CES Working Paper Series

INCOME REDISTRIBUTION AND MIGRATION

David E. Wildasin

Working Paper No. 2

Center for Economic Studies
University of Munich
Ludwigstr. 33
8000 Munich 22
Germany
Telephone: 089-2180-2747
Telefax: 089-397303

Earlier versions of this work have been presented at the Indiana University Microeconomics Workshop, at the Second Nordic Conference on "Taxation in Small Open Economies" in Bergen, Norway, and at the University of Munich. I am grateful to the participants at these presentations, and particularly H.-W. Sinn, for comments. I retain responsibility for any errors. I am grateful to the *Center for Economic Studies,* University of Munich, for partial support of this work.

CES Working Paper No. 2
June 1991

INCOME REDISTRIBUTION AND MIGRATION

Abstract

Suppose that redistributive fiscal policies transfer income between owners of immobile factors of production and workers in a given region. If the region's border is opened, immigration by mobile workers from another region changes the gross and net incomes of the original residents of the region, and the menu of income distribution possibilities open to it through tax/transfer policy. A simple general equilibrium analysis shows that migration leads to Pareto-inferior outcomes in the destination region if immigrants are net fiscal beneficiaries. Residents of the destination region may gain, however, if interjurisdictional transfers are paid to the source region in order to reduce the level of immigration.

David E. Wildasin
Department of Economics
Indiana University
Bloomington, IN 47405
USA

"If 99 communities tax the rich to aid the poor, the rich may congregate in the hundredth community ... Here competition does not perform with its usual excellence ... [R]edistribution is intrinsically a national policy ..." — Stigler (1957).

"The scope for an active redistributive policy depends critically upon the existing degree of mobility of both individuals and other economic resources. ... The degree of immobility necessary to allow an effective and substantial program of income redistribution is usually present only at the national level." — Oates (1968, 172–73).

"Local policies of redistribution readily become a distorting element in location. ... The poor will ... move into areas where much redistribution occurs and the rich will tend to leave such areas. ... [L]ocation choice in line with distributional considerations ... distorts efficient resource use. ... It follows that distributional adjustments should be primarily a function of central finance." — Musgrave (1969, 310–311).

I. Introduction

It is generally recognized that the mobility of households has important implications for public sector redistributive policy. Such policies, whether explicit or implicit in nature, generate a type of adverse selection: net beneficiaries are attracted to jurisdictions engaged in redistribution, while net contributors are repelled. This basic insight, which underlies the remarks of Stigler, Oates, and Musgrave cited above, has been extremely influential in the literature of fiscal federalism. It has, for instance, led most writers to conclude that central governments should assume primary responsibility for the "distribution branch" functions of the public sector. [1] Since redistributional programs have tended to lead the growth of the public sector in advanced economies, such a view has profound implications for the issue of centralization of government policy. In practice, however, redistribution is generally not a completely centralized government activity. State and local governments in the United States, as well as lower-level governments in other countries (Canadian provinces or local governments in the United Kingdom, for example) do redistribute income through their tax systems, through cash transfers to the poor or other target groups, and through provision of a wide variety of public goods and services, such as health and education. The existence of such decentralized redistribution has prompted much analysis of the use of intergovernmental equalizing grants to forestall inefficient "fiscally-induced" migration of the type alluded to by Musgrave above. [2]

Concern with fiscally-induced migration also surfaces in discussions of international mi-

[1] For more recent discussion of this view, see Brown and Oates (1987) and Peterson and Rom (1990).

[2] See Buchanan (1950) for an early contribution in this vein and Boadway and Flatters (1982) for a survey and additional references. Gramlich (1985) and Wildasin (1990, forthcoming) also discuss the use of matching grants to support income redistribution carried out by lower-level governments. Inman and Rubinfeld (1979) thoroughly discuss the role that distributional considerations have played in the provision and financing of education. It should be borne in mind that there are countervailing arguments that might favor decentralization rather than centralization of redistributive policy. Pauly (1973) emphasizes the potential benefits of decentralization when preferences for redistribution are diverse. Brennan and Buchanan (1980) favor decentralization as a check on the political power of government. See also McLure (1986) for this view.

gration. For instance, many commentators express concern about the possible fiscal burden that Mexican immigrants may impose on the US. Migrant workers or their family members may be able to take advantage of a variety of public and social services, but may not make commensurate contributions through the tax system. [3] Analogous issues arise in the European setting. Within the EC, workers may migrate from countries with low levels of social insurance and other benefits to countries with more generous programs. This prospect will certainly be a major consideration in the disposition of Turkey's application for EC membership. The issue of migration from non-EC to EC countries is also a matter of increasing concern, and fears of East-West migration may significantly constrain the liberalization of economic relations between former Warsaw Pact countries and their neighbors to the West, with broader implications for political and national security developments in Europe.

The objective of the present investigation is to examine the implications of mobility for income redistribution using a very simple and stylized general equilibrium model. This model is used to address a rather straightforward question. We may think of redistribution policy as a device for achieving different points along a social net income or utility-possibility frontier. In the absence of migration, and given some set of redistributive policy instruments, society faces a menu of net income distributions that can be attained using these instruments. Now suppose that the barriers to migration are reduced or eliminated. The direction and extent of any resulting migration will in general depend on the type of redistributive policy that is in place, since such policies will affect the net income available to the residents of the society. Migration itself affects the distribution of income, since it changes factor supplies, factor productivity, and factor prices. Because of these effects, the menu of net income distributions attainable for society when migration is possible differs from the no-migration menu. Assuming that redistribution policy is aimed at affecting the distribution of net income, it becomes critically important to understand first, how migration responds to redistributive policy, and second, how migration alters the set of feasible net income distributions open to the economy. Addressing these issues is a primary task of the analysis that follows. The analysis focusses on the characterization of the *income distribution frontier*, that is, a curve showing possible net income distributions available to the residents of a society, and on the way that this frontier changes when migration is possible. [4]

The analysis shows that a portion of the income distribution frontier with free migration can lie outside the no-migration frontier, implying that higher net incomes are attainable for all members of society. Other portions of the frontier lie below the no-migration frontier. In this case, migration must reduce net incomes for at least some households. In particular, the income distribution frontier with free migration must lie below the no-migration frontier

[3] "Low-skilled foreign workers can have positive net benefits on the economic well-being of the native US population. Yet [if] ... they can bring dependent family members and have access to the income transfer and social service systems ... they are likely to have a negative impact." Chiswick (1988, 114). See also Borjas (1990, esp. ch. 9) for similar discussion.

[4] For related analysis, see Baumol (1989) who, building on Baumol and Fischer (1979), discusses how emigration by taxpayers can limit the set of attainable income distributions.

in the important case where mobile workers are net beneficiaries from redistributive policy and thus impose a fiscal burden on society. A clear implication of the analysis in this case is that a jurisdiction might wish to limit migration. Sometimes, however, direct control over the level of migration or over the access of migrants to the benefits of redistributive policies is infeasible. [5] If direct controls are infeasible, however, are there policy instruments that can be used to limit migration in an indirect fashion? If so, would it be in the interest of a jurisdiction to use such instruments?

In the case of Western Europe, there is much talk of providing aid to East European countries in order to forestall migration. [6] The German government is expending large amounts of resources in an attempt to limit migration from the former DDR into western Germany. The US could provide higher levels development aid to Mexico and other Latin American countries which might reduce the level of South-North migration. Could such aid ever be advantageous from the viewpoint of the *donor* country? Perhaps surprisingly, the answer is yes. If we expand the set of redistributive policy instruments to include (direct or indirect) transfer payments to *non-resident* mobile households, some portions of the income distribution frontier with free migration lies strictly outside the frontier for the case where such payments are prohibited. That is, it may be possible to raise the net incomes of all of those residing within a given jurisdiction by imposing taxes on them and giving the proceeds to mobile households residing *outside* the jurisdiction. This result does not require any particularly strong assumptions. It arises simply from the desirability of adding an instrument of policy to affect migration flows when those flows cannot be directly controlled.

[5] Three examples illustrate some of the possible constraints on government policy. First, although not explicitly mentioned in the U.S. Constitution, the freedom to migrate among the states is generally regarded as a constitutionally-protected right. Furthermore, Supreme Court decisions in *Shapiro v. Thompson* (1969) and *Memorial Hospital v. Maricopa County* (1974) established that a state cannot deny social welfare benefits to households merely because they are recent arrivals in the state. See Tribe (1988, 1441-1443 and 1455-1457). Second, the Treaty of Rome establishing the EEC entitles citizens of any member state to seek employment and to obtain social benefits in any other member state without legal prejudice (Articles 48 and 51). Third, the constitution of the Federal Republic of Germany confers citizenship on all people of German origin. Upon the opening of the frontier with East Germany, citizens of the DDR acquired the right of access to social benefits in the Federal Republic. Of course, formal German unification has subsequently removed all legal distinctions between citizens of the German Federal Republic and those of the former German Democratic Republic. In addition, there are people of German ancestry living in the Soviet Union and in various East-European countries who are potential (and in significant numbers already, actual) migrants to Germany who can (and do) claim access to German social benefits. In each of these cases, the imposition of formal legal limits either on migration or on access to redistributive benefits would entail changes in fundamental constitutional structures or in international treaty obligations. Of course, there are in practice many means by which *de jure* constraints can be circumvented. This does not however change the basic fact that *de jure* constraints do matter.

[6] The following remarks by former US national security adviser Zbigniew Brzezinski are representative: "Before too long we may have to engage in massive philanthropy, because the economic collapse of the Soviet Union is likely to produce massive migrations – hundreds of thousands, perhaps millions of people will be leaving the Soviet Union." (*World Monitor*, December 1990, p. 16.)

The paper is organized as follows. Section II outlines the basic model. Section III describes the effect of migration on the income distribution frontier for one jurisdiction. Section IV explores the implications of transfers from one jurisdiction to another. Section V discusses a number of welfare and policy implications of the analysis as well as some generalizations. Section VI identifies some issues for further research.

II. The Basic Model: Market Equilibrium with Migration

Let there be two regions or countries, 1 and 2. The simplest specification of the model abstracts from any market imperfections or real migration costs, allows only for one produced good, and aggregates all inputs into just two categories: an immobile resource, such as land or natural resources, and a mobile resource, homogeneous labor. The returns to the fixed input in each region accrues to immobile households that reside there (landowners, for example) while the returns to mobile labor accrue to the workers. The number of mobile workers (natives) originally and exogenously assigned to region i is n_i, and each inelastically supplies one unit of labor. When migration is possible, the number of workers actually employed in i, l_i, may differ from n_i, hence $l_i - n_i$ represents the amount of immigration into region i. In each region, output $f_i(l_i)$ is a smoothly increasing and strictly concave function of the amount of labor employed there, $f_i' > 0 > f_i''$. Wages adjust freely, the labor market clears, and therefore the equilibrium allocation of labor must satisfy

$$l_1 + l_2 = n_1 + n_2 \equiv \bar{n}. \tag{1}$$

In the absence of government intervention, labor will flow between regions until incomes for mobile households are equalized. With competitive labor markets, this occurs where $f_1'(l_1) = f_2'(l_2)$, as shown in Figure 1. In this figure, any point on the horizontal axis represents an allocation of labor between the regions. The initial allocation is n_1. If there is a political or cost barrier that prevents migration, initial wages might not be equalized because technologies differ and because relative endowments of fixed factors also differ. In Figure 1, the wage is initially higher in region 1 ($w_1^0 > w_2^0$). Once the barrier to migration is removed, however, labor flows into region 1, ending with an equilibrium level of l_1^e units of labor in 1 and a uniform wage of w^e in both regions. The equilibrium return to the owners of the immobile resource in region i is $f_i(l_i) - l_i f_i'(l_i)$. In the figure, this is given by the area under the f_i' curves and above the line $w^e w^e$.

Note the role of the fixed factors in this model: they create diminishing returns to labor which serve to equilibrate migratory flows. The decline in w_1 from w_1^0 to w^e represents a reduction in real income to workers as immigration occurs in region 1. For this equilibrating adjustment in the labor market to occur, it is actually only necessary for *one* of the production functions to be (sufficiently) concave. For example, the production function in region 2 might use only labor (or region 2 might have such abundance of land that land is not scarce) so that $f_2'(l_2)$ is constant ($f_2'' = 0$). This case could be depicted in Figure 1 by

interpreting the horizontal line $w^e w^e$ to be the curve $f_2'(l_2)$. The equilibrium employment in region 1 would still be l_1^e and w^e would be the equilibrium wage.

Two important generalizations of the model are obvious. First, there could be many immobile factors in each region rather than just one. Thus, there could be a fixed number of immobile workers (for example, high-skilled workers), in either region or in both regions, who own both their own labor and any other fixed factors such as land or natural resources. Then $f_i(l_i) - l_i f_i'(l_i)$ is interpreted as the total income of such immobile households, including both the return to their labor and the return to other nonhuman fixed factors. For ease of exposition l_i will still be referred to as labor in region i, but the term "fixed factor" or "immobile factor" should be interpreted to mean the totality of all other factors other than the class of mobile workers denoted by l_i.

Second, it is inessential to require that *all* of the workers in this class be mobile. If for instance the parameters of the model are such that workers migrate from 2 to 1, then the potential mobility of workers in 1 is irrelevant to the analysis. Similarly, the model does not require that all workers in region 2 (the region of origin) be mobile. It is only necessary that a number sufficient to equalize incomes be freely mobile. [7]

III. Taxes, Transfers, and the Income Distribution Frontier

Now let us introduce instruments of public policy in region 1, in the form of redistributive transfers. Let s be a per capita subsidy paid to all l_1 mobile residents in region 1,

[7] Having sketched the basic model, the contrast between the basic setup here and that in the papers in Bhagwati and Wilson (1989) that investigate problems of redistributive taxation with mobile households can now be discussed. First, several of those papers follow the Mirrlees (1971) (see Wilson (1989a, b)) and Atkinson (1973) (see Bhagwati and Hamada (1989)) models of optimal income taxation by assuming that households differ from one another in terms of some innate ability which gives them different productivities, either in labor or in education acquisition. These ability differentials then generate unequal gross incomes. Wage rates (per effective unit of labor) are exogenously fixed in these models, and there are no non- wage sources of income. (Wilson (1989c), who considers optimal taxation from a world welfare viewpoint, is an exception in this respect.) In the present model, by contrast, wages are endogenously determined, all mobile workers are identical, and income inequality is attributable to differential returns to labor and non-labor factors of production. Second, many of the papers in the Bhagwati-Wilson collection are motivated by the problem of the "brain drain" and tend accordingly to focus on the possibility that high-income taxpayers (i.e, net contributors to the tax-transfer system) may flee taxation, and the problems that this poses for the origin country. The discussion here focusses instead on the possibility that low-income households (i.e., net beneficiaries of the system) may be attracted by favorable fiscal benefits, and the problems that this poses for the destination country. This distinction is quite important when considering the possible policy instruments open to the government of a given jurisdiction; in particular, it may be much easier for one government to offer subsidies to the residents of another jurisdiction, as discussed in Section IV below, than to impose taxes on them. Finally, most of the papers in Bhagwati-Wilson focus on the problem of optimal taxation, whereas the discussion here will be mainly concerned with the effect of migration on the menu of options open to society, rather than the choice of an optimal policy from this menu.

financed by a lump-sum tax on the owners of immobile factors in region 1. [8] Let

$$X_1 = n_1(w_1 + s) = n_1(f_1'[l_1] + s) \tag{2}$$

denote the total (subsidy-inclusive) income of the n_1 workers initially located in region 1, and let

$$Y_1 = f_1(l_1) - l_1 f_1'(l_1) - sl_1 \tag{3}$$

denote the income accruing to the owners of fixed factors in region 1 net of the taxes required to finance the subsidy to mobile workers. This net income measure subsumes the government budget constraint.

With a closed border, $l_1 = n_1$. The curve PQ in Figure 2 portrays the *income distribution frontier* for the closed-border case, showing different possible values of (X_1, Y_1) corresponding to different subsidy rates s. The total income in region 1 in this case is fixed and equal to $f_1(n_1)$ so that the incomes of workers and of owners of immobile factors trade off unit for unit. Let point A represent the income distribution when $s = 0$. [9] The endpoint P corresponds to case where the entire fixed total income $f_1(n_1)$ accrues to the owners of fixed factors, so that $s = -f'(n_1)$ is actually a tax assessed on workers. At Q, $s = [f_1(n_1) - n_1 f_1'(n_1)]/n_1$, and all income accrues to workers. Given the assumption of fixed per worker labor supply, taxes and subsidies are non-distorting and PQ has a slope of -1.

When the border between regions 1 and 2 is open, higher levels of s attract additional workers to region 1. The free-migration equilibrium condition $f_1'(l_1) + s = f_2'(l_2)$ together with (1) defines an implicit function $l_1(s)$ with $l_1' = -(f_1'' + f_2'')^{-1} > 0$ showing the equilibrium level of labor supply in 1 given s. In Figure 1, with $s > 0$, the equilibrium labor allocation is shown as $l_1(s)$.

Opening up migration changes the income distribution frontier. For concreteness, suppose throughout all of the following discussion that the wage in region 1 is higher than that in 2 in the absence of migration, as portrayed in Figure 1. Consider first the effect of migration when there is no redistribution, so that $s = 0$. Since $l_1(0) > n_1$, $f_1'(l_1[0]) < f_1'(n_1)$ and hence the incomes of native workers must fall relative to the pre-migration level at A. The return to the fixed factors in region 1 rises as the regional labor force rises, and indeed the increase in income to owners of fixed factors must exceed the loss in income to the native workers. [10] Thus, the income distribution with free migration and no redistribution is given by a point like A' in Figure 2, lying above PQ.

[8] The subsidy could be expressed as a percentage of income rather than in per capita terms without changing the results. Note that this formulation assumes that both migrants and native residents receive equal treatment with respect to tax and transfer policy. This issue is discussed further in the conclusion.

[9] That is, $X_1 = f_1'(n_1)$ and $Y_1 = f_1(n_1) - n_1 f_1'(n_1)$ at A.

[10] Proof: Given $s = 0$, the change in $X_1 + Y_1$ due to an increase in l_1 is

$$\frac{d(n_1 f_1'[l_1] + f_1[l_1] - l_1 f_1'[l_1])}{dl_1} = (n_1 - l_1) f_1''(l_1)$$

which is positive for all $l_1 > n_1$.

Suppose now that one wanted native workers to have as much income in a free-migration equilibrium as they have at A, the no-redistribution no-migration point. This would require a subsidy, say $\bar{s}$, implicitly defined by $f_1'(l_1[\bar{s}]) + \bar{s} = f_1'(n_1)$. At this subsidy rate, the income of the owners of fixed factors in region 1 is less than that corresponding to A. [11] Thus, the point C on the post-migration income distribution frontier corresponding to $s = \bar{s}$ lies below point A. [12] One can also show that the income distribution frontier under free migration has a slope less than -1 (algebraically) for all points to the right of A'. [13] Thus, it crosses the frontier PQ only once between A' and C and it is steeper than PQ everywhere to the right of A'.

Values of $s < 0$ (negative subsidies, i.e., taxes on mobile workers) discourage migration into region 1. There exists a value of $s = \underline{s}$ which would reduce immigration into region 1 to 0. This value of s satisfies $l_1(\underline{s}) = n_1$, i.e., $f_1'(n_1) + \underline{s} = f_2'(n_2)$. At this value of s, $Y_1 = f_1(n_1) - n_1 f_2'(n_2)$ and $X_1 = n_1 f_2'(n_2) = f_1(n_1) - Y_1$. This income distribution, therefore, lies on the curve PQ at a point such as B. Clearly, for $s < \underline{s}$, the income distribution frontier lies below PQ.

To summarize some of the more important implications of this analysis, let (s^0, X_1^0, Y_1^0) denote the subsidy rate and income levels in a situation where the boundary between regions 1 and 2 is closed and no migration occurs, and let (s', X_1', Y_1') represent the same variables in a free-migration equilibrium. Consider a comparative-statics change from a no-migration situation to a free-migration equilibrium.

Proposition 1: *(a) Suppose that there is no redistribution in region 1 either before or after migration is permitted ($s^0 = s' = 0$). Then the income of mobile workers is lower and the income accruing to the owners of the fixed factors is higher in a free-migration equilibrium than when the border is closed (i.e., $X_1' < X_1^0$ and $Y_1' > Y_1^0$). (b) Suppose that $s^0 > 0$ in an initial no-migration situation. Then, in a free migration equilibrium, either the net income accruing to mobile workers must fall ($X_1' < X_1^0$), the net income accruing to owners of fixed factors must fall ($Y_1' < Y_1^0$), or both, depending on the value of s'. In*

[11] At $s = \bar{s}, \bar{l}_1 = l_1(\bar{s}) > n_1$. $Y_1 = f_1(\bar{l}_1) - \bar{l}_1 f_1'(\bar{l}_1) - \bar{s}\bar{l}_1 = f_1(\bar{l}_1) - \bar{l}_1 f_1'(n_1)$. By concavity of f_1, $f_1(\bar{l}_1) - \bar{l}_1 f_1'(n_1) < f_1(n_1) - n_1 f_1'(n_1)$.

[12] Brecher and Choudhri (1990) show that in an economy with no initial distortions, opening the economy to factor migration is not Pareto-improving. The present finding that the free-migration income distribution frontier lies below the initial no-redistribution point appears to confirm the Brecher-Choudhri result.

[13] To see this, note that $dY_1/ds = -l_1(1 + f_1'' l_1') - sl_1'$ while $dX_1/ds = n_1(1 + f_1'' l_1')$. Hence, along the frontier,

$$dY_1/dX_1 = -\frac{l_1}{n_1} - \frac{sl_1'}{n_1(1 + f_1'' l_1')}.$$

For $s > 0, l_1 > n_1$; since $l_1' > 0$ and $dX_1/ds > 0$, $dY_1/dX_1 < -1$. One can show, incidentally, that the frontier is concave in a neighborhood of $s = 0$. It is globally concave if $f_2''' = 0$. Concavity properties are not needed for the following analysis, however.

particular, holding $X_1' = X_1^0$ *implies that* $Y_1' < Y_1^0$ *and holding* $Y_1' = Y_1^0$ *implies that* $X_1' < X_1^0$.

Part (a) of this proposition is the observation that A' is northwest of A, and part (b) is the observation that the income distribution frontier with free migration lies below and to the left of the segment AQ of the no-migration income distribution frontier PQ.

IV. The Income Distribution Frontier with Interregional Transfers

There have been many discussions in the trade literature of the famous "transfer problem." The question addressed in that literature is whether it might ever be possible for one country to gain (in a welfare sense) from transferring resources to another country. The answer is yes, for reasons that have to do with the general equilibrium terms of trade effects of such transfers. These effects cannot arise in the present model since both regions produce the same homogeneous output whose price is invariant. However, it is still possible that one region might benefit from making transfers to another purely for fiscal reasons. [14]

To explore this possibility, let us modify the model by now supposing that region 1 is able to offer resources to region 2 which are equivalent, in their effect, to a per capita subsidy to mobile workers residing there. [15] Cash subsidies to workers would be the most direct form of such a transfer program. In practice, in-kind transfers of food, housing, or medical supplies, provision of technical expertise or other resources that raise real wages, or provision of public goods and services may be more commonplace and, in some cases, perhaps more focussed and salient instruments of policy that would achieve the same objective.

It is impossible to capture all of these policy instruments in any detailed way in a simple model. The crucial question, however, is whether expenditures by one region on behalf of mobile residents of another region can serve the donor's interests by forestalling migration or by limiting its extent. To address this question in its starkest form, let us restrict attention to pure cash transfers, where σ denotes the subsidy or expenditure per recipient paid by residents of region 1 to mobile workers in region 2. Thus, region 1 now has three policy instruments: s, σ, and the lump-sum tax imposed on owners of immobile factors in the

[14] See Bhagwati *et al.* (1983) for a recent treatment of the transfer problem. Despite similarities in the underlying policy question being examined, there are basic differences between the present analysis and the transfer problem literature. The latter focusses on the effect of transfers on the structure of world prices for traded goods, and generally abstracts from the possibility of international migration; furthermore, the potential gains to a donor from making a transfer to another country depend on the existence of at least 3 countries, and hinge on differences in marginal propensities to consume different commodities. In the present analysis, there are only two jurisdictions; also, there is only one consumable good, for which all consumers have an equal marginal propensity to consume (of 1), and no possible changes in relative commodity prices.

[15] It is trivial to show that resources accruing to immobile households in region 2 cannot directly benefit region 1 within the context of the model used here. They may therefore be ignored for the purposes of the present analysis. (Such transfers might of course be advantageous for political or other reasons not captured within the model.)

region. The total income accruing to the original workers residing in region 1 is still given by (2). The net income received by the owners of immobile factors is reduced by the added subsidy paid to workers in region 2, that is,

$$Y_1 = f_1(l_1) - l_1 f_1'(l_1) - sl_1 - \sigma l_2 \tag{4}$$

instead of (3). The equilibrium value of l_1 is still determined by equalization of net incomes for mobile workers. However, that condition must now reflect the transfers paid to workers residing in region 2:

$$f_1'(l_1) + s = f_2'(l_2) + \sigma. \tag{5}$$

This condition together with (1) determine the equilibrium values of l_1 and l_2 as implicit functions of $s - \sigma$, such that $l_1' = -(f_1'' + f_2'')^{-1} = -l_2' > 0$.

How does the availability of the new policy instrument, σ, affect the income distribution frontier in region 1? Of course it cannot shrink the frontier, which is an envelope. However, it is not obvious that the frontier actually shifts out. To see whether it does, note that the values of s and σ corresponding to any point $(\bar{X}_1, \bar{Y}_1)$ along the frontier must be a solution to the optimization problem

$$(P) \qquad max_{s,\sigma} \quad Y_1 \quad \text{subject to} \quad X_1 \geq \bar{X}_1$$

where X_1 and Y_1 are given by (2) and (4). The first-order conditions for this optimization problem imply that, along the income distribution frontier, [16]

$$\sigma = s + l_2 f_2'' \tag{6}$$

or, equivalently,

$$h(s_2 - \sigma) \equiv s - \sigma + l_2(s - \sigma) f_2''(l_2[s - \sigma]) = 0. \tag{6'}$$

A second-order necessary condition for a solution to (P) is that [17]

$$h' = 1 + l_2' f_2'' + l_2 f_2''' l_2' \geq 0 \tag{7}$$

at the optimum. Obviously it is sufficient for this that $h' > 0$ globally. This is a relatively weak condition which will be assumed below in order to simplify the analysis. [18]

[16] Proof: Form the Lagrangian $L = Y_1 - \lambda(\bar{X}_1 - X_1)$ and derive the first-order conditions

$$s: \quad -l_1 f_1'' l_1' - (s - \sigma) l_1' - l_1 + \lambda n_1 (f_1'' l_1' + 1) = 0$$
$$\sigma: \quad l_1 f_1'' l_1' + (s - \sigma) l_1' - l_2 - \lambda n_1 f_1'' l_1' = 0.$$

Eliminating λ from these equations and some algebraic manipulation yields (6). Note that maximizing Y_1 subject to $X_1 \geq \bar{X}_1$ is equivalent to maximizing X_1 subject to $Y_1 \geq \bar{Y}_1$. Either approach leads to (6) as a characterization of points along the income distribution frontier.

[17] Details in Appendix.

[18] Several examples illustrate the meaning of the assumption $h' > 0$. First, note that if f_2 is quadratic (i.e., $f_2(l_2) = a_2 l_2 - b_2 l_2^2$), with a_2, b_2 positive, $f_2''' = 0$ and $h' > 0$ globally. Second, if f_2 is logarithmic (i.e., $f_2(l_2) = a_2 log(l_2)$, $a_2 > 0$, $f_2''' = -l_2^2 < 0$ and again $h' > 0$ globally. Third, if f_1 and f_2 are Cobb-Douglas and identical, i.e., $f_1 = a l_1^\alpha$, $f_2 = a l_2^\alpha$, with a, α both positive), then $h' = (f_1'' + f_2'')^{-1}(f_1'' + 2f_2'' + l_2 f_2''') = (l_1^{\alpha-2} + l_2^{\alpha-2})^{-1}(l_1^{\alpha-2} + \alpha l_2^{\alpha-2}) > 0$. Relaxtion of the assumption that $h' > 0$ seems mainly to raise issues of a technical nature.

The income distribution frontier for region 1 can now be characterized:

Proposition 2: *Assume that $h' > 0$ globally.*

(i) Any point $(\bar{X}_1, \bar{Y}_1)$ on the income distribution frontier for region 1 is associated with values $(\bar{s}, \bar{\sigma})$ and an allocation of labor $(\bar{l}_1, \bar{l}_2) = l_1(\bar{s}-\bar{\sigma}), l_2(\bar{s}-\bar{\sigma})$ such that $\bar{s}-\bar{\sigma} = \delta^*$ and $l_i(\bar{s}-\bar{\sigma}) = l_i(\delta^*) \equiv l_i^*$ $(i = 1, 2)$ for some fixed $\delta^* > 0$, independent of $(\bar{X}_1, \bar{Y}_1)$. Further, define $X_1^* \equiv n_1(f_1'[l_1^*] - l_2^* f_2''[l_2^*])$. Then $\bar{\sigma} = (\bar{X}_1 - X_1^*)/n_1$.

(ii) The income distribution frontier for region 1 has a constant slope of $\frac{dY_1}{dX_1} = -\bar{n}/n_1 < -1$.

Proof: Assuming $h' > 0$ implies that there is a unique value δ^* such that $h(\delta^*) = 0$. The equilibrium level of employment in region i is $l_i^* = l_i(\delta^*)$ whenever $s - \sigma = \delta^*$. For any point $(\bar{X}_1, \bar{Y}_1)$ on the income distribution frontier for region 1, the corresponding values of $\bar{s}$ and $\bar{\sigma}$ must satisfy (6)', i.e., $\bar{s} - \bar{\sigma} = \delta^* = -l_2^* f_2''([l_2^*])$. Hence, $\bar{X}_1 - X_1^* = n_1(f_1'[l_1^*] + \bar{s} - f_1'[l_1^*] + l_2^* f_2''[l_2^*]) = n_1(\bar{s} - \delta^*) = n_1\bar{\sigma}$.

Next, note that $\bar{Y}_1 = f_1(l_1^*) - \frac{l_1^*}{n_1}\bar{X}_1 - \bar{\sigma}l_2^*$. Using the fact from (i) that $\bar{\sigma} = (\bar{X}_1 - X_1^*)/n_1$ and differentiating yields (ii). *QED*

Before discussing the implications of this proposition, it may be useful first to consider a diagrammatic illustration of the main ideas behind it. [19] In Figure 3, let n_1 represent the original population of mobile workers in 1, and suppose that their income is to be set at $\bar{X}_1/n_1$ each, or $\bar{X}_1$ in total. This would not occur without subsidies, since the equilibrium wage with no redistribution, given by the intersection of f_1' and f_2', lies below $\bar{X}_1/n_1$. Jurisdiction 1 can attain $\bar{X}_1$ by paying a sufficiently high subsidy to mobile workers residing only within its own boundaries, while paying no subsidy to non-residents. The subsidy would have to be large enough to shift up the curve $f_1' + s$ to an intersection with the curve f_2' at point m. At this point, the equilibrium net income of each mobile worker is $\bar{X}_1/n_1$, as required. The same net income for workers could be attained as well, however, by setting a smaller subsidy s_0 for workers in region 1 and a subsidy of σ_0 for workers in region 2, or with a still smaller subsidy of s_1 in region 1 and a larger subsidy of σ_1 in region 2. As we vary s and σ in this way to keep $\bar{X}_1$ constant, the owners of immobile factors in region 1 are affected in two ways. First, their gross income changes. In particular, as s falls and σ rises, the equilibrium value of l_1 falls, as given by the succession of intersection points m, d, and c, so that the gross rent to the immobile factor owners falls. Second, the total tax paid by the mobile factor owners also changes. As s falls and l_1 falls, the tax burden of transfers to residents, sl_1, falls, while as σ rises, the burden of paying for transfers to non-residents, σl_2, rises.

Holding $\bar{X}_1$ fixed, what combination of s and σ is best from the viewpoint of immobile factor owners? Suppose $(s, \sigma) = (s_0, \sigma_0)$ initially and consider a move to $(s, \sigma) = (s_1, \sigma_1)$.

[19] This diagrammatic approach was prompted by very helpful suggestions from Hans-Werner Sinn (who actually suggested a somewhat different diagram).

As the equilibrium level of labor in region 1 falls, the gross rents to these immobile factor owners fall by $abef$. The cost of payments for transfers to residents falls by $abcdef$. The cost of payments for transfers to non-residents rises by $cdghij$. Adding up, the net income of the immobile factor owners changes by $bjke - ghik$.

There are two critical qualitative conclusions that this diagram can illustrate. First, is it ever desirable to set $\sigma > 0$? Yes, if $\bar{X}_1$ is sufficiently high. For then the points m, d, and c all lie far to the right in Figure 3, the "loss rectangle" from increasing σ, $ghik$, is not very wide, and hence $bjke > ghik$. Increases in σ (and accompanying reductions in s) would thus raise the net income of the immobile factors. [20]

Second, can we illustrate from the diagram that the value of $s - \sigma$ that maximizes Y_1 is independent of the specified value of X_1, as asserted in Proposition 2? To answer this question, suppose that the particular values $(s, \sigma) = (s_0, \sigma_0)$ shown in the figure do indeed maximize Y_1 when $X_1 = \bar{X}_1$. For this to be the case, it is necessary that $bjke \approx ghik$, that is, the gains and losses to the immobile factor owners from small changes in (s, σ) must balance out. Now suppose that we had started instead with a different target value of X_1, say $X_1 = \bar{X}_1' > \bar{X}_1$. One way to attain this higher level of X_1 is to set $s = s_0' \equiv s_0 + (\bar{X}_1' - \bar{X}_1)/n$ and similarly set $\sigma = \sigma_0' \equiv \sigma_0 + (\bar{X}_1' - \bar{X}_1)/n$. With these subsidies, the curves $f_1' + s_0$ and $f_2' + \sigma_0$ would both shift up by identical amounts to a new intersection directly above point d, at which the workers would indeed attain $X_1 = \bar{X}_1'$. Similarly, if we set $s = s_1' \equiv s_1 + (\bar{X}_1' - \bar{X}_1)/n$ and $\sigma = \sigma_1' \equiv \sigma_1 + (\bar{X}_1' - \bar{X}_1)/n$, we get a new equilibrium directly above point c at which workers again have a net income of $X_1 = \bar{X}_1'$.

Now, according to Proposition 2, if $(s, \sigma) = (s_0, \sigma_0)$ is optimal (from the viewpoint of the immobile factor owners in 1) when $X_1 = \bar{X}_1$, $(s, \sigma) = (s_0', \sigma_0')$ should be optimal when $X_1 = \bar{X}_1'$ because the interregional subsidy differential is the same in both cases. To check this, consider the effect of a move from the subsidy pair (s_0', σ_0') to (s_1', σ_1') on the net income of the immobile factors. Note that the points b, j, g, e, and k are all determined by the value of the marginal productivity of labor at the labor allocations lying below the points c and d. Changes in s and σ that leave the labor allocations unchanged, such as the change from (s_0, σ_0) to (s_0', σ_0'), do not change the locations of these points. It follows that a change from the subsidy pair (s_0', σ_0') to (s_1', σ_1') would change the net income of the immobile factor owners by precisely $bjke - ghik$, exactly as before. Thus, if (s_0, σ_0) maximizes Y_1 when $X_1 = \bar{X}_1$, (s_0', σ_0') as defined above must maximize Y_1 when $X_1 = \bar{X}_1'$. Changes in the level of net income to be received by mobile workers therefore do not themselves change the tradeoff, at the margin, between s and σ. Hence, $s_0' - \sigma_0' = s_0 - \sigma_0 = \delta^*$ for all values of X_1 as we wanted to show.

Let us now consider the implications of Proposition 2. First, it shows that *when it is possible to make inter-regional transfers to mobile workers, the inter-regional allocation of*

[20] Recall from the preceding formal analysis that $\sigma > 0$ at a solution to (P) only for $\bar{X}_1$ sufficiently large.

labor does not change as the net income distribution in region 1 is altered. Therefore, *total production, gross factor prices, and gross factor incomes in both regions are the same at all points on the income distribution frontier for region 1.*

Allowing σ to be used as a policy instrument therefore changes matters quite dramatically. Along the curve $BA'C$ in Figure 2, higher values of X_1 correspond to higher values of s and also to higher values of l_1, as higher subsidies to mobile workers attract additional workers from region 2. By contrast, when it is possible to pay subsidies to mobile workers in region 2 as well as to those in region 1, the inter-regional subsidy differential $s - \sigma$ is set equal to a constant (namely, δ^*) no matter which point on the income distribution frontier for region 1 is to be achieved. Thus, higher values of X_1 are achieved by increasing both s and σ in such a way that $s - \sigma$ remains constant. Simultaneous increases in s and σ do not induce mobile workers to move into region 1, and thus different levels of X_1 and Y_1 can be achieved while keeping the allocation of labor unchanged.

Geometrically the income distribution frontier for region 1 when subsidies can be paid to workers in both regions is just a straight line with a slope of $-\bar{n}/n_1$. It is shown in Figure 2 as the dashed line DEF. It must be tangent to $BA'C$, the income distribution frontier when transfers can only be made to mobile workers in region 1, at a point like E, lying to the right of A'. Recall that $s = 0$ at the no-redistribution point A' and that $s > 0$ to the right of A' along $BA'C$. At the value $s = \delta^* > 0$ the value of σ according to (6) is $\sigma = 0$. That is, point E corresponds to an income distribution at which it is undesirable to pay make any transfer to (or from) the mobile workers in region 2, even if it is feasible to do so. At this point, the frontiers $BA'C$ (along which σ is constrained or assumed to be zero) and DEF (along which non-zero values of σ are permissible) must coincide.

Points along the segment DE of the frontier DEF correspond to income distributions that are obtainable only by taxing mobile workers in region 2 (that is, by setting $\sigma < 0$), while point along EF are attained by offering positive subsidies to those workers ($\sigma > 0$). In fact, at the point E, $X_1 = X_1^* = n_1(f_1'[l_1^*] + \delta^*)$. For any $X_1 \gtrless X_1^*$, $X_1 = n_1(f_1'[l_1^*] + s)$ with $s \gtrless \delta^*$ and $\sigma = s - \delta^* \gtrless 0$. Thus, the frontier DF must lie strictly outside the frontier $BA'C$ at all points other than E. Finally, one can show that DEF must lie below the original no-migration income distribution frontier PQ for any value of $X_1 \geq n_1 f_1'(n_1)$. That is, the segment AQ must lie above the frontier DEF. [21]

While the entire frontier DEF is attainable if both s and σ can be freely chosen, it may be impossible in practice to for region 1 to choose negative subsidies, i.e., taxes, for

[21] The proof is virtually identical to the proof that C in Figure 2 lies below A. When no migration is allowed, $X_1 = n_1 f_1'(n_1)$ at point A. With free migration, $s = \sigma = 0$ implies $X_1 < n_1 f_1'(n_1)$. Thus, to achieve $X_1 = n_1 f_1'(n_1)$ in the presence of migration requires some $\tilde{s} > 0$ and $\tilde{\sigma} \geq 0$, $\tilde{l}_1 > n_1$, and $\tilde{l}_2 < n_2$. The corresponding value of Y_1 is $\tilde{Y}_1 = f_1(\tilde{l}_1) - \tilde{l}_1 f_1'(\tilde{l}_1) - \tilde{s}\tilde{l}_1 - \tilde{\sigma}\tilde{l}_2 = f_1(\tilde{l}_1) - \tilde{l}_1 f_1'(n_1) - \tilde{\sigma}\tilde{l}_2 \leq f_1(\tilde{l}_1) - \tilde{l}_1 f_1'(n_1) < f_1(n_1) - n_1 f_1'(n_1)$, which is the value of Y_1 at point A. Thus the income distribution frontier with free migration lies below A. Since it has a slope less than -1, it lies below the frontier PQ for all $X_1 > n_1 f_1'(n_1)$.

the mobile workers in region 2. This is certainly the case if the two regions correspond to different countries, in which case workers in region 2 would simply not be within the jurisdiction of region 1. In this case, only that part of the frontier DEF corresponding to non-negative transfers to mobile workers is relevant for policy. In this case, the income distribution frontier for region 1 is the curve $BA'E$ for values of $X_1 < X_1^*$ and is the segment EF of DEF for $X_1 > X_1^*$.

V. Conclusion: Implications, Generalizations, and Limitations of the Analysis

A. Welfare Implications

The analysis so far has examined only the possible distributions of income that are attainable in a world with mobile households and different types of policy instruments. Once the income distribution possibilities are known, however, many implications of the analysis for welfare of households in region 1 are obvious, provided that one confines attention to those who are *initial* residents. The most clear-cut results emerge in the case where all factor owners are entirely self-interested, so that their welfare levels may be identified with their income levels X_1 and Y_1. The income distribution frontier in such a society is identical to its utility-possibility frontier. If instead households are altruistic, their welfare may depend on both X_1 and Y_1. A social welfare function, which represents some social procedure for trading off income across population groups, would also depend (positively) on both X_1 and Y_1.

In the case where all households are self-interested, the following conclusions can be read off immediately from Figure 2. First, allowing free migration as compared with no migration can result in a Pareto-improvement relative to the zero-migration situation, since parts of the income redistribution frontier with free migration (either $BA'C$ or $BA'EF$) lie above the no-migration frontier PQ. However, they only lie above PQ to the left of the no-redistritution point A. Hence, *free migration can be Pareto-improving only if, in the no-migration situation, resident mobile workers (and non-resident mobile workers, if possible) are being taxed to provide transfer payments to owners of immobile factors.*

Second, free migration can lead to Pareto-inferior outcomes. In particular, the income distribution frontiers with migration ($BA'C$ and DF) both lie below PQ to the right of the no-redistribution point A. Thus, *free migration cannot lead to Pareto improvements, and may lead to Pareto-inferior outcomes, if, in the no-migration situation, owners of immobile factors are being taxed to provide transfer payments to mobile workers.*

Third, the use of transfers from owners of immobile factors in region 1 to mobile workers in region 2 can shift out the income distribution frontier in the presence of migration, from EC to EF. Hence, given free migration, *it may be Pareto-improving for region 1 to make*

transfers to non-resident mobile workers in region 2. And, recall that $l_1 = l_1^*$ along the entire segment EF. That is, *transfers to mobile workers in region 2 from owners of immobile factors in region 1 serve to limit immigration into region 1 to some maximal level. Allowing greater levels of migration can be Pareto-harmful.*

Thus, it can be advantageous, from a welfare viewpoint, for a region with an open border to make transfer payments to mobile workers in another region. The benefit from doing so comes precisely from the opportunity that this provides to limit migration to a maximum advantageous level. This argument for the "gains from giving" differs from that given in previous discussions of the "transfer problem." There, the gain to a donor country from the transfer of resources to another country depends crucially on the general equilibrium change in the commodity price structure in an otherwise undistorted economy. By contrast, the potential benefits to the donor region in the present analysis are purely fiscal in nature: region 1 can only benefit from subsidizing mobile workers in the other region if it makes positive transfers to its own workers. There are no such gains to be had if region 1 does not engage in income redistribution in favor of mobile workers. Therefore, *the welfare gains to region 1 from transfers to region 2 cannot occur in an undistorted equilibrium; they only arise in a second-best environment with distortions of resource allocation brought about by redistributive policy in favor of mobile workers.*

Let us now briefly consider the welfare implications of the analysis when altruism exists or when there is a social welfare function that can resolve distributional problems. A social welfare function can be represented by a function $u(X_1, Y_1)$, depending positively on the net income of both groups of factor owners. A function of this form would also represent the welfare of any households in the economy who are altruistic toward others.

Suppose, to take an idealized case, that redistributive policy in region 1 is set in such a way as to maximize social welfare, and suppose that the border of region 1 is initially closed. Initially, social welfare maximization leads to an income distribution somewhere along PQ. A revealed preference argument establishes the following. *If redistributive policy favors mobile workers in the no-migration situation (i.e., the initial social-welfare-maximizing policy lies on AQ), then welfare cannot be increased by free migration while maintaining the net incomes of mobile workers.* That is, starting at an initial optimum along AQ, it is impossible to achieve a preferred outcome along either $BA'C$ or along EF at any point to the right of A. The income distribution frontier with free migration does lie above PQ at some points to the left of A, and it is possible that the gains in net incomes to owners of immobile factors in the post-migration situation could be so large that they offset the losses to mobile workers. (For instance, A' itself could be preferred to any point along AQ for some preference structure.) Of course, as already noted above, allowing migration can actually be Pareto-improving if mobile workers are subject to taxation. In particular, *if social welfare in the no-migration situation is maximized at a point somewhere along the segment BG, revealed preference implies that welfare must rise with free migration.*

The welfare implications of migration when some (or all) households are altruistically-motivated are quite similar to those just discussed. The nature of the argument in this case can be seen from one illustration. Take the case where the owners of immobile factors in region 1 (say, the rich) care about the welfare of mobile workers (the poor) and the mobile workers are self-interested. This means that the welfare of the rich in the no-migration situation would be maximized at some point along PQ to the right of A. The welfare of the poor would be maximized at Q. If the redistributive policy of region 1 is determined by a political process that responds positively to the interests of the region's residents, a policy of transfers from rich to poor will occur in the initial no-migration equilibrium, somewhere to the right of A and presumably somewhere between the optimum of the rich and point Q. It is now obvious that allowing for migration cannot be Pareto-improving. Either the new income distribution will lie to the left of the original one, in which case it hurts the native workers, or it lies to the right and below the original one, at an income distribution that has been revealed inferior with respect to the preferences of the rich.

B. Redistribution in a Federal System

Suppose that region 1 does engage in redistribution in favor of mobile workers. We have seen that it might benefit by making transfers to workers in the other region. If the two regions represent different countries, such transfers could be implemented by transfers from the government of region 1 to the government of region 2. However, region 1 may have very imperfect control over the use of resources that it transfers to region 2, and, in particular, it might be difficult to insure that such transfers are directed to the mobile workers in region 2 that are the desired beneficiaries from the donor country's viewpoint.

On the other hand, suppose that two jurisdictions form a federation, and assign the central government of the federation the task of implementing redistributive policies that transfer resources from owners of immobile factors to mobile factors. It is certainly possible that such a federation could be Pareto-improving from the viewpoint of the initial residents of the donor region, provided that that region would have undertaken redistribution in favor of mobile workers in any case and provided that migration could not be effectively limited by closing the border between the two regions. Not surprisingly, the residents of the region that receives net transfers in such a federation may also be made better off. The centralization of the redistributive function of government through establishment of a federation of jurisdictions may therefore be welfare improving.

Of course, the formation of federations can be a very complex process that entails many benefits and costs other than those associated with income redistribution. However, in any federation, some decision must be reached about the extent of redistributive activity to be undertaken by different levels of government. In the US, for example, all levels of government – Federal, state, and local – engage in policies that redistribute income. Greater centralization of the redistributive function inevitably entails net redistributions among regions, as

some make net contributions and others receive net benefits from the redistributive policies of higher-level governments. This corresponds loosely with inter-regional transfers of the type analyzed above. Within this policy context, the results should be interpreted to mean that regions that provide net contributions to the federation could nevertheless gain, or at least might not lose as much as would otherwise appear to be the case. Such gains would result from reductions in the level of fiscally-induced migration that would otherwise result from redistributive activities undertaken by the individual regions.

If one thinks of regions as cities within a state, fiscally-induced migration could impose significant burdens on jurisdictions engaging in redistribution, and the analysis indicates some of the gains that could be realized by shifting redistributive activities to the state level. Analytically identical arguments can be used to identify possible benefits from centralization of redistributive activities at the national or even international level. While many factors come into play in policy analysis at these levels, the fiscal considerations that are at the center of the present analysis will certainly be important. For instance, in the European context, there is a question as to whether membership in the EEC ought to be extended to additional countries. One implication of EEC membership is that the citizens of any member state cannot be legally prohibited from migrating to another member state. Many existing member states have extensive redistributive transfer programs, and participation is open to all residents who are citizens of member states of the EEC. Therefore, the admission of a country such as Turkey or Poland to the EEC carries with it the possibility that citizens of those countries may migrate to other member states; in doing so, they may impose significant fiscal burdens on the destination states. No doubt this is one important factor to be considered in the future evolution of the EEC. [22]

Another important issue in the EEC context concerns the proper role of the EEC itself in coordinating or centralizing some of the redistributive functions of member states. Such limited fiscal functions as the EEC now has are mainly redistributive in nature (see Wildasin [1990] for some discussion of the use of grants from the Social Funds of the EEC to promote distributional objectives). Recently, there has been some discussion of a possibly enhanced role of this type for the EEC (Padoa-Schioppa *et al.* [1987]). Since the income redistribution programs of EEC members are typically large and well-established, amd since massive centralization of income redistribution activities in Europe would present a host of political and fiscal problems, there is little prospect that the EEC will soon become to its member states what the central governments of the US or Canada are to their respective federations. However, it must be remembered that a system of intergovernmental grants can effectively centralize an otherwise decentralized system of redistribution by inducing lower-

[22] It should be noted that the EEC member states may have only a limited ability to control such international migration in any case. The most clear-cut example is provided by pre-unification Germany. Once the source country (the DDR) opened its border, there was no practical means by which the BRD could limit immigration by East Germans who, as a constitutional matter, immediately acquired citizenship status in the West. The German case is extreme, but it remains to be seen how the countries of Western Europe will respond if confronted with the prospect of substantial migration from the East.

level governments to pursue what amounts to a centralized policy without, however, having to dismantle the lower-level redistributive programs (Wildasin [forthcoming]). Thus, in order to reap the potential gains from federation among jurisdictions engaged in redistribution, it is not really necessary to create an extremely powerful central government to which member states relinquish their separate identities as sovreign states. If the EEC is to play a larger role over time in coordinating redistributive policies among member states, it may well do so in the more indirect form of intergovernmental grants rather than by directly superceding national government policies. [23]

C. Generalizations and Limitations

Several assumptions underlying the preceding analysis can be significantly relaxed without changing the results. Since the analysis focusses on the income distribution possibilities in region 1, it is not extremely sensitive to the precise specification of factor market conditions in region 2. For the sake of simplicity and for its inherent interest, the preceding discussion has assumed that wages in both regions are set according to marginal productivity and that migration costs are zero. However, there is no need to assume marginal productivity factor pricing in region 2. The main role of this assumption is simply to generate an upward-sloping supply of mobile workers from region 2 to region 1. In Figure 1, $f_2'(l_2)$ is such a supply curve. However, one could simply assume the existence of such a supply curve without postulating a competitive labor maket in region 2. The labor market in region 2 could be highly distorted, regulated, or otherwise imperfect without changing the essentials of the analysis. Migration costs, say a fixed cost of c per migrant, simply have the effect of shifting the supply curve down by the amount c. The two critical assumptions for the analysis are that there is an upward-sloping supply of mobile laborers, and that this supply curve can be shifted downward by subsidies paid by region 1 directly or indirectly to workers in region 2.

Of course, while the detailed working of the labor market in region 2 is not crucial for the present analysis, it would be very important for other issues. In particular, an analysis of the *overall* efficiency and distributional implications of labor market tax/transfer interventions, taking into account welfare effects in *both* regions rather than just one, would depend critically on the specification of labor market conditions in both regions. [24] Related to the problem of efficient interregional labor allocation is the assumption, maintained

[23] An interesting analysis by Sinn (1988) of the problems of the Sahel should be mentioned here. He treats the problem of the Sahel as a common-property reosurce problem, in which returns to land are captured on a common-property basis by residents. This induces excessive population in the Sahel and drives land rents to zero, which, within the context of the above analysis, can be viewed as a 100% tax on the rents to immobile factors paid to residents of region 1. He shows that the Sahel itself may benefit from a reallocation of foreign aid away from the Sahel to neighboring regions. This is equivalent, in the present framework, to showing that point F in Figure 2 lies to the right of the intersection of the curve $BA'C$ with the horizontal axis.

[24] See Wildasin (1986, 1987) for discussion of the literature on tax/transfer policy and efficient interregional allocation of labor.

throughout the formal analysis above, that immigrants obtain full access to the benefits of income redistribution programs. While some governments may be unable to prevent immigrants from taking advantage of income redistribution, others may be able to do so, at least indirectly. For example, at the local government level, it is well known that the use of zoning can make a local property tax functionally equivalent to a head tax, thus obviating any implicit redistribution that might otherwise occur under property taxation (Hamilton [1975], Mieszkowski and Zodrow [1989]). Furthermore, such a system of zoning/property taxation can lead to efficient resource allocation, where this might not be true if there is no zoning. Thus, regulatory policies (like zoning) that do not at first sight have much to do with income redistribution may actually allow governments to differentiate effectively between original residents and new residents. The results of the analysis in previous sections are sensitive to the availability of such regulatory or other policy instruments.

The model used above has been deliberately simplified, and it is important to recognize its limitations. First, the model assumes that all factors of production can be aggregated into two groups. In reality, there are different types of mobile labor, other mobile factors of production, and many different kinds of immobile factors of production. Mobile workers may be completely unskilled or may be highly-trained professionals; their labor may be complementary with some immobile factors, as assumed in the above model, but it may be substitutable with others. Similarly, their labor may be either substitutable or complementary with the labor of the native work force. The implications of migration for the distribution of income among different types of workers or the owners of different immobile factors can be quite different, depending on the nature of such substitute/complement relationships.

Second, the model abstracts from the effects of migration and public policy on the general equilibrium structure of production, prices, and trade. As shown in previous literature, migration can change factor supplies in both the origin and destination regions which, according to well-known trade theorems, will cause some industries to exand and others to contract. Such considerations are precluded here by the assumption of homogeneous production but might be important in practice.

Third, the model assumes perfectly competitive factor markets and full employment in region 1. The effects of migration could be quite different – certainly the welfare analysis would differ – if unionization or other sources of wage rigidities prevent factor markets from clearing. Related to this point is the fact that households do not supply all factors of production inelastically. As is well known, tax and transfer policies distort factor markets even in the absence of migration. A more complete welfare analysis would take these effects into account.

Fourth, migration has an intertemporal dimension. Immigrants change their economic status over time. Sometimes migrants are predominantly young males. Immigrants may arrive in the destination region with limited facility with the local language and other institutions. Particularly if they enter illegally, it may be difficult or impossible for them to obtain social insurance benefits, income transfers, and other social services. Thus, despite various formal constraints that appear to guarantee social benefits to immigrants, Chiswick (1988) notes that US immigration policy "has inadvertently had many features of an 'optimal' policy" as the country has obtained "large flows of low-skilled young adult workers ...without dependent family members ...[who] did not receive US income transfers and social services." However, as Chiswick points out, the status of immigrants, including illegals, changes over time. Immigrants who initially make net contributions to public pension programs may become benefit recipients later; young male migrants may initially place little burden on social medical care or educational institutions but family members that join them later, or the original migrants themselves, may become net fiscal beneficiaries at a later stage. [25] A policy that effectively limits the value of social welfare benefits to original immigrants may fail to do so for their dependents. Furthermore, successful immigrants may experience rising earnings over time which lead to high fiscal contributions, especially when tax/transfer programs are stongly income-conditioned. The static analysis presented above is really not designed to address these issues directly, but they should be borne in mind in interpreting the results. In particular, present-value interpretations of wages, subsidies, etc. might be necessary in order to avoid misleading conclusions.

For all of these reasons, the foregoing analysis must be interpreted carefully. The highly aggregated static model developed here is perhaps the simplest that can be used to explore the distributional and welfare implications of migration for an economy that engages in significant redistributive policy. The simplicity of the model contributes to the clarity and strength of the results. The model thus provides a natural benchmark and reference point. Carefully interpreted, the analysis can provide insight into many aspects of the complex connections between migration and redistributive policy. But there is clearly much scope for further investigation of models that relax some of the restrictive assumptions imposed here.

[25] Borjas (1990) presents data indicating that welfare participation by immigrants to the US tends to rise over time as immigrants become assimilated.

REFERENCES

Atkinson, A.B. (1973), "How Progressive Should Income Tax Be?" in M. Parkin (ed.), *Essays in Modern Economics* (London: Longman).

Baumol, W.J. (1989), "The Income Distribution Frontier and Taxation of Migrants," in J.N. Bhagwati and J.D. Wilson (eds.), *Income Taxation and International Mobility* (Cambridge: MIT Press), 159-178.

Baumol, W.J. and D.Fischer (1979), "The Output Distribution Frontier: Alternatives to Income Taxes and Transfers for Strong Equality Goals," *American Economic Review 69*, 514-525.

Bhagwati, J.N., R. Brecher, and T. Hatta (1983), "The Generalized Theory of Transfers and Welfare: Bilateral Transfers in a Multilateral World," *American Economic Review 73*, 606-618.

Bhagwati, J.N. and K. Hamada (1989), "Tax Policy in the Presence of Migration," in J.N. Bhagwati and J.D. Wilson (eds.), *Income Taxation and International Mobility* (Cambridge: MIT Press), 113-140.

Bhagwati, J.N. and J.D. Wilson (eds.) (1989), *Income Taxation and International Mobility* (Cambridge: MIT Press).

Boadway, Robin W., and Flatters, Frank R. (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.

Borjas, G. (1990), *Friends or Strangers: The Impact of Immigrants on the US Economy* (New York: Basic Books).

Brecher, R.A. and E.U. Choudhri (1990), "Gains from International Factor Movements without Lump-sum Compensation: Taxation by Location versus Nationality," *Canadian Journal of Economics 23*, 44-59.

Brennan, G. and J.M. Buchanan (1980), *The Power to Tax: Analytical Foundations of a Fiscal Constitution* (New York: Cambridge University Press).

Brown, C.C. and W.E. Oates (1987), "Assistance to the Poor in a Federal System," *Journal of Public Economics 32*, 307-330.

Buchanan, J.M. (1950), "Federalism and Fiscal Equity," *American Economic Review 40*, 583-599.

Chiswick, B. (1988), "Illegal Immigration and Immigration Control," *Journal of Economic*

Perspectives 2, 101–116.

Gramlich, E. M. (1985), "Reforming US Fiscal Federalism Arrangements," in J. M. Quigley and D. L. Rubinfeld (eds.), *American Domestic Priorities: An Economic Appraisal* (Berkeley: University of California Press), 34-69.

Hamilton, B.W. (1975), "Zoning and Property Taxation in a System of Local Governments," *Urban Studies 12*, 205-211.

Inman, Robert B., and Rubinfeld, Daniel L., "The Judicial Pursuit of Local Fiscal Equity," *Harvard Law Review 92*, June 1979, 1662-1750.

McLure, Charles E. Jr., "Tax Competition: Is What's Good for the Private Goose Good for the Public Gander?" *National Tax Journal 39*, September 1986, 341-348.

Mieszkowski, P. and G. Zodrow (1989), "Taxation and the Tiebout Model," *Journal of Economic Literature 27*, 1098-1146.

Mirrlees, J.A. (1971), "An Exploration in the Theory of Optimal Income Taxation," *Review of Economic Studies 38*, 175-208.

Mirrlees, J.A. (1989), "Migration and Optimal Income Taxes," in J.N. Bhagwati and J.D. Wilson (eds.), *Income Taxation and International Mobility* (Cambridge: MIT Press), 179-200.

Musgrave, R.A. (1969), *Fiscal Systems* (New Haven: Yale University Press.)

Oates, W.E. (1968), "The Theory of Public Finance in a Federal System," *Canadian Journal of Economics 1*, 37-54.

Padoa-Schioppa, T. *et al.*, (1987), *Efficiency, Stability, and Equity* (New York: Oxford University Press).

Pauly, Mark V., "Income Redistribution as a Local Public Good," *Journal of Public Economics 2*, February 1973, 35-58.

Peterson, P.E. and M.C. Rom (1990), *Welfare Magnets: A New Case for a National Standard* (Washington: Brookings).

Sinn, H.-W. (1988), "The Sahel Problem," *Kyklos 41*, 187-213.

Stigler, G.J. (1957), "The Tenable Range of Functions of Local Government," Joint Economic Committee, *Federal Expenditure Policy for Economic Growth and Stability*, reprinted in E.S. Phelps (ed.) *Private Wants and Public Needs*, Rev. ed., 1965, (New York: Norton), 167-176.

Tribe, L. (1988), *American Constitutional Law*, 2nd ed. (Mineola, New York: Foundation

Press).

Wildasin, D.E. (1986), *Urban Public Finance* (New York: Harwood Academic Publishers).

Wildasin, D.E. (1987), "Theoretical Analysis of Local Public Economics," Chapter 29 in Edwin S. Mills (ed.), *Handbook of Regional and Urban Economics*, Volume 2 (Amsterdam: North-Holland,), 429-476.

Wildasin, D.E. (1990), "Budgetary Pressures in the EEC: A Fiscal Federalism Perspective," *American Economic Review: Papers and Proceedings 80*, 69-74.

Wildasin, D.E. (forthcoming), "Income Redistribution in a Common Labor Market," *American Economic Review*.

Wilson, J.D. (1989a), "The Effect of Potential Emigration on the Optimal Linear Income Tax," in J.N. Bhagwati and J.D. Wilson (eds.), *Income Taxation and International Mobility* (Cambridge: MIT Press), 97-112.

Wilson, J.D. (1989b), "Optimal Linear Income Taxation in the Presence of Emigration," in J.N. Bhagwati and J.D. Wilson (eds.), *Income Taxation and International Mobility* (Cambridge: MIT Press), 141-158.

Wilson, J.D. (1989c), "Optimal Income Taxation and Migration: A World Welfare Point of View," in J.N. Bhagwati and J.D. Wilson (eds.), *Income Taxation and International Mobility* (Cambridge: MIT Press), 201-219.

APPENDIX

Second-order condition for (P).

It is convenient to convert (P) to an unconstrained problem. For notational convenience, let δ denote $s - \sigma$. From the definition (2) and the fact that l_i is a function of δ,

$$s = \frac{X_1}{n_1} - f_1'(l_1[\delta]).$$

Substituting into (4) and simplifying (noting that $l_2(\delta) = \bar{n} - l_1(\delta)$),

$$\begin{aligned} Y_1 &= f_1(l_1[\delta]) - l_1(\delta)f_1'(l_1[\delta]) - \delta l_1(\delta) - (s-\delta)\bar{n} \\ &= f_1(l_1[\delta]) - l_1(\delta)f_1'(l_1[\delta]) - \delta l_1(\delta) - \frac{\bar{n}}{n_1}X_1 + \delta\bar{n} + \bar{n}f_1'(l_1[\delta]). \end{aligned} \tag{A.1}$$

Given any value of $X_1 = \bar{X}_1$, δ must be chosen to maximize Y_1 as given by (A.1), that is, a problem with two instruments (s and σ) and one side constraint ($X_1 \geq \bar{X}_1$) has been converted to an unconstrained problem with one instrument (δ). The first-order condition for a maximum of Y_1 with respect to δ is

$$\begin{aligned} \frac{dY_1}{d\delta} &= (-l_1 f_1'' - \delta + \bar{n}f_1'')l_1' + \bar{n} - l_1 \\ &= l_2(f_1''l_1' + 1) - \delta l_1' \\ &= \frac{l_2 f_2'' + \delta}{f_1'' + f_2''} = 0 \end{aligned}$$

which is equivalent to (6).

The second-order condition is that $d^2Y_1/d\delta^2 \leq 0$ at the maximum. Using the above first-order condition, the second-order condition is

$$\frac{d^2Y_1}{d\delta^2} = \frac{1 + l_2'f_2'' + l_2f_2'''}{f_1'' + f_2''} \leq 0$$

which is equivalent to (7) in the text.

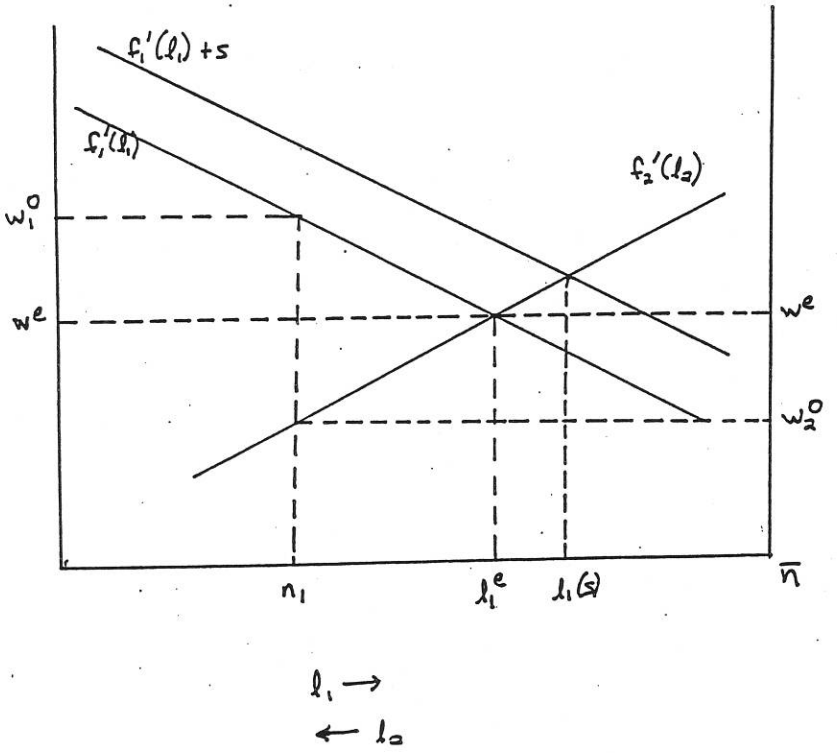

Figure 1

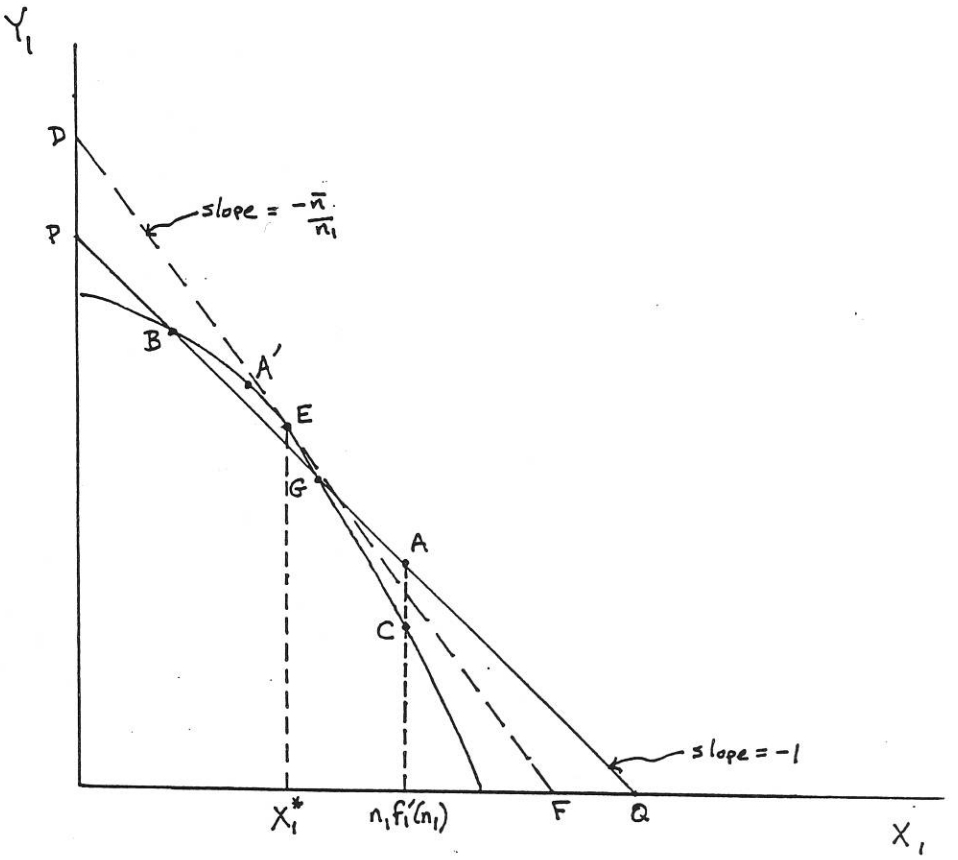

Figure 2

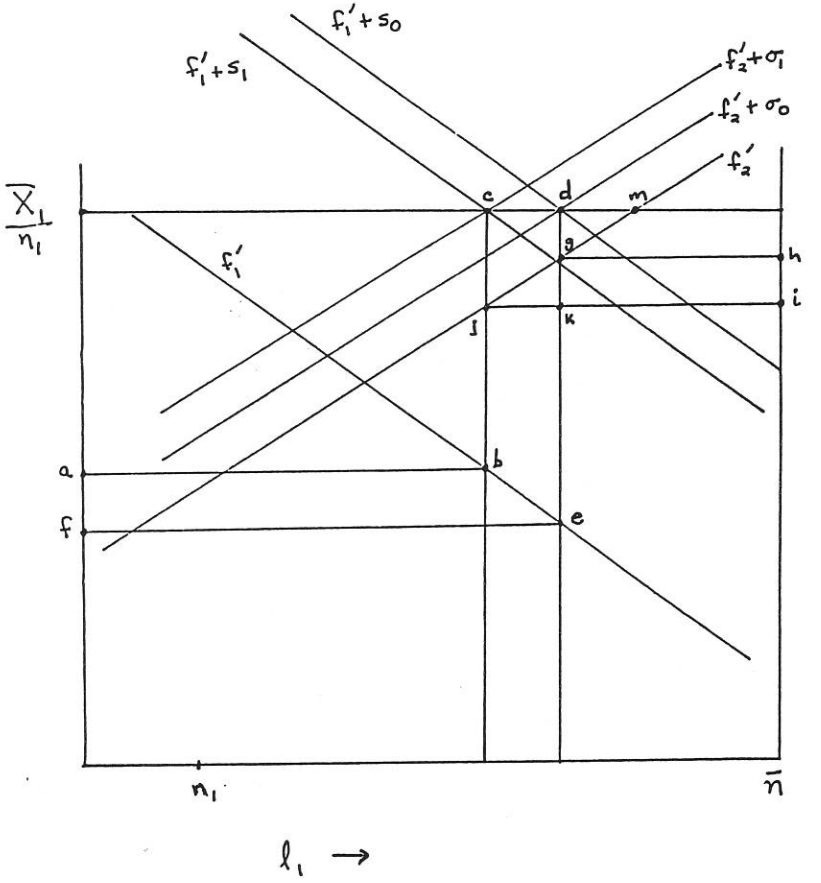

Figure 3

CES Working Paper Series

01 Richard A. Musgrave, Social Contract, Taxation and the Standing of Deadweight Loss, May 1991

02 David E. Wildasin, Income Redistribution and Migration, June 1991

03 Henning Bohn, On Testing the Sustainability of Government Deficits in a Stochastic Environment, June 1991

04 Mark Armstrong, Ray Rees and John Vickers, Optimal Regulatory Lag under Price Cap Regulation, June 1991

05 Dominique Demougin and Aloysius Siow, Careers in Ongoing Hierarchies, June 1991

06 Peter Birch Sørensen, Human Capital Investment, Government and Endogenous Growth, July 1991