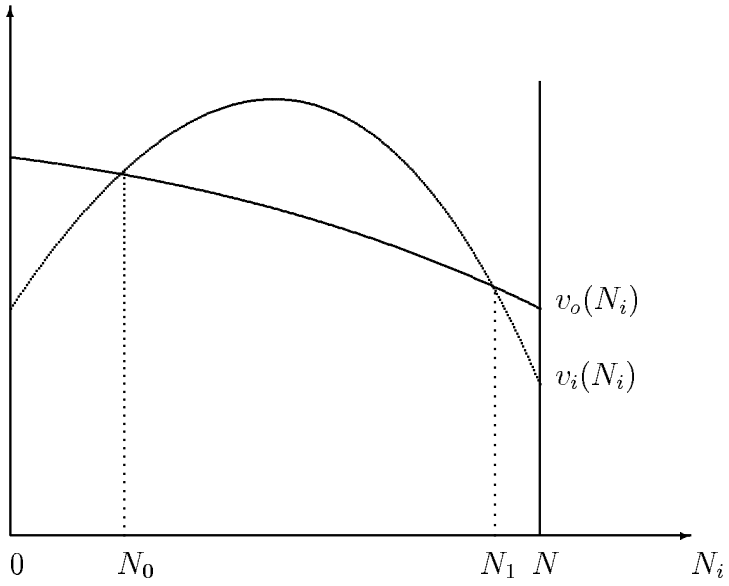

Figure 1: Indirect utility levels with $S_i = 0$