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**Wirtschaftswissenschaftliche Fakultät  
der Eberhard-Karls-Universität Tübingen**

**Decentralized Income Redistribution  
in a Federal Economy**

by

Dietmar Wellisch



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# Decentralized Income Redistribution in a Federal Economy

by

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## Abstract

This paper examines decentralized income redistribution in a federation with strategically competing regions and immobile as well as freely mobile households. The mobile households are altruistic toward the immobile households.

The basic point of this paper can be stated as follows: the Nash-equilibrium of competing regional governments is Pareto-efficient. There is no role for a higher-level government, meaning there is no need to centralize the redistribution function. This result holds not only if mobile households are altruistic toward immobile residents they reside with but also if they are altruistic toward the citizens of other jurisdictions.

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## Decentralized Income Redistribution in a Federal Economy

Dietmar Wellisch\*

### I. Introduction

The basic argument for decentralized income redistribution within a federal economy is that tastes for redistribution vary across regions. Regions in which residents have stronger preferences toward the poor population should have larger redistributive budgets as regions in which residents have weaker tastes toward the poor (Pauly (1973)). A central government which chooses uniform taxes and transfers within the entire federation does not take account of these different preferences. Therefore, centralized income redistribution would be inefficient. This advantage of decentralized income redistribution in its strongest form only holds if households are completely immobile. If households are able to migrate, then regions with larger redistributive budgets would attract the poor and repel the rich (Brown and Oates (1987)).

Recently, David Wildasin has shown that in the case of mobile households in a federal economy (such as the EC) a central government (such as the council of the EC) must intervene to achieve a Pareto-efficient income redistribution (Wildasin (1991)). Wildasin assumes that in each region immobile as well as mobile households reside. In the main part of his article, poor households are the mobile group and freely migrate. Immobile households (e. g. landowners or highly skilled workers) are altruistic toward the poor mobile workers.<sup>1</sup> This structure is an extension of earlier work by Pauly (1973) and by Brown and Oates (1987). These authors mainly investigated decentralized income redistribution when poor households are mobile and all wage income is exogenously determined. An important feature in Wildasin's article is the endogenous determination of wages within all jurisdictions. Wages adjust in response to changes in labor supply and these adjustments serve to

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1 *It should be noted that it is of no consequence for Wildasin's results whether the mobile households are poor or rich. The important feature in his article is that immobile households are altruistic toward the mobile population.*

equilibrate migrating flows. He shows that the redistributive activity within one jurisdiction creates fiscal externalities in other regions. By adopting corrective grants the central government internalizes these fiscal externalities and the outcome is a socially optimal allocation of mobile households across regions. Also the Samuelson rule for Pareto-efficient income redistribution applies.

Many European economists believe that within the EC rather highly skilled households migrate in response to redistributive measures in some member states. The rich highly skilled households are mobile and are altruistic toward the poor immobile households in the region they reside or else they are altruistic toward the poor group independently of their location. The present model differs from Wildasin's model in pursuing this idea.

Regional governments maximize the utility of the rich mobile households, thereby adapting the altruism of the rich households. In this setting we can show that there is neither a need for coordination between the regions (the countries within the EC) nor for central government intervention (by the EC itself) to achieve a Pareto-efficient income redistribution and an optimal allocation of households across regions. The regional governments, acting in their own interest (i. e. in the interest of the mobile households residing in their jurisdiction), are able to achieve this outcome in a competitive Nash-equilibrium.

To show this, the paper is organized as follows. Section II presents the basic model and derives the Pareto-efficient allocation. Section III analyzes the decentralized income redistribution and shows how the efficient outcome can be achieved given a sufficient set of policy instruments on the regional level. In this section, mobile households are only concerned with the consumption of the poor immobile households they reside with. Section IV differs from section III in as much as mobile households are also concerned with the consumption of poor workers in the other jurisdiction. In this case we derive an efficient outcome too. Section V compares the results with Wildasin's model. It also compares the main feature of the present model with that direction in the literature which investigates one group of mobile households and the optimal supply of regional public goods (Hartwick (1980), Boadway (1982), Boadway and Flatters (1982), Myers (1990) and Wellisch (1991a, b)). Finally, section VI concludes with some remarks on policy applications.

## II. Pareto-efficient income redistribution

The federal economy consists of two regions. In each region the households are aggregated into two groups. The members of the first group are unskilled immobile workers. They are unable to migrate because of such factors as inappropriate qualifications and inability to speak the languages of other European countries. They are homogeneous and their number is normalized to one in each region. The members of the other group are also homogeneous but are highly skilled households. They are mobile because of, say, their ability to speak the common language of the federal economy as a whole. The mobile households residing in one region are altruistic toward the poor immobile workers in that region.<sup>2</sup> Their utility  $u^i(x_i, y_i)$  depends on their own consumption of goods  $x_i$  and on the consumption  $y_i$  of the poor households. The utility function is assumed to be strictly quasi concave.

Members of both groups supply inelastically one unit of labor in their region of residence. The regional production functions are linear-homogeneous with respect to both kinds of labor. Assuming the different kinds of labor are the only factors of production, the regional production function becomes  $f^i(n_i)$ . This follows also from the fact that the number of immobile workers is normalized to one.  $n_i$  is the number of mobile households residing and working in  $i$ ,  $n_1 + n_2 = n$ . The total number of mobile households is  $n$ .

The Pareto-efficient problem is to

$$\begin{aligned} \text{Max } (x_1, x_2, y_1, y_2, n_1(n_2)) \quad & u^1(x_1, y_1) + \lambda_1 \{ u^2(x_2, y_2) - \bar{u}^2 \} \\ & + \lambda_2 \{ f^1(n_1) + f^2(n-n_1) - n_1x_1 - (n-n_1)x_2 - y_1 - y_2 \}. \end{aligned} \quad (1)$$

To obtain the efficient allocation, we maximize the utility of a representative mobile household in region 1, holding the utility of a representative mobile worker in region 2 at a predetermined level. The second constraint is the feasibility constraint for the federal economy as a whole. For example, the entire production in the EC must cover the consumption of all mobile and immobile households. The population constraint for mobile households has already been substituted for  $n_2$  in the second constraint.

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<sup>2</sup> This assumption is relaxed in the fourth section.

From the first order conditions we obtain the following conditions for a Pareto-efficient income redistribution and a socially optimal allocation of mobile households across regions:

$$\begin{aligned} n_1 u^1_{y_1} / u^1_{x_1} &= 1, \\ n_2 u^2_{y_2} / u^2_{x_2} &= 1, \\ f^1_{n_1} - x_1 &= f^2_{n_2} - x_2, \end{aligned} \tag{2}$$

where  $u^1_{x_1}$  refers to the marginal utility of  $x_1$  for a mobile household residing in region 1 and  $f^1_{n_1}$  is the marginal product of labor in region 1, for example.

The first two conditions set out in (2) characterize the Pareto-efficient income redistribution (see Pauly (1973)). In terms of the familiar Samuelson condition, the sum of the MRS of the rich mobile households in region  $i$  - providing an additional unit of consumption to the poor immobile household in  $i$  - must be equal to the social costs of one unit (the MRT).

The third condition set out in (2) requires an equalization of the marginal net benefit of households over the regions for an optimal distribution of mobile households. The marginal net benefit of a household in one region is equal to its marginal productivity minus its consumption in that region.

Next we must ask whether there is a role for a central government or for cooperation among regional authorities to help achieve these optimality conditions.

### III. Decentralized decision making by regional governments

We assume a decentralized equilibrium of the Nash-Cournot type. Each regional government takes as given the policy actions of the other regional authority.

Competitive conditions are assumed for both regions. The market income of a member of the rich mobile group in region  $i$  is equal to its marginal product  $f^i_{n_i}$  and the real wage rate for an immobile household in  $i$  is equal to  $f^i(n_i) - n_i f^i_{n_i}$ , using the linear-homogeneous property of the production function. The mobile households in each region have to pay residence based head taxes  $\tau_i$  to finance transfers  $t_i$  to the immobile workers in the same region and to finance grants  $z_{ij}$  to the other region  $j$ . The second revenue source of the regional government in  $i$  is a grant from region  $j$ ,  $z_{ji}$ . Thus, the budget constraint for a mobile household residing in  $i$



becomes  $x_i = f_{n_i}^i - (t_i + z_{ij} - z_{ji})/n_i$ . Analogously, the constraint for an immobile worker in  $i$  is equal to  $y_i = f^i(n_i) - n_i f_{n_i}^i + t_i$ .

The regional government maximizes the welfare of the mobile households residing in its jurisdiction.<sup>3</sup> Because this group is altruistic toward the poor workers the regional government indirectly also has their consumption in mind. We further assume no migration restrictions (and also no migration costs). Hence the regional authority is concerned with the migration equilibrium condition  $u^1(x_1, y_1) = u^2(x_2, y_2)$ .

The problem for the regional government in choosing  $t_i$  and  $z_{ij}$  becomes (using the private budget constraints)

$$\text{Max } (t_i, z_{ij}) \quad u^i(f_{n_i}^i - (t_i + z_{ij} - z_{ji})/n_i, f^i(n_i) - n_i f_{n_i}^i + t_i) \quad (3)$$

$$\text{s. t. } u^1 = u^2.$$

Here we neglect myopic government behavior and assume that regional authorities explicitly consider the migration responses created by their policy actions (see Boadway (1982) for a discussion of myopic versus rational behavior on the part of regional governments).

The migration response functions for the mobile households can be easily obtained from the migration equilibrium condition set out in (3). They are with respect to  $t_i$ ,  $t_j$ ,  $z_{ij}$  and  $z_{ji}$

$$\begin{aligned} (t_1): \quad dn_1/dt_1 &= \frac{u^1_{x_1}/n_1 - u^1_{y_1}}{N}, \\ (t_2): \quad dn_2/dt_2 &= \frac{u^2_{x_2}/n_2 - u^2_{y_2}}{N}, \\ (z_{12}): \quad dn_1/dz_{12} &= \frac{u^1_{x_1}/n_1 + u^2_{x_2}/n_2}{N}, \\ (z_{21}): \quad dn_1/dz_{12} &= dn_2/dz_{21}. \end{aligned} \quad (4)$$

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3 This assumption is critical for our analysis, but common in previous literature (see Pauly (1973), Brown and Oates (1987), or Wildasin (1991)). If the regional governments maximize some form of Social Welfare Function, our results do not longer remain valid. Since we are only interested in possible inefficiencies due to decentralized decision making, it is straightforward to make this assumption (see Gordon (1983)), i.e. to ignore any inefficiencies associated with inconsistent objectives.

The denominator  $N$  of these expressions is equal to  $N = u^1_{x_1 n_1} + u^1_{y_1 n_1} + u^2_{x_2 n_2} + u^2_{y_2 n_2}$ .  $u^i_{x_i n_i}$  specifies the change in utility of the mobile household in region  $i$  when its own consumption varies due to a change in the number of mobile households residing in  $i$ . Analogously,  $u^i_{y_i n_i}$  refers to the change in utility of a mobile household when the consumption of an immobile household in region  $i$  varies as a consequence of a change in the number of mobile households in  $i$ . The detailed expressions are

$$u^i_{x_i n_i} = u^i_{x_i} \left\{ f^i_{n_i n_i} + (t_i + z_{ij} - z_{ji})/n_i^2 \right\}, \quad u^i_{y_i n_i} = -u^i_{y_i n_i} f^i_{n_i n_i}.$$

The signs of the reaction functions are fairly unimportant for the following results.<sup>4</sup> So we turn to the first order conditions for an optimal regional policy with respect to  $t_i$  and  $z_{ij}$ . These conditions have to be calculated from the maximization problem (3).

We obtain the following first order conditions (for nonnegative transfers to the poor and non-negative interregional grants):

$$\begin{aligned} \frac{\partial u^1}{\partial t_1} &= -u^1_{x_1}/n_1 + u^1_{x_1 n_1} dn_1/dt_1 + u^1_{y_1} + u^1_{y_1 n_1} dn_1/dt_1 \leq 0, \quad t_1 \geq 0, \quad t_1 \frac{\partial u^1}{\partial t_1} = 0, \\ \frac{\partial u^1}{\partial z_{12}} &= -u^1_{x_1}/n_1 + u^1_{x_1 n_1} dn_1/dz_{12} + u^1_{y_1 n_1} dn_1/dz_{12} \leq 0, \quad z_{12} \geq 0, \quad z_{12} \frac{\partial u^1}{\partial z_{12}} = 0, \\ \frac{\partial u^2}{\partial t_2} &= -u^2_{x_2}/n_2 + u^2_{x_2 n_2} dn_2/dt_2 + u^2_{y_2} + u^2_{y_2 n_2} dn_2/dt_2 \leq 0, \quad t_2 \geq 0, \quad t_2 \frac{\partial u^2}{\partial t_2} = 0, \\ \frac{\partial u^2}{\partial z_{21}} &= -u^2_{x_2}/n_2 + u^2_{x_2 n_2} dn_2/dz_{21} + u^2_{y_2 n_2} dn_2/dz_{21} \leq 0, \quad z_{21} \geq 0, \quad z_{21} \frac{\partial u^2}{\partial z_{21}} = 0. \end{aligned} \tag{5}$$

For example, an increase in transfers to poor workers in region 1 has the following effects. First, it reduces the net income and consumption possibilities of a mobile worker in 1 by  $1/n_1$ , because there are  $n_1$  mobile households per immobile worker. The transfer increases the consumption of poor workers by one unit. Second, this policy action creates a migration response which changes the wage income of mobile and immobile workers. Finally, the

4 For a stable migration equilibrium,  $N$  has to be negative,  $d(u^1 - u^2)/dn_1 = N < 0$ . In this case,  $dn_i/dt_i > 0$  if the regional governments tend to underredistribute relative to the Samuelson criterion. On the other hand,  $dn_i/dz_{ij}$  is clearly negative in the stable case. This means that the mobile population in  $i$  decreases with an increased interregional grant from  $i$  to  $j$ .

mobile workers are affected by a change in their tax burden due to a change in the number of taxpayers in the region. One can interpret the other first order conditions analogously.

To see the properties of this equilibrium more clearly, we have to substitute the migration response functions (4) into the first order conditions (5). First, we substitute the response function  $dn_1/dt_1$  into the condition with respect to  $t_1$  (assuming an interior solution for  $t_1$ ):

$$(-u^1_{x_1/n_1} + u^1_{y_1}) \left\{ 1 - \frac{u^1_{x_1 n_1} + u^1_{y_1 n_1}}{u^1_{x_1 n_1} + u^1_{y_1 n_1} + u^2_{x_2 n_2} + u^2_{y_2 n_2}} \right\} = 0.$$

Since the expression in the second bracket cannot be zero, the expression in the first bracket must itself be zero:

$$n_1 u^1_{y_1} / u^1_{x_1} = 1.$$

But this is the condition for a Pareto-efficient income redistribution. The same result follows for region 2 (analogous computation). Thus we can state the following proposition:

**Proposition 1:** *If mobile households are altruistic toward immobile households in their region of residence, then income redistribution is Pareto-efficient. There is neither a need for coordination between the two regions nor a need for central government intervention to achieve the Pareto-efficient outcome.*

Up to this point, interregional grants have been of no importance. We have obtained the result that decentralized income redistribution is Pareto-efficient without using the first order conditions with respect to interregional transfers. But this set of instruments on the regional level is very important for the optimal spatial allocation of mobile households. Next we turn to this point.

First we have to note that

$$\frac{\partial u^1}{\partial z_{12}} = \frac{1}{N} \left\{ -\frac{u^1_{x_1}}{n_1} (u^2_{x_2 n_2} + u^2_{y_2 n_2}) + \frac{u^2_{x_2}}{n_2} (u^1_{x_1 n_1} + u^1_{y_1 n_1}) \right\} = -\frac{\partial u^2}{\partial z_{21}}.$$

Thus, along with the first order conditions with respect to the  $z_{ij}$ 's, a Nash-equilibrium necessarily requires  $\partial u^1 / \partial z_{12} = 0 = \partial u^2 / \partial z_{21}$ .

The complete expression for the first order condition with respect to  $z_{12}$  is given by

$$-u_{x_1}^1/n_1 + u_{x_1}^1 \left\{ f_{n_1 n_1}^1 dn_1/dz_{12} + (t_1 + z_{12} - z_{21})/n_1^2 dn_1/dz_{12} \right\}$$

$$- u_{y_1}^1 f_{n_1 n_1}^1 n_1 dn_1/dz_{12} = 0.$$

Using the first order condition for the government of region 1 with respect to  $t_1$ ,  $n_1 u_{y_1}^1 / u_{x_1}^1 = 1$  (which has just been derived), together with the household restriction for mobile households in region 1,  $(t_1 + z_{12} - z_{21})/n_1 = f_{n_1} - x_1$ , we arrive finally at

$$-u_{x_1}^1/n_1 + u_{x_1}^1 (f_{n_1}^1 - x_1)/n_1 dn_1/dz_{12} = 0$$

or  $(f_{n_1}^1 - x_1) dn_1/dz_{12} = 1.$

Analogously, we derive for region 2:

$$(f_{n_2}^2 - x_2) dn_2/dz_{21} = 1.$$

Because of  $dn_1/dz_{12} = dn_2/dz_{21}$ , we immediately obtain for the decentralized equilibrium without any central government intervention

$$f_{n_1}^1 - x_1 = f_{n_2}^2 - x_2.$$

The optimal spatial allocation of mobile households is also achieved with decentralized income redistribution provided there is sufficient set of policy instruments available at the regional level, i. e. the regional governments use interregional grants to support the other region.

In summary, all conditions characterizing a Pareto-efficient situation are met in a decentralized economy if the regional authorities maximize the welfare of the mobile households.

#### IV. Decentralized income redistribution with altruistic spillovers

In this section we want to show that the basic conclusions remain valid if mobile households are not only altruistic toward the immobile households in their region of residence but are also concerned with the consumption of poor workers in the other region. Thus, the utility function of a mobile household residing in  $i$  consists of three rather than two arguments,  $u^i(x_i, y_i, y_j)$ .<sup>5</sup>

The new Pareto-efficient problem may be stated as to

$$\begin{aligned} \text{Max } (x_1, x_2, y_1, y_2, n_1(n_2)) \quad & u^1(x_1, y_1, y_2) + \lambda_1 \{ u^2(x_2, y_2, y_1) - \bar{u}^2 \} \\ & + \lambda_2 \{ f^1(n_1) + f^2(n-n_1) - n_1x_1 - (n-n_1)x_2 - y_1 - y_2 \}. \end{aligned} \quad (6)$$

From the first order conditions of this problem we derive the following conditions for an efficient allocation given this new preference structure:

$$\begin{aligned} n_1 u^1_{y_1} / u^1_{x_1} + n_2 u^2_{y_1} / u^2_{x_2} &= 1, \\ n_2 u^2_{y_2} / u^2_{x_2} + n_1 u^1_{y_2} / u^1_{x_1} &= 1, \\ f^1_{n_1} - x_1 &= f^2_{n_2} - x_2. \end{aligned} \quad (7)$$

$u^j_{y_i}$  represents the partial derivative of the utility of a mobile household in region  $j$  with respect to the consumption of an immobile worker in  $i$ .

While the third equation shows the usual condition for an optimal distribution of mobile households, the first and the second conditions differ from the analogous conditions in (2). They state that the sum of the MRS (providing an additional unit of transfers to a poor immobile worker in one region) must be equal to the marginal cost of one unit. The sum of the MRS is now composed of the welfare enhancing effects accruing to mobile households living in both regions. For instance, if the consumption of a poor immobile worker in  $i$  increases, the welfare of the mobile households in  $i$  increases as well as the utility of mobile workers residing in  $j$ . There is a similarity to the Samuelson rule for regional public goods in the presence of interregional spillovers. The redistributive policy in one region has positive spillovers to the residents of the other region.

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<sup>5</sup> It is further assumed that the utility function is strictly quasi concave.

We now turn to the decentralized Nash-equilibrium.

The private budget constraints and the regional government restrictions correspond to the constraints of the last section. The regional governments are further assumed to maximize the welfare of their own mobile residents, taking their migration responses into account. The maximization problem differs from the one set out in the third section due to different utility functions of mobile households. It becomes

$$\text{Max } (t_i, z_{ij}) \quad u^i(\hat{f}_{n_i}^i - (t_i + z_{ij} - z_{ji})/n_i, \hat{f}^i(n_i) - n_i \hat{f}_{n_i}^i + t_i, \hat{f}^i(n_j) - n_j \hat{f}_{n_j}^i + t_j) \quad (8)$$

$$\text{s.t. } u^1 = u^2.$$

As in the third section, we first of all derive the migration response functions with respect to  $t_1$ ,  $t_2$ ,  $z_{12}$  and  $z_{21}$ . Using the condition for the migration equilibrium set out in (8),  $u^1 = u^2$ , it follows that

$$\begin{aligned} dn_1/dt_1 &= \frac{u^1_{x_1}/n_1 - u^1_{y_1} + u^2_{y_1}}{N'} , \\ dn_2/dt_2 &= \frac{u^2_{x_2}/n_2 - u^2_{y_2} + u^1_{y_2}}{N'} , \\ dn_1/dz_{12} &= \frac{u^1_{x_1}/n_1 + u^2_{x_2}/n_2}{N'} , \\ dn_2/dz_{21} &= dn_1/dz_{12}. \end{aligned} \quad (9)$$

Now the denominator  $N'$  of these expressions is defined as  $N' = u^1_{x_1 n_1} + u^1_{y_1 n_1} - u^1_{y_2 n_2} + u^2_{x_2 n_2} + u^2_{y_2 n_2} - u^2_{y_1 n_1} \cdot u^1_{y_2 n_2}$  refers to the change in utility of mobile households residing in region 1 due to a change in the consumption of immobile workers in jurisdiction 2 when the number of mobile households in 2 varies. For instance,  $u^1_{y_2 n_2} = -u^1_{y_2} n_2 f^2_{n_2 n_2}$ .  $u^2_{y_1 n_1}$  is defined analogously. Again the signs of the migration responses are fairly unimportant.<sup>6</sup> Hence, we turn immediately to the first order conditions characterizing an optimal regional policy with respect to  $t_i$  and  $z_{ij}$ . From the maximization problem (8), it follows that

<sup>6</sup> In a stable equilibrium,  $N'$  has to be negative too,  $d(u^1 - u^2)/dn_1 = N' < 0$ . With altruistic spillovers,  $dn_i/dt_i > 0$  only if the regional authorities underredistribute relative to the 'myopic' equilibrium (myopic w. r. t. the migration responses),  $u^i_{x_i}/n_i - u^i_{y_i} < -u^j_{y_i} < 0$ . On the other hand,  $dn_i/dz_{ij}$  is once again clearly negative in the stable case.

$$\frac{\partial u^1}{\partial t_1} = -u^1_{x_1}/n_1 + u^1_{x_1 n_1} dn_1/dt_1 + u^1_{y_1} + u^1_{y_1 n_1} dn_1/dt_1 - u^1_{y_2 n_2} dn_1/dt_1 \leq 0,$$

$$t_1 \geq 0 \text{ and } t_1 \frac{\partial u^1}{\partial t_1} = 0,$$

$$\frac{\partial u^1}{\partial z_{12}} = -u^1_{x_1}/n_1 + u^1_{x_1 n_1} dn_1/dz_{12} + u^1_{y_1 n_1} dn_1/dz_{12} - u^1_{y_2 n_2} dn_1/dz_{12} \leq 0,$$

$$z_{12} \geq 0 \text{ and } z_{12} \frac{\partial u^1}{\partial z_{12}} = 0,$$

(10)

$$\frac{\partial u^2}{\partial t_2} = -u^2_{x_2}/n_2 + u^2_{x_2 n_2} dn_2/dt_2 + u^2_{y_2} + u^2_{y_2 n_2} dn_2/dt_2 - u^2_{y_1 n_1} dn_2/dt_2 \leq 0,$$

$$t_2 \geq 0 \text{ and } t_2 \frac{\partial u^2}{\partial t_2} = 0,$$

$$\frac{\partial u^2}{\partial z_{21}} = -u^2_{x_2}/n_2 + u^2_{x_2 n_2} dn_2/dz_{21} + u^2_{y_2 n_2} dn_2/dz_{21} - u^2_{y_1 n_1} dn_2/dz_{21} \leq 0, \quad z_{21} \geq 0$$

$$\text{and } z_{21} \frac{\partial u^2}{\partial z_{21}} = 0.$$

To ascertain the properties of that equilibrium, we first have to note that  $\partial u^1/\partial z_{12} = -\partial u^2/\partial z_{21}$ . Along with the first order conditions with respect to the  $z_{ij}$ 's, this implies that the competitive Nash-equilibrium is characterized by  $\partial u^1/\partial z_{12} = 0 = \partial u^2/\partial z_{21}$ .

Using once again the identity of the following migration responses  $dn_1/dz_{12} = dn_2/dz_{21}$ , we go on to obtain from the first order conditions with respect to the  $z_{ij}$ 's

$$\{u^1_{x_1 n_1} + u^1_{y_1 n_1} - u^1_{y_2 n_2}\} \{n_1/u^1_{x_1}\} = \{u^2_{x_2 n_2} + u^2_{y_2 n_2} - u^2_{y_1 n_1}\} \{n_2/u^2_{x_2}\}. \quad (11)$$

This result can now be used to derive the characteristics of the decentralized income redistribution. For this purpose we substitute the migration response  $dn_1/dt_1$  into the first order condition with respect to  $t_1$ . Assuming an interior solution, we obtain

$$(u^1_{y_1} - u^1_{x_1}/n_1) \frac{u^2_{x_2 n_2} + u^2_{y_2 n_2} - u^2_{y_1 n_1}}{N'} + u^2_{y_1} \frac{u^1_{x_1 n_1} + u^1_{y_1 n_1} - u^1_{y_2 n_2}}{N'} = 0.$$

Rearranging this expression and using (11), it simplifies to

$$n_1 u^1_{y_1}/u^1_{x_1} + n_2 u^2_{y_1}/u^2_{x_2} = 1.$$

This is precisely the condition for a Pareto-efficient income redistribution as derived in (7).

Because the same result follows for region 2, it can be stated:

**Proposition 2:** *Decentralized income redistribution is also Pareto-efficient if mobile households are altruistic toward all immobile poor workers independently where they live.*

To show that the optimal distribution of mobile households is met in this case too, we have to rewrite (11) in full:

$$\begin{aligned} & \{ (f^1_{n_1} - x_1) u^1_{x_1}/n_1 + u^1_{x_1} f^1_{n_1 n_1} - u^1_{y_1} n_1 f^1_{n_1 n_1} + u^1_{y_2} n_2 f^2_{n_2 n_2} \} n_1 / u^1_{x_1} \\ & = \{ (f^2_{n_2} - x_2) u^2_{x_2}/n_2 + u^2_{x_2} f^2_{n_2 n_2} - u^2_{y_2} n_2 f^2_{n_2 n_2} + u^2_{y_1} n_1 f^1_{n_1 n_1} \} n_2 / u^2_{x_2}. \end{aligned}$$

Substituting into this expression the condition for an efficient income redistribution just derived,  $n_i u^i_{y_i}/u^i_{x_i} + n_j u^j_{y_i}/u^j_{x_j} = 1$ , we obtain

$$f^1_{n_1} - x_1 = f^2_{n_2} - x_2.$$

Comparing the Pareto-efficiency problem set out in (1) (respectively (6)) with the problems of regional authorities set out in (3) (respectively (8)), a more detailed explanation of the basic results may be given. The central planner's problem ((1) respectively (6)), using the equal utility constraint,  $u^1 = u^2$ , does not prevent the attainment of the Pareto-efficient outcome set out in (2) (respectively (7)). Regional governments also face the equal utility migration equilibrium as a constraint. Hence, both problems are identical.

The central planner is able to control the entire resources of the federal economy. Regional



authorities perform interregional transfers to alter the resources of the other region thereby buying their preferred population. In this way they indirectly control the resources of the federal economy too. Since the problems as well as the opportunities of the central planner and regional governments are identical, the results must also be the same.

## V. Comparison with previous results

In his paper on decentralized income redistribution in a common labor market, David Wildasin has shown that the central government chooses corrective subsidies for the regions so as to internalize the fiscal externalities in such a way that transfer payments to poor mobile households are equal within all jurisdictions, independently of different tastes for redistribution on the part of the immobile households. Because migration equilibrium in his model is characterized by identical consumption levels for all mobile households in the federal economy, equal transfer payments within all jurisdictions must be accompanied by equal wage rates for mobile workers across the whole economy. This means that the optimal population distribution compatible with free migration,  $f_{n_i}^i = f_{n_j}^j$ , is reached in Wildasin's model.

In our model, optimal distribution of mobile altruistic households requires  $f_{n_i}^i - x_i = f_{n_j}^j - x_j$ , because consumption by the poor immobile households does not need to be equal in both regions.<sup>7</sup> This condition is reached in our model by decentralized decision making or, equivalently, in our decentralized equilibrium, the per capita tax  $\tau$  levied on the rich mobile households must be equal within both regions,  $\tau_1 = \tau_2$ . This constitutes a strong parallel with Wildasin's result, because the regional governments also have to treat the mobile households equally in both regions. But in our model this does not imply equal wage rates or in general terms,  $f_{n_1}^1 \neq f_{n_2}^2$ .

As is the case with Wildasin, so too our model is open to reinterpretation, especially in the third section.<sup>8</sup> It can readily accommodate the other side of the overall redistributive mechanism, meaning the imposition of taxes on immobile rich households (or landlords) to finance transfers to the poor mobile workers (and also to finance interregional grants). The poor mobile workers are altruistic toward the immobile households, meaning the immobile

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7 This means that  $u_1 = u_2$  does not imply  $x_1 = x_2$  if  $y_1 \neq y_2$ .

8 A reinterpretation of section IV in this way is, however, rather unrealistic.

households must transfer part, but not all, of their income to the poor workers residing within the same jurisdiction. We can assume that the political process supports the poor because the poor are a relatively large group.  $t_i$  now refers to a tax rather than to a subsidy and  $\tau_i$  becomes the subsidy for the poor mobile workers. All the results remain valid within the appropriate reinterpretation.

The main difference to Wildasin's model is not whether the regional authorities maximize the welfare of the rich or the poor households. What matters is whether the regional authorities maximize the utility of the mobile altruistic households or of the immobile altruistic households. In Wildasin's model the immobile households are altruistic toward the mobile ones and the regional authorities accept their preferences. Hence there is a need for a central government intervention to achieve an efficient outcome. In the present model, mobile households are altruistic toward the immobile workers. Regional authorities consider the migration responses of that group and, by means of interregional transfers, not only an efficient income redistribution can be reached but also an optimal spatial allocation of mobile households is achieved.<sup>9</sup>

It is interesting to compare the results with a second direction in the literature. This direction analyzes the optimal supply of regional public goods (without spillovers) in the presence of mobile homogeneous households and investigates the optimal distribution of this homogeneous population across regions (Hartwick (1980), Boadway (1982), Boadway and Flatters (1982) and recently Myers (1990)).

Hartwick has derived an optimal interregional transfer scheme. Now a similar result can be derived for the net transfer from region 1 to region 2, thereby taking into consideration the fact that there are no rents in our economy (unlike Hartwick's analysis).<sup>10</sup> Using the result of identical per capita taxes for mobile households in both regions,  $\tau_1 = \tau_2$ , and substituting the regional government constraints into this result, we obtain the optimal interregional net transfer:

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9 *It should also be noted that the results remain true if there are constant per capita migration costs. The utility differential between residents in both regions precisely reflect these costs. But the migration responses to policy actions would not alter.*

10 *There is a possible reinterpretation of the model which involves rents. The immobile households can be regarded as the owners of immobile land or natural resources in their respective regions. For instance, we can imagine a poor economy with subsistence farmers who own land and high income mobile workers. I thank David Wildasin for making this note to me.*

$$z_{12} - z_{21} = \frac{n_1 n_2}{n} \left\{ \frac{t_2}{n_2} - \frac{t_1}{n_1} \right\}.$$

In equilibrium there is a net transfer from region 1 to region 2 if the subsidy (per mobile worker) to the poor is higher in region 2. Intuitively, the interjurisdictional net transfer toward the poorer region is needed in order to satisfy the altruistic demands of the mobile households in an efficient way.

The subsidy to the poor in this model corresponds to the supply of regional public goods in Hartwick's analysis.

There is another important feature in this model. In equilibrium we have only one region with positive interregional grants (see Myers (1990)). This can be seen by recalling that  $\partial u^1 / \partial z_{12} = - \partial u^2 / \partial z_{21}$  and if we remember the first order conditions with respect to  $z_{ij}$ :

$$\frac{\partial u^i}{\partial z_{ij}} \leq 0, z_{ij} \geq 0 \text{ and } z_{ij} \frac{\partial u^i}{\partial z_{ij}} = 0 \text{ f. } i = (1, 2) \text{ and } j = (2, 1).$$

Therefore, the region with the less redistributive income transfer chooses the Pareto-efficient interregional grant, while the other region prefers a zero grant.

In this model income redistribution has been defined as a regional public good (see Pauly (1973)). This means that analogous results as in Boadway (192) and in Myers (1990) can be expected, given an appropriate reinterpretation in the case of Section III, i. e. if the households are assumed to be altruistic toward the other citizens in their regional jurisdiction. These authors investigate the provision of regional public services in the presence of migration. In their model (both authors essentially take the same approach) regional authorities behave rationally with respect to migration responses. They derived an optimal provision of regional public goods in a competitive Nash-equilibrium. In their model land rents are also present. The regional governments levy a source based tax on land. Myers shows that the net rents from region  $i$  to the residents of region  $j$  can be interpreted as an aggregate transfer payment from  $i$  to  $j$  and vice versa. Thus, using this aggregate interregional grant, the structure of Myers approach is very similar to ours. Consequently, he derives the result that decentralized decision making is also compatible with an optimal distribution of mobile households across regions.

The approach of section IV is similar to that of Wellisch (1991a, b) who has analyzed the provision of regional public goods (or bads as in the case of waste emissions) that generate spillovers. These papers show that in the presence of interregional mobility the externalities associated with the provision of such public services are perfectly internalized in a decentralized equilibrium. Because we can interpret the kind of income redistribution analyzed in the fourth section as a regional public good generating spillovers, there is clearly a strong parallel.

## VI. Conclusions

In the previous literature on decentralized income redistribution, the basic argument in favor of decentralization of this function is that tastes for redistribution vary across regions. In Wildasin's model (1991), immobile households are allowed to have different preferences for redistribution. In spite of these differences, the transfers to the poor are equal across regions. Communities with weaker preferences for redistribution should receive larger corrective subsidies from the higher-level government to support assistance to the poor.

In our model, mobile households are altruistic and are all alike. This means that tastes for redistribution are equal across jurisdictions. However, the wage income of poor immobile workers can vary in different regions. But this does not mean that per capita taxes on mobile households are unequal in various regions. What can differ are transfers to the poor across jurisdictions. To support a higher transfer to the poor in region  $j$  (this means a higher transfer per capita of mobile households residing in  $j$ ) an interregional grant from  $i$  to  $j$  must be implemented in the presence of the same per capita taxes for mobile households in different regions.

The main advantage of this approach is to show that a Pareto-efficient income redistribution is obtainable by decentralized decisions and despite migration responses to policy actions.

The crucial question for applying either this model or Wildasin's approach to policy considerations is whether mobile or immobile households have more influence on the political processes in the regions. If immobile households are altruistic toward mobile ones and constitute the larger group, then the regional governments maximize their welfare and Wildasin's approach has to be employed. Nowadays in Europe this is probably the more realistic case.

But, on the other hand, it is observable that the European member states are getting closer to a common labor market and this is likely to become increasingly true in the future. Hence the applicability of the present model will become more important when the labor market is more strongly integrated in Europe next century. It is also more important in such typical federal economies as the USA, Canada or Switzerland in nowadays.

## References

- Atkinson, A. B. and J. E. Stiglitz, 1980, Lectures on public economics (McGraw-Hill, New York).
- Boadway, R., 1982, On the method of taxation and the provision of local public goods: comment, *American Economic Review* 72, 846-851.
- Boadway, R. and F. Flatters, 1982, Efficiency and equalization payments in a federal system of government: a synthesis and extension of recent results, *Canadian Journal of Economics* 15, 613-633.
- Brown, Ch. C. and W. E. Oates, 1987, Assistance to the poor in a federal system, *Journal of Public Economics* 32, 307-330.
- Gordon, R., 1983, An optimal taxation approach to fiscal federalism, *Quarterly Journal of Economics* 98, 567-586.
- Hartwick, J. M., 1980, Henry George rule, optimal population, and interregional equity, *Canadian Journal of Economics* 13, 695-700.
- Myers, G. M., 1990, Optimality, free mobility, and the regional authority in a federation, *Journal of Public Economics* 43, 107-121.
- Oates, W. E., 1972, Fiscal federalism (Harcourt Brace Jovanovich, New York).
- Pauly, M. V., 1973, Income redistribution as a local public good, *Journal of Public Economics* 2, 35-58.
- Starrett, D. A., 1980), On the method of taxation and the provision of local public goods, *American Economic Review* 70, 380-392.
- Stiglitz, J. E., 1977, The theory of local public goods, in: M. Feldstein and R. P. Inman, eds., *The economics of public services* (Macmillan, London) 247-333.
- Stiglitz, J. E., 1983, The theory of local public goods twenty-five years after Tiebout: a perspective, in: G. R. Zodrow, ed., *Local provision of public services: the Tiebout model after twenty-five years* (Academic Press, New York) 17-53.
- Wellisch, D., 1991a, On the decentralized provision of public goods with spillovers in the presence of interregional migration, University of Tübingen.
- Wellisch, D., 1991b, Decentralized environmental policy, interregional spillovers, and free migration, University of Tübingen.
- Wildasin, D. E., 1980, Locational efficiency in a federal system, *Regional Science and Urban Economics* 10, 453-471.
- Wildasin, D. E., 1986, *Urban public finance* (Harwood, New York).
- Wildasin, D. E., 1990, Budgetary Pressures in the EEC: a fiscal federalism perspective, *American Economic Review* 80, 69-74.
- Wildasin, D. E., 1991, Income redistribution in a common labor market, *American Economic Review*, forthcoming.