Fiscal policy

The role of factor mobility for fiscal policy in the EU

SUMMARY

Increased integration of labour and capital markets creates significant challenges for the welfare states of modern Europe. Taxation of capital and labour that finances extensive programmes of cash and in-kind redistribution creates incentives for capital owners and workers to locate in regions where they obtain favourable fiscal treatment. Competition among countries for mobile resources constrains their ability to alter the distribution of income and may lead to reductions in the size and scope of redistributive policies. Mobility of labour and capital is imperfect, however. Recent trends indicate that labour and capital are neither perfectly mobile nor perfectly immobile, but rather adjust gradually to market conditions and economic policies. This paper presents an explicitly dynamic analysis showing that governments can achieve some redistribution when it is costly for factors of production to relocate. As the costs of factor mobility fall, however, the effectiveness of redistributive policies is more limited, and governments have weaker incentives to pursue them. Liberalized immigration policies, EU enlargement, and other steps that promote integration of the factors markets of Western Europe with those of surrounding regions thus present a challenge to policy-makers if they also wish to maintain fiscal systems with extensive redistribution.

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Factor mobility and fiscal policy in the EU: policy issues and analytical approaches

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1. INTRODUCTION

The past century has seen dramatic growth in the role of the public sector in the countries of Western Europe, both by extensive regulatory as well as fiscal interventions. In the fiscal sphere, the EU countries in recent decades have maintained public expenditures and revenues at about 40% of GDP (see Table 1). These expenditures partly finance the provision of classic public goods like national defence and this century has seen episodes – hopefully not to be repeated in the next – where a large share of public-sector spending has been devoted to defence and national security generally. But by far the most important reason for the growth of public spending has been the increase in the level of redistributive (or social insurance) activities of governments. These include public pension systems and health care programmes whose benefits largely accrue to the old and that entail substantial intergenerational as well as intragenerational transfers. They also involve a host of other transfers: from the employed to the unemployed, toward the less-skilled, toward students, toward families with children, toward farmers, toward workers in specific industrial sectors such as shipbuilding or coal-mining, toward people or businesses in poor regions, and many others.

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Table 1. Total tax revenue as a percentage of GDP

	1965	1970	1975	1980	1985	1990	1995	1997
Austria	33.9	34.9	37.7	40.3	42.4	41.0	42.4	44.3
Belgium	31.1	35.7	41.6	43.7	46.9	43.9	45.4	46.0
Czech Rep.							40.1	38.6
Denmark	29.9	40.4	41.4	45.4	48.9	47.1	49.4	49.5
Finland	30.3	32.5	37.7	36.9	40.8	44.9	45.2	46.5
France	34.5	35.1	36.9	41.7	44.5	43.0	44.0	45.1
Germany*	31.6	32.9	36.0	38.2	38.1	36.7	38.5	37.2
Greece	18.2	20.9	21.0	24.3	29.0	29.7	32.1	33.7
Hungary							42.7	39.4
Iceland	26.2	27.0	29.6	29.2	28.4	31.4	31.2	32.2
Ireland	24.9	29.9	30.2	32.6	36.4	34.2	33.1	32.8
Italy	25.5	26.1	26.2	30.4	34.5	38.9	41.2	44.4
Luxembourg	27.7	28.9	39.7	43.0	47.7	43.9	44.4	46.5
Netherlands	32.8	37.1	43.0	45.2	44.1	44.6	42.0	41.9
Norway	29.6	34.9	39.9	42.7	43.3	41.8	41.5	42.6
Poland							42.3	41.2
Portugal	15.8	19.8	21.2	24.7	27.2	30.2	33.3	34.2
Spain	14.7	16.9	19.5	23.9	28.8	34.4	32.8	33.7
Sweden	35.0	39.8	43.4	48.8	50.0	55.6	47.9	51.9
Switzerland	19.6	22.5	27.9	28.9	30.6	30.9	33.5	33.8
Turkey	10.6	12.5	16.0	17.9	15.4	20.0	22.6	27.9
UK	30.4	37.0	35.4	35.1	37.5	36.3	35.2	35.4
US	25.0	28.1	27.5	27.6	26.9	27.6	28.8	29.7
EU 15	27.8	31.2	34.1	36.9	39.8	40.3	40.5	41.5

Notes: * Unified Germany beginning 1991.

Source: OECD (1999, Table 3).

Table 2. Sources of tax revenue, as a percentage of total taxation

EU 15	1965	1970	1975	1980	1985	1990	1995	1997
Personal income tax	23.9	25.2	18.5	29.0	28.0	27.2	26.4	25.5
Corporate income tax	6.7	6.8	6.0	5.9	6.4	6.8	6.9	8.5
Social Security contributions	22.8	24.3	28.4	29.0	28.7	28.1	29.1	28.6
Taxes on property	6.7	5.7	4.9	4.1	3.8	4.2	4.3	4.5
Taxes on goods and services	38.2	36.4	31.3	31.0	31.6	31.6	31.2	30.9
US								
Personal income tax	31.7	36.6	34.6	39.1	37.8	37.7	36.3	39.0
Corporate income tax	16.4	13.2	11.4	10.8	7.5	7.7	9.4	9.4
Social security contributions	13.3	16.1	20.5	21.9	25.2	25.8	25.1	24.2
Taxes on property	15.9	14.2	13.9	10.7	10.7	11.4	11.3	10.7
Taxes on goods and services	22.8	20.0	19.5	17.6	18.8	17.3	17.9	16.7

Source: OECD (1999), Tables 11, 13, 15, 23, and 25.

On the tax side, public expenditures have been financed by consumption taxes, payroll taxes, taxes on personal income, and taxes on business income, as shown in Table 2. This structure of taxation in European countries implies that the burden of public expenditures, broadly speaking, falls more heavily on households with higher levels of consumption, income and wealth. But of course the tax systems of Western Europe also fall unevenly on different types of households and businesses because of explicit and implicit distinctions between different types of income, consumption and wealth, and because of uneven levels of enforcement, administration and evasion. All of these features of the revenue system of Western Europe themselves entail intentional or accidental redistribution of income, as well.

No simple generalization can accurately characterize such a vast system of public-sector policies. But it is fair to say that they reflect the outcome of a democratic policy making process that has not been prepared to accept the market-determined distribution of income in an unaltered form. The market-determined distribution of income, of course, reflects essentially the distribution of endowments and factor prices. Even in a static world it would exhibit inequality attributable to differences in ability, health and other personal characteristics. Of course, the world and the distribution of income are not static. The distribution of wealth, though fixed at any one moment, evolves over time as a result of household consumption, saving, and bequest behaviour, and the distribution of income also evolves accordingly. Moreover, factor prices change due to technological change, demographic change, changes in demand, and associated changes in domestic and world product prices. Just to provide one illustration, returns to labour and capital in the agricultural sector in North America and Western Europe have failed to keep pace with returns elsewhere in the economy, leading to a century-long decline in the share of labour and capital allocated to this sector. This long-term shift can obviously be attributed in large part to technological change and also to world demographic shifts. This long-term shift has been accompanied by fiscal and regulatory policy efforts both in North America and in Europe that have had the effect of protecting the returns to resources in the agricultural sector. In addition to their distributional consequences, these policies, like many other redistribution policies, have also interfered with efficient resource allocation by dulling the incentives for scarce resources to flow from less productive to more productive uses.

Changes in economic policy that directly or indirectly affect factor markets and factor prices obviously affect the distribution of income, sometimes in intended directions and sometimes not. The process of European economic integration – part, but not all, of which is the result of explicit steps toward liberalization of markets undertaken under the auspices of the EU – is bound to have important effects on factor markets and the distribution of income. In particular, integration of factor markets themselves affects factor prices directly. In addition, factor mobility affects the fiscal systems of countries that experience increases or decreases in population and labour forces and in the stock of capital.

This paper attempts to outline some of the implications of factor market integration for fiscal policy in the countries of the EU and for the EU itself. It draws particular attention to the dynamic dimensions of factor market integration, and identifies some of the many issues for further research on these topics.

The paper begins, in Section 2, with a concise recapitulation of some principles that have emerged from existing literature on fiscal competition. For the most part, this literature has tended to rely on somewhat stylized analytical frameworks built on polar assumptions about factor mobility. This analytical approach exposes fundamental issues in a transparent fashion, but strong simplifying assumptions can also be misleading. Section 3 describes recent trends in international migration and capital movements. The evidence suggests that the countries of Europe are experiencing inter-regional movements of labour and capital of significant magnitude, but that these movements are far from instantaneous. Labour and capital are clearly linked across regions, but there appear to be obstacles to very rapid adjustments of labour and capital stocks. This suggests that labour and capital are mobile but imperfectly so.

In view of the evidence on labour and capital mobility, analyses of factor mobility with explicit dynamics offer promise. Section 4 therefore develops a new approach to the analysis of fiscal competition. It shows how 'stock adjustment' models of labour and capital mobility can be utilized to investigate the distributional and allocative effects of fiscal policy in a world where factors of production are only imperfectly mobile, and where the response of labour and capital to fiscal policy takes place gradually over time. Section 5 concludes with a discussion of some of the important policy issues that EU countries seem likely to face during coming decades.

2. REDISTRIBUTIVE POLICY WITH FACTOR MOBILITY: ATEMPORAL MODELS

Most of the economic analysis of fiscal competition has focused on polar cases in which factors of production are assumed either to be completely immobile or costlessly mobile. Even though analyses based on stylized assumptions can be criticized for lack of realism, the study of polar cases is nevertheless quite helpful in obtaining clear insights into complex issues, providing important benchmarks and reference points.

2.1. The 'canonical' model: the fiscal implications of capital mobility

The simplest way to begin the exploration of the implications of factor market integration is to suppose that a previously immobile factor of production becomes costlessly mobile among a large number of small jurisdictions. The assumption of 'small open' jurisdictions means that the factor of production is available to each jurisdiction at an externally fixed net rate of return. As examples, one might imagine that a small locality within a large country, such as a single local school district within the United States or a single small town in Germany, suddenly faces an infinitely elastic supply of capital.[1]

[1] There is now a large and rapidly growing literature on fiscal competition; for surveys with many additional references, see Cremer *et al.* (1996), Wildasin (1998), Wilson (1999), Oates (1999), and Wellisch (2000). For simplicity, the present discussion focuses almost entirely on the interplay between redistributive policy and factor mobility, rather than on the more classical margins of behavioural adjustment to fiscal policy such as labour-leisure trade-offs. For a recent analytical survey of redistributive policy that addresses these and other issues, see Boadway and Keen (forthcoming).

If capital were perfectly immobile, a source-based local capital tax, such as a property tax or a corporation income tax, would reduce the net rate of return to capital by the amount of the tax. This can be illustrated in Figure 1, where the curve VMP_K shows the rate of return to capital in a given locality. This curve is downward-sloping because of diminishing returns to capital in the presence of other factors of production (such as labour, natural resources, and public infrastructure) which are treated as fixed in supply, at least over the time horizon of the analysis. Thus, if the local stock of capital is fixed at K_0, the competitive rate of return on capital in the absence of taxation is given by r_0. The imposition of a tax of t_K per unit of capital reduces the net rate of return to $VMP_K - t_K$, resulting in a new equilibrium rate of return equal to $r_0 - t_K$. In this situation, the local government collects revenue equal to $t_K K_0$ (the rectangular area $r_0ce(r_0 - t_K)$ in the figure) which could be used to finance cash or in-kind transfers to the owners of other factors of production or to provide public goods and services. The entire burden of this tax would fall on the owners of capital in the locality. Note that for non-human resources such as capital, the owners of the resource need not be residents of the jurisdiction where their resources are located; thus, a portion of the burden of the tax may fall in part on non-residents of the locality, to a degree that depends on the share of the tax resource owned by 'foreigners'.

By contrast, when capital is costlessly mobile, local taxes cannot significantly reduce the net return to capital within the locality: capital owners will not suffer reduced returns in one locality when they can move their capital elsewhere and earn a higher net return. In the locality depicted in Figure 1, for example, suppose that the rate of return on capital in external markets is r_0. Then the imposition of a tax at rate t_K must drive $K_0 - K'$ units of capital from the locality, until capital is sufficiently scarce in relation to other factors of production in the local market that its before-tax rate of return rises to $r_0 + t_K$,

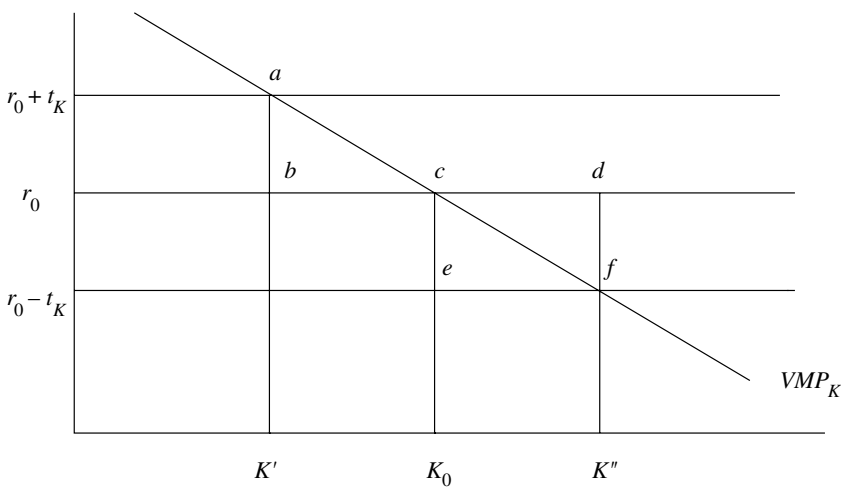

Figure 1. The effects of taxes and subsidies on a potentially mobile resource

enabling owners of capital located there to earn the same net rate of return as elsewhere.[2]

It is sometimes argued that governments cannot raise revenues from the taxation of highly mobile resources because those resources flee the taxing jurisdiction. This would indeed be true if the local demand for the taxed resource is perfectly elastic. However, as Figure 1 shows, it remains quite feasible for a locality to impose a tax on perfectly mobile capital, and to use the revenue to finance public goods and services or cash transfers that benefit its residents, provided that the demand for capital is less than perfectly elastic. However, whereas this policy would make the beneficiaries of local public services better off at the expense of the owners of local capital if capital were fixed in supply, this is no longer the case when capital can adjust freely. Rather, the outflow of capital from the locality induced by the tax must reduce the before-tax income of other local resources (natural resources, immobile labour), and because the local capital tax distorts the allocation of capital – in equilibrium, it will now be more productive in this locality than its opportunity cost to the locality, that is, than the external net rate of return – the loss of income to local workers will exceed the value of the tax revenue collected from capital taxation. This is illustrated in Figure 1 by the fact that the revenue rectangle $(r_0 + t_K)abr_0$ is smaller than the trapezoid $(r_0 + t_K)acr_0$ that represents the reduction in income accruing to local factors of production other than capital. Except to the degree that public expenditures have a greater value to local residents than the tax revenue used to finance them, this policy ends up lowering the welfare of local residents. The pecuniary value of this loss is the area of the triangle *abc* in Figure 1. Note that the residents of a locality inflict a net loss on themselves by taxing freely mobile capital even if *all* of the taxed capital is owned by non-residents. In brief, a small open locality can engage in redistributive policies in which it imposes fiscal burdens on a mobile factor of production, but its incentive to do so is limited or completely negated by the harm that this does to local residents. This is in striking contrast to the effect of the same policy when the taxed factor of production is completely immobile.

If a source-based tax on mobile capital is harmful to local residents, might a source-based subsidy be beneficial to them? Suppose, in Figure 1, that a subsidy of t_K per unit is provided to capital employed in the locality, and that capital is freely mobile. If the external rate of return on capital is still r_0, the effect of the subsidy is to attract $K'' - K_0$ units of capital, resulting in an increase in output and an increase in the return to local immobile resources equal to the trapezoidal area $r_0cf(r_0 - t_K)$. This trapezoid would represent higher wages for local workers, higher rents accruing to the owners of local land or housing (assuming the housing stock to be fixed), or higher returns to any other

[2] Because a single small locality cannot perceptibly affect the net rate of return on capital, it is tempting, but inaccurate, to say that capital does not bear the burden of the local tax. As shown by Bradford (1978), building on the insights of Brown (1938), while the local tax only reduces the net return to capital by a very small amount, the reduction in the net return falls on the worldwide stock of capital. The loss in real income for capital owners worldwide is of the same order of magnitude as the local tax. For more discussion, see Wildasin (1986, pp. 107–108).

immobile local resources. However, the cost of the subsidy – which must be financed by taxes on these immobile resources – is equal to $t_K K''$, that is, the rectangular area $r_0 df(r_0 - t_K)$, and exceeds the increase in the before-tax returns to the immobile resources by an amount equal to *cdf*. That is, a *subsidy* to mobile capital *also* inflicts net harm on the residents of the local jurisdiction. From their viewpoint, then, the best policy must be one that imposes a zero net burden on mobile capital, resulting in an equilibrium capital stock of K_0.

2.2. More general models of fiscal competition

While the standard model of taxes and subsidies for mobile capital is very simple, the major insights derived from it remain valid under more realistic conditions. For example, it is not at all crucial that *all* capital invested within the locality be freely mobile, only that enough capital be mobile *at the margin* that local tax policy is unable to depress the net return to capital. In Figure 1, for example, the analysis of the effects of a tax on capital is completely unchanged provided that no more than K' units of the local capital stock are immobile.

The analysis can also be extended to the case where there are many factors of production, of which some are mobile and some are immobile. Suppose, for example, that the local economy uses two types of labour, skilled and unskilled, in addition to capital. In addition to the source-based income tax on capital, suppose that skilled labour employed within the local economy is also subject to taxation, for example through a personal income tax. Suppose that these taxes are used to finance spending that benefits local unskilled workers. If capital and high-skilled labour are initially immobile, these fiscal policies will redistribute income from capital owners and from skilled workers toward the unskilled. But if both capital and skilled labour are mobile, these policies would now have the effect of reducing the amount of the mobile resources used within the local economy. Just as in the case where only capital is mobile, these redistributive policies would now harm rather than help the owners of the immobile resources – in this case, the unskilled.

The same fundamental conclusion holds if there are several types of mobile capital and several types of mobile labour. As shown in Section 3's discussion of international investment and migration, many countries experience simultaneous outflows and inflows of both capital and labour, resulting in net capital flows and net migration that are far smaller than the gross outward and inward flows. Simultaneous inflows and outflows of capital and labour likely indicate that 'capital' and 'labour' are not actually homogeneous factors of production, but rather aggregates of many specific types of inputs. From the viewpoint of understanding the fiscal implications of factor mobility, it is the degree of exposure to the many external markets for many specific factors of production, and the way in which this constrains the ability of a local government to use fiscal policy to alter net factor returns, that is of critical importance.

To vary the model still one more time, suppose that source-based taxes on capital are used to finance expenditures that benefit *skilled* workers, for example through state-subsidized higher education or perhaps through subsidies to firms in high-technology sectors of the economy, and that unskilled workers neither pay taxes nor receive benefits from public expenditures. If capital and skilled labour are both immobile, then the postulated tax and expenditure policies have the effect of redistributing income from capital owners to skilled workers. But suppose, instead, that both capital and skilled labour are freely mobile factors of production whose net returns are fixed in the external market. These policies now result neither in a lower nor higher return for capital or skilled labour than could be earned elsewhere, that is, there is no longer any net redistribution from the owners of taxed capital to the subsidized skilled workers. They do, however, affect the allocation of resources: the tax on capital will drive some capital out of the local economy, while the subsidy to skilled labour will attract some skilled workers. On balance, total output in the local economy might go up or go down as a result of this fiscal policy, but, on balance, it will necessarily harm the one group – the immobile, unskilled workers – that are neither taxed nor subsidized. In effect, a policy of taxing some mobile resources in order to subsidize others amounts to a combination of the two policies previously illustrated in Figure 1. As we have seen, each taken separately is harmful to local residents; so they are as well when combined (Wildasin, 1992). Whereas unskilled workers were 'innocent bystanders' who were completely unaffected by the locality's redistributive policy when both capital and skilled labour were immobile, they are now left 'holding the bag', suffering reductions in net income from redistributive policies in which they themselves do not directly participate either as contributors or as beneficiaries.

As Table 2 makes clear, the tax systems of modern European economies rely on many different types of taxes. The expenditure sides of their fiscal systems are no less complex. In order to understand correctly the policy implications of simple models like the one just outlined, it is important to note that fiscal variables like t_K should be interpreted to incorporate the *net* impact of all taxes and benefits that are borne by or that accrue to capital and skilled labour, respectively, contingent on their location within the locality. Thus, for example, a net subsidy to skilled labour would include the effects of all cash and in-kind transfers that benefit skilled workers *net* of local income taxes, local payroll taxes (whether assessed against highly skilled workers or their employers), and local consumption taxes (taxes on retail sales or value-added, local excises). As we have seen, *source-based* local taxes on capital or capital income affect the incentive to invest in the local economy. But *residence-based* local taxes on capital income – for instance, personal income taxes on dividends, interest and capital gains – would affect the net income of workers, especially higher-income skilled workers, and thus would affect the incentive for workers to reside in a given locality. It is thus interesting to note that residence-based taxation of *capital* income can distort the spatial allocation of *labour*; moreover, it is the *average* rather than the marginal tax rate on capital income

that affects household locational incentives.[3] On the *expenditure* side of local fiscal policy – cash transfers and subsidies plus the monetized value of local public goods and services – the benefits that accrue to capital and to skilled labour enter *negatively* into their respective net fiscal burdens.

Tax and expenditure policies that achieve net fiscal transfers in favour of unskilled workers when capital and highly skilled labour are immobile harm them when these factors are mobile. On the basis of this analysis, then, one might expect that an increase in the mobility of capital and highly skilled labour would lead to some restructuring of local fiscal policy in ways that would move net fiscal burdens on these factors of production – variables like t_K in the above analysis – closer to zero. Reforms of the revenue system, such as reductions in the progressivity of the personal income tax, reductions in corporation income tax rates, or increased reliance on user fees and charges could be part of this restructuring. Privatization of public enterprises removes the expenditures and revenues of these activities from the public-sector accounts, implying a reduction in redistributive transfers through regulated prices that embody cross-subsidization among consumers and through net fiscal transfers to loss-making enterprises. On the expenditure side, reductions in means-tested cash and in-kind transfers, increases in the provision of infrastructure that enhances the return to private capital, and increases in public services valued by highly skilled workers would also reduce the effective fiscal burdens on mobile resources. Note that the analysis certainly does not suggest that all fiscal adjustment occurs solely on the tax side of the public-sector accounts; thus it is more appropriate to characterize fiscal adjustment to factor mobility as *fiscal* competition rather than as *tax* competition.[4]

2.3. The political economy of redistribution: exit and voice

In a world where several different resources are immobile, the coercive power of the public sector can be exploited, through the political process, to transfer rents among the owners of these resources – for example, from owners of land in the western part of a locality to landowners in the eastern part, or from immobile rich workers to immobile

[3] Residence-based taxation of capital income is especially likely to affect the locational choices of high-income households, for whom non-wage income is particularly important. Just to illustrate this well-known empirical regularity with reference to the US, for the approximately 5% of US taxpayers with the highest levels of adjusted gross income in 1997, wage and salary income only amounted to approximately 57% of total Adjusted Gross Income (AGI), whereas the comparable figure for taxpayers with average AGI levels was 83% (Hollenbeck and Kahr, 1998–9). (Since these figures are based on the incomes of taxpayers as reported for tax purposes, they already reflect the fact that much non-wage income is sheltered from taxation.) These top-bracket taxpayers had an average level of taxable dividend, interest and capital gains income of approximately $21 000. Discounting at 5%, a permanent move between localities whose average tax rates differ by 10% would thus result in a wealth gain or loss of about $40 000. See Wildasin (1993) for a discussion of interstate differences in average tax burdens in the US and their implications for migration incentives.

[4] Formal models of fiscal competition that explicitly incorporate the provision of public goods and public inputs have been developed in the literature and yield similar conclusions regarding the impact of factor mobility on the allocative and distributional consequences of fiscal policy; indeed, similar conclusions emerge as well when considering other types of policies as well, such as environmental regulation. See, for example, Keen and Marchand (1997), Oates and Schwab (1988), and, for additional references, Oates (1999).

poor workers. Each of these groups has an incentive to participate in the political process to exploit the other, and to defend itself against exploitation by the other. In the language of Hirschman (1970), each has an incentive to use 'voice'.

But suppose now that a resource, previously immobile, becomes freely mobile. It is no longer in the interest of others in the jurisdiction to target this resource as a contributor in some redistributive mechanism, since it no longer earns rents that can be captured through fiscal policy. By the same token, the owners of the now-mobile resource no longer have an incentive to participate in the local political process since, on the one hand, the benefits of any fiscal transfers directed toward them would be eroded by inflows of competing resources, and, on the other hand, the burden of any transfers directed against them can be avoided by leaving – Hirschman's 'exit' option.

Thus, even as the 'voices' arguing for more favourable fiscal treatment of increasingly mobile resources (such as capital or highly skilled young workers) become less insistent, fiscal policy may become more and more favourable toward them. The analysis of fiscal policy with increased factor mobility suggests that the locus of political debate would likely shift toward disputes among those resources that remain relatively immobile – 'landowners in the east' and 'landowners in the west', owners of natural resources and the elderly, and others whose incomes are directly or indirectly tied to locationally fixed resources. It is perhaps one of the paradoxes of increasing factor mobility that as political power becomes increasingly concentrated in the hands of immobile factor owners, the value of exercising that power tends to diminish.

In summary, the consideration of simple models of fiscal competition, based on extreme polar assumptions, shows that integration of factor markets – represented in most of the literature by the free mobility of previously-immobile factors of production – can have significant implications for redistributive fiscal policies. By opening up locational choice as a new margin of behavioural response, factor market integration can dramatically change the distributional effects of fiscal policy. In addition, increased factor mobility implies that fiscal policies entail new types of allocative inefficiencies. This is of critical importance not only for normative policy evaluation, but for understanding the political economy of fiscal policy.

3. FACTOR MOBILITY: SOME RECENT INTERNATIONAL TRENDS

While simple models based on polar assumptions offer great analytical advantages, they may also be misleading. In the context of European integration, it is difficult to justify *a priori* characterizations of capital and labour mobility in terms of extreme polar assumptions. With respect to labour mobility, language and cultural barriers are obviously important impediments to movement among some countries; by the same token, it is obvious that these impediments are not prohibitively high. The movement of financial capital among financial centres now entails only minimal intrinsic costs, but there remain important regulatory barriers to integration of financial markets. Furthermore, foreign direct investment (FDI), the relocation of business enterprise,

and the establishment of productive capacity in new locations is neither completely costless nor prohibitively costly.

A look at recent trends may be useful, taking the US case as a benchmark for comparison with European countries. To begin with, consider capital mobility. Gross flows of financial capital are of immense magnitude; many of these flows represent offsetting movements through which financial and other institutions achieve portfolio diversification and protection against exchange rate and other financial risks. (In 1998, net financial investment from abroad was approximately 6% of GDP; the comparable figure for 1991 was only 1.5% of GDP – Board of Governors of the Federal Reserve System, 1999.) Net foreign investment flows are substantially smaller than gross financial flows, and foreign direct investment is smaller still, but they are growing over time. de Ménil (1999) analyses the growth of FDI in relation to total capital formation, noting that whereas inward gross FDI accounted for only 0.9% of total investment in EU countries in 1984, it rose to over 6% in 1989 and 1990 before dropping back to 4.4% in 1994. For particular countries, FDI plays a more substantial role, especially when outward as well as inward FDI is taken into account. Table 3 illustrates the trends in FDI outflows and inflows for selected European countries and for the US since 1970, showing that there has generally been an increase in gross FDI flows over time. For example, as a simple measure of total FDI openness, the *sum* of outward and inward FDI as a share of total 1997 investment exceeded 20% for 10 of the 14 European countries shown in the table, amounting to more than 30% for 6 of them; by comparison, of the 12 European countries for which comparable data are available for 1975, the corresponding figure was less than 10% for all but the UK and the Netherlands which, at barely 20%, reported the highest figure for that year.

The importance of FDI also varies by sector. For instance, comparatively little FDI would show up in the residential housing sector in a typical economy, whereas manufacturing and financial services might be far more multinational in character. Table 4 shows that multinationals have played a large role in the manufacturing sector in recent years: foreign affiliates in the manufacturing sector of European countries account for 20–35% of manufacturing value-added, total earnings in manufacturing, and capital investment in manufacturing. The data in Table 4 are too limited to draw firm conclusions about trends, but such data as are available suggests that the role of multinationals in European manufacturing is rising over time.

Overall, these figures suggest that FDI seems to be at least as important in the EU countries as for the US. Both in the US and in Europe, *net* flows of FDI are far smaller than *gross* flows. Neither in Europe nor in the US does FDI account for a major share of total investment, but its impact in particular sectors, such as manufacturing, is very substantial.

Turning now to labour mobility, it is important to recognize at the outset that international comparisons are somewhat difficult because of different systems for defining and measuring migration. Nevertheless, broad characterizations of migration trends and impacts are possible. (The statistics reported below are official OECD data

(OECD, 1998a, 1999c). Measurement of illegal immigration is obviously highly problematic, but is conjectured to be quite important both in the US and in the EU countries. (See Chiswick, 1988 for a discussion of illegal immigration and immigration policy.) Table 5 provides annual data on the stock of foreign population for many

Table 3. Foreign direct investment: percentage share of investment, foreign direct investment inflows and outflows

	1970	1975	1980	1985	1990	1995	1997
Belgium							
Inflows		6.86	6.24	7.15	17.66	19.07	24.40
Outflows		1.71	0.79	2.02	13.86	20.71	15.23
Denmark							
Inflows		3.37		1.02	4.22	12.25	8.16
Outflows		0.99		2.82	5.53	8.79	12.73
Finland							
Inflows		0.77	0.21	0.88	2.23	5.36	10.53
Outflows		0.29	1.05	2.72	7.64	7.67	26.04
France							
Inflows		1.89	2.15	2.58	5.16	8.09	9.01
Outflows		1.62	2.03	2.22	13.64	5.40	13.87
Germany							
Inflows		0.81	0.18	0.40	0.81	2.28	2.40
Outflows		2.56	2.58	4.38	7.72	7.44	9.73
Ireland							
Inflows		8.05	5.12	4.53	7.37	13.42	19.10
Outflows					4.29	7.61	7.02
Italy							
Inflows	2.36	1.22	0.52	1.22	2.89	2.57	1.94
Outflows	0.43	0.65	0.67	1.98	3.33	3.73	5.46
Netherlands							
Inflows	7.30	6.73	6.40	5.97	20.83	15.58	17.36
Outflows	15.20	13.76	16.64	10.73	25.96	25.96	39.63
Norway							
Inflows		2.26	0.35	−2.72	4.02	7.88	10.10
Outflows		1.77	1.48	8.31	5.89	9.43	14.17
Portugal							
Inflows		3.01	2.19	6.08	13.69	2.76	9.84
Outflows		0.21	0.19	0.48	0.86	2.78	7.48
Spain							
Inflows		2.46	3.18	6.19	11.62	5.33	5.07
Outflows		0.61	0.66	0.79	2.93	3.14	9.17
Sweden							
Inflows	1.47	0.55	1.00	2.02	4.01	44.31	32.94
Outflows	2.88	3.01	2.48	9.30	29.61	33.81	38.87
Switzerland							
Inflows				5.38	8.03	5.47	11.33
Outflows				19.41	10.31	18.56	35.82
UK							
Inflows	6.18	6.84	10.04	6.54	16.00	11.06	16.82
Outflows	6.97	6.18	11.15	12.66	9.60	24.20	28.84
USA							
Inflows	0.71	0.91	3.10	2.55	5.28	4.91	7.82
Outflows	3.70	4.99	3.52	1.79	4.04	8.19	7.87

Source: OECD (1999d).

European countries and on the proportion of foreigners who acquire nationality each year. Observe that foreigners made up 5% or more of the total population in Austria, Belgium, Germany, Luxembourg, Sweden and Switzerland in 1997; the same would be true for France. Foreigners make up less than 2% of the total population in the Czech Republic, Finland, Hungary, Italy, Portugal, and Spain. In most European countries, the percentage of foreigners has risen during the period 1988–97. Note also that a portion of the foreign population acquires nationality in each country every year – usually from

Table 4. Foreign affiliates in the manufacturing sector: percentage share of value added, wages and salaries, and investment, selected years

	1992	1993	1994	1995	1996	1997
Czech Republic				36.3	44.9	19.0
Value added						3.3
Wages and salaries						2.2
Gross fixed investment						
Finland*						
Value added	7.8		8.9	9.7	12.6	13.8
Wages and salaries	6.8		9.5	10.8	12.7	14.0
Gross fixed investment	6.2		9.2	8.2	6.5	7.8
France						
Value added		28.7	27.2	30.0	30.4	
Wages and salaries		26.3	25.2	27.1	27.7	
Gross fixed investment		30.5	28.3	32.1	30.8	
Hungary						
Value added						68.3
Wages and salaries		36.7	42.8	46.8	50.8	56.5
Gross fixed investment						
Ireland						
Value added	69.5	70.8	73.7	76.9	77.1	
Wages and salaries	49.6	49.8	52.1	52.6	52.0	
Gross fixed investment						
Netherlands				24.4	27.9	
Value added				27.3	28.5	
Wages and salaries				23.8	23.4	
Gross fixed investment				35.8	27.9	
Norway	9.8	13.5	14.8	22.2	16.7	
Value added	8.1	9.2	10.4	19.5	18.6	
Wages and salaries	8.4	9.1	10.0	17.0	16.8	
Gross fixed investment	9.8	13.5	14.8	22.2	16.7	
Sweden	14.6	14.1	14.4	20.4	20.1	
Value added	18.3	17.0	15.6	21.2	21.8	
Wages and salaries	18.3	17.0	17.2	21.6	21.4	
Gross fixed investment	5.5	13.2	10.0	9.8	10.3	
Turkey						
Value added	10.7	13.4	12.9	14.7	15.4	
Wages and salaries	8.1	9.3	9.8	12.6	11.9	
Gross fixed investment	5.5	13.2	10.0	9.8	10.3	
UK						
Value added		24.3	25.6	32.6		
Wages and salaries		21.9	22.5	21.5	23.4	
Gross fixed investment		29.7	30.5	31.8		

Source: OECD (1999b), country tables 4, 5, and 9.

Table 5. Foreign population in European countries: foreign population as share of total and share acquiring nationality, in per cent

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Austria										
% of total population	4.5	5.1	5.9	6.8	7.9	8.6	8.9	9.0	9.0	9.1
% acquiring nationality	2.5	2.5	2.4	2.5	2.2	2.3	2.3	2.1	2.2	2.2
Belgium										
% of total population	8.8	8.9	9.1	9.1	9.0	9.1	9.1	9.0	9.0	8.9
% acquiring nationality				0.9	5.0	1.8	2.8	2.8	2.7	3.5
Czech Republic										
% of total population					0.4	0.8	1.0	1.5	1.9	2.0
% acquiring nationality										
Denmark										
% of total population	2.8	2.9	3.1	3.3	3.5	3.6	3.8	4.2	4.7	4.7
% acquiring nationality	2.7	2.3	2.0	3.4	3.0	2.8	3.0	2.7	3.3	2.3
Finland										
% of total population	0.4	0.4	0.5	0.8	0.9	1.1	1.2	1.3	1.4	1.6
% acquiring nationality	6.0	8.1	4.2	4.7	2.3	1.8	1.2	1.1	1.4	2.0
France										
% of total population			6.3							
% acquiring nationality			2.7							
Germany										
% of total population	7.3	7.7	8.4	7.3	8.0	8.5	8.6	8.8	8.9	9.0
% acquiring nationality	1.0	1.5	2.1	2.7	3.1	3.1	3.8	4.5	4.2	3.7
Hungary										
% of total population							1.3	1.4	1.4	1.4
% acquiring nationality								7.3	8.8	6.1
Ireland										
% of total population	2.4	2.3	2.3	2.5	2.7	2.7	2.7	2.7	3.2	3.1
% acquiring nationality										

Italy										
% of total population	1.1	0.9	1.4	1.5	1.6	1.7	1.6	1.7	2.0	
% acquiring nationality				0.6	0.5	0.7	0.7	0.8	0.7	0.8
Luxembourg										
% of total population	27.4	27.9	29.4	30.2	31.0	31.8	32.6	33.4	34.1	34.9
% acquiring nationality	0.7	0.6	0.7	0.5	0.5	0.6	0.6	0.6	0.6	0.5
Netherlands										
% of total population	4.2	4.3	4.6	4.8	5.0	5.1	5.0	4.7	4.4	
% acquiring nationality	1.5	4.6	2.0	4.2	4.9	5.7	6.3	9.4	11.4	8.8
Norway										
% of total population	3.2	3.3	3.4	3.5	3.6	3.8	3.8	3.7	3.6	3.6
% acquiring nationality	2.7	3.4	3.4	3.5	3.5	3.6	5.4	7.2	7.6	7.6
Portugal										
% of total population	1.0	1.0	1.1	1.2	1.3	1.3	1.6	1.7	1.7	1.8
% acquiring nationality										
Spain										
% of total population	0.9	0.6	0.7	0.9	1.0	1.1	1.2	1.2	1.3	1.5
% acquiring nationality	2.4	1.6	2.8	1.3	1.5	2.1	1.8	1.5	1.7	1.9
Sweden										
% of total population	5.0	5.3	5.6	5.7	5.7	5.8	6.1	5.2	6.0	6.0
% acquiring nationality	4.5	4.2	3.7	5.7	5.9	8.5	6.9	6.0	4.8	5.5
Switzerland										
% of total population	15.2	15.6	16.3	17.1	17.6	18.1	18.6	18.9	18.9	19.0
% acquiring nationality	1.2	1.0	0.8	0.8	1.0	1.1	1.1	1.3	1.5	1.4
UK										
% of total population	3.2	3.2	3.2	3.1	3.5	3.5	3.6	3.4	3.4	3.6
% acquiring nationality	3.5	6.4	3.2	3.4	2.4	2.3	2.2	2.0	2.2	1.9
US										
% of total population			4.7							
% acquiring nationality										

Source: OECD (1999c).

1–3% of the foreign population, though the fraction has approached or even exceeded 10% in some cases, notably the Netherlands, Norway and Sweden. Presuming that those who acquire nationality are likely to remain in the country for some years to follow, it is clear that the fraction of foreign population in these countries may understate the importance of immigrants.[5] Especially after allowing for errors due to illegal immigration, it seems clear that immigrant populations in many of the more affluent EU countries are quite high. For the less affluent countries of Europe, unsurprisingly, the converse is true.

For the US, annual inflows of immigrants have varied in the range 0.6–1.8 million in the past decade; for Germany, the EU country that has experienced the highest levels of immigration in recent years, gross annual inflows have fluctuated in the range 0.6–1.2 million during the same period, with net immigration of 0.1–0.6 million. It is striking that Germany, with a population only one-third of that of the US, has experienced absolute levels of immigration not much below those for the US. Data on population outflows are not available for many countries, but, where data are available, they indicate that *gross* inflows into EU countries substantially exceed *net* inflows; for example, net inflows in 1995, expressed as a proportion of gross inflows, amounted to 28% for Germany, 37% for Belgium, 67% for the Netherlands, and 57% for Sweden. Figures for migration among major census regions of the US show, similarly, that gross migration flows among regions greatly exceed the amount of net migration. Within the EU countries, a substantial minority of the foreign population is drawn from other EU countries (a share of one-third is perhaps representative), but the majority of foreigners are from non-EU countries.

As is well known, fertility rates and rates of population growth have fallen substantially in the post-war period both in the US and in the EU countries. Rates of natural increase have also declined and in some cases – notably Germany and Italy – have actually turned negative. In the US, natural increase still accounts for most population growth, but, for the past decade, immigration has been larger than natural increase as a source of population growth in the EU countries as a whole. This is indicative of a high level of net migration to the EU which originates predominantly in less-affluent regions such as Eastern Europe, the countries of the former Soviet Union, Turkey, and other less-developed regions of the world. It is fair to say, then, that migration, particularly from poorer regions of the world, has become a major determinant of population and labour-force trends both in North America and in the EU countries, but especially so for the latter.

In assessing the degree of integration in European markets for labour and capital, it is important to note that flows of labour and capital are indications of a process of adjustment to equilibrium. While such flows obviously cannot occur if factor mobility is

[5] In the Netherlands, for example, net migration of foreigners was approximately 45 000–50 000 persons annually during the period 1994–7, but naturalizations exceeded this amount by 5000–30 000 per year, resulting in a reduction in the share of foreign population even in the face of high levels of immigration. Approximately 100 000 people per year have acquired French citizenship in recent years; in Germany, the corresponding figure is over 250 000 annually.

prohibited, or prohibitively costly, the absence of such flows should not be taken to mean that they could not occur if desired. The key question is whether differentials in factor returns can persist – specifically, in the present context, factor returns net of tax and net of the benefits of public expenditures – and if so, how large they can be and for how long they can persist. As de Ménil (1999) has emphasized, there do appear to be significant differences in rates of return to capital within EU countries. It is certainly also the case that there are significant differences in the gross returns to labour within EU countries (as indeed is also true not only among but within countries). On the other hand, Table 5 indicates that migrants are especially attracted to higher-income European countries, and, as noted, they are drawn to EU countries particularly from relatively poor countries. These basic trends reveal a tendency for resources to flow from areas where their returns are low to areas where their returns are high.

This review of recent trends in labour and capital movements in Europe indicates that factor markets are becoming increasingly integrated. However, it is not clear that this process is instantaneous. If labour and capital were perfectly mobile, even very small inter-regional and international differences in the returns to labour and capital would trigger very high rates of factor movements for very short periods of time, causing rates of return to be brought back to equality very quickly. While innovations in information technology now make it possible for arbitrageurs to eliminate even modest differences in the rates of return for very liquid financial assets, the equilibration of returns among regions can take quite a long period of time for most factors of production. For example, economic historians (see Hatton and Williamson, 1994 and references therein) have examined the movement of labour and capital from the 'Old World' to the 'New World' in the last half of the 1800s and in the early 20th century. Broadly speaking, these studies indicate that labour and capital flowing from Europe to America succeeded in obtaining higher rates of return, as standard theory suggests. Moreover, they also find that the factor returns gradually adjusted over time: differentials in wages and the returns to capital between Europe and America narrowed, the returns to immobile resources like land in Europe fell, and the returns to similar resources in America rose. This process of adjustment took decades, however, and indeed in some respects continues even now.

What can explain the protracted nature of this adjustment process, not only in the specific historical context of migration and capital flows between Europe and America, but more generally? Essentially there are two reasons why factor mobility does not instantaneously equilibrate net factor returns. First, there are what one might call the 'intrinsic' impediments to factor movement, attributable to transportation, information and other costs that prevent factor owners – the workers and the owners of capital – from obtaining the highest possible net return at every moment in time. Aside from the pecuniary costs of mobility, factor owners often must overcome language and cultural barriers in new locations and learn how to function in new legal and commercial environments. These barriers make the movement of labour and capital more costly and more risky and prevent the complete equalization of factor prices. Over time, many of these barriers are diminishing, as communication and transportation systems improve,

and as information about economic conditions in different regions becomes more widely available. These costs are far lower now than was true 50, 100 or 500 years ago. But they are not zero.

Secondly, there are policy barriers to factor movements. These barriers take many forms, both explicit and implicit. In recent European experience, the most dramatic reductions in policy barriers to factor mobility have resulted from the end of the Cold War, the collapse of the former Soviet Union (FSU), the dissolution of the former DDR, and related events. On a less dramatic scale, recent years have seen deliberate efforts within the EU to ease explicit controls on international movements of capital and to harmonize occupational licensure and related labour market regulations so that workers can move more easily among the labour markets of EU members states. Initiatives such as the Schengen agreement facilitate the movement of workers among countries.

As a matter of policy discretion, the EU countries may or may not liberalize factor markets still further. Immigration policy is a topic of great current interest and stormy political debate in several EU countries. Western Europe is surrounded by lower-wage regions – Eastern Europe, the countries of the FSU, the Middle East and North Africa – with many actual and potential immigrants. EU enlargement, for example to admit countries like Poland, Hungary or Turkey, would substantially lower formal migration barriers. Short of complete formal liberalization of migration policy, however, the countries of Western Europe must still make decisions about how strictly to enforce policies against illegal immigration, and regulations governing labour markets, social policies, housing markets, education and similar matters make the Western European countries more or less attractive to potential migrants.

In summary, both because of the intrinsic costs of factor mobility and because of policy choices, labour and capital cannot, in general, flow instantaneously from one region to another within individual countries or among countries. The flows of capital and labour to which EU countries are increasingly exposed suggest that factor mobility is empirically important in these countries, and that it needs to be taken seriously in the evaluation of fiscal policy. Especially in view of the magnitudes of *gross* factor flows, it would be difficult to accept the stylized assertions that 'labour is immobile' or 'capital is immobile' in the EU context. Particularly when one contemplates the gradual evolution of the fiscal and other institutions of the modern welfare state over a period of several decades, it is obvious that the cumulative impact of sustained movements of labour and capital can be very substantial indeed. By the same token, international flows of labour and capital are sufficiently small, and the process of adjustment through which the returns to capital and labour are gradually equilibrated is sufficiently slow, that it is equally difficult to accept at face value simple stylized assertions that 'labour is perfectly mobile' or 'capital is perfectly mobile' in the European context. Rather, it seems that some intermediate characterization of labour and capital mobility is most appropriate. For these reasons, simple atemporal models of factor mobility, though they provide many insights into the analysis of fiscal (and

other) policies, are too stark in characterizing factors of production as either perfectly mobile or perfectly immobile.

4. FACTOR MOBILITY AND FISCAL COMPETITION IN A DYNAMIC CONTEXT

In considering how to extend the analysis of fiscal policy to take imperfect factor mobility into account, one must recognize that the stock and composition of productive human and non-human capital within a region depends on a host of economic and demographic factors aside from inter-regional factor flows. Fertility, mortality, health, education and retirement behaviour all affect the size of the effective labour force over time. The stock of non-human capital is subject to gradual deterioration over time; flows of replacement, maintenance, and net investment can preserve and augment the stock of non-human capital. Many types of economic behaviour and economic policy *within* a region affect the evolution of the stocks of human and non-human capital. A region that is open to factor flows has additional margins of adjustment. Like other forms of dynamic adjustment of these stocks, the migration of labour and the flow of capital across regional boundaries is not instantaneous, but rather proceeds at a rate that reflects economic incentives, intrinsic costs of adjustment, and economic policy and institutions.

These considerations suggest that fiscal competition in a world of imperfect factor mobility may best be analysed in an explicitly dynamic framework. Over time, businesses within any one locality have to make decisions about whether to replace or maintain machines, buildings and other capital assets that gradually depreciate. At any one moment in time, however, some significant fraction of the capital stock will be of relatively recent vintage, and immediate relocation of that part of the capital stock would entail the destruction of a substantial portion of its value. Similarly, most if not all individuals can consider changing locations over the course of their lifetimes, but the cost of doing so varies over the life cycle. Every year, some young soon-to-be workers complete their education and enter the work force with little or no prior attachment to specific employers; even younger 'workers' are in the process of obtaining skills and education and do not even have strong attachments to particular types of occupations. These young people also are either single, have no children, or have very young children. For these and other reasons, it is relatively easy for them to consider changing locations. As workers age, however, their attachments to specific occupations, employers, and places tend to deepen, with the result that turnover and migration rates tend to fall over the life cycle (see, e.g., Topel, 1986, 1991; Topel and Ward, 1992). Thus, at any moment in time, there is a significant fraction of the work force for which relocation is relatively costly.

There are several ways to model imperfect mobility of labour and capital in an explicitly dynamic context. For example, the overlapping generations model provides one natural framework for the analysis of labour mobility. In the simplest version of that model, households are assumed to live for only two periods, the first of which

corresponds to youth and the second to mid-life and old age. In accordance with empirical findings about mobility over the life cycle, one might assume that the degree of mobility of individual workers declines over the life cycle (see, e.g., Wildasin and Wilson, 1996; Konrad, 1997; and Leers *et al.*, 1999).

The overlapping generations model is especially useful in analysing long-term fiscal policies, especially those, such as public pensions, healthcare, and long-term debt policy, which are likely to have important intergenerational impacts. A large portion of 'welfare state' fiscal policy involves intergenerational transfers from those in the working part of the life cycle to those who are retired, particularly through income and payroll taxes imposed on workers (or their employers) and the provision of public pensions and health care for retirees. Especially in the EU countries, the ageing of the population is giving rise to increased financial stress on fiscal systems as the population of current beneficiaries increases in relation to the population of current contributors. Some commentators (see, e.g., Straubhaar and Zimmermann, 1993) suggest that migration may play an important role in helping to restore the financial health of EU public pension systems.[6] Models that take life-cycle considerations explicitly into account are useful for the analysis of issues of this nature.

On the other hand, the overlapping generations approach (in its simplest form) shares with the atemporal analysis of Section 2 the somewhat unattractive 'putty-clay' feature that workers are sharply characterized either as perfectly mobile or perfectly immobile, depending on their age. Plausibly, however, the ability or willingness of workers at various ages to change locations depends not only on their age but on the magnitude of the fiscal and other migration incentives that they face.

Consider, as an alternative, the application of standard adjustment-cost models of investment to the problem of factor mobility. Capital is a *stock* which is gradually depleted over time as a result of depreciation but which can be maintained or increased through a flow of purchases of new capital. If firms could costlessly adjust their capital stocks in response to changes in policy or other shocks, investment flows would occur at extremely high rates in extremely short bursts: firms would simply make their capital stocks adjust instantaneously to their new desired levels. In practice, however, the process of investment occurs gradually because it is costly to add, refurbish or replace plant and equipment. Moreover, the costs of adjusting the capital stock are likely to rise as the rate of investment rises. While it is often possible to accelerate the planning and execution of investment projects, doing so normally entails extra out-of-pocket expense, disruption of existing operations, and other costs. Increasing adjustment costs provide firms with incentives to maintain a steadier flow of investment over time, resulting in slower adjustment of the capital stock to new, desired levels in response to changes in fiscal policy or other economic conditions. When investment and disinvestment is costly,

[6] Standard generational accounting methods (Kotlikoff, 1992) show that young workers are net fiscal contributors under existing policies, that is, they pay more into the fiscal system, in present-value terms, than the benefits that they receive. Wildasin (1999) provides empirical analysis of the implications of migration for public pensions systems in the EU.

capital is neither freely mobile nor completely immobile; rather, capital can be withdrawn from one use, and directed toward another, but only gradually.

This adjustment cost idea has also been applied to study labour demand and the adjustment of the level of employment (see Hamermesh and Pfann, 1996 for a survey). Just as firms cannot costlessly alter the stock of capital, similarly they incur costs in hiring new workers, and in laying off, dismissing, and retiring existing ones. Moreover, workers themselves, and their families, incur costs when they change jobs and locations. The reallocation of workers among firms – and, in particular, the reallocation of workers among firms in different locations, that is, labour migration – can occur more or less rapidly depending on such fundamental mobility costs as search, transportation and the acquisition of firm- and location-specific skills, and on policy-related costs such as penalties for job separation, barriers to labour mobility across political boundaries, and the like. An adjustment-cost model of employment and migration can accommodate the gradual response to market and fiscal incentives that these costs are likely to generate.

While an adjustment cost approach could be applied either to capital or to labour mobility, its classic application is in the context of investment analysis. As already discussed in Section 2, standard models of fiscal competition have commonly been employed to study the fiscal implications of capital mobility. It is therefore natural to initiate the analysis dynamic fiscal competition in an adjustment-cost framework applied to the study of imperfect capital mobility. The discussion returns later to the issue of labour mobility.

4.1. Fiscal competition for capital with explicit dynamics

Suppose again that individual jurisdictions are small and open with respect to the external capital market, each thus facing a perfectly elastic supply of capital at the world interest rate of r. This is presumably the appropriate assumption to make for individual countries within Europe, no one of which accounts for more than a small share of the total world stock of capital; for the EU considered as a whole, this assumption might be more questionable. Suppose that each jurisdiction can impose a tax at an *ad valorem* rate τ_k on the return to capital located within its boundaries, that is, a source-based capital tax, and that the proceeds of this tax are used to transfer resources, either in cash or in kind, to the residents of the jurisdiction – assumed, for now, to be immobile. In contrast to the traditional models, however, suppose that the capital stock within a given jurisdiction entails costs of adjustment that are increasing in the level of investment.

In this setting, a local source-based tax on capital does result, eventually, in an outflow of capital. In the long run, capital invested within the locality continues to earn the same net rate of return as elsewhere. The magnitude of the capital outflow needed to achieve this depends on the elasticity of demand for capital, ε, which in turn depends on the local production technology, including the degree of substitutability between

capital and other inputs like labour as well as their relative importance in the local production process.[7]

More importantly, one can show that the change in the capital stock that results from a permanent and unanticipated increase in τ_k follows a path of exponential decay. The speed with which the capital stock falls in response to a tax increase is described by a variable ρ the value of which depends, in particular, on the nature of the adjustment-cost technology. When the costs of adjustment are high, the rate of adjustment of the capital stock ρ is small, while in the extreme case where there are no adjustment costs, adjustment is instantaneous and capital is 'perfectly mobile'. As adjustment costs rise, the 'short run' becomes, effectively, longer and longer, and the model (discussed in greater detail in the Appendix) behaves increasingly like one in which capital is 'perfectly immobile'.

Although the long-run adjustment of the capital stock in this dynamic framework corresponds precisely to the finding of standard atemporal analysis of tax competition, the situation is quite different in the short run. In fact, the capital stock does not change at all at the moment that the tax rate is increased, and the adjustment of the capital stock proceeds gradually thereafter. Thus, with this explicit dynamic adjustment, it is not correct to describe capital either as 'perfectly mobile' or as 'perfectly immobile'. In fact, the adjustment-cost approach effectively includes these polar opposites as special cases. More precisely, it shows that the polar cases are not so much *alternative* but rather *incomplete* views, since both cases arise, but only at the very beginning and at the very end of the adjustment process.

What are the implications of this gradual adjustment for the analysis of redistributive policies? The fact that capital is not very mobile in the short run means that capital income can be a target for redistributive policy: the returns to the owners of local capital consist of quasi-rents that can be captured by local tax or other policies. Since the capital stock is initially fixed, a tax on the profits of firms or on the return to capital has no immediate impact on the productivity of labour or on the before-tax income of workers. The owners of capital, or the firms that utilize capital – assuming that these are distinct from the workers – suffer a reduction in net income equal to the tax imposed on them, and the net income of local residents rises correspondingly thanks to the transfer of this income to them through the public sector. Over time, however, capital flows out of the jurisdiction, causing labour productivity and the earnings of labour to fall. In the long run, the net return to the capital that remains within the jurisdiction is restored to the world net rate of return, and the net return to labour actually falls, despite the redistributive transfers received by

[7] In terms of Figure 1, one can see that the reduction in the equilibrium capital stock that results from a tax on mobile capital depends on the elasticity of the VMP_K schedule, i.e., on the elasticity of demand for capital in the local economy. Precisely the same considerations come into play in assessing the effect of local taxation on the *long-run* equilibrium level of capital in a dynamic adjustment-cost model. As a point of reference, in the familiar case where total output is given by a Cobb–Douglas production function, the elasticity of demand for capital is (in absolute value) given by $|\varepsilon| = 1/(1-\alpha)$ where α is the share of national income accruing to capital. If capital income amounts to one-fourth of the total, then $\varepsilon = -1.33$. More generally, a higher elasticity of substitution in production between labour and capital would imply that the capital stock is more responsive to the local tax rate in the long run, while a lower elasticity of substitution would imply a lower elasticity of demand for capital and a correspondingly smaller response to the local tax rate.

residents. To the extent that workers themselves own the capital or the firms that are the subject of taxation, of course, the net benefits of redistribution are smaller because the workers themselves are taxpayers as well as fiscal beneficiaries.

Since workers gain in the short run but lose in the long run, it is unclear whether this redistributive policy, on balance, helps them or harms them. To assess the net effect, one can calculate the effect of an increase in the size of the tax/transfer programme on the present value Y of workers' net incomes. Suppose that local workers initially own the share θ of the local capital stock; if all capital is owned by non-residents, then $\theta = 0$, whereas $\theta = 1$ if it is owned entirely by residents. Formal analysis shows that an increase in the tax rate on capital will raise (or lower) Y as $\tau < (>) r(1-\theta)/\rho\varepsilon$ and that the optimal tax rate, from the viewpoint of local residents, is

$$\tau = (1-\theta)\frac{r}{\rho\varepsilon} \tag{1}$$

This remarkably simple expression sheds considerable light on the role of imperfect capital mobility on the impact of redistributive policy. It looks like familiar inverse-elasticity rules for optimal taxation in that the elasticity of demand for capital appears in the denominator of the expression, indicating that a high demand elasticity for capital (associated with a high degree of substitutability between labour and capital) implies a low tax rate on capital. It also reveals, as one would expect, that the greater the proportion of local capital (or firms) owned by workers, the smaller is the desired scale of the redistributive policy; obviously this policy is most attractive to workers when the entire tax base is owned by others ($\theta = 0$). (The role of local ownership in the formulation of tax policy with mobile capital is also emphasized by Sørensen, 2000.) Most importantly, however, equation (1) shows that the beneficiaries of local redistributive policy would wish to tax capital more heavily when the capital stock adjusts slowly (ρ is small), but that the optimal tax rate is low when the capital stock adjusts rapidly. Indeed, if the capital stock adjusts sufficiently slowly, the optimal tax rate reaches 100%, whereas the optimal tax rate approaches zero as the speed of adjustment becomes so rapid as to be almost instantaneous.

While the qualitative implications of equation (1) are quite intuitive, it is perhaps surprising that the expression for the optimal tax takes such a simple form. It is straightforward to use equation (1) to calculate optimal tax rates under different assumptions about speeds of adjustment, demand elasticities, and other parameters. As noted above, a plausible value for ε might be as high as 1.3, while an elasticity of 1.0 would be consistent with a somewhat lower elasticity of substitution between labour and capital. The speed of adjustment, ρ, can be expressed in terms of the number of years required to complete half of the adjustment of the capital stock in response to a change in policy.[8] Estimates from empirical studies suggest that a period of several years is typically

[8] Specifically, with a speed of adjustment of ρ, the half-life of the adjustment process is simply $T = -\ln(0.5)/\rho$.

needed for half of the capital stock adjustment to occur; a decade is likely to be more than sufficient. On the other hand, if taxed 'capital' were like financial assets, which can be moved very rapidly, half of the adjustment might be completed in just a matter of months.

Table 6 shows the results of calculations of optimal tax rates for a variety of assumed parameter values. The three panels of this table correspond to differing assumptions about the elasticity of demand for the mobile factor of production. The columns of each panel represent a variety of assumptions about the speed of adjustment for the taxed resource and the rows correspond to varying assumptions about the share of the taxed resource owned by the residents of the jurisdiction. As described above, the first two panels, which assume an elasticity of demand of 1 and 1.33, respectively, are appropriate for the analysis of a source-based tax on capital; the third panel is discussed further below.

If redistributive policy is chosen to maximize the welfare of workers who have no ownership stake in local firms, empirically plausible rates of capital stock adjustment – with half of the adjustment occurring within 2–5 years – imply net fiscal burdens on capital of around 15–30%. Although, strictly speaking, the model only allows for one type of capital, it is clear that optimal tax rates would be differentiated among different types of capital if possible. Table 6 suggests that very long-lived capital would be taxed at a considerably higher rate, up to and including 100%, while capital that can adjust very rapidly would be taxed lightly, at a rate of 10% or even less. When a portion of the taxed

Table 6. Optimal tax rate on mobile factor (in per cent)

Local ownership share	Half-life of adjustment process (in years)					
	0.5	1	2	5	10	20
Case A: Elasticity of demand for mobile factor = 1						
0.00	3.61	7.21	14.43	36.07	72.13	100.00
0.25	2.71	5.41	10.82	27.05	54.10	100.00
0.50	1.80	3.61	7.21	18.03	36.07	72.13
0.75	0.90	1.80	3.61	9.02	18.03	36.07
1.00	0.00	0.00	0.00	0.00	0.00	0.00
Case B: Elasticity of demand for mobile factor = 1.33						
0.00	2.71	5.41	10.82	27.05	54.10	100.00
0.25	2.03	4.06	8.12	20.29	40.58	81.15
0.50	1.35	2.71	5.41	13.53	27.05	54.10
0.75	0.68	1.35	2.71	6.76	13.53	27.05
1.00	0.00	0.00	0.00	0.00	0.00	0.00
Case C: Elasticity of demand for mobile factor = 4.00						
0.00	0.90	1.80	3.61	9.02	18.03	36.07
0.25	0.68	1.35	2.71	6.76	13.53	27.05
0.50	0.45	0.90	1.80	4.51	9.02	18.03
0.75	0.23	0.45	0.90	2.25	4.51	9.02
1.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Author's calculations, as explained in text.

capital is owned by local residents, source-based capital taxes become a less attractive tool for rent capture. In the extreme case, of course, the optimal capital tax rate drops to zero; more generally, as shown in equation (1) and as reflected in the table, the optimal tax rate falls in proportion to the share of capital owned by those whose interests the tax policy reflects.

In comparing these calculations with empirical counterparts, it is important to remember that τ_k represents the source-based fiscal burden on capital, *net* of any public expenditures or subsidies that offset taxes *per se*. The calculation of effective tax rates on corporation income and other source-based taxes is a very complex matter, but few if any studies of effective tax rates even attempt to estimate the impact of expenditure-side policies on the return to capital. Undoubtedly some forms of public expenditure, such as provision of infrastructure or subsidies to public enterprises, offset part of the burden imposed by source-based taxes, so the gross fiscal burden on capital arising from the tax system alone certainly overstates the net fiscal burden. Given these uncertainties, the figures shown in the table are, very roughly, in the range of values suggested in the literature (e.g., Mendoza and Tesar, 1998).

4.2. Fiscal competition for imperfectly mobile labour

While the analysis presented so far treats capital as an imperfectly mobile factor of production and labour as completely immobile, it is apparent that the same or similar analysis can be used to evaluate the implications of imperfect labour mobility. Technically speaking, there is no obstacle to simply relabelling the factors of production, treating labour as the mobile resource. In this context, one might think not only of capital but of land, natural resources such as fisheries, and natural and very long-lived infrastructure such as harbours and road systems as the immobile factor of production. Suppose that 'native' residents claim the entire return to this immobile factor of production and to a fraction θ of the earnings of labour, and that a fraction $1-\theta$ of the earnings of labour accrues to workers whose welfare does not 'count' in the determination of fiscal policy. This might correspond, say, to the initial share of foreign-born workers within a country.

If the return to labour accounts for a 75% share of national income, and if the production function takes the standard Cobb–Douglas form, then, as noted above, the elasticity of demand for labour is 4. Under this assumption, the bottom panel of Table 6 presents calculations of the net fiscal burden on imperfectly mobile labour that would maximize the income of the immobile factor(s) of production, for various values of the speed of adjustment for the work force and for the share of labour income accruing to 'native' residents. In this context, it becomes interesting to consider quite long periods of adjustment, on the order of a decade or longer. As is clear from the table, the net fiscal burden on mobile workers is relatively modest, even when the adjustment process is quite prolonged, provided that a relatively small fraction of the labour force consists of 'non-native' workers. Once again, it should be remembered that the proper interpretation of

the optimal tax rate in equation (1) is the fiscal burden on the mobile resource, *net* of any benefits from cash or in-kind transfers.

This caveat is especially critical in considering the fiscal competition for workers since such a large fraction of public expenditure is incurred for provision of transfers and public goods and services for workers and their families. When non-natives reside in a typical EU country, even as illegal immigrants, they obtain the benefits of numerous public services – transportation, public health, public safety, water – that are provided either at a zero price or at a price below the marginal cost of production. Legal immigrants, and to some extent illegal immigrants also, obtain benefits from public provision or financing of healthcare, education and, in many instances, from cash transfers such as family allowances. The calculation of the net fiscal burdens or benefits on different types of workers and families is easiest for programmes such as public pensions, where benefits are entirely in cash. For health, education, and other public goods and services, the monetization of benefits is very difficult, and statements about the net fiscal burdens borne by workers or families of any particular type are therefore necessarily rather speculative.

At the extremes of the income distribution, of course, it is obvious that the rich are net fiscal contributors and that the poor are net fiscal beneficiaries. The top 10% of income recipients in any EU country account for a highly disproportionate share of total income, earnings and tax revenues, but their utilization of public services and the benefits that they receive in the form of cash transfers are not comparably disproportionate. (The reverse is probably true for the bottom 10% of income recipients, especially the elderly. As discussed previously, however, this group is perhaps the least mobile of any major demographic category.) If these individuals become increasingly able over time to relocate from one country to another, the desirability of maintaining extremely high net fiscal impositions on them is likely to become more doubtful – as indeed the evidence from state income taxation in the US suggests.

4.3. Redistributive politics and economic integration with imperfect factor mobility: myopia and cross-ownership of resources

Broadly speaking, the formal analysis of redistributive policy with imperfect factor mobility suggests that there is scope for effective redistribution even when the targets of redistribution may ultimately be able to enter or leave the jurisdiction in which the policy is implemented. However, the 'desired' effects of redistributive policies occur in the near term, before factor owners have sufficient time to relocate in response to policy changes, while the 'undesired' consequences of these policies tend to occur in the more distant future. As a practical matter, in a world where not all households or politicians plan over infinitely long horizons, there is clearly scope for differences of opinion about the weighting of the present benefits of redistribution against its future costs. Just as in the macroeconomic sphere of debt policy, some households may take a very long-term intergenerational perspective on policy evaluation, while others may be more myopic.

More myopic decision-makers would tend to favour more extensive redistribution than those who attach greater weight to the longer-term evolution of the economy.

While many different domestic groups may compete in the political process for rent transfers, most political systems make it relatively difficult for non-residents to influence policy. Thus, if, for example, a large share of a nation's capital stock is owned by foreigners (a low value of θ), heavy source-based taxation of capital offers the opportunity for well-represented native residents to capture rents from poorly represented non-residents as indicated in Table 6. Of course, foreign investors might well anticipate the fact that their capital could be expropriated through unfavourable fiscal policies and refrain from investing in the first place. Indeed, it is well known that international cross-ownership of capital is rather limited (Baxter and Jermann, 1997; Wildasin and Wilson, 1998). This suggests an interesting tension between those forces favouring increased capital mobility within Europe – fundamental technological change favouring the expansion of multinational enterprise, regulatory liberalization and standardization – and the fiscal incentives for source-based capital taxation. The speed of adjustment of the capital stock (ρ) is falling over time for European countries, both because the intrinsic costs of factor mobility are falling and because policy barriers have tended to fall as well, developments that favour a reduction in the net fiscal burden on capital. However, the extent of cross-ownership of capital is increasing over time as well, a development that would favour higher fiscal burdens on capital. Starting from a situation where there is limited cross-ownership of capital, there are obvious gains from reduced reliance on source-based capital taxes to finance redistribution, but there is an obvious time-consistency problem as well. There are numerous forms of commitment mechanisms, such as the immediate provision of irreversible subsidies to capital in the form of public infrastructure or institutional constraints such as international treaties, that can help to solve the time-consistency problem.

5. CONCLUSION: CHALLENGES FOR FISCAL POLICY IN EUROPE

The process of economic integration in Europe is unfolding gradually over time. Increased integration of factor markets is one part of that process. In part because of conscious efforts by governments to reap the economic benefits of economic integration, in part because of changes in fundamental political structures (especially the breakup of the Soviet Union and the end of the Cold War), and in part because of long-term improvements in transportation and communications technology, increasing mobility of labour and capital is a fact of life in modern Europe. This mobility is not and, practically speaking, never will be perfect. But the erosion of barriers to factor mobility nevertheless carries important implications for redistributive fiscal policies, the hallmark of the modern European welfare state.

The foregoing analysis shows that increasing factor mobility tends to limit the effectiveness and the attractiveness of redistributive policies. The integration of capital markets, for example, intensifies competition for capital and while it may still be possible

to extract some quasi-rents through the use of source-based revenue instruments such as the corporation income tax, the optimal rate of taxation is reduced when capital can flow more rapidly into or out of a country. Indeed, competition for capital is already seen in some policy circles as a dangerous trend (see, e.g., OECD, 1998b). Looking forward over the next half-century or so, however important capital mobility may be, demographic change – especially the effects of low fertility and mortality in affluent countries surrounded by lower-wage regions – seems likely to play a crucial role in the evolution of fiscal policy. The remainder of this section discusses several of the challenges that EU countries are likely to confront over this time horizon.

5.1. Migration policy and fiscal policy

The world has witnessed numerous episodes of major population movements in the past, such as the flow of migrants from the old to the new world in the nineteenth century. In previous epochs, however, the role of the state in national economies has been far more limited than is true today. Whereas migrants in earlier eras might have faced effective tax burdens equal to perhaps 10–15% of their incomes and might have received fiscal benefits from the state of a similar magnitude, the situation is entirely different in an age when the revenues and expenditures of modern welfare states amount to nearly half of GDP. There may have been a presumption in earlier times that almost all of the economic benefits and costs of the migration decision would be borne by the migrant, but in Europe today extensive systems of taxation, transfers and public services ensure that society as a whole shares substantially in these benefits and costs.

In recent years, despite high unemployment rates and many regulations that complicate the search for employment, EU labour markets have been magnets for migrants. A first question for policy is whether and by how much to impede the flow of population into the EU countries. In terms of the dynamic model described above, policy-makers may be able to affect the 'adjustment cost technology' for labour, facilitating immigration and speeding up the adjustment process or impeding labour mobility and slowing it down. Decressin and Fatás (1995) find that labour flows among EU regions are about half as responsive to labour demand shocks as in the US, suggesting perhaps the higher intrinsic costs of labour mobility in Europe but also the potential scope for reduction in the policy barriers to migration.

From the welfare viewpoint, liberalized immigration policies can yield important benefits, particularly improved efficiency in the allocation of labour. However, inflows of labour from neighbouring countries also put downward pressure on wages in the EU countries, harming native workers whose labour is substitutable with that of migrants. Within the context of inflexible EU labour markets, reductions in real wages may occur rather slowly, during which time slackness in labour markets may appear as unemployment. Indeed, immigration may create pressures to protect the employment and earnings of existing workers, perhaps retarding the process of institutional change in the labour market in the short run, even as it undermines the institutions that support

labour market rigidities in the long term.[9] But whether immigration contributes to lower real wages or to higher unemployment, it worsens the labour-market environment for existing workers, especially those with fewer skills.

Redistributive policies provide a means by which policy-makers can ameliorate undesired adverse distributional effects arising from increased immigration. However, most redistributive instruments (means-tested cash and in-kind benefits financed by taxes on high-income individuals and source-based capital income taxes) traditionally apply to all households on a residence basis. If immigrants are not or cannot be excluded from social benefits, then the attempt to compensate those who are adversely affected by immigration (for example, low-income native workers who compete with low-skilled immigrants) will in itself increase the incentives for further immigration, reducing and possibly negating altogether the potential gains to domestic residents from greater immigration (Wildasin 1994; Razin and Sadka, 1995). Thus, policy-makers face a dilemma in dealing with the migration pressures now bearing on Western Europe. Liberalized immigration policies would speed up the flow of migrants from poor surrounding regions, enabling efficiency gains from labour mobility to be realized but also bringing about effects on the distribution of income that may be undesirable. At the same time, as the analysis of fiscal competition in Section 4 makes clear, increasing the mobility of labour and the speed with which migration takes place can also limit the usefulness of redistributive policy tools, which might otherwise be employed to offset some of the impacts of migration on the distribution of income.

5.2. Regional policy

The EU countries as a whole are affluent. However, some regions within the EU are relatively poor. One goal of the EU's structural funds is to promote economic development in poor regions, or to assist the residents of these regions. The CAP, which helps to maintain incomes for those in the agricultural sector, should probably also be viewed as part of the EU's regional policy. The agricultural work force in Europe has been in a gradual decline, with the agricultural share of the EU work force falling from 7.9% to 5.1% just during the decade 1986–96, for example (OECD, 1997). The reallocation of labour from rural agriculture toward urban industry and services has been the result of intersectoral and inter-regional real-income differentials, an adjustment process that would have proceeded more rapidly in the absence of the CAP (and perhaps other policies), which has propped up incomes for workers in the rural areas of EU countries (Baldwin *et al.*, 1997).

[9] The example of German unification is instructive. As explained by Sinn and Sinn (1994) and Sinn (1995), the efforts of labour unions and policymakers have succeeded in extending high real wages into the former East Germany, simultaneously protecting the real wages of workers in the West and contributing to higher unemployment. For recent discussions of labour market institutions and the unemployment problem in the EU countries, see, e.g., Bertola and Ichino (1995), Burda and Mertens (1995), Siebert (1997), and Nickell (1997). Schöb and Wildasin (1998) analyse the efficiency and distributional effects of labour market integration in a system of jurisdictions with unemployment.

Regional policy for the EU countries, however, involves not only the regions within existing EU member states, but other neighbouring regions as well – the countries of eastern and southeastern Europe and of North Africa, in particular. Policies dealing with regions outside the EU are less systematized than for those within, but include trade policy, migration policy and economic development policies. One of the main questions of regional policy in this regard is actually the issue of EU enlargement. Since EU membership entails free trade and free movement of labour and capital, it offers substantial potential benefits to many of the residents of new member states.

Equity considerations often figure prominently in regional policies. Rich regions typically transfer resources to poor regions, foreign aid generally flows from rich countries to poor countries, and sectoral subsidies often flow to declining rather than to growing sectors of the economy. A perennial question is whether these policies promote reasonable economic goals or whether they simply interfere with the efficient functioning of markets. If a region is subject to adverse demographic, technological, political, economic or other factors, is it better to expend resources in developing (or simply subsidizing) the region or to facilitate the flow of population and capital away from the region?

The impact of regional policies is critically dependent on the degree of factor mobility. Subsidies that promote investment or employment in a region may raise wages there if workers are immobile. If, on the other hand, workers are inter-regionally mobile, these policies will reduce the flow of labour out of the region, benefiting owners of land, natural resources and long-lived capital, but at a cost in terms of lost opportunities for workers to move to regions where they could be more productively employed. To consider one dramatic recent example, consider the Balkan situation. Because of political and military strife, the EU countries have already had to face the dilemma of managing a significant number of displaced persons. Current policy discussions focus on the rebuilding of Kosovo, Albania, Macedonia, and presumably Montenegro and Serbia as well. Such a policy is bound to be quite costly, though necessary to restore the economic health of the region. As an alternative, one might allow or even facilitate the relocation of additional refugees to EU countries.

This example highlights the policy trade-offs for the EU countries: in the absence of economic growth and prosperity in neighbouring regions, migration pressure is heightened, making it more difficult to enforce immigration restrictions and exacerbating whatever difficulties immigration poses for the destination countries. One way to promote economic development of poor regions is through inter-regional transfers, whether in the form of simple economic relief, through investment in infrastructure, or through subsidies to private investment. These transfers, however, impose fiscal burdens on the donor regions. As an alternative, greater integration of the markets for labour, capital and goods and services through liberalized migration and trade policies may promote more rapid economic development of poor regions and the opportunity for mobile factors in poor regions to escape to more productive uses elsewhere. For the reasons discussed above, however, the redistributive fiscal policies that characterize the affluent countries of the EU may be difficult to maintain in the face of such liberalization.

Discussion

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Much of trade theory assumes that goods are traded and factors are immobile. Wildasin's paper is a welcome attempt to correct this counter-empirical assumption and show how this matters for taxation issues. The paper begins with a very simple case, where there is one factor that is in perfectly elastic supply internationally, and a second factor that is in perfectly inelastic supply. There is no public good and any taxes collected are redistributed to the owners of the immobile factor. Wildasin shows that a source-based tax on the mobile factor (capital) cannot improve the welfare of the immobile factor.

In this simple case, the optimal tax on mobile capital is zero. This result is well known: tax things in inelastic supply, avoid taxes on things in elastic supply. But in spite of this, Wildasin is using a good methodology, starting with a very simple basic case. I like the approach of starting with a pure, simple base case in order to clarify the fundamentals. But I am uncomfortable with the starting case being the ending case. It leaves the impression and implicit policy recommendation that the optimal tax on perfectly mobile capital is zero. Wildasin's 'base case' is probably about the only set of assumptions that generate such a result. I would have preferred that the author had progressed from the base case to more realistic scenarios in order to better enlighten tax policy.

There are two reasons why the optimal tax is zero in the Wildasin model. First, there is no purpose for any tax in the first place. There is no public good or any other motive for the tax. Secondly, even if there was, it would be optimal to tax the factor in inelastic supply instead of mobile capita. Let's consider these two assumptions in turn. First, if tax revenue is used for a public final or intermediate good, then the tax on the perfectly mobile factor is not zero if it is the only tax instrument available. Secondly, it is generally the case that the second factor is not in inelastic supply. If it is labour, then there is typically a labour-leisure decision, and skilled labour is produced or accumulated. And of course, labour is also mobile. Europe in particular has some obvious labour market problems, and I am very uncomfortable with leaving the impression that we should tax labour rather than capital. In fairness, Wildasin makes no such recommendation, but it is somewhat implicit.

Consider first the case where there is a public or final intermediate good. In my longer remarks at the conference, I showed the equations and simulation results from a simple general equilibrium model that I made up (the code is available from myself): there is one final good, and one public intermediate input. Capital is perfectly mobile. Labour is perfectly immobile, but there is a labour-leisure choice. Results are summarized in Table 7.

When the share of leisure in utility is zero, Wildasin's results are confirmed and the optimal tax on capital is zero. But when leisure has a positive share and the elasticity of substitution between leisure and consumption increases, the tax burden should be shifted

Table 7

Exogenous parameters				
Share of leisure in utility	0.0	0.1	0.2	0.25
Elasticity of substitution between consumption and leisure	—	2.0	4.0	5.0
Optimal tax rates **				
Tax on labour	0.500	0.488	0.168	0.000
Tax on capital	0.000	0.005	0.180	0.318
Constraint (second-best) tax rates				
Tax on labour	0.000*	0.000*	0.378	0.267
Tax on capital	0.435	0.437	0.000*	0.000*

Notes: ** optimal given the set of tax instruments available.
* constrained to equal zero.

towards capital and indeed only capital when the two parameters are sufficiently larger, as shown in the right-hand column. Furthermore, if the tax on labour is constrained to be zero, the tax on capital is positive even with a zero utility share on leisure since, unlike in Wildasin's model, the tax revenue is actually used for something useful. Conversely, when we would like to tax capital but cannot do so (the two right-hand columns), the optimal tax on labour is not zero.

The second point I would like to make is that we need to get beyond the notion of homogeneous, perfectly mobile capital. Much of today's foreign investment is direct investment by oligopolistic multinational firms, motivated by specific business opportunities, not by some general return to financial capital (often the financial capital is raised in the host-country market). My reading of extensive empirical evidence on multinational location decisions is as follows (unfortunately, public economics is plagued by a separation of tax and expenditure analysis). First, evidence that taxes discourage inward foreign direct investment is, at best, very weak. Secondly, evidence that good infrastructure encourages inward FDI is strong. Infrastructure here includes physical goods such as roads, ports or telecommunications, institutional aspects such as property rights, contract enforcement, general good government, and educational goods (threshold levels of skills are needed to attract inward investment).

The conclusion which I draw from these findings is that taxes do not deter investment, if taxes finance public intermediate inputs that are valued by firms.

Summarizing, the paper starts nicely with a simple, pure, special case. This is useful and appropriate. But then, instead of ending with the special case and rushing off to other issues, I would prefer to see alternative, empirically relevant assumptions added to the model one by one. These include: taxes needed for public final or intermediate inputs; endogeneity of labour supply (labour-leisure choice, endogenous skill acquisition and migration); and direct investment by oligopolistic firms (and a review of empirical evidence on this point). I personally believe that such an approach would create a more balanced view of what is in fact a complicated issue: the need to tax something in order to provide public goods/inputs when all feasible taxes are distortionary.

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I found this an interesting and instructive paper. It compares the two polar forms of perfect factor mobility and perfect immobility in a simple fashion, which I found informative and persuasive. The heart of the paper is the inter-temporal model, which neatly encompasses the polar forms. It formalizes one's intuition that the taxation of imperfectly immobile capital is a way of shifting some of the quasi-rents implied by fixity from firms to the community at large. As Wildasin observes, this strategy is not worthwhile either if all those rents would have accrued to the community anyway because all capital was owned locally, or if there were no quasi-rents because capital was perfectly mobile. One of the implications of this model is that at the start of the period of higher taxation, the community is a net saver, running a trade surplus and buying financial assets abroad. This is because increasing taxation raises government or transfer income at first but eventually cuts it, whereas consumption, which is perfectly smoothed to correspond to permanent income, will adjust immediately. This saving is the instrument for the perfect intergenerational transfers assumed by Wildasin, and if it is frustrated capital taxation shifts welfare from future to current generations. Constraints on saving abroad – for example, requirements for savings institutions to match the currency of assets and liabilities, or inefficiency in processing large increases in investment (the public analogue of Wildasin's private costs of investment function) – will lower the optimal tax rate. A further discouragement might be fear of confiscation or penal taxation abroad, especially if countries that have just perpetrated a raid on foreign-owned capital in their own country think that others may behave the same way.

The last observation raises a further issue – time consistency. Wildasin's model looks at an unanticipated imposition of a permanent capital tax. This is a useful place to start, but as soon as investors read *Economic Policy* they will immediately realize that an increase is inevitable and that during the transition period they will lose money. The result is that initially they will seek returns above r and thus that our economy has to generate above-equilibrium returns, say r', from the very start. But, of course, with no tax the whole of r' will go to the foreign investors; hence, the optimal policy will be to raise taxes so that while the pre-tax rate of return has to rise to say, r'', the post-tax rate falls to $r[=r''-t]$. In other words, with perfect foresight the optimal tax rate would be the only equilibrium.

An important restriction of Wildasin's argument is that it assumes constant technology, even when he discusses adjustment periods in decades. Assuming that technical progress is related to investment (as is done in many growth models), does not change the nature of the trade-offs identified, but it does increase the income loss from taxing capital and so reduce the optimum tax rate. In any practical consideration of the consequences of factor mobility, this growth effect should figure large.

Wildasin's countries are small open economies. While this is obviously useful didactically, it is not necessarily the most appropriate framework for actual policy-making in Europe, where the question of whether to harmonize tax rates is pressing. The issue hinges around the mobility of capital between European countries and between

Europe and the rest of the world. To the extent that the elasticity of supply of capital is higher for an individual European country than for Europe as a whole, there may be gains to harmonization. Essentially European governments could act in concert to reduce the external rate of return faced by each of them for the types of capital that were mobile only within Europe. However, if capital is homogeneous and European countries remain connected to a perfect world market for it, no amount of harmonization can overcome the problems arising from mobility in this model.

Extending the model to labour mobility is interesting and important, and it would be useful to give a flavour of the results when several factors are mobile. There is, however, a fundamental issue to be resolved when labour is mobile: 'whose welfare are we maximizing?'; 'who is ''us''?' In Wildasin's model this is not much of a problem. Mobile factors command the world rate for their factor and there is nothing that government can do about it, so maximizing income for the immobile group maximizes total welfare except perhaps for the mobile factors' transitory losses arising from their failure to foresee the tax increase. But in the real world with both imperfect mobility and (some) mobile factors having the vote (skilled labour), it becomes much more complex both practically and, perhaps, morally.

Consider, for example, Western European governments' current dilemmas over influxes of unskilled workers from the east. Maximizing the welfare of the unskilled labour that resides in their countries today (presumed to be immobile, despite the mobility of those further east) suggests restrictions. On the other hand, if skilled labour or capital is partially immobile it may gain from the influx, so policy might become more liberal. If governments recognized some responsibility for the eastern workers' welfare (say after they had been there for five years) the pressure for liberal policies would be even stronger.

To conclude, I find this an interesting paper drawing lots of nice insights from a simple model. This is a great help to policy debate because it punctures some of the wishful thinking that creeps into imprecise discussions. For practical purposes, however, it is necessary to generalize the model in a number of directions which seems likely both to attenuate some of the results and make the whole exercise much more ambiguous.

Panel discussion

A central question in the discussion was how large labour mobility currently is in the European Union and how it can be measured correctly. Diego Puga asked how much mobility there is within the EU compared to the number of people that move into the EU from outside. He remarked that, within the EU, only 1.5% of the labour force was born in one EU country and lived in another EU country. He further stressed the importance of distinguishing between permanent and temporary migration. He argued that the cost of moving is one reason for the low mobility of labour. Jörn-Steffen Pischke

added that it is unclear whether labour mobility would be large enough to respond to changes in taxes. In the model, the assumption is that factor prices are the same across countries, but considerable wage differentials clearly exist. However, there can be high taxes in Sweden and not everybody will emigrate. Jörn-Steffen Pischke felt that intra-EU migration is quite low and unresponsive to these relatively large differentials. Regarding the possible migration from outside the EU, he asked whether the location decisions are responsive enough to taxes or even to wage differentials. He pointed out that studies for the US found little evidence that immigrants locate within the US in states with favourable labour market conditions. For Europe there might be even less evidence. Hans-Werner Sinn asked about the relative mobility of capital and labour. While capital may be more mobile than labour, there will be a new situation for Europe after enlargement of EU, because the living standards in the Eastern countries are very low. He pointed out that the EU population will go up by 28% and income in these countries is only one-tenth to one-fifth of West German wages in terms of the current exchange rate. He thus argued that there will be an emigration wave into Western Europe. He was concerned that the people who come will select the country that treats them best and, even though labour mobility is not very high, the differential mobility between the Western European countries will be very high. He suggested that, for a policy paper, it would be useful to integrate this into the line of reasoning.

Philippe Bacchetta raised the question of what the optimal taxation or subsidy for adjustment cost should be. Erik Berglöf asked, in the light of the EU enlargement, what exceptions there should be to labour mobility in the new agreements with Eastern European countries. He further asked what the evidence from earlier enlargement about the ability of government to affect labour mobility is and how it has affected different labour skills. He pointed out that labour mobility was very important for these countries. If restrictions were imposed on labour mobility it might affect the political economy in the countries which are candidates for membership of the EU. However, he felt that, in the development of these countries, the strongest effect from enlargement would come from bringing down the risk premium on capital in order to attract capital.

Patrick Honohan asked about the time consistency of the optimal tax rate. He argued that the optimal tax rate determined by the government would be the one where it would not want to exploit temporary higher tax rates. This would be the long-run equilibrium, where the government never actually exploits the possibility of a potential surprise. He argued that if the government could commit itself long term, it would choose a lower tax rate. This way it would have a higher capital stock from the start.

Some of the panel members related the present paper to the paper by Peter Birch Sørensen in this volume. George de Ménil stressed that both papers only look at the small country case, which is usually where the interaction is not taken into account and the game theoretic context is ignored. He felt that the analysis in both papers did not do justice to the dynamics of capital accumulation. In the paper by David Wildasin, although capital moves slowly, it may look as if there is dynamic capital behaviour, but

there is no savings behaviour. Some delay is put into the movements in the standard model and that delay creates an average expected present discounted value of rigidity that makes taxation possible. However, in a dynamic context, one would like to ask what is the long-term effect on growth. Harry Huizinga pointed out that the relationship between tax rate and foreign ownership needs to be analysed cautiously in both papers.

Samuel Bentolila was concerned that, aside from competition on taxes, there is also competition on labour market regulations and labour standards. He pointed out that social dumping could lead to a race to the bottom. He asked 'who will have the tax burden when capital income taxation is reduced?'. He pointed out that taxes on labour or value added are also not neutral taxes. Overall, he suggested adding a bit more flesh to the theoretical paper by looking at what happened in a big integrated area with high labour and capital mobility. Again, the United States was suggested as being the appropriate analogy.

Bruno Jullien felt that the paper focuses too much on the difference between labour and capital. In the new economy, firms like Microsoft produce mainly with human capital. This is often counted as labour, but from a taxation perspective it is capital. He raised the question of how this can be dealt with in the paper.

APPENDIX

This appendix outlines a model which underlies the dynamic tax analysis described in the text. Further details, including explicit derivations, are available on request from the author.

The model focuses on a single small jurisdiction. Within this jurisdiction, capital is combined with immobile and inelastically supplied factors of production – called 'labour', but also interpreted to include land, natural resources, public infrastructure, and other fixed inputs – to produce one or more traded goods. Assuming that the prices of traded goods are unaffected by local policies, these goods may be treated as a composite commodity which is taken as *numéraire*. Thus, let $f(k_t)$, with $f' > 0 > f''$, denote output within the locality at time t, expressed as a function of the amount of capital employed within the jurisdiction at that time, k_t. The strict concavity of f reflects the presence of other, fixed factors of production. Assuming that local factor markets are perfectly competitive, these factors will receive a gross income at time t equal to $w_t \equiv f(k_t) - k_t f'(k_t)$. It is assumed that these factors are owned by local residents who themselves are immobile and assumed to be identical. In order to obviate any issues relating to intergenerational transfers, these households are also assumed to be infinitely lived (or, equivalently, to be linked through altruistically motivated intergenerational transfers).

Capital is traded in external markets, where it earns a rate of return r that is unaffected by local policies and is thus taken as exogenously fixed for the purposes of the analysis. It is also assumed to be time invariant. Firms located within the locality can acquire capital at a cost of r and also must pay a local tax on capital. In order to keep the analysis of capital tax policy as simple as possible, and, in particular, to obviate issues of time consistency as well as to maintain ease of comparison with atemporal models used in previous literature, assume that the locality imposes a per-unit tax on capital at a *time-invariant* rate of τ_k. (There are obvious issues concerning dynamic consistency that arise in this context; they are, however, left for future analysis.) Thus, the tax-inclusive cost of capital to local firms is $r + \tau_k$.

The dynamics of the model are determined largely by adjustment costs that firms must bear when they undertake local investment; in particular, these costs preclude instantaneous adjustment of the local capital stock. Specifically, the cost of adjustment incurred by local firms is given by $c(i_t)k_t$, with $c' > 0 < c''$ where i_t is the rate of gross investment within the locality at time t, that is, the amount of expenditures on capital goods expressed as a proportion of the amount of capital in the locality, k_t. This adjustment cost is assumed to take the form of lost output and is thus expressed in units of *numéraire*. Note that since $c(\cdot)$ is homogeneous of degree zero in the level of investment and the total stock of capital, total adjustment costs are homogeneous of degree one in these variables. This assumption, and the assumption that adjustment costs are convex in the rate of investment, are standard ones in the investment literature. Assuming that capital depreciates at a constant exponential rate of δ, the evolution of the local capital stock takes the usual form:

$$\dot{k} = (i_t - \delta)k_t. \tag{A1}$$

The cash flow of local firms at time t is the value of their output net of adjustment costs, less investment expenditures, less tax payments, less payments for local labour,

$$\pi_t = f(k_t) - c(i_t)k_t - \tau_t k_t - i_t k_t - w_t \tag{A2}$$

Assume that no agents face liquidity constraints or other capital market imperfections and that all agents plan over infinite horizons. Local residents are assumed to plan their lifetime private consumption streams subject to the constraint that the present value of lifetime consumption is equal to the present value of lifetime income net of any taxes or transfers, firms maximize the present value of profits net of taxes or subsidies, and the local government must satisfy a budget constraint that requires the present value of public expenditures to be equal to the present value of tax revenues. Under these assumptions, firms choose the paths of investment i_t and capital k_t to

$$max\ \Pi \equiv \int_0^\infty \pi_t e^{-rt} dt \tag{A3}$$

subject to (A1), with an initially-given stock of capital $k_0 = K_0$.

In addition to collecting revenues from the taxation of local capital, the local government may collect revenue from or provide subsidies to local residents in a lump-sum fashion and it can spend money on the provision of public goods that benefit local residents. Let T denote the present value of lump-sum taxes imposed on local residents; under the assumptions of the model, the precise time path of revenue flows from these taxes is unimportant. Assume that the level of provision of public goods is exogenously fixed and let $\overline{G}$ denote the present value of public expenditures on public good provision; provided that public good provision levels are fixed, their time path is unimportant. Since the stock of capital in the locality can vary over time, the amount of tax revenue collected from capital taxation can also vary, with $\tau_k k_t$ the amount of revenue collected at time t. The local government budget constraint requires that

$$\overline{G} = T + \int_0^\infty \tau_k k_t e^{-rt} dt \tag{A4}$$

Local residents derive utility from private consumption and from local public goods. The latter, however, are treated as exogenously fixed, and can be ignored in the remainder of the analysis. No restrictions are placed on the role of public goods in the preference structure of households. The preferences of households over private consumption streams can also be very general; essentially all

that is required is that household intertemporal utility maximization exhausts the present-value lifetime budget constraint. This basic assumption implies that the welfare of local residents is an increasing function of lifetime wealth. As already noted, households are endowed with fixed supplies of labour, earning a gross return of $w_t = f(k_t) - k_t f'(k_t)$ in every period. Local residents may also be endowed with some stock of capital $\bar{k}$ which earns a flow return of $r\bar{k}$ in every period, as well as some ownership shares in local and foreign firms. Let θ represent the local ownership share in local firms, with $0 \leqslant \theta \leqslant 1$, and let $\overline{\Pi}$ represent the present value of profits derived from ownership of firms outside of the locality. Under these assumptions, the present value of lifetime income for local residents is given by

$$Y = \int_0^\infty [f(k_t) - k_t f'(k_t)]e^{-rt}dt + \bar{k} + \theta\Pi + \overline{\Pi} - T. \tag{A5}$$

Under the assumptions of the model, local tax policy affects the welfare of local residents only insofar as it affects Y.

The question then arises as to what value of the local tax rate would maximize the welfare of local residents. The analysis of this question requires explicit comparative dynamic analysis since, starting from any initial situation, a change in the local tax rate initiates a process of adjustment of the local capital stock, and the optimal local tax rate is the one that makes local residents as well off as possible, taking into account the impact of this entire adjustment process.

In particular, a permanent increase in the local tax rate entails a trade-off between short-run benefits and long-run costs. In the long run, a higher local tax rate simply drives capital out of the local jurisdiction, eventually harming local residents. However, in the short run, a higher local tax rate allows local residents to collect tax revenues whose burden falls partly on the non-resident owners of local capital. To strike the best balance between the short-run benefit and long-run cost of a higher tax obviously requires taking into account how much of the local capital stock is owned by non-residents (the parameter θ) and the speed of adjustment of the capital stock (the parameter ρ). The long-run harm that the local tax on capital ultimately causes depends on the elasticity of demand for capital ε, which in turn depends on the underlying production technology. If, for example, capital is used in fixed proportions with local immobile factors, ε would be zero and no capital would leave the local economy in response to higher taxes, no matter how much time is allowed for adjustment of the capital stock; more generally, the greater the elasticity of demand for capital, the greater the long-run effect of taxation on the long-run equilibrium level of capital in the locality. The short- and long-run trade-offs involved in choosing the local tax rate are thus quite complex. Nonetheless, they can be distilled into the very simple formula for the optimal local tax rate given in the text.

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