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PUBLIC PENSIONS IN THE EU: MIGRATION INCENTIVES AND IMPACTS*

by

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Abstract

Workers who relocate from one EU member state to another become subject to the fiscal system, including the public pension program, of the destination country. Data on public pension contributions and benefits are used to estimate the change in the present value of lifetime wealth for “representative” workers in 7 EU countries that results from switching from one public pension program to another. Migrants may experience changes in net public pension wealth as great as 25% of lifetime wealth for some origin/destination pairs. Illustrative calculations suggest that the welfare effects of migration are quantitatively important for some EU countries.

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Introduction

The allocative and distributional consequences of public policies depend crucially on the behavioral responses to which they give rise. In an economy where factors of production are partially or completely mobile, the possibility of migration provides one margin of behavioral response with potentially far-reaching consequences. The literature of fiscal federalism, which has been heavily influenced by the work of Wallace Oates, has drawn attention to the implications of capital and labor mobility for the analysis of such policies as property, corporate income, and other forms of capital taxation, individual income taxation, education and income maintenance policy, and environmental regulation, among others. Many of the early applications of Oates' ideas were made in the context of local public finance, especially with reference to local public education provision and finance in the United States. The present paper addresses what at first sight might appear to be a completely unrelated set of issues, namely, the provision of social insurance by national governments in Europe. However, powerful analytical insights in economics often have implications that extend well beyond the contexts in which they are initially developed. To motivate and justify the analysis presented in subsequent sections, a brief overview of major developments in the literature will be helpful.

Wallace Oates and open-economy public economics

Following Samuelson's famous contributions of 1954 and 1955 on the pure theory of public goods, Tiebout (1956) argued that the problem of efficient provision of *local* public goods could effectively be solved through the exercise of locational choice. Households express their demands for local public goods – 'reveal their preferences' – when they choose to live in one locality rather than another. A major milestone in the further development of this provocative idea is Oates' well-known 1969 paper on capitalization effects and local public finance. This article focuses attention on the expression of preferences for locally-provided education in the market for residential housing. Oates argues that preferred combinations of local public education and local taxes should command a premium in the housing market and examines empirically the relationship between local fiscal variables and housing prices. This paper, and the large body of subsequent research that it spawned, has drawn attention to the role of household mobility in achieving more efficient provision of public goods, helping to add both theoretical and empirical content to the somewhat loosely-expressed ideas found in Tiebout's original contribution.

Of course, the distributional effects of public policy can be just as important as their allocative effects. As Oates explains in his 1972 classic on *Fiscal Federalism* and elsewhere, however, the ability of local governments to pursue policies aimed at distributional objectives may be quite limited.¹ As observed also by Stigler (1957), Musgrave (1969), and others, the relative openness of lower-level governments constrains their ability to impose burdens on some individuals in order to transfer resources or to provide services to others. Localities that attempt to transfer resources from one group to another are likely to stimulate inflows of beneficiaries and outflows of contributors, with adverse allocative effects and uncertain

distributional impacts. The redistributive interventions of higher-level governments, however, are harder to avoid because their geographical scope is generally larger. Consequently, a standard conclusion from the literature of fiscal federalism is that redistributive policies are best undertaken by central rather than local governments.

These basic conclusions from the literature of fiscal federalism point to a dilemma for policy. On the one hand, fiscal decentralization may promote economic efficiency in the public sector; on the other hand, it may interfere with the pursuit of distributional equity goals. This dilemma is well-illustrated by the case of local public education. The essence of efficient allocation is the adjustment of resource allocation to reflect benefits and costs, and both the benefits and costs of education certainly vary across economic and demographic groups. Uniformity of educational quality is thus certain to conflict with allocative efficiency. Yet variations in educational quality may violate ethical norms. In the US, locational sorting within large and fragmented metropolitan areas has resulted in wide local variations in levels of education spending, peer- group attributes, and other determinants of educational quality. As standard models of local public finance lead us to expect, decentralized public provision of education has produced a distribution of educational resources that reflects the underlying social and economic diversity of American society, an outcome that is no doubt more efficient than the more uniform levels of provision that might be achieved through a more centralized system. However, the economic and social stratification of metropolitan areas in America, which is in itself a vivid manifestation of inequality in American society, may also perpetuate inequality across generations. Perhaps it is not surprising, therefore, to find that state governments have intervened in the financing of education in order to achieve more equal outcomes than would be achieved by localities acting alone. In particular, the past half-century of American experience in school finance has seen substantial growth in the use of grants from state governments to local school districts, generally designed to mitigate local variation in the level of fiscal resources available to finance schools.² As the principles of fiscal federalism would suggest, higher-level governments –in this case, the state governments – appear to be more effective than lower-level governments in achieving equity goals in public policy.

Factor market integration and the welfare state

The mixed roles of state and local governments in education provision and finance in the US exemplify how higher- and lower-level governments may play rather different roles in balancing the sometimes conflicting objectives of equity and efficiency in public policy. A basic lesson to be derived from the work of Oates and others is that governments whose jurisdictional boundaries are relatively open to movements of capital and labor are constrained in their ability to undertake redistributive transfers. This lesson has far-reaching implications, going well beyond the context of local school finance in the United States. While factor mobility may be substantially more constrained in other settings, the ‘intrinsic’ or fundamental economic costs of factor movement within and among countries have been declining steadily over time due to technological progress in transportation and communications. Policy impediments to factor mobility, though often very great, have also begun to decline in many

regions. The postwar era has seen the global integration of financial markets, the reduction of barriers to trade brought about by the North American Free Trade Agreement, increased internal migration in countries such as Germany, South Africa, and China in the wake of dramatic political and economic changes, and international migration between and among both more developed and less developed countries. Broader integration of markets for goods and services, capital, and labor has gradually occurred in postwar Europe since the founding of the EEC, marked by milestones such as the Single European Act, the Maastricht Treaty, and the growth of the European Union through the accession of new member states.

It is especially interesting to consider the implications of open-economy public economics for the highly-developed welfare states of Western Europe, precisely because their programs of redistributive policy are so extensive. These economies seem at first glance to fit the conventional fiscal federalism model, with ‘central’ (i.e., national) governments raising large amounts of revenue to support cash and other transfers to the aged, the sick, the unemployed, children, and other target groups in society. However, the European welfare state developed in an era in which labor and capital were less mobile than they are today. Moreover, looking to the future, the intrinsic barriers to labor and capital movements in Europe are likely to continue to fall, and a recurring policy issue is whether or not to take further steps to lower the policy barriers to factor mobility still further, for instance by expanding membership in the European Union.³ The basic insight of the traditional fiscal federalism model of centralized redistribution is that the geographical scope of the redistributing authority should encompass the relevant factor markets. In a world where the economic costs of factor mobility are very high, national governments might well meet this criterion. However, as capital and labor are increasingly traded in international markets, national economies gradually become smaller units within large ambient factor markets. Keeping the responsibility for redistributive policies at the level of national governments thus implies that the redistributive functions of the public sector are gradually being shifted to what are effectively ‘lower-level’ governments. This process may or may not provide a rationale for the development of supra-national institutions for redistribution (see Brennan and Buchanan [1980], Padoa-Schioppa *et al.* [1987]), but in any case it provides fertile ground for positive analysis of the economics and political economy of income redistribution in a changing market environment.

The present paper analyzes one aspect of income redistribution policy, namely, public pension programs, in the context of an integrated European Union among whose member states workers are potentially mobile.⁴ When a household migrates from one EU member state to another, it typically assumes various fiscal obligations and obtains fiscal benefits in the destination country, while reducing or eliminating its fiscal connection to the origin country. In particular, a worker who migrates from one EU country to another ends or at least curtails its participation in the public pension program of one country in exchange for participation in that of another. For a destination country, immigration adds new contributors, and eventually new beneficiaries, to the public pension program. Migrant contributions and benefits affect the other residents of the country in the form of changes in their required

contribution levels or in the benefits that they eventually receive.

Because of these fiscal externalities, the social benefits and costs of migration do not correspond to its private benefits and costs. Most significant migrations in history antedate the development of the modern welfare state, and most of the benefits and costs of migration in earlier eras could therefore be presumed to accrue to migrants themselves (leaving aside forced migrations and expropriation of indigenous populations). The level of migration in modern Europe is now fairly high (see, e.g., Straubhaar and Zimmermann [1993]) and it thus offers an important and unusual example of a situation where social policies may insulate migrants from market signals of the economic consequences of their behavior. A crucial question, however, concerns the *magnitude* of the divergence between the private and social costs and benefits of migration in general, and, in particular, the magnitude of the net fiscal impacts of migration attributable to public pension programs. *A priori*, these effects could be very large, or they could be trivial. The principal objective of the following empirical analysis is to shed some preliminary light on this quantitative question.

The paper is organized as follows. Section II discusses the fiscal dimension of migration in general terms. Simple theoretical models identify the fiscal contributions and burdens of migrants as crucial determinants of the allocative and distributional impacts of migration. Empirical analysis should in principle take comprehensive account of the total interaction between a migrant and the fiscal system, an interaction that spans many aspects of policy and many time periods. The first part of Section III sketches the conventional life-cycle model which is used as the organizing framework for the subsequent calculations of ‘net public pension wealth.’ The second part of Section III presents calculations of net public pension wealth for representative workers in 7 European countries, using 1986 public pension contribution and benefit formulae. It also reports estimates of the change in net public pension wealth that these workers would experience in moving from one to another of the 7 countries. Section IV illustrates a potential application of the results by estimating the welfare effects of changes in public pension policy under the assumption that some portion of the labor force is internationally mobile. Section V concludes with a brief summary of some of the major results and a discussion of open questions and directions for further research.

Fiscal aspects of migration: A general conceptual framework

Market conditions, fiscal treatment, and environmental and social amenities are all potentially important factors for migrants contemplating a move from one country to another to take into account. From a life-cycle viewpoint, it is not just the current conditions in each country that matter, but those expected to obtain over the remainder of the household’s planning horizon.⁵ Similarly, migration affects market conditions (i.e., the prices of non-traded goods and factors, such as wages and housing prices), fiscal conditions, environmental quality, and social conditions, both in the short and the long runs, and in both the origin and destination countries.

Fiscal variables relevant for household locational choice can be either pecuniary or

non-pecuniary in nature. Pecuniary variables include cash transfer payments, taxes, and subsidies, and may be lump-sum or non-lump-sum in nature. Fiscal variables may also have pecuniary indirect effects on households; for instance, harbors, rail freight systems, and other infrastructure for commercial and industrial transportation may raise the productivity of labor and lower production costs, leading to higher real wages for households. Non-pecuniary variables include public goods and services that benefit households directly, such as public safety, defense, or environmental, land-use, health, or other regulations. The boundary between the categories of pecuniary and non-pecuniary public benefits and costs is not clear-cut. Some public in-kind benefits, such as food coupons, are almost identical to cash benefits in their effects on consumer welfare; some public health, housing, and education benefits are also very closely substitutable for private consumption; as a practical matter, this means that monetary equivalents for these benefits may be ascertained relatively easily.

The fiscal consequences of migration for the origin and destination countries may also be either pecuniary or non-pecuniary in nature. A household that moves from one country to another may begin paying taxes and receiving subsidies in the new country and cease to do so in the old. Many public services, such as public safety, transportation, education, or health care are ‘impure’ or congestible, i.e., at any given level of service, more resources must be expended to serve larger populations than smaller ones. Immigration generally congests these services and emigration de-congests them, an effect that is non-pecuniary in its initial impact but that can be measured in monetary units as the cost of restoring service to the pre-migration level (see however Hobson [1991]).

A simple static general equilibrium model illustrates the principle efficiency and distributional consequences of fiscal policy in the presence of labor mobility. Figure 1 depicts the allocation of a fixed amount of labor between two countries, 1 and 2. VMP_i shows the marginal productivity of labor in each country. If migration is costless, goods prices are the same in both countries, and there are no locational amenities and no public sector, workers will migrate until wages are equalized. If labor markets are competitive, the resulting allocation of labor (L_1^*) is efficient. This simple model can be generalized easily; for instance, if there are non-traded goods whose prices differ across countries, one may interpret the VMP_i schedules as regional real income schedules, with no change in the basic conclusions. If there are country-specific amenities that all workers value equally, one can interpret VMP_i as the real income schedule of workers in country i ; the efficiency of the competitive equilibrium is unaffected. If there are (positive or negative) attachments to place, the real income obtainable by immigrants in each country must be adjusted accordingly, but once again the efficiency of the equilibrium is undisturbed, provided that the costs of migration are borne by migrants.

To take the public sector into account, suppose that workers in each country pay taxes of T_i and receive benefits of B_i per capita. T_i could include income, earnings, consumption, or other residence-based taxes.⁶ The benefits could be family allowances, welfare benefits, public pension benefits, or other cash transfers, as well as the monetized value of any other congestible public services that are provided on a residence basis, such as education, health,

or transportation. Define the *net fiscal benefit* from residing in country i as $N_i \equiv B_i - T_i$. The VMP_i curves in Figure 1 must be shifted up or down by the amount N_i to show the real incomes of workers in each country, inclusive of fiscal effects. For illustrative purposes, negative values of net fiscal benefits have been assumed in Figure 1.⁷

Clearly, the allocation of labor will no longer be efficient if $N_1 \neq N_2$. In the figure, the efficiency loss from fiscal interventions is given by the triangle abc , the magnitude of which depends on fiscal differentials ($N_1 - N_2$) and on the elasticities of demand for labor in each country. Fiscal policies also change equilibrium gross and net factor prices and thus the distribution of income, and, once again, the magnitudes of these effects depend on the demand for labor and the sizes of the net fiscal benefits to workers in each country. A number of theoretical studies discuss the evaluation of fiscal policy and related issues in models of this general form (e.g., Wellisch and Wildasin [1994], Wildasin [1991, 1992, 1994], and references therein). They confirm that the elasticities of demand for labor in different countries (the elasticities of the VMP_i curves) and the net fiscal contributions of workers in different countries (the N_i 's) are crucial determinants of the allocative and distributional consequences of fiscal policy in a world with mobile labor.

Empirical implementation of a model like that presented in Figure 1 is conceptually straightforward. One should measure the slopes or elasticities of the VMP_i curves and the net fiscal benefits accruing to workers in each country. Empirical determination of net fiscal benefits presents several challenges, however. While the benefits and costs of fiscal and other policies can in principle be measured in monetary terms, the actual calculation of the variables N_i can in practice be quite difficult. This is especially true on the benefit side – so much so that empirical studies sometimes focus entirely on tax differentials. Omitting the value of the benefits from public expenditure is likely to lead to serious error, however. In fact, as a rough working hypothesis, it is probably reasonable to assume that benefits from public expenditures are of the same order of magnitude as the taxes that finance them.

A second main source of difficulty in taking fiscal variables into account in empirical work on migration is that migration decisions are not costlessly reversible, and are therefore probably made with fairly long planning horizons (Topel [1986], Lalonde and Topel [1991], Burda [1993]). The static model of Figure 1 can easily be reinterpreted in present-value terms (or in terms of perpetual flows in a stationary equilibrium), in which case the variables N_i represent net fiscal benefits to workers over the relevant horizon – e.g., a lifetime. This presents a problem for empirical analysis, since the net benefit streams anticipated by potential migrants are not observable. For instance, a 30-year-old Italian who made a permanent move to Germany in 1990 could expect to pay taxes in Germany for a period of several decades. However, neither German taxes in 2020 nor the worker's forecast of those taxes is observable.

The goal of the following empirical analysis is to estimate the net fiscal benefits that accrue to workers who participate in public pension programs in selected EU countries. Public pension policy has been selected for investigation for three main reasons. First, public

pensions are quantitatively important in European countries. Social security contributions, a very substantial fraction of which are directed to public pension programs, amounted to about 15–20 percent of GNP in 1986 (the year to which the data analyzed here pertain) for most of the countries studied (Eurostat [1990a]). Second, both the benefits from public pensions and the taxes used to support them are mainly pecuniary in nature, substantially obviating the difficulty of determining the subjective evaluation placed by program beneficiaries on program benefits. Third, the impact of these programs on participant households is inherently intertemporal in nature, as are the fiscal impacts of migrants on the programs of both origin and destination countries. This case therefore illustrates how and why an explicit intertemporal accounting for fiscal effects can and should be undertaken.⁸

Public pensions and migration incentives and impacts

Theoretical framework

To set the stage for the empirical analysis, it is useful to formulate a simple theoretical framework. Suppose that households are life-cycle utility-maximizers who supply labor inelastically and who have utility functions defined over lifetime consumption streams. Retirement occurs with certainty at age R and death occurs with certainty at age D . Assume that every household supplies one unit of labor until retirement, earning the annual wage of w_i if it resides in country i . (For notational simplicity, the present discussion takes this wage as fixed over time; the subsequent empirical analysis allows for time-varying wages.) Assume that the prices of consumption goods are the same in all countries (relative to some common numeraire), let c_t denote the value of consumption in period t of the life cycle, and r denote a fixed market interest rate. In the absence of any government fiscal policy, the household faces a lifetime budget constraint, starting at age 0, of

$$\sum_{t=0}^D \frac{c_t}{(1+r)^t} = \sum_{t=0}^R \frac{w_i}{(1+r)^t}. \quad (1)$$

The budget constraint for an older household is of course identical to (1) except that it covers a shorter horizon, beginning at some initial $t_0 > 0$.

To incorporate a public pension program into this framework, suppose that public pensions are financed by proportional payroll taxes, with the tax rate in country i denoted by τ_i . Although a more realistic specification is used in the empirical analysis, assume here for simplicity that the benefit received by a worker in country i is a lump-sum annuity of b_i . Then the budget constraint facing a worker residing in country i becomes

$$\sum_{t=0}^D \frac{c_t}{(1+r)^t} = \sum_{t=0}^R \frac{(1-\tau_i)w_i}{(1+r)^t} + \sum_{t=R}^D \frac{b_i}{(1+r)^t}. \quad (2)$$

Public pensions raise lifetime wealth by providing a flow of benefits during retirement, but reduce lifetime wealth by requiring a flow of contributions during the working years. The net effect of the public pension program on lifetime wealth for workers in country i , which

(following Feldstein (1974)) is called *net public pension wealth*, is given by

$$NPPW_i = \sum_{t=R}^D \frac{b_i}{(1+r)^t} - \sum_{t=0}^R \frac{\tau_i w_i}{(1+r)^t}. \quad (3)$$

Depending on the tax rates and benefit structure of the program, net public pension wealth could be positive or negative.

A household that derives utility only from private good consumption and that faces identical goods prices in all countries will choose to reside in a country where net lifetime wealth is maximal; that is, where the right-hand side of equation (2) is as large as possible. Other things the same, higher net public pension wealth makes a country a more desirable place to live. $NPPW_i$ is a measure of the fiscal incentive for a household to reside in country i . This is also a measure of the net fiscal impact, in present-value terms, of having the household reside in the country. If $NPPW_i$ is negative, then (in present-value terms) the country receives more in tax contributions from the household than the benefits that it must pay out, and conversely if $NPPW_i$ is positive.

The next subsection estimates the net public pension wealth for ‘representative’ workers in several EC member states.

Empirical findings

Public pension programs in modern societies are large and complex. The public pension benefits and contributions of any one worker or household depend on a wide range of worker and household attributes, including length of life, earnings, marital status, and occupational status. If a worker relocates from one country to another, benefits and contributions will in general depend on all factors relevant for the programs in both countries, and may in addition be subject to special rules that apply to migrants. Thus, there is no one simple measure of the change in net public pension wealth experienced by every worker originating in one country and moving to another. Instead, there are many measures, corresponding to all of the possible circumstances facing every possible kind of worker or household.

The present analysis is limited to some simple central cases, leaving refinements and more comprehensive treatment of the problem for future research. In broad terms, the analysis proceeds by specifying the attributes of the hypothetical worker, by then calculating the present value of lifetime public pension contributions and benefits for this worker conditional on residence in a given country, and by then calculating how these present values would change if the worker relocated from one country to another.⁹

More specifically, net public pension wealth is calculated for workers whose lifetime average wages are equal to the mean wage in each of the countries analyzed.¹⁰ The worker’s lifetime earnings are assumed to grow over time in accordance with the estimated effect of experience on the wages of West German workers reported in Krueger and Pischke (1992). (Lifetime earnings streams were also estimated under the alternative assumptions that (a) earnings are constant over the life cycle and (b) earnings grow at the rates estimated by

Mincer (1974) for US workers. The qualitative conclusions are not highly sensitive to these assumptions.) It is assumed that all workers begin working at age 20 and retire at the ages at which they qualify for ‘full’ retirement benefits. Calculations are presented for workers who migrate either at age 20, that is, at the very beginning of the working lifetime, or at age 40, under the assumption that workers only migrate once during their lifetimes. It is also assumed that each worker lives to an age equal to the conditional life expectancy for the worker’s final country of residence (Eurostat, 1989). Workers are assumed either to be single or to be married with a non-working spouse and no children. If married, the spouses are assumed to die at the same age as the worker.

It is necessary to make some assumption about the earnings received by a worker who migrates from one country to another. One view would be that the earnings are an attribute of the worker rather than the country, and that (for instance) Italian workers earn less than German workers because they have less human capital. In this view, an Italian worker earning the mean Italian wage who moves to Germany would not be expected to earn the mean German wage, and might instead be assumed to continue to earn the mean Italian wage. An alternative view is that workers have higher earnings in Germany because German firms have more capital or better technology which raise the productivity of labor. In this case, an average Italian worker migrating to Germany would earn the average German wage. Although a case could be made for either of these views, the calculations below assume that workers retain the mean earnings of the country from which they originate. Thus, for example, workers moving from a low-wage to a high-wage country are assumed to continue to receive low wages in the destination country and thus to pay the taxes, and receive the benefits, accruing to a low-wage worker in the destination country.

One difficulty in calculating public pension benefits and contributions arises from the fact that contributions are not necessarily specifically earmarked for old-age pensions alone in all countries. Obtaining reasonably comparable data on contribution and benefit rates presents the most formidable data problem for this study, and limits the number of countries investigated to seven: Belgium, Denmark, France, Germany, Italy, Luxembourg, and the Netherlands.¹¹ Program contribution and benefit formulae are assumed to be time-invariant at their 1986 values.¹²

Consider now a hypothetical worker of age 20 or 40 living initially in one of the seven countries under consideration and following the assumed life-cycle wage profile of a typical manual worker in that country. Using 1986 benefit formulae and contribution rates, it is possible to calculate the present value of this worker’s lifetime contributions, pension benefits, and net public pension wealth, contingent on remaining in the country of origin. This net public pension wealth figure is a measure of the fiscal cost to the country of having that worker remain there for the duration of his life, or of the savings that the country would obtain if the worker were to emigrate. (If net public pension wealth is negative, the worker is a net contributor in present- value terms and the country would experience a fiscal loss from the worker’s departure.) It is also possible to calculate the present value of contributions, retirement benefits, and net public pension wealth under the assumption

that this hypothetical worker relocates to one of the other countries and remains there until death, discounted back either to age 20 or to age 40, as the case may be. For 20-year-old workers, the resulting net public pension wealth figure is both a measure of the benefit to the worker, in present-value terms, of participating in the destination- country public pension program, and the cost, in present-value terms, that an immigrant will impose on the destination country. For 40-year-old workers, the resulting figure shows the net benefit from participating, over the remainder of the life cycle, in the public pension program of the destination country, taking into account the benefits that will accrue to the worker from prior participation in the public-pension program of the origin country.

Based on the above calculations, it is finally possible to determine the *change in net public pension wealth resulting from migration*, that is, the difference between net public pension wealth in the destination country of the hypothetical migrant and the net public pension wealth in the origin country. This difference is a measure of the fiscal incentive, in present-value terms, that the public pension program creates for a worker to migrate from one country to another.

The results of these calculations are shown in Tables 1 and 2. All absolute figures are shown in 1986 ecu's, which are approximately equal to 1986 \$US. Conversion rates between national currencies and the ecu for 1986 are taken from Eurostat (1990b).¹³ In addition to showing absolute figures, public pension wealth and wealth changes have been expressed as percentages of the lifetime wealth of the workers being analyzed. (For 40-year-old workers, 'lifetime wealth' means the present value of earnings from age 40 to retirement, discounted back to age 40.) Table 1 presents the estimated net public pension wealth for workers who remain in their host countries.¹⁴

The figures in Table 1 show how much the hypothetical workers would gain, in present value terms, from continuing to participate in the public pension programs in their origin countries until death. It is not altogether obvious what metric to use in deciding whether these amounts are large or small, and for the main purpose of this paper, the absolute value of *NPPW* in each country is less important than international variations in *NPPW*. Nevertheless, the estimates in Table 1 do suggest that the impact of participation in public pension programs on the lifetime wealth of representative may be large and, in most instances, negative. In fact, the public pension programs in many of these countries may lower lifetime wealth by as much as one to five years' worth of earnings. However, there are substantial differences among these countries. The Netherlands stands out as having a strongly negative net public pension wealth. In Denmark and France, the reduction in lifetime wealth from the public pension program is much smaller, and public pension wealth is actually positive for older married workers in Denmark and for all older workers in France and Italy.

These figures also show the size of the net fiscal burden (generally negative) that each worker imposes on the origin country as a result of continued participation in the public pension program, and thus the size of the fiscal benefit that the country would receive if the

worker were to emigrate and sever his links with the host country program. The figures can also be interpreted as showing how much net fiscal burden an immigrant would impose on the given country if he had the same earnings and demographic attributes as a representative native worker in the country. Most countries would experience net fiscal benefits from immigration of workers with average earnings levels, consistent with the pro-immigration policy views of some observers (Straubhaar and Zimmermann [1992]).

One interesting way to describe the magnitude of a worker's net public pension wealth is to relate it to the present value of a worker's earnings, and the figures in Table 1 show that net public pension wealth for 20-year-old workers range from -2 percent in Denmark to -31 percent in the Netherlands. This means that participation in the public pension programs in these countries affect the lifetime welfare of young workers in the same way as a 2 percent to 31 percent reduction in earnings. Equivalently, participation in these programs has the same effect on lifetime wealth as a proportional earnings tax at rates ranging from 2 percent to 31 percent. For most countries, this earnings-tax equivalent is greater than 10 percent.

Since the calculations in Table 1 just show *NPPW* for a representative worker in each country, they cannot be used directly to compare the position of workers in different countries. Nevertheless, the results in Table 1 do suggest that public pension programs affect the lifetime budget constraints of workers in different countries in rather different ways, and that workers could therefore experience gains or losses in public pension wealth by moving from one of these countries to another. They also suggest that the fiscal impact of migration may be significant. Remembering of course that this analysis looks only at the public pension impact of migration, it appears that most countries would reap some fiscal benefit from increased migration of workers with average earnings potential.

Table 2 addresses these issues more directly. For each of the seven countries, it shows how *NPPW* changes for a resident worker who migrates to one of the other six countries.¹⁵ To interpret the figures in the table, take first the case of a single Belgian worker of age 20. This worker would enjoy an increase in *NPPW* from moving to Denmark, France, Italy, or Luxembourg. The size of this benefit varies by destination country. A young single Belgian worker obtains comparatively little benefit by moving to Italy or Luxembourg, although even 2400 ecu, the change in *NPPW* for a worker moving to Italy, is not negligible, amounting to about 1/3 of the annual earnings of a 20-year-old worker. This worker stands to gain quite a lot (approximately the equivalent of several years' worth of earnings) in moving to France or Denmark. A single young Belgian worker moving to Germany or the Netherlands, on the other hand, is estimated to suffer a loss in lifetime wealth in exiting from the Belgian public pension program and participating in that of one of these countries. The loss is particularly great in the case of a move to the Netherlands, which entails a loss of about 15 percent of lifetime wealth. This is approximately equal to 6 times the initial annual earnings of a 20-year-old worker.

The sign and magnitude of the change in public pension wealth differ by age, marital status, and origin/destination country pairs. Certain patterns are fairly clear from the

calculations. First, *NPPW* is low in the Netherlands and workers generally experience a fiscal benefit from leaving there and are harmed if they move there. This seems to be due mainly to the high contribution rates in the Netherlands. Young workers can generally raise their *NPPW* by moving to Denmark, typically experiencing increases in lifetime wealth of 10 percent or more in doing so; young Danish workers are estimated to sacrifice around 10 percent or so of lifetime wealth in moving to most of the other countries analyzed. These changes in *NPPW* are generally on the order of 3–5 years' worth of earnings at the beginning of the life cycle. The differentials in *NPPW* for young workers moving among France, Germany, and Italy are somewhat smaller; these differentials typically amount to less than 10 percent of lifetime wealth.

The calculations in Table 2 also show how much a 40-year-old worker would gain or lose upon moving from one country to another, under the assumption that public pension contributions and benefits are determined in accordance with EU rules.¹⁶ The changes in *NPPW* are expressed both in absolute terms (ecu) and as a percentage of lifetime wealth as of age 40 (i.e., as a percentage of the present value of earnings from age 40 to retirement). In most cases, the results are quite similar to those for 20-year-old workers. However, pension benefits in both France and Italy are more closely tied to earnings in the immediate pre-retirement period than in the other countries considered. As a result, a move to France or Italy is generally more attractive (or less unattractive) for older workers than for younger ones. For instance, while a move to Italy raises the lifetime wealth of a young single Belgian worker by 2400 ecu, a 40-year-old single Belgian worker's lifetime wealth rises by almost 23,000 ecu upon moving to Italy. Differences of this magnitude for old vs. young migrants to France or Italy are typical in the calculations presented in Table 2.

Evaluating changes in public pension policy

The estimates in Tables 1 and 2 suggest that public pension programs can create large fiscal incentives for intra-EU migration and that intra-EU migration can have large fiscal and welfare impacts. Those estimates could, in principle, be used for a variety of econometric and policy applications. As an illustration of one of several possible applications, the present section shows how these estimates can be used to evaluate the welfare impact of changes in public pension policy undertaken by a single country. The exercise is only illustrative since, as might be expected and as will be made clear, such policy changes are likely to involve intergenerational transfers that are best analyzed in an explicitly dynamic setting, an exercise for which estimates like those presented here are necessary but which also requires the development of a model that goes beyond the scope of the present paper.¹⁷ The more modest objective here is to show how estimates of net public pension wealth presented above can be used for one type of policy analysis and to get some sense of the potential quantitative importance of such estimates for policy evaluation. This can usefully be done within the framework of a simple static general equilibrium model.

Suppose that an EU country is considering some change in its public pension policy. A change in policy will make the country more or less attractive to potential migrants

and thus will change the international allocation of labor. How should this effect be taken into account in assessing the impact of the policy on national welfare? An answer to this question clearly presupposes some measure of economic welfare. This concept is intrinsically ambiguous when population is subject to change, either by migration or through fertility and mortality, since it is difficult to know whose welfare is to be taken into account. Although other alternatives might be of interest, I assume for the present analysis that there is some initial population of workers and owners of other factors of production in country i , and that it is the real incomes of these individuals that ‘matter’ for economic welfare. To use this concept of welfare to evaluate public pension policy, it is convenient to make several simplifying assumptions.

Let L_{it} be the number of workers employed in country i of age t , where $t = y$ corresponds to ‘young’ workers and $t > y$ represents older workers. Assume that the supply of young workers is perfectly elastic at an externally-given net lifetime income of \bar{w}_y . (Note that this assumption does not require migration costs to be zero.) All other workers are completely immobile. Let L_{it}^0 be the number of workers of age t initially employed in country i . Assume that there is no unemployment or that the amount of unemployment is invariant to public pension policy, so that $L_{it} \equiv L_{it}^0$ for all $t > y$. Assume that national output is an increasing concave function $F_i(L_i)$ of total employment $L_i = \sum_t L_{it}$, implying that workers of all ages are equally productive and that labor is the only variable input in the production process. Since net public pension wealth is estimated generally to be negative, participation in the public pension system is on net like a tax on workers. Thus, let τ_{it} be the *negative* of net public pension wealth for workers of age t expressed as a proportion of lifetime earnings, corresponding to the percentage estimates that appear in Table 1. Assuming no distortions in the labor market other than those created by the public pension system, the (lifetime) net income of a worker of age t is (the present value of) $(1 - \tau_{it})F'_i(L_i)$ and the (present value of) net income to owners of other factors of production is (the present value of) $F_i(L_i) - L_i F'_i(L_i) + \sum_t \tau_{it} F'_i(L_i) L_{it}$, where the latter expression incorporates the government budget constraint. National welfare is the sum of net incomes across all initial workers and owners of other factors of production, which adds up to

$$W_i = F_i(L_i) + (1 - \tau_{iy})F'_i(L_i)(L_{iy}^0 - L_{iy}), \quad (4)$$

making use of the assumption that only the young are mobile. Note from (4) that changes in the net public pension wealth of older workers through changes in the policy parameters τ_{it} , $t > y$, has no effect on national welfare, though of course it would affect the distribution of income.¹⁸ Suppose that there is a change in the public pension program that affects the net public pension wealth of young workers and thus τ_{iy} . Using the equilibrium condition for mobile workers,

$$(1 - \tau_{iy})F'_i(L_i) = \bar{w}_y, \quad (5)$$

one can solve for L_i as a decreasing function of τ_{iy} . It is straightforward to calculate the change in W_i per unit change in τ_{iy} from (4) and (5). However, the resulting expression involves absolute magnitudes that depend, for instance, on the size of the work force. This is unsurprising, since W_i itself depends on the size of the economy. A more useful way to

express the impact of changes in public pension policy is to compare the welfare change with the size of policy change measured in revenue terms. Define $R_{iy} \equiv \tau_{iy} F'_i L_{iy}$ to be the net fiscal burden that the public pension system imposes on each young worker. A change in τ_{iy} will affect both W_i and R_{iy} , and one can then calculate the impact of a change in policy on welfare relative to the size of the change in net fiscal contributions. This normalizes the absolute size of the welfare change, showing the change in welfare, expressed in ecu, per 1-ecu change in the net fiscal contributions of the young. It is easily shown (see Appendix) that

$$\frac{dW_i}{dR_{iy}} = \frac{\tau_{iy} \epsilon_i}{\sigma_i + \tau_{iy} \epsilon_i} \quad (6)$$

where $\epsilon_i \leq 0$ is the demand elasticity for labor and σ_i is the proportion of young workers in the labor force. For this expression to make sense, it is important that the fiscal burden on mobile workers not be so high that an increase in the burden per worker would actually decrease total contributions. Provided that this is the case, $\text{sgn}\{dW_i/dR_{iy}\} = -\text{sgn}\{\tau_{iy}\} = -\text{sgn}\{R_{iy}\}$, i.e., moving the net public-pension contribution of mobile workers closer to zero is always welfare-improving. (This result is well-known in the literature on tax competition and, fundamentally, is just a restatement of the standard optimal tariff argument in the context of a small jurisdiction trading in inputs rather than outputs.) In particular, if mobile workers are net fiscal contributors, national welfare can be increased by lowering their fiscal burden.

With values of τ_{iy} drawn from the Table 1 estimates for 20-year-old workers, it is only necessary to add estimates of the demand elasticity of labor and the proportion of young in the population to use (6) in calculating the impact on national welfare of a 1-ecu increase in the fiscal contributions of young workers. Suppose, for example, that a change in pension policy increases the fiscal contribution of 50 percent of the work force, so that $\sigma_i = .5$. The appropriate value for the demand elasticity, ϵ_i , depends on the production technology, particularly the substitutability between the mobile and immobile factors of production. For example, if the production function exhibits unitary elasticity of substitution between labor and other inputs and overall constant returns to scale, the elasticity of demand for mobile labor is $-1/(1 - \alpha_i)$ where α_i is the income share of mobile labor in country i .¹⁹ If labor accounts for 2/3 of national income and the elasticity of substitution between labor and other inputs is equal to 1, the demand elasticity ϵ_i would be -3. If either the substitution elasticity or the income share of labor is lower, the demand elasticity ϵ_i is also lower.

Table 3 presents calculations of the welfare change per ecu increase in fiscal contributions by ‘young’ workers, for both low and high values of the demand elasticity of labor (-1 and -3, respectively) and for values of τ_{iy} based on Table 1’s estimates of $NPPW$ as a percentage of lifetime wealth for workers of different ages and marital status. To take an illustrative entry, the figure of -0.35 in the first row of the ‘Single, Age 20’ column for Belgium means that if the initial contribution rate of young workers is equal to the figure of -0.13 shown in the corresponding entry of Table 1, then an increase in this contribution rate sufficient to raise an extra 1 ecu of net contributions from all young workers would lower national welfare by 0.35 ecu, assuming that the demand elasticity of labor were -1. The figure of -3.58 in

the second row of the same column shows that the welfare loss would be much higher if the demand elasticity of labor were -3.

Moving across the columns for Belgium in Table 3 corresponds to using different values for the initial fiscal burden of the public pension program. Since all countries are assumed to have identical shares of young workers in the work force, moving across rows for different countries for a common value of the labor demand elasticity also corresponds to using different values for the initial fiscal burden. In general, the lower the initial burden, the lower the marginal welfare impact of a change in public pension policy, as standard principles of second-best welfare economics would lead one to expect. Since one-half of the work force is assumed to be ‘young’ for the purposes of this calculation, neither the contribution rates for 20-year-olds nor those for 40-year-olds represent the contribution rate for ‘average’ young workers. In principle, *NPPW* could be calculated for each age cohort, and the resulting contribution rates could then be weighted by the proportion of workers in each age cohort. For simplicity, the last columns of Table 3 illustrate what happens when the fiscal contribution rates are the simple arithmetic average of the figures for 20- and 40-year-olds. The estimates in these columns show that the assumed marital status of workers is not very important for estimating the welfare cost of changes in public pension policy.

There are two major conclusions to draw from the figures in Table 3. First, the estimated welfare cost of increases in the public pension contributions of young workers may vary quite a bit among countries because their initial burdens differ significantly. Focusing on the last two columns of the table, it appears that the marginal welfare cost of an increase in contributions by young workers is relatively high in Belgium, Germany, Luxembourg, and especially the Netherlands.²⁰ For France, Italy, and Denmark, the welfare impact of an increase in contributions is relatively small, and in the case of France, it is positive, implying that ‘average young immigrants’ receive a net subsidy from participation in the public pension system and that national welfare would be increased by an increase in pension contributions. Second, the welfare effect of changes in public pension policy is sensitive to the assumed value of the labor demand elasticity. Particularly in countries where there is a substantial loss associated with increases in pension contributions, the magnitude of the loss can be much higher when the demand elasticity is high. Since long-run elasticities can greatly exceed short-run elasticities, these findings raise interesting issues about myopic and far-sighted policy evaluation and time consistency of policy. A proper analysis of these issues, however, requires a model with explicit dynamics.

The calculations in Table 3 are only illustrative, but they demonstrate convincingly that public pension policy may well cause significant distortions in labor allocations and that there may be substantial international differences in the magnitudes of these distortions.

Conclusion

Differentials in the net benefits from public pensions, along with other policies such as income taxes and public service provision, alter the payoff to migration and can influence

the international allocation of labor. These tax/transfer/public service ‘wedges’ can cause inefficient locational choices, create deadweight welfare losses, and alter the distribution of income through changes in equilibrium factor prices. The prospect of such effects may constrain countries in their policy choices. In particular, they may find it advantageous to limit the redistributive dimensions of their policies in order to reduce the extent of fiscally-induced migration and to limit the fiscal impact of such migration as does occur. Alternatively, they may choose to tailor their fiscal policies in order to select for immigrants with favorable attributes and to encourage emigration of households with unfavorable attributes.

An essential first step in empirical application of standard theoretical models is the identification of the net fiscal benefits and costs facing households who move from one jurisdiction to another. The empirical analysis in Section III suggests that public pension programs in EU member states can have significant effects on the lifetime wealth of representative workers, perhaps reducing lifetime wealth by 10–15 percent or even more in typical cases. It also suggests that public pension programs create fiscal differentials in the treatment of workers in different countries, some of non-negligible size. These differentials imply that potential migrants can often raise or lower their lifetime net wealth by 5–15 percent or even more by moving between certain countries. These differentials create fiscal incentives for inefficient labor allocation and give rise to significant fiscal impacts from migration. The calculations in Section IV suggest that welfare in several countries would be increased by reductions in the public pension burdens on young workers. This of course raises a policy dilemma since most public pension programs are underfunded and there are therefore pressures to *raise* fiscal burdens on workers rather than *lower* them.²¹ The results in Section IV also indicate that the welfare effects of changes in public pension policy differ substantially among countries. Efforts toward harmonization of public pension systems that would lower fiscal burdens in countries where these burdens are high while raising those in countries with low burdens are low might generate overall welfare gains, but would not necessarily be Pareto-improving, unless accompanied by appropriate international compensatory transfers.

Empirical research on migration commonly assumes that migration decisions are heavily influenced by earnings differentials. Since the public sector accounts for about half of GDP in Western Europe, however, one should presume that fiscal variables may also play a crucial role in determining the magnitude and direction of migration. If the estimates of *NPPW* presented above are even approximately correct, participation in public pension programs is an important determinant of the net benefits or costs of migration among EU countries. One might therefore wish to include international differences in *NPPW* as explanatory variables in econometric analyses of migration. Indeed, according to the simple life-cycle hypothesis (ignoring liquidity constraints and other complications), *NPPW* should have the same effect on migration choices as differences in gross lifetime wealth. This is a testable hypothesis.

It must be noted, however, that a regression model that uses only *NPPW* would ignore all other fiscal variables that might influence migration; these other variables might or might not be well proxied by *NPPW*. The present investigation should be viewed as a sort of pilot study. Further research is clearly needed to provide a better empirical basis for the analysis

of policy issues relating to migration and fiscal policy in the EU. Part of the agenda is to consider the implications for migration of other fiscal policies – income taxes, VAT, family allowances, or quality of public service provision – that have been ignored here. Empirical analysis of other fiscal policies could be combined with the present results to provide more satisfactory estimates of the net fiscal benefits accruing to migrants among EU countries.

The estimates of net public pension wealth in the seven countries analyzed here provide, at best, a reasonable comparison of public pension benefits and costs for a subset of worker types, namely those who are young or middle-aged and who have average earnings. A valuable extension of the present analysis would be to investigate the public pension implications of migration for other worker types: those who are nearing retirement, those who are some distance away from the mean of the wage distribution, or those who may be unemployed, disabled, or sick. A more complete evaluation of public pension programs, and of social insurance programs more generally, remains to be undertaken.

Perhaps the most interesting extension of the present study would be to expand the number of countries analyzed to include some of the poorer members of the EU, such as Spain, Portugal, and Greece. In view of the current controversies surrounding immigration from Eastern Europe and the possible membership of East European countries in the EU, inclusion of these countries would also be very valuable, though of course the fiscal systems of these countries are in such flux that calculations based on them would have to be viewed as provisional at best.

APPENDIX

This Appendix details the derivation of equation (6) in the text.

First, substitute from (5) into (4). Then

$$\frac{dW_i}{d\tau_{iy}} = (F'_i - \bar{w}_y) \frac{dL_i}{d\tau_{iy}}. \quad (\text{A.1})$$

Solving (5) implicitly for L_i in terms of τ_{iy} ,

$$\frac{dL_i}{d\tau_{iy}} = \frac{F'_i}{(1 - \tau_{iy})F''_i}, \quad (\text{A.2})$$

and hence, using (5) in (A.1),

$$\frac{dW_i}{d\tau_{iy}} = \frac{\tau_{iy}(F'_i)^2}{(1 - \tau_{iy})F''_i}. \quad (\text{A.3})$$

Next, note that

$$\frac{dR_{iy}}{d\tau_{iy}} = F'_i L_{iy} + \tau_{iy}(L_{iy}F''_i + F'_i) \frac{dL_i}{d\tau_{iy}}. \quad (\text{A.4})$$

Substituting from (A.2) into (A.4) and using (A.3),

$$\begin{aligned} \frac{dW_i}{dR_{iy}} &\equiv \frac{dW_i/d\tau_{iy}}{dR_{iy}/d\tau_{iy}} \\ &= \frac{\tau_{iy}(F'_i)^2}{(1 - \tau_{iy})F''_i F'_i L_{iy} + \tau_{iy}(L_{iy}F''_i + F'_i)F'_i} \\ &= \frac{\tau_{iy}F'_i}{F''_i L_{iy} + \tau_{iy}F'_i} \\ &= \frac{\tau_{iy}(F'_i/L_i F''_i)}{L_{iy}/L_i + \tau_{iy}(F'_i/L_i F''_i)} \\ &= \frac{\tau_{iy}\epsilon_i}{\sigma_i + \tau_{iy}\epsilon_i} \end{aligned}$$

which is (6). The last step uses the fact that

$$\epsilon_i = \frac{F'_i}{L_i F''_i}.$$

Notes

¹Oates takes up the theme of local redistribution again in Brown and Oates (1987).

²State grants to local school districts have emerged partly as a response to litigation aimed at equalizing the level of local finance for education. Inman and Rubinfeld [1979] survey many of the key economic and legal issues in the local school finance debate in the US. The allocative and distributional impacts of various forms of equalizing transfers from higher- to lower-level governments have been the focus of sustained attention in the literature of school finance and fiscal federalism. See Ladd and Yinger (1994), Oakland (1994), and Reschovsky (1994) for a recent symposium discussion and references to relevant literature. It is worth noting the analysis of equalizing transfers has long been of interest to scholars in Canada (see, e.g., e.g., Boadway and Flatters (1982) and Boadway and Hobson (1993)), no doubt because of the importance of a country where interprovincial transfers are a major and controversial component of the overall fiscal system.

³The EU countries face a number of policy issues that affect labor and capital mobility. These include not only the accession of new member states, but liberalization of labor market regulations, control of illegal immigration, and refugee policy.

⁴The empirical relevance of labor mobility, in Europe and elsewhere, is a topic of debate. Several points deserve brief mention. (i) Labor mobility alters the allocative and distributional consequences of redistributive policy even if migration is costly. (ii) What matters for policy is whether *some* labor is mobile at the margin, not whether all labor is mobile. (iii) Labor is more mobile over long than short periods. In the present context, the time horizon of the analysis is on the order of a lifetime or generation. (iv) The observed level of migration is not a reliable indicator of the extent of potential labor mobility, both because the level of observed migration is an equilibrium-adjustment phenomenon and because governments can and do pursue policies that artificially limit migration. Indeed, concerns about migration may well explain why the EU acted quickly to allow rich nations like Austria or the Nordic countries to become members but refused membership to Turkey. In such circumstances, it would be more accurate to say that policies are selected in order to limit migration than to say that labor is immobile. See Wildasin (forthcoming) for more detailed discussion of empirical aspects of labor mobility.

⁵In principle, this could be quite brief or it could extend beyond a single generation; the focus in the present discussion will be on permanent moves by households who do not take into account the welfare of future generations.

⁶Note that personal income taxation of *capital* income (e.g., capital gains taxation) affects the attractiveness of different tax homes and thus the allocation of *labor* (Wildasin, 1993).

⁷Models of this type appear repeatedly in the literature of fiscal federalism. See Flatters et al. (1974) for one important example, and Mieszkowski and Zodrow (1989) and Wildasin

(1986) for further discussion and many additional references.

⁸Simon (1989, ch. 6), Borjas (1990, ch. 9), and references therein discuss the fiscal impact of immigration in the US. In the US context, attention has tended to focus on the extent to which low-income immigrants take advantage of cash transfers and other direct subsidies for the poor (see also Borjas and Hilton [1996]). The OECD (1987) reports on the annual income tax and social insurance contributions of a typical worker in 23 countries and makes allowance for some cash benefits in the form of family allowances. Very few studies have attempted to quantify the fiscal impact of immigration over a multi-year horizon, although the importance of analyzing fiscal policy from such a perspective is widely appreciated (e.g., Kotlikoff [1992]).

⁹For the sake of brevity, the following paragraphs outline only the essentials of the empirical methodology. Additional details are presented in a longer version of this paper, available on request from the author.

¹⁰Annual earnings are derived from Eurostat (1986, Table 3.6.3) United Nations Statistical Office (1990, p. 16).

¹¹The principle source for these calculations is Commission of the European Communities (1988). Contribution rates are those given in Table II-1 for Old-age, survivors, and invalidity contributions for Denmark, Germany, Italy, Luxembourg, and the Netherlands. (For Belgium and France, invalidity contribution rates are not separately available and so only the contribution rates for Old-age and survivors are used.) Benefit formulae are given in Table VII-1.

¹²There are many plausible hypotheses that one could make about expectation formation for public pension policy (Leimer and Lesnoy [1982]), and calculations of net social security wealth, including those presented here, can be quite sensitive to these assumptions.

¹³The ecu was worth US \$1.07 in 1986.

¹⁴Present values are calculated using a (real) discount rate of 4 percent.

¹⁵Recall that migration is assumed not to affect a worker's lifetime earnings stream. Thus, *NPPW* for a Belgian worker who migrates to Luxembourg will differ from that shown in Table 1 for a native worker in Luxembourg because the earnings of a Belgian worker in Luxembourg differ from that of the native worker. Hence, one cannot determine the change in *NPPW* for migrant workers simply by calculating differences in *NPPW* directly from Table 1.

¹⁶See Secretariat of the Administrative Commission of the European Communities on Social Security for Migrant Workers (1989). Essentially, for a worker who is employed in more than one EU public pension system, benefits are determined by the rules of the public pension programs in all of the countries involved. The worker then receives a fraction of benefits from each country, in proportion to the time employed in each country.

¹⁷Homburg and Richter (1993) analyze the efficiency implications of public pensions in an overlapping generations model with mobile labor. Although the basic insights of the simple static model sketched below are fundamentally consistent with the results of the Homburg- Richter analysis, they are able to explore the interactions between migration and feasible pay-as-you-go public pension systems that cannot be captured in a static model.

¹⁸See, e.g., von Weizsäcker (1994) for a discussion of the impact of public pension policy on the intergenerational distribution of income, a topic that goes beyond the scope of the present analysis.

¹⁹Let $F_i(L_i) = A_i L_i^{\alpha_i}$, corresponding to a Cobb-Douglas production function with an income share for labor of α_i . Equilibrium factor pricing implies that the gross wage is equal to $F'_i = \alpha_i A_i L_i^{\alpha_i - 1}$ and the elasticity of demand for labor can then be computed from $\epsilon_i^{-1} \equiv d \ln F'_i / d \ln L_i = \alpha_i - 1$.

²⁰The denominator of (6) is negative for the Netherlands when the demand elasticity of labor is high; taken literally, this means that a *reduction* in the contribution rate would lead to an *increase* in total contributions, as well as a welfare gain.

²¹For discussion of public pension funding issues in Europe with some reference to migration, see, e.g., Marchand and Pestieau (1991).

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