**<u>Working Paper No 49/00</u>**

**Agglomeration, tax competition and local public goods supply**

**by**
**Eva Benedicte Norman**
**Victor D. Norman**

SNF project no 1070
"Internationalisation and economic policy"

The project is financed by the Research Council of Norway
Grant no 124559/510

SIØS - Centre for International Economics and Shipping

FOUNDATION FOR RESEARCH IN ECONOMICS AND BUSINESS ADMINISTRATION
BERGEN, SEPTEMBER 2000
ISSN 0803 - 4028

*SIØS - CENTRE FOR INTERNATIONAL ECONOMICS AND SHIPPING*

SIØS – Centre for international economics and shipping – is a joint centre for The Norwegian School of Economics and Business Administration (NHH) and The Foundation for Research in Economics and Business Administration (SNF). The centre is responsible for research and teaching within the fields of international trade and shipping.

*International Trade*

The centre works with all types of issues related to international trade and shipping, and has particular expertise in the areas of international real economics (trade, factor mobility, economic integration and industrial policy), international macroeconomics and international tax policy. Research at the centre has in general been dominated by projects aiming to provide increased insight into global, structural issues and the effect of regional economic integration. However, the researchers at the centre also participate actively in projects relating to public economics, industrial policy and competition policy.

*International Transport*

International transport is another central area of research at the centre. Within this field, studies of the competition between different modes of transport in Europe and the possibilities of increasing sea transport with a view to easing the pressure on the land based transport network on the Continent have been central.

*Maritime Research*

One of the main tasks of the centre is to act as a link between the maritime industry and the research environment at SNF and NHH. A series of projects that are financed by the Norwegian Shipowners Association and aimed directly at shipowning firms and other maritime companies have been conducted at the centre. These projects include studies of Norwegian shipowners' multinational activities, shipbuilding in Northern Europe and the competition in the ferry markets.

**Human Resources**

The centre's human resources include researchers at SNF and affiliated professors at NHH as well as leading international economists who are affiliated to the centre through long-term relations. During the last few years the centre has produced five PhDs within international economics and shipping.

**Networks**

The centre is involved in several major EU projects and collaborates with central research and educational institutions all over Europe. There is particularly close contact with London School of Economics, University of Glasgow, The Graduate Institute of International Studies in Geneva and The Research Institute of Industrial Economics (IUI) in Stockholm. The staff members participate in international research networks, including Centre for Economic Policy Research (CEPR), London and International Association of Maritime Economists (IAME).

## Introduction

The purpose of this paper is to develop a framework for analysing local public goods supply and tax competition between jurisdictions in a context where there are gains from geographic agglomeration and where labour is imperfectly mobile. Thus, the paper brings together the literature on local public finance (Tiebout (1956), Williams (1966), Aaron (1969)) and the so-called new economic geography literature (Krugman (1991), Krugman and Venables (1995), Venables (1996)), and it does so in a "European" context in which there are strong preferences for place of residence, and correspondingly limited mobility of individuals (Faini et.al. (2000)).

We capture agglomeration gains in the simplest possible manner, by assuming that individuals consume a bundle of locally produced, differentiated products, produced by monopolistically competitive firms and modelled along Spence-Dixit-Stiglitz lines. Because consumers value variety, and the range of products available will be larger the larger the local market, this creates agglomeration gains. These will be reinforced if there are economies of scale in the supply of goods provided by local authorities -- i.e. if local authorities provide pure public goods or private goods with scale economies.

The agglomeration forces are counteracted by residential preferences. We assume that individuals differ both as to where they prefer to work and live, and in the degree to which they prefer one place to another. To simplify, we capture this by an index measuring how highly a consumer values a particular choice, and by assuming a uniform distribution of individuals across this index. All individuals are assumed to have the same utility function defined over this index, the supply of public goods, and consumption of private, differentiated goods.

In the paper, we use this framework to look at a two-community equilibrium. Labour is the only factor of production in the model, and individuals have to make a joint decision on where to work and live. Equilibrium obtains when the marginal resident has nothing to gain from moving to the other community. There are clearly two possible outcomes. One is agglomeration in one community. That will happen if the agglomeration gains are sufficiently strong relative to the dispersion and intensity of residential preferences. The other possibility, on which we focus, is that the loss in residential surplus that the marginal individual would incur by moving, is greater than the marginal gain from agglomeration. In that case, there will be a stable, interior equilibrium -- i.e. geographical dispersion.

In an interior equilibrium, each community will gain by attracting new residents. Thus, the framework lends itself to the study of competition for residents between communities. The instruments available are publicly provided goods and local tax rates. We assume that no discrimination is possible, so all publicly provided goods are provided in equal quantities to all residents and everyone pays the same tax. If so, a community can only make itself more attractive to new residents if marginal residents differ from non-marginal ones in their willingness to pay for public goods. If potential immigrants are more tax-averse than current residents, a community can attract new residents by reducing the supply of public goods and lowering tax rates; if they value public goods more highly than the natives, immigration will be stimulate by raising taxes and increasing the public goods supply.

The resulting game between the communities will, therefore, be systematically biased towards overprovision of publicly provided goods that the most mobile individuals value more highly than the less mobile ones, and towards underprovision of publicly provided goods with the opposite characteristic. Whether or not there will be a bias towards lower tax rates, depends on whether the willingness to pay for the average publicly provided good increases or decreases with the mobility of the individual.

Results of this type are not new, and they are easily derived from models with purely fiscal externalities; i.e. models in which more residents are attractive because they provide a broader tax base. What is new, is that the results hold even if there are no economies of scale in the publicly provided goods; i.e. even if local authorities provide purely private goods produced with constant returns to scale. As most goods provided by local authorities are of that kind, we feel that our model is a more meaningful framework for understanding the nature of competition between communities than models that focus on purely fiscal externalities.

**The general model**

The model has $L$ individuals, each endowed with one unit of labour, which is the only factor of production. Individuals are mobile between communities, and move to the community where their total utility will be highest.

*Preferences and consumer choice*

The utility of an individual depends on three factors: the place of residence, the consumption of publicly provided local goods, and the consumption of private goods.

The utility person $h$ gets when living in community $i$ is

(1) $$U_i^h = U\left(\alpha_i^h, g_i, c_i\right),$$

where $\alpha_i^h$ measures the intensity of his preference for living in community $i$ (assumed to differ between individuals); and where $g_i$ and $c_i$ denote his consumption of publicly provided and private goods, respectively.

We take $g_i$ to be a single good provided in equal quantities to all residents by the local authority in community $i$. It could be a pure public good or a private good with or without economies of scale in production. Publicly provided goods are financed by local taxes, levied in a non-discriminatory fashion on local residents.

Private goods are not traded, which means that consumers are limited to the range of locally produced goods. Consumption of private goods, $c_i$, is an aggregate of differentiated products. It will be the same for all individuals living at $i$, since they all supply the same amount of labour, pay the same amount in taxes, and face the same prices and product range.

We model product differentiation in the original Spence-Dixit-Stiglitz fashion. Let $e_{ki}$ be per capita consumption of variety $k$ in community $i$, and let $\varphi(e_{ki})$ be the subutility from consuming this amount. We make the usual assumptions about $\varphi(e_{ki})$; it is an increasing and concave function ($\varphi' > 0$; $\varphi'' < 0$). The consumption aggregate $c_i$, which may be thought of as a quantity index, is defined as

(2) $$c_i \equiv \sum_{k=1}^{n_i} \varphi(e_{ki})$$

where $n_i$ is the number of different varieties produced in community $i$.

Let $x_{ki}$ denote total production of variety $k$ in community $i$. As private goods are not traded, and everyone within the community consumes equal amounts of private goods, per capita consumption of variety $k$ must be

(3) $$e_{ki} = \frac{x_{ki}}{L_i},$$

where $L_i$ is the number of consumers in community $i$. Inserting (3) into (2) gives per capita consumption of private differentiated goods as

(4) $$c_i = \sum_{k=1}^{n_i} \varphi\left(\frac{x_{ki}}{L_i}\right).$$

*The private sector*

In the private sector a number of identical firms produce differentiated consumption goods. There are increasing returns to scale in the production of each variety, and these are sufficiently high to ensure that each firm produces only one variety and that each variety is produced by one firm only. The number of firms thus equals the number of different varieties.

Utility maximisation gives the first order condition for optimal choice of $e_{ki}$ as

(5) $$U_c \varphi'(e_{ki}) = \lambda p_{ki},$$

where $p_{ki}$ is the price of variety $k$, and $\lambda$ the marginal utility of income.

Inserting (3) into (5) and rewriting gives the inverse demand functions

(6) $$p_{ki} = \frac{U_c}{\lambda} \varphi'\left(\frac{x_{ki}}{L_i}\right),$$

where $x_{ki}$ is the output of firm $k$.

Let $b(x_{ki})$ be the cost function of firm $k$. The profits are then

(7) $$\pi_{ki} = p_{ki}x_{ki} - b(x_{ki}).$$

We make Chamberlain's large-group assumption that the number of firms is so large that each firm takes the aggregate $c_i$ as given. From the point of view of an individual firm, the term $U_c/\lambda$ in equation (6) is then a constant. Inserting (6) into (7) gives the profits of firm $k$ as

(8) $$\pi_{ki} = \frac{U_c}{\lambda}\varphi'\left(\frac{x_{ki}}{L_i}\right)x_{ki} - b(x_{ki}).$$

The first order condition for profit maximisation, marginal revenue equals marginal cost, becomes

(9) $$p_{ki} + \frac{U_c}{\lambda}\varphi''\frac{1}{L_i}x_{ki} = b',$$

or, rewriting,

(10) $$p_{ki}\left(1+\frac{\varphi'' e_{ki}}{\varphi'}\right) = b'.$$

There is free entry and exit in the private sector. New firms will enter until the marginal firm earns zero profits. As firms are identical, the zero-profit condition must hold for all firms in equilibrium,

(11) $$\pi_{ki} = p_{ki}x_{ki} - b(x_{ki}) = 0,$$

which implies

(12) $$p_{ki} = \frac{b(x_{ki})}{x_{ki}}.$$

Both the marginal-revenue-equals-marginal-cost (equation (10)) and the zero-profit condition (equation (12)) must hold in equilibrium, which gives the following equilibrium condition:

(13) $$\frac{b'}{1+\frac{\varphi'' e_{ki}}{\varphi'}} = \frac{b}{x_{ki}}.$$

Here, $-\frac{\varphi'}{\varphi'' e_{ki}}$ is the elasticity of substitution between any two varieties of private goods.

Assume that the elasticity of substitution between any two varieties is constant and equal to $\sigma$. There are increasing returns to scale in the production of each variety, as represented by the linear labour-requirement function

(14) $$A + Bx_{ki}.$$

Total costs are nominal wages times labour input,

(15) $$b(x_{ki}) = w_i(A + Bx_{ki}).$$

Inserting (14) and (15) into (13) gives the following equilibrium condition:

(16) $$x_{ki} = \frac{A}{B}(\sigma - 1).$$

We are free to choose units such that

(17) $$A \equiv \frac{1}{\sigma}, \; B \equiv \frac{\sigma - 1}{\sigma}.$$

The supply of each firm is then

(18) $$x_{ki} = 1,$$

and the price of each variety

(19) $$p_{ki} = w_i.$$

Each firm supplies one unit of its exclusive variety, and the price of each variety is equal to the nominal wage rate in the community.

Note that the labour requirement of each firm is (inserting (17) and (18) into (14))

(20) $A + Bx_{ki} = 1$.

One unit of labour is needed to produce one unit of each variety. $n_i$ thus denotes the number of firms, the number of different varieties and the number of workers in the private sector.

*The public sector*

The residents of each community are provided with some local public goods; pure public goods or publicly provided private goods. Everyone living in a community consumes the same amount, $g_i$, of these goods. The production of local public goods is financed by a local tax levied on the residents of the community. Everyone living in a community pays the same amount of taxes.

Labour is the only factor of production. Let $h(L_i)g_i$ be the labour requirement function of the public sector. The nature of local public goods, whether they are pure public goods or publicly provided private goods, is reflected in the term $h(L_i)$.

If $h'(L_i) = 0$, then $g_i$ is a pure public good, i.e. a good for which there is no rivalry in consumption. If $h'(L_i) > 0$, $g_i$ is a publicly provided private good in the sense that if one more person is to consume the good, others must reduce their consumption, everything else equal. One reason for the government to supply private goods is that there are increasing returns to scale in the production of these goods. That will be the case when $h(L)/L$ is decreasing in $L_i$.

*Population and real income*

There are $L_i$ inhabitants in community $i$, of which $h(L_i)g_i$ work in the public sector. The number of workers in the private sector is therefore $L_i - h(L_i)g_i$. The number of private firms equals the number of workers in the private sector, so the number of private firms must also be $n_i = L_i - h(L_i)g_i$.

Inserting for $n_i$ and $x_{ki}$ in equation (4), we see that per capita consumption of private goods is

$$(21)\qquad c_i = [L_i - h(L_i)g_i]\varphi\left(\frac{1}{L_i}\right) \equiv c^i(g_i, L_i).$$

Note that

$$(22)\qquad \frac{\partial c^i}{\partial g_i} = -h(L_i)\varphi\left(\frac{1}{L_i}\right) < 0.$$

The effect of increasing the provision of public goods per capita, everything else equal, is that the consumption of differentiated goods per capita is reduced. The production of local public goods is financed by an equal tax on the residents of the community. As the production of public goods increase, so does the costs of public goods production. This leads to increased taxes per capita as long as the number of inhabitants remains unchanged. After-tax income is therefore reduced, leading to reduced consumption of differentiated goods. The tax effect is equivalent to $h(L_i)$ units of labour. Because output per firm is given, the entire reduction in private consumption takes the form of a reduction in the number of product varieties available. Increased public employment gives a one-to-one reduction in the number of private firms, and thus in the number of product varieties. This is reflected in the term $\varphi(1/L_i)$ in (22). Note that this means that the social marginal cost of publicly provided goods is higher than the private marginal cost, which is simply $h(L_i)$.

From (21) we also find the relationship between private consumption and the size of the community:

$$\frac{\partial c^i}{\partial L_i} = \left(L_i - hg_i\right)\left(-\varphi'\frac{1}{L_i}\right) + \varphi\left(1 - h'g_i\right)$$

i.e.

$$(23)\qquad \frac{\partial c^i}{\partial L_i} = \frac{c_i}{L_i}\left[\left(1-\beta\right) + \left(\frac{g_i\left[\left(h/L_i\right) - h'\right]}{1 - g_i(h/L_i)}\right)\right] > 0 \text{ with } \beta \equiv \frac{\varphi' e_i}{\varphi}$$

This has an instructive interpretation. The term *(1-β)* captures the real, positive externality -- i.e. gain from agglomeration: More residents means a larger local market, and thus a wider selection of products. It also means that consumption of each variety is reduced, but the net effect is positive. The second term in brackets captures the fiscal externality. If there are economies of scale in the production of publicly provided goods, the marginal labour requirement will be lower than the average requirement, so the second term will be positive. The economic reason is simply that more people in that case means lower taxes per capita.

Inserting (21) into (1) gives the utility of individual $h$ in community $i$ as

(24) $$U_i^h = U\left(\alpha_i^h, g_i, c^i(g_i, L_i)\right).$$

**Migration and geographic equilibrium**

Now, consider a country consisting of two communities. Each local community is formally like the one described in the previous section. In each community there are two sectors, private and public, producing locally consumed goods. Publicly provided goods are financed by local taxation, whereas the after-tax wage is used for consumption of private differentiated goods. People are mobile between communities, and settle in the community where their total utility will be highest. Total utility depends on consumption and on the place of living per se. To proceed with the analysis we need to specify these locational preferences in some more detail.

Assume that the utility from living in community 1, $\alpha_1$, is distributed uniformly on the interval $\left[-(1/2),(1/2)\right]$, and that $\alpha_2 = -\alpha_1$. A person who values living in community 1 very highly ($\alpha_1$ is close to 1/2), has an equally strong dislike of living in community 2 ($\alpha_2$ is close to -1/2). The distribution of $\alpha_1$ is illustrated in figure 1. $\alpha_1$ is measured along the horisontal axis, and increases as we move from left to right. (As $\alpha_2 = -\alpha_1$, $\alpha_2$ is also measured along the horisontal axis, but increases as we move from right to left.) The total number of people in the country, $L$, is given by the total area under the curve $f(\alpha_1)$; i.e.

$$L = \int_{-\frac{1}{2}}^{\frac{1}{2}} f(\alpha_1) d\alpha_1 .$$

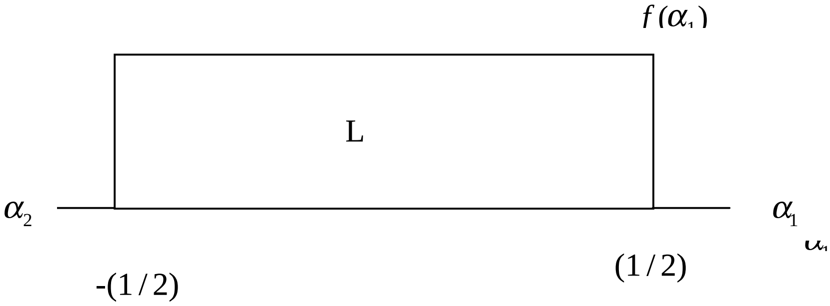


Figure 1

A person settles in community 1 iff $U(\alpha_1^h, g_1, c_1) > U(\alpha_2^h, g_2, c_2)$. This can give rise either to an interior equilibrium in which there are residents in both communities, or to complete agglomeration in one community. We focus on the former.

In an interior equilibrium, the utility of the marginal individual must be the same in both communities, so we must have

(25) $$U(\alpha_1^M, g_1, c_1) = U(-\alpha_1^M, g_2, c_2).$$

where $M$ denotes the marginal inhabitant. Let $F(\alpha_1^M)$ be the number of people for whom $\alpha_1 \geq \alpha_1^M$; i.e. $F(\alpha_1^M)$ is the number of inhabitants in community 1. From figure 2 we see that

$$L_1 = F(\alpha_1^M) = L - \int_{-\frac{1}{2}}^{\alpha_1^M} f(\alpha_1) d\alpha_1$$

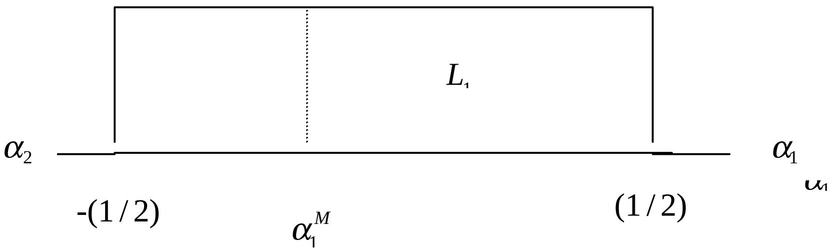


Figure 2

To find the critical value of $\alpha_1$, invert $F(\alpha_1^M)$:

$$\alpha_1^M = G(L_1)$$

Inserting for $\alpha_1^M$ in (25), the equilibrium condition becomes

$$U\big(G(L_1), g_1, c_1\big) = U\big(-G(L_1), g_2, c_2\big). \tag{26}$$

(26) does not necessarily ensure that the interior equilibrium is stable. If the utility difference $U_1^M - U_2^M$ increases with $L_1$, the equilibrium implied by (26) is unstable in the sense that a small deviation will induce massive immigration or emigration.

Thus, the condition for an interior equilibrium to be stable is that

$$\frac{d\Big[U\big(G(L_1), g_1, c^1(g_1, L_1)\big) - U\big(-G(L_1), g_2, c^2(g_2, L_2)\big)\Big]}{dL_1} < 0, \tag{27}$$

as depicted in figure 3. If the number of inhabitants in community 1 is larger (smaller) than $\hat{L}_1$, then $U_1^M < U_2^M$ ($U_1^M > U_2^M$) and emigration (immigration) will take place until $L_1 = \hat{L}_1$.

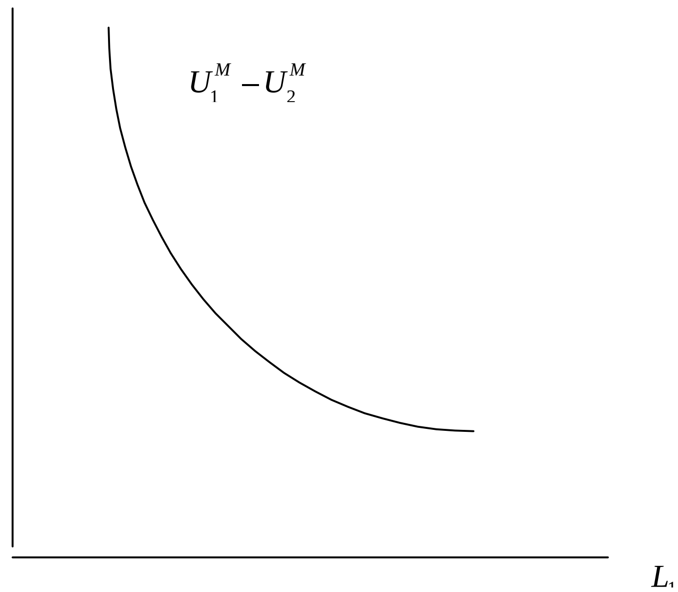


Figure 3

Carrying out the differentiation in (27) gives

$$(28)\qquad \left(U_\alpha^1 G_L + U_\alpha^2 G_L\right) + \left(U_c^1 \frac{\partial c^1}{\partial L_1} + U_c^2 \frac{\partial c^2}{\partial L_2}\right) < 0 .$$

Consider a symmetric equilibrium, so $U_\alpha^1 = U_\alpha^2 \equiv U_\alpha$ and $U_c^1 = U_c^2 \equiv U_c$. Equation (28) then reduces to

$$(29)\qquad 2U_\alpha G_L + 2U_c \frac{\partial c^i}{\partial L_i} < 0 .$$

We know that $F'(\alpha_1^M) = -f(\alpha_1^M) = -L$. As $\alpha_1^M = G(L_1)$, we get $G_L = -(1/L)$. Inserting for $G_L$ in (29), the stability condition for a symmetric equilibrium becomes

$$(30)\qquad -\frac{U_\alpha}{U_c}\frac{1}{L} + \frac{\partial c^i}{\partial L_i} < 0 .$$

This says that the marginal gain from agglomeration (which by (23) is the sum of the real and fiscal externalities) must be smaller than what individuals at the margin are willing to pay to live in their preferred community.

## Local public finance and tax competition

We now have the framework needed to discuss whether there will be over-, under-, or optimal supply of local public goods in a federal system of competing local communities, and whether the distribution of residents will be optimal.

*National optimum*

Consider first the national optimum. We shall not be concerned with distributional issues, so let us assume an additive national welfare function

$$(31)\qquad W = \int_{\hat{\alpha}_1}^{\frac{1}{2}} U\left(\alpha_1, g_1, c_1\right) f(\alpha_1) d\alpha_1 + \int_{-\frac{1}{2}}^{\hat{\alpha}_1} U\left(-\alpha_1, g_1, c_1\right) f(\alpha_1) d\alpha_1$$

The national optimum is found by maximising (31) with respect to $\alpha_1$, $g_1$ and $g_2$. Assuming an interior solution, the first order conditions for a national optimum are

$$\text{(32)} \qquad \frac{\partial W}{\partial \alpha_1} = -U(\alpha_1, g_1, c_1) f(\alpha_1) + U(-\alpha_1, g_2, c_2) f(\alpha_1) = 0$$

$$\text{(33)} \qquad \frac{\partial W}{\partial g_1} = \int_{\hat{\alpha}_1}^{\frac{1}{2}} \left[ U_g + U_c \frac{\partial c_1}{\partial g_1} \right] f(\alpha_1) d\alpha_1 = 0$$

$$\text{(34)} \qquad \frac{\partial W}{\partial g_2} = \int_{-\frac{1}{2}}^{\hat{\alpha}_1} \left[ U_g + U_c \frac{\partial c_2}{\partial g_2} \right] f(\alpha_1) d\alpha_1 = 0$$

Equation (32) says that the utility of the marginal inhabitant must be equal in the two communities, while (33) and (34) state the usual first order conditions regarding optimal supply of public goods: The sum of the marginal rates of substitution equals the marginal rate of transformation. Another way of writing (33) and (34) is

$$\text{(33´)} \qquad \frac{U_g^A}{U_c^A} = -\frac{\partial c^1}{\partial g_1},$$

$$\text{(34´)} \qquad \frac{U_g^A}{U_c^A} = -\frac{\partial c^2}{\partial g_2},$$

where $A$ refers to the average inhabitant. (The sum of the marginal rates of substitiution ($MRS_{g,c}$) equals the number of inhabitants times $MRS_{g,c}$ of the average inhabitant.)

*A decentralised equilibrium*

In a decentralised equilibrium we assume that the residents of a community decide on taxes and supply of goods from the public sector, and that they do so by majority voting. Assuming single-peaked preferences, this ensures a unique voting equilibrium, where the amount of local public goods supply is the amount preferred by the median voter.

The maximisation problem that determines taxes and public goods supply in community 1 is therefore

(35) $$\max_{g_1} U\left(\alpha_1^m, g_1, c_1\right),$$

with $m$ denoting the median voter. The first order condition for optimal choice of $g_1$ is

(36) $$U_g^m + U_c^m \frac{dc_1}{dg_1} = 0$$

Total change in per capita consumption of private differentiated goods due to increased provision of local public goods is

(37) $$\frac{dc_1}{dg_1} = \frac{\partial c^1}{\partial g_1} + \frac{\partial c^1}{\partial L_1}\frac{dL_1}{dg_1}.$$

The effect on private consumption of an increase in public goods supply, may be split in two: The first is the direct effect, as given by equation (22). This is clearly negative. The second is the migration effect. If an increase in $g_1$ leads to a change in $U_1^M - U_2^M$, there will be emigration or immigration. A change in the number of residents leads to a change in per capita consumption of differentiated goods, as given by equation (23). If $L_1$ increases when $g_1$ does, the second term of (37) is positive. Conversely, if $L_1$ decreases as $g_1$ increases, the second term of (37) is negative.

Inserting (37) into (36) gives the first order condition for optimal supply of local public goods in community 1 as

(38) $$U_g^m + U_c^m \frac{\partial c_1}{\partial g_1} + U_c^m \frac{\partial c_1}{\partial L_1}\frac{dL_1}{dg_1} = 0.$$

The migration effect depends on the direct effect on $U_1^M$ of an increase in per capita supply of public goods in community 1. Specifically, we must have

(39) $$\frac{d(U_1^M - U_2^M)}{dg_1} = \frac{\partial(U_1^M - U_2^M)}{\partial L_1}\frac{dL_1}{dg_1} + U_g^M + U_c^M \frac{\partial c_1}{\partial g_1} = 0.$$

Define

$$(40) \qquad S \equiv -\frac{\partial (U_1^M - U_2^M)}{\partial L_1} \ ,$$

which is positive by the stability condition (equation (27)).

Solving (39), we get

$$(41) \qquad \frac{dL_1}{dg_1} = \frac{1}{S}\left( U_g^M + U_c^M \frac{\partial c_1}{\partial g_1} \right)$$

Inserting (41) into (38) gives

$$(42) \qquad U_g^m + U_c^m \frac{\partial c_1}{\partial g_1} + U_c^m \frac{\partial c_1}{\partial L_1} \frac{1}{S}\left( U_g^M + U_c^M \frac{\partial c_1}{\partial g_1} \right) = 0 \, ,$$

Define

$$b \equiv \frac{\partial c^1}{\partial L_1} \frac{1}{S},$$

which is positive.

Manipulating (42) then gives the following first order condition for the local choice of $g_1$

$$(43) \qquad \left( \frac{U_g^m}{U_c^m} + \frac{\partial c_1}{\partial g_1} \right) + \frac{b}{1+b}\left( \frac{U_g^M}{U_c^M} - \frac{U_g^m}{U_c^m} \right) = 0 \, .$$

$(U_g^h / U_c^h)$ is the marginal rate of substitution between consumption of publicly provided and private goods of person $h$, i.e. the marginal willingness to pay for an extra unit of the publicly provided good. Call it $MRS_{g,c}$. If $MRS_{g,c}$ is increasing in $\alpha_1$, the median resident has a higher $MRS_{g,c}$ than the marginal. The second term of (43) is then negative, and the first term must then be positive for the equality to hold. Conversely, if $MRS_{g,c}$ is decreasing in $\alpha_1$, the second term is positive and the first term must be negative.

*Tax competition or competition in public services?*

To interpret (43), consider first what it implies about the nature of competition between communities. Suppose first that $MRS_{g,c}$ is increasing in $\alpha_1$; i.e. that the marginal resident has a lower willingness to pay for publicly provided goods than the median voter. Figure 4 shows the iso-utility curves of the median voters in teh two communities. If region 2 raises taxes and increase its supply of public goods, the marginal resident will move to region 1. The utility of the ("former") median voter in region 1 thus increases with increasing $g_2$. Thus, the iso-utility curves for the median voters must be as shown. It follows that a cooperative solution between the median voters would entail higher taxes and greater supply of public goods in both communities. Thus, if $MRS_{g,c}$ is increasing in $\alpha_1$, we shall see tax competition between the communities.

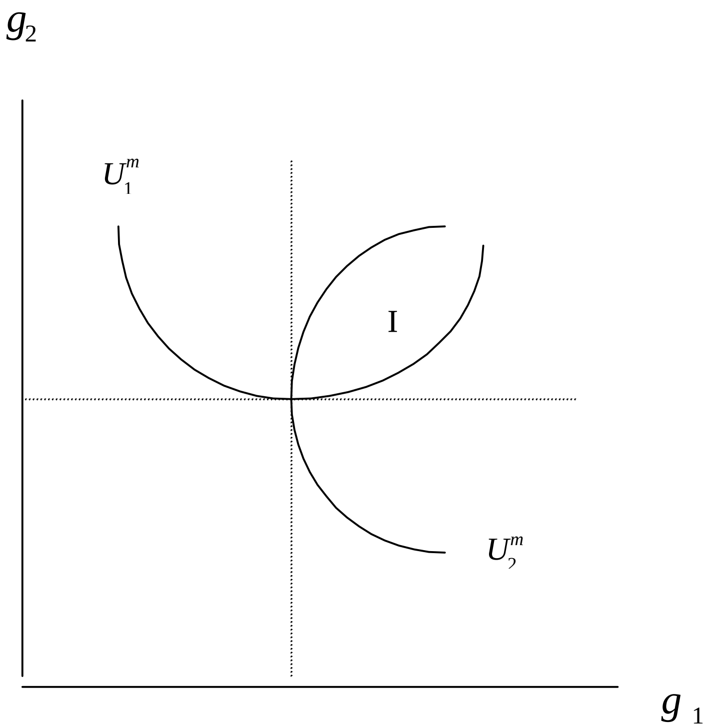


Figure 4

If $MRS_{g,c}$ is decreasing in $\alpha_1$, we get the opposite result; i.e. competition in public services and overprovision of public goods relative to the preferences of the median voters. We leave to the reader to verify this.

*Efficiency*

To see how the decentralised equilibrium deviates from the efficient solution, it is instructive to rewrite (43) as

$$(44)\qquad \left(\frac{U_g^A}{U_c^A}+\frac{\partial c_1}{\partial g_1}\right)+\left(\frac{U_g^m}{U_c^m}-\frac{U_g^A}{U_c^A}\right)+\frac{b}{1+b}\left(\frac{U_g^M}{U_c^M}-\frac{U_g^m}{U_c^m}\right)=0$$

Recall that the first order condition for efficient supply of local public goods in community 1 is

$$(33')\qquad \frac{U_g^A}{U_c^A}=-\frac{\partial c^1}{\partial g_1}\,.$$

Thus, there are two sources of possible inefficiency. The first is the "cost-of-democracy" wedge between the willingness to pay for public services of the median and the average voter. The second is the distortion arising because of competition for residents between local authorities. Both wedges could have either sign; so there is no a priori reason to believe that a democratic, decentralized solution will give systematic overprovision or underprovision of publicly provided goods. Nor is there any reason to believe that the two have the same sign. Thus, it could well be that decentralization counteracts the democratic distortion; but it could equally well be that it magnifies it.

## References


Aaron, Henry J. (1969): "Local public expenditures and the migration effect", *Western Economic Journal* 7

Faini, Ricardo, Victor Norman, F. Rouane and Paul Seabright (2000): "Integraion and the regions of Europe: How the right policies cand prevent polarization", *Monitoring European Integraion* 10, CEPR

Krugman, Paul R. (1991): *Geography and Trade*, MIT Press

Krugman, Paul R. and Anthony J. Venables (1995): "Globalization and the inequality of nations", *Quarterly Journal of Economics* 110: 857-880

Tiebout, Charles M. (1956): "A pure theory of local expenditures", *Journal of Political Economy* 64: 416-424

Venables, Anthony J. (1996): "Equilibrium location of vertically linked industries", *International Economic Review* 37: 341-359

Williams, Alan (1966): "The optimal provision of public goods in a system of local government", *Journal of Political Economy* 74: 18-33