

Educating Europe

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Abstract

The mobility of labor reduces national incentives to invest in internationally applicable education. Such effects may be especially severe for the prospective new member states of the European Union. The European Union could overcome this by allowing countries to institute graduate taxes or income-contingent loans, collected also from migrants. This paper presents calculations on how such a system could look like for Finland, as well as discusses its implementation. Such contracts could be voluntary, education financed publicly only for those accepting also to share the returns. With EU enlargement, such reforms could generate a triple dividend.

Keywords: graduate taxes, European Union, individual accounts, income-contingent loans, migration

JEL Codes: H24, H52, I28, F22

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1. Introduction

Few forces have shaped, and continue to shape, the world as much as migration. During the second half of the 20th century, Western Europe transformed from being a prime source of emigrants leaving for a better life in other continents to a lucrative destination. Migration flows improve overall efficiency and may generate vast efficiency gains, when based on productivity differences. Simultaneously, migration also sets European systems of social protection in jeopardy.¹ More surprisingly, even migration based on productivity differences may reduce efficiency in a dynamic setting as it reduces national incentives to finance internationally applicable education. There are three separate, but often interlinked, reasons for this. First of all, the government has to invest in the education of the young before they decide where to live, work, and pay taxes after graduation. The expected returns to the government are lower the higher the probability that the student emigrates. Secondly, each government faces a temptation to free-ride, especially concerning expensive science-based fields of study. Instead of educating future professionals itself, the government may aim to attract those educated elsewhere by cutting taxes. There are no similar disincentives in, say, educating lawyers due to degrees in law being much more country-specific. Thirdly, increased mobility of professionals increases the marginal cost of public funds collected from them.

Some observers would welcome a reduced public financing of higher education. It would be hard to justify taxing low-income citizens to finance education for those who enjoy in

¹Borjas (1987) analyzes self-selection of immigrants to the United States and its economic effects. For an extensive overview on the economics of immigration, see Borjas (1994).

average high income in future, they argue. They suggest that a better solution would be to offer student loans in order to solve borrowing constraints. There are, however, several justifications for not relying only on student loans. An obvious one are external effects when different factors are complementary. Public provision of education also implements risk-sharing among students. Eaton and Rosen (1980) and Sinn (1995) prove that income redistribution may increase efficiency with a missing private insurance market. Ordinary student loans tend to deter applicants from disadvantaged backgrounds. Therefore, they waste talent and are inequitable by reducing intergenerational mobility. (Bennett et al. 1992, Barr 1993). There are four alternatives to maintain the current level of public financing of education in the European Union. One is taxing immobile tax bases to finance the education of high-skilled professionals, whose tax burden would be eroded in international tax competition. This would imply regressive redistribution, as shown by Wildasin (2000). The second alternative, the centralization of decision-making of education, would lead to excessive harmonization, and is ruled out by the subsidiarity principle. This paper suggests two new alternatives. They are introducing graduate taxes or introducing income-contingent loans, both paid according to the same rules independently of future domicile.

The introduction of graduate taxes or income-contingent loans could be a part of a wider reform of the European welfare state. Fölster (1997) and Sørensen (forthcoming) have suggested financing consumption smoothing over active lifetime using individual saving accounts, while Richter (2002) suggests that migrants should be integrated into the income redistribution system of their new home country only after a delay. Combining these ideas

would suggest establishing a system of individual accounts with delayed integration, in which migrants would make mandatory contributions and receive benefits according to the system of their earlier home country for a transition period, while the remaining balance would be transferred to the system of the new home country after the delay. There are strong reasons to have a separate account for financing education, most notably the frontloading of the costs of investment in education and financing education being an investment in future productive capacity instead of consumption smoothing. Together, these reforms would considerably limit tax competition without imposing harmonization. They would also favor the establishment of a well-functioning European market for education. For example, governments could find it attractive to finance education for their own citizens also when these study abroad, or offer education also for students from other member states in exchange for receiving from them graduate taxes or repayments of income-contingent loans.

Australia, New Zealand and the United Kingdom have adopted income-contingent loan schemes where maximum repayment is limited to loan and interest, whereas low-income workers pay back less than the full loan. Such a system requires, however, general tax revenue to subsidize low-income workers.² Also Sweden had a system of income-contingent loans, in effect between 1989 and 2001. The repayment rate was four percent of total income if living in Sweden and a yearly amount if living abroad. Loans taken after June 2001 are ordinary annuity loans. (CNS 2002). Sweden abandoning its income-contingent loan system

²For an analysis of the Australian Higher Education Contribution Scheme, see Chapman (1997). García-Peñalosa and Wälde (2000) compare the efficiency and equity effects of alternative ways of financing higher education. They argue that, with uncertainty, the graduate tax is a better solution than student loans, student loans whose repayment is conditional on future revenue, or relying on general tax revenue.

may reflect the pressures of increased labor mobility. Unlike income-contingent loans, annuity loans do not require co-operation from foreign tax authorities. Of all of those who graduate from Swedish universities, 15 percent emigrate. (Eklund 1998). Due to wide income gaps, migration flows from the prospective new EU member states to the current states could be both larger and more permanent. In 2001, GDP per capita at purchasing power parity in the prospective new member states was only 46 percent of EU average. It ranged from 33 percent in Latvia to 70 percent in Slovenia and 74 percent in Cyprus, being 40 percent in Poland, the largest prospective new member state.³ (Eurostat 2002). For comparison, Spanish GDP was 70 percent and Portuguese 50 percent of the then average of old member states when they joined. (Richter 2002). The potential brain drain could have dire consequences to the incentives that the new member states face in financing their education. Such a concern has so far been largely neglected at the expense of the fear of negative consequences of "welfare tourism" to the current member states.

Also Poutvaara (2000, 2001) suggests financing income redistribution for students from taxes collected from them, independently of their future domicile. There is only one type of human capital, equally applicable everywhere, and ex ante identical students decide on their own investment in education. This paper has a different focus. Young people have different abilities, and there are several forms of human capital. Different types of education are allowed to have different degrees of international applicability, and education is provided by the government. This is, indeed, the case for the majority of young people in European

³Data for Malta is not available.

countries. Governments are a major source of funding for universities, as well as affect the type of education provided. Indeed, the government may even choose the type of education to limit mobility.⁴ Graduate taxes or income-contingent loans could be used to finance also other types than university education given to adults. In that case, tax rates could be differentiated according to the type of education received. The focus is on education targeted to young adults. In the spirit of Tiebout (1956), parents valuing education may buy better education for their children by paying higher taxes. Such a mechanism is much weaker in higher education, as young adults may go to a university in a different city, or even country, than in which their parents pay taxes.

This paper is organized as follows. Section 2 develops a theoretical model of how the government invests in education of its young citizens without the mobility of labor. Section 3 studies how the government decides on investment in education with labor mobility when the emigrants pay their wage taxes only to their residence country. This corresponds to the current European tax constitution. Section 4 studies investment behavior in two alternative federal arrangements to curb tax competition: graduate taxes and income-contingent loans. Both would be paid to the country which has financed education, thereby giving that country a stake in productivity increases independently of future domicile of its students. Section 4 presents also a calculation of a graduate tax for Finland, as well as discusses administrative issues and possible synergies in other policy fields, most notably integrating pension systems

⁴On the other hand, Kehoe (1989) argues that tax competition may offer a way to avoid the time-consistency problem. Thum and Übelmesser (2001) suggest that labor mobility could increase investment in education as it serves as a commitment device to low taxation. Chau and Stark (1999) highlight that higher returns to skills available abroad increase private incentives to invest in those skills.

and limiting tax evasion. Section 5 elaborates on graduate taxes in connection with the enlargement of the European Union. Section 6 concludes.

2. Economy without Migration

There are several possible motivations for a government to educate its young citizens. An altruistic government may educate the young citizens solely in order to increase their future income. If the government represents the interests of the middle-aged and elderly citizens, it may still educate the young in order to increase future productivity of complementary factors of production, or tax revenue available in the future to finance pension benefits. Even if the government were not altruistic, it may educate the young citizens in order to be able to collect more tax revenue from them in the future.

The model is as follows. At the beginning of adulthood, citizens acquire education provided by the government. The length of education may differ across different programs. After education has been completed, individuals supply labor services inelastically for their remaining working life. The government has access to international loan markets with a given interest rate r . Wage income as well as costs are denoted in net present value terms using the discount rate r . We denote the ability of a young citizen indexed by i by a_i , and we assume that with education in the field j , citizen i 's net present value of lifetime wage income $w_{i,j}$ depends on his or her ability and resources devoted to that education, denoted by $c_{i,j}$. Assuming unit costs of resources devoted to education, $c_{i,j}$ is also the cost of education

j given to individual i . Therefore, the net present value of gross wage income is given by:

$$w_{i,j} = w_j(a_i, c_{i,j}).$$

The wage tax rate t is constant. Education may generate external benefits to the rest of society in excess of tax revenue collected from the educated. For example, a larger stock of human capital would increase the marginal product of complementary factors of production. In a corporatist labor market, these external effects may also capture the difference between the marginal product of the educated and their wage rate. With labor unions aiming at compressing wage distribution, an increase in the marginal productivity of one worker need not be fully reflected in his or her wage rate. Whatever the source of the external benefits of human capital of the educated, apart from future tax revenue from them, their net present value is captured by:

$$e_{i,j} = e_j(a_i, c_{i,j}).$$

The shadow price of public funds is $1 + \mu$, where $\mu \geq 0$. The utility function of those educated is linear in consumption. When the weight of a young citizen to be educated is denoted by α , $0 \leq \alpha \leq 1$, and the weight of external benefits is denoted by β , $\beta \geq 0$, the social benefit as perceived by the government is

$$b(a_i, c_{i,j}) = \alpha(1 - t)w_j(a_i, c_{i,j}) + \beta e_j(a_i, c_{i,j}) + (1 + \mu)tw_j(a_i, c_{i,j}).$$

Investment in education may be either a discrete or a continuous choice. While I concentrate in the general analysis on continuous investments, some proofs simplify by assuming choices to be discrete. When analyzing continuous investments, I assume that w_j and e_j are non-decreasing concave functions. Formally, $\frac{\partial}{\partial c} w_j \geq 0$, $\frac{\partial^2}{\partial c^2} w_j \leq 0$, $\frac{\partial}{\partial c} e_j \geq 0$, $\frac{\partial^2}{\partial c^2} e_j \leq 0 \forall j$.

The social maximization problem is to choose for each young citizen the type of education as well as the quantity of resources used. Formally, the type of education j is given for each citizen i , by

$$j = \arg \max_k \left[\max_{c_{i,k}} (b(a_i, c_{i,k}) - (1 + \mu)c_{i,k}) \right],$$

while the resources used to finance a continuous investment in education are given by

$$b_c = 1 + \mu \forall i, j,$$

where subscript c denotes partial derivative such as $b_c = \frac{\partial}{\partial c_{i,j}} b(a_i, c_{i,j})$. With discrete educational choices, the solution of the maximization problem of the government concerning citizen i is given by

$$j = \arg \max_k [b(a_i, c_{i,k}) - (1 + \mu)c_{i,k}].$$

In either case, the government chooses the education for each individual so that the social surplus of education is maximized. With concave and increasing e and w , the amount of education provided in any field is lower if the government assigns a zero weight on those to be educated. However, educational investment in some individuals may be higher:

Proposition 1 *A government assigning zero weight to the earnings of those to be educated may invest more in education than a government assigning a positive weight on the earnings of those to be educated.*

Proof. Assume that there is one individual facing two discrete educational alternatives. In alternative A, wage income is 10, external benefits are 0 and the cost of education is 3. In alternative B, wage income is 7, external benefits are 3 and the cost of education is 4. Assume that $\beta = 1, \mu = 0$ and $t = 0.5$. If the government attaches zero weight to the educated, it perceives the social surplus of education A as 2, and that of B as 2.5. If the government attaches a weight $\alpha = 1$ to the educated, then it perceives the social surplus of A as 7 and that of B as 6. Thus, a government with $\alpha = 0$ chooses more expensive education B than government with $\alpha = 1$. ■

The counterintuitive result of Proposition 1 arises from the accounting of external benefits, and it is presented as a theoretical possibility meriting empirical scrutiny. A model with homogeneous human capital would predict that the investment in human capital is always increasing in the weight attached to those to be educated.

3. Common Labor Market with Tax Competition

Let us next assume that labor is mobile. Without loss of generality, assume that there are two member states, labeled 1 and 2. The timing of events is that first national governments invest in the education they provide to their citizens. In the second stage, the educated citizens choose in which member state they live and work. In the third stage, citizens

educated in each member state supply labor and pay taxes in the member state they have chosen to live in.

The wage tax rate is denoted by t for member state 1 and \hat{t} for member state 2. I simplify the analysis by assuming that the wage tax rate is exogenous, in order to concentrate on the effects of labor mobility on the public provision of education. Allowing the wage tax rate to vary would strengthen the incentives to cut public financing of education, as tax competition would result in reduced tax revenue, thereby increasing the shadow price of public funds and reducing the returns that the government receives from those to be educated via tax revenues. The probability for a given individual to emigrate after education is completed depends on the type of education. While the probability is likely to depend also on the wage tax rate in the native member state and the wage tax rate in the other member state, these potential arguments are not written explicitly, as they are treated as exogenous. Furthermore, the probability of migration could depend on individual ability and the level of resources used for education, but also these links are omitted for simplicity. The probability of emigration of individuals with education j , denoted by p_j for member state 1 and \hat{p}_j for member state 2, is therefore exogenous. The social benefit of education j for individual i in member state 1 as perceived by the government is now

$$\begin{aligned}
 b(a_i, c_{i,j}) &= (1 - p_j)\alpha_1(1 - t)w_j^1(a_i, c_{i,j}) + p_j\alpha_2(1 - \hat{t})w_j^2(a_i, c_{i,j}) \\
 &\quad + (1 - p_j)\beta e_j^1(a_i, c_{i,j}) + (1 - p_j)(1 + \mu)tw_j^1(a_i, c_{i,j}),
 \end{aligned} \tag{1}$$

in which α_1 (α_2) is the social weight assigned by the government of member state 1 to its

educated citizen living in member state 1 (2), $w_j^1(a_i, c_{i,j})$ ($w_j^2(a_i, c_{i,j})$) is the gross wage in member state 1 (2) of an individual from member state 1 with ability a_i and education j created using resources $c_{i,j}$, and $e_j^1(a_i, c_{i,j})$ are the external benefits of an individual from member state 1 with ability a_i and education j created using resources $c_{i,j}$ when living in member state 1. All variables related to citizens being educated in the member state 2 are denoted by "hat", so that, for example, $\widehat{w}_j^1(\widehat{a}_i, \widehat{c}_{i,j})$ would be the gross wage of an educated citizen from member state 2 but living in member state 1. My formulation allows member states to have different technologies both in producing and in using human capital, as well as emigrants and natives facing different wages with same ability and human capital investment. These could result, for example, from different language skills. While I present the results for member state 1, corresponding results can be derived for the other member state simply by changing the indices. As it is plausible that the government does not care more about emigrants than citizens staying, I assume that $0 \leq \alpha_2 \leq \alpha_1 \leq 1$. Maximizing social surplus $b(a_i, c_{i,j}) - (1 + \mu)c_{i,j}$ implies:

Proposition 2 *If the weight assigned to expatriates is zero, then for any student i resources used for any potential choice of education j are decreasing in the probability of emigration.*

Proof. With continuous investment, the first-order condition with respect to $c_{i,j}$ simplifies to

$$(1 - p_j) \left((\alpha_1 + (1 - \alpha_1 + \mu)t) \frac{\partial}{\partial c_{i,j}} w_j^1(a_i, c_{i,j}) + \beta \frac{\partial}{\partial c_{i,j}} e_j^1(a_i, c_{i,j}) \right) = 1 + \mu.$$

The claim follows as the right-hand side is constant, and $w_j^1(a_i, c_{i,j})$ and $e_j^1(a_i, c_{i,j})$ are increasing concave functions with constant positive multipliers. With discrete education, the government would invest in education j of individual i if $b(a_i, c_{i,j}) - (1 + \mu)c_{i,j} \geq 0$. This holds as long as p_j is below a critical value. ■

If the weight assigned to expatriates is zero and investments in education are continuous, then an increasing labor mobility of one educational group reduces investment in all citizens in that group. It may also reduce the size of that group. For example, if the government was initially indifferent, for some individual, between education of type j and education of type $h, h \neq j$, then the government strictly prefers education of type h after an increase in p_j . This reduces the size of the group. Surprisingly,

Proposition 3 *An increasing labor mobility of some groups may either increase or decrease total resources used to finance education even when the weight assigned to expatriates is zero.*

Proof. See Appendix. ■

If the government assigns a positive weight to the expatriates, then an increase in the probability of emigration may increase the number of citizens receiving that type of education, as well as the level of resources used to educate them. This requires that the expatriates earn a higher net wage abroad than their gross wage and external benefits that they might otherwise generate domestically, and that the government values the utility of expatriates sufficiently high. The government would have to be willing to tax the remaining population to finance the utility gains of expatriates. This is not likely if the government has to win

approval from the remaining population. Therefore, it seems more likely that increased labor mobility would induce the government to change the mix of education provided towards those fields that benefit the remaining population. If this is the case, increased labor mobility would lead into eroded provision of internationally applicable education, like the natural sciences, engineering, medicine, and economics, and bias the curriculum offered towards internationally less applicable fields, like law and humanities with national emphasis.

If the two member states are identical, then labor mobility does not offer any efficiency gains, while it may distort investment in education. Therefore, it may either reduce welfare or leave it unchanged. If the countries differ, then the welfare effects of labor mobility may go either way. If the government attaches a positive weight to the utility of expatriates, and both member states have a comparative advantage in producing human capital needed in the other member state, both member states may do so. Labor mobility may increase social welfare when the two member states are not identical, even when the governments attach zero weight to expatriates. This can result from mutually beneficial brain exchange. For example, the presence of migrants with a different type of human capital may generate positive externalities by spreading new ideas and technology. More surprisingly,

Proposition 4 *Even when the two member states are identical, an increase in the labor mobility of one type of human capital may increase social welfare if the other type is already mobile.*

Proof. See Appendix. ■

To summarize, the welfare effects of labor mobility may be more complex than one would expect. An increase in the mobility of one group may either increase or decrease social welfare in either member state. The reason why an increase in the mobility of labor in one member state may decrease welfare in the other member state hinges on the policy response of the government in the member state suffering from a higher probability of emigration of one group. If a further increase in the probability of emigration of an internationally applicable type of education results in the government in that member state switching to offering internationally non-applicable education, the other member state suffers also as it no longer receives immigrants and the tax revenue and potential external benefits they would offer. Therefore, welfare effects of migration probabilities may be non-monotonic.

4. Federal Alternatives

4.1. Graduate Taxes

Assume next that emigrants pay graduate taxes to the government which initially educated them. The net present value of graduate tax payments depends on future income flow.⁵ While there could be an exempted income below which graduate tax is not collected, this section concentrates on the case in which a graduate tax is an equal share of income for all educated. The federally imposed maximum value of the graduate tax rate in member state 1 (2) is t_g (\hat{t}_g). The simplest case would be where this value would be the same in each member state, but this need not be the case.⁶ The general wage tax rate in member

⁵Already Friedman and Kuznets (1945) suggested financing professional education by students selling shares in their future earnings.

⁶If there were no restrictions, national governments could adopt confiscatory “graduate taxes”, effectively

state 1 (2) with graduate taxes is t_w (\hat{t}_w). In order to allow the comparison of social benefits from education with or without graduate taxes also with $\mu > 0$, I assume that $t_w = t - t_g$ and $\hat{t}_w = \hat{t} - \hat{t}_g$. Otherwise, a change in the aggregate tax burden would affect government investment in education even without migration. A member state receiving considerable immigration without much emigration might prefer not to establish graduate taxes, as these would imply losing part of tax revenue that would otherwise be collected from immigrants. If a member state finds it optimal to establish a graduate tax, then it is optimal to establish the maximal graduate tax rate as this maximizes tax revenue from those citizens emigrating to the other state. The social benefit of education j for individual i in member state 1 as perceived by the government is now

$$\begin{aligned}
b(a_i, c_{i,j}) = & (1 - p_j)\alpha_1(1 - t_w - t_g)w_j^1(a_i, c_{i,j}) + p_j\alpha_2(1 - \hat{t}_w - t_g)w_j^2(a_i, c_{i,j}) \\
& + (1 - p_j)\beta e_j^1(a_i, c_{i,j}) + (1 - p_j)(1 + \mu)t_w w_j^1(a_i, c_{i,j}) \\
& + (1 + \mu)t_g [(1 - p_j)w_j^1(a_i, c_{i,j}) + p_j w_j^2(a_i, c_{i,j})].
\end{aligned} \tag{2}$$

We observe:

Proposition 5 *If the type of education is fixed for each individual, then the introduction of a graduate tax in either member state increases investment in education in that member state.*

Proof. See Appendix. ■

obstructing free mobility.

The results of Proposition 5 hold also when the other state does not establish a graduate tax, implying that $\widehat{t}_g = 0$. Furthermore, the other state also gains from the immigrants it receives having a higher level of human capital. However, a state introducing a graduate tax and cutting the ordinary wage tax loses a part of the tax revenue that it earlier collected from immigrants.

Surprisingly, the imposition of a graduate tax may still reduce social welfare:

Proposition 6 *The presence of a graduate tax may reduce efficiency.*

Proof. See Appendix. ■

While the introduction of graduate taxes does not always increase welfare, this holds in a stylized model of only internationally applicable and internationally non-applicable types of education:

Proposition 7 *Allowing member states to levy graduate taxes is welfare improving if there are two types of education, one internationally applicable and the other internationally non-applicable.*

Proof. See Appendix. ■

Each member state has to compare efficiency gains from levying graduate tax to the loss of tax revenue from the immigrants from the other member state. Either member state imposes a graduate tax only if the benefits exceed the costs. The member state which initially loses more tax base to the other member state than it receives always finds it profitable to introduce a graduate tax, even if it would not change its investment in education. If one of

the member states does not impose a graduate tax, then it would be the one enjoying a net inflow of taxable income from the other member state without a graduate tax. Even though the possibility of either member state establishing a graduate tax benefits both member states, one member state may abstain from doing so if not compensated for the lost tax gain from migration.

The proposition can be generalized to a situation in which the government chooses between an internationally applicable and an internationally non-applicable education for each citizen. Even though it establishes that the availability of a graduate tax improves the social welfare in both member states, it need not be a Pareto improvement. If one of the member states establishes a graduate tax while the other does not, then migrants from the first to the second have to pay taxes to finance education twice, via a graduate tax to their member state of origin and via general wage taxes to their member state of residence.

A system with national graduate taxes would respect the subsidiarity principle. Member states could adopt different degrees of public participation in education. Depending on political preferences, member states could adopt for a compulsory graduate tax with wider income redistribution, or, alternatively, for voluntary contracts in which students would have to commit to paying a graduate tax in the future in exchange for public financing of education, or opt out and pay their education themselves. Such a voluntary system would maintain some degree of tax competition, viewed by Brennan and Buchanan (1980) as an essential mechanism through which a federal structure protects citizens against excessive taxation by lower-level governments. While voluntary contracts would suffer to some extent

from adverse selection problem, such problems could be mitigating by a partial subsidy from the general tax revenue to those who participate.⁷ Graduate tax contracts could be combined with both privately and publicly provided education, as they could be constructed so that the government would provide students with a voucher and a student aid scheme in exchange for signing the contract. Furthermore, governments could offer graduate tax contracts also for nationals from other EU member states.

4.2. Income-contingent Loans

In modern European states, a considerable part of income transfers effectively smooth tax payers' incomes over their active lifetime, instead of redistributing income across individuals. When benefits and taxes are not linked, taxes collected to finance also this consumption smoothing are from an individual perspective as distorting as taxes collected to finance redistribution. This would not need to be the case. Sørensen (forthcoming) argues that social insurance which does not redistribute income across individuals should be financed by benefit taxes in order to ensure efficiency, according to the principles developed by Wicksell (1896), Lindahl (1919) and Musgrave (1939). Building on Fölster (1997), Sørensen suggests that part of an individual's wage or social security taxes would be replaced by a mandatory social security contribution added to his or her individual account. Whenever receiving a benefit meant to smooth consumption over active lifetime, like an unemployment benefit or a student allocation, this would be subtracted from the balance of the individual account.

⁷Nerlove (1975) analyzes problems associated with financing higher education using income-contingent loans. Focusing on Yale Tuition Postponement Option, implemented in early 70s, he shows that the consequences of income-contingent loans depended crucially on who participated.

The balance of individual account would increase at the market rate of interest. At the time of retirement, a positive balance would be converted into a supplementary annuity, while a negative balance would be cancelled. There would be a debt ceiling for a negative balance. This would allow also those suffering a long spell of unemployment or illness earlier in their life a chance to reach a positive balance before retirement. For those with a positive balance at the end of their working life, their contribution to the individual account would represent forced saving, rather than distorting taxation.

Certain special aspects of education, most notably its external effects on the rest of society as well as the frontloading of the costs of investment, might call for the establishment of a separate individual education account. As the costs of some forms of higher education tend to be very high, adding its financing to an ordinary individual account analyzed by Sørensen would easily lead into those choosing an expensive education to reach a debt ceiling already during their studies. Therefore, individual accounts either would have to impose so high a debt ceiling that it would be equivalent to no debt ceiling for many with less expensive education and lower income, or accept that education would still be financed out of general tax revenue at the margin. With a separate individual education account, students could borrow from their account to finance both education and living expenses, and this debt would then accumulate at the market interest rate. The interest rate used could be that faced by the government debt, in order to induce governments to invest in education in an efficient manner. Insurance against low incomes could be provided by collecting repayments only from the income above a certain level until the loan and the interest would be repaid.

If there would be any remaining debt at the retirement age, it would be cancelled. In return for the government absorbing the downside risk, a student would have to pay an insurance premium. This insurance premium would be added to the debt, and could be a certain fraction of the balance borrowed. Income-contingent loans would also allow differentiating the prices charged for different degrees. Financing for expensive degrees offering relatively low direct monetary returns but judged to be socially valuable, like arts and humanities, would still call for subsidies from the general tax revenue or cross-subsidies from degrees with relatively cheap production costs but high private returns, like law.

While an income-contingent loan system would reduce tax distortions for those earning enough to pay for their accumulated debt, it need not be a socially better alternative than graduate taxes. If there is a cap on payments by those with high income, this requires increasing the contribution rate of those with lower income. Therefore, income-contingent loans would deliver effectively zero marginal tax rates to finance education in incentive terms for those earning sufficiently to repay their whole education, at a cost of higher effective marginal tax rates for those with lower income. Evaluating the efficiency effects depends then on the relative size and labor supply elasticities of the affected groups, while welfare evaluation would also have to account for an efficiency and equity trade-off. Income-contingent loans and graduate taxes also differ in the incentive effects for the government. If those emigrating are expected to have higher income, then graduate taxes encourage a larger investment in their human capital than income-contingent loans.

4.3. Calculation for Finland

Finnish government expenditures for universities and student allocations, including housing allocation, totalled 1.3 billion euros in 2002. When evaluating any proposals for a graduate tax, at most such an amount would have to be collected from those with university education. The amount collected could be less in case part of education would be financed out of general tax revenue to reflect external benefits to the rest of society, or if research expenditures of universities would be financed separately. Whatever amount would be collected from university graduates would allow reducing other tax burdens by the same amount. If the government would finance all expenditures on higher education and student aid from those working-age university graduates who earn more than 24,000 euros per year and are less than 65 years of age then it would have to collect in average 3,800 euros from each of them.⁸ To collect such a tax revenue, the graduate tax rate would have to be 16 percent of income above the floor. If tax cuts would be targeted to all tax payers earning more than 24,000 euros annually and being less than 65 years old, then their marginal wage tax rate for income above 24,000 euros could be cut by 8.7 percent. In net, a switch to a graduate tax would then increase the marginal tax rate of the university graduates earning more than 24,000 per year by 7.3 percent, while the marginal wage tax rate of those earning more than 24,000 euros annually without university education would be decreased by 8.7 percent.

While a graduate tax would increase marginal tax rates faced by those with university

⁸The calculations are based on updated Income Distribution Survey (IDS) at VATT. While the calculations are only for university education, a graduate tax could be used to finance also other types of education given to adults. In that case, tax rates could be differentiated according to the type of education received.

education, it would reduce the wage tax rate affecting migration decisions. In the example above, the reduction would be 8.7 percent. As those with university education and subject to a graduate tax would have to pay the tax independently of their residence, such a tax would no longer affect migration decisions. The effects on average incomes are much more moderate. The average wage tax rate of university graduates earning above 24,000 euros annually would be increased by 3.4 percent, while the average wage tax rate of those without university education would be reduced by 2.6 percent. In case a graduate tax would be collected to finance only student allocations including housing allocation, it would have to be 4.9 percent of the income exceeding 24,000 euros annually for university graduates below 65 years of age. The general wage tax rate of the same age group could be cut by 2.7 percent for income above 24,000 euros. The average wage tax rate, including graduate tax, would increase by 1.1 percent for university graduates, and be reduced by 0.8 percent for those without university education.

While there is no research about fiscal effects of migration for Finland, it is reasonable to expect the effects for Finland would not differ much from those for Denmark. Andersen (2002) has calculated the fiscal effects of emigration for Denmark. The results depend crucially on who migrate, as well as how emigration affects public expenditures. If emigrants are of average income, then a permanent emigration of less than 4,000 30-year-old Danes would result in the discounted tax loss of one percent of Danish GDP.⁹ If public expenditures are reduced in ratio to migration, then the net loss of one percent of Danish GDP would require

⁹Future tax revenues are discounted using a two percent interest rate, and then compared with the Danish GDP in the year 2001.

an emigration of more than 13,500 30-year-olds. However, if emigration is concentrated to those with higher education, then its consequences are more drastic. A permanent emigration of 1,900 30-year-olds with higher education would result in the net loss of one percent of GDP to the public sector. The average annual emigration from Denmark was 25,000 during the 1990s, of whom 10,000 were 25 to 39 years old. However, half of emigrants returned within two years, and 80 percent returned within ten years. Emigration from Finland has increased during the 1990s, reaching 14,000 in 2001. Of Finnish emigrants over the 1990s, about 60 percent returned within 10 years. (Statistics Finland 2002, Pirttilä and Rajakangas 2002) In 2001, 5.8 percent of Finnish working-age doctors and 5.0 percent of nurses lived abroad. (Vaalgamaa and Ohtonen 2002) Emigrants tend to be those with the most recently completed education. Of the 1,038 members of the Union of Health Professionals who emigrated in 2001, 150 had completed education in 2000 or 2001. The share of the members of the Finnish Association of Graduates in Economics and Business Administration (SEFE) living abroad is 4 percent. (Oksanen 2002)

4.4. Administrative Issues and Synergies

The implementation of graduate taxes or income-contingent loans requires that all member states of the federation collect tax revenue or loan repayment also for the other member states. This would call for a creation of a European tax payer identity number, as well as exchanging information between member states. A European tax payer identification number could be constructed from existing national social security numbers by adding a country code in front of them, and deciding that the first social security number received with its

initial country code would serve as the European tax payer identification number also in case of changing nationality. Alternatively, immigrants from another member state could still receive a new social security number in their new country of residence, with obligations from the previous country being automatically transferred to the new account.

Investment in the compatible infrastructure between tax authorities of the different member states and establishment of a European tax payer identification number would simultaneously be an investment to limit the effect of “fiscal termites”. While the current effects on tax revenue would seem to be small, certain aspects of globalization and new technology may be “busily gnawing at the foundations of the tax systems”. (Tanzi 2000). Favorable tax treatment to key personnel may be an example of such a termite, and increasing numbers of those working abroad another as it provides more opportunities to conceal income than working in only one state. By removing the financing of higher education from taxation affecting migration decisions, graduate taxes or income-contingent loans would reduce the pressure to introduce preferential tax regimes.

Introducing a European tax payer identification number would offer synergies with establishing portable pensions across EU member states, as well as in limiting tax evasion. If pension rules penalize changing a firm or state, then they impose implicit barriers to the free mobility of labor. The subsidiarity principle and free mobility could be combined by requiring that pension benefits would be accumulated in each member state as a separate incremental entitlement for each year or month. These entitlements to future pensions would then be recorded using European tax payer identification numbers with an annual basis, in-

cluding information on when and under what conditions the benefit can be claimed. The same European tax payer identification number could also be used to exchange information on labor and capital income earned in different member states, thereby limiting the possibilities for tax evasion.

5. EU Enlargement and Graduate Tax - A Triple Dividend?

The gap in living standards between the current EU states and the applicant countries has generated fear that migration would put current welfare systems under severe pressure. This has resulted in plans to limit migration from the new member states during a transition period. Such restrictions, however, also threaten potential efficiency gains from migration. Sinn (1994) has suggested that individuals should be free to choose between competing welfare systems only when young, and then remain in the same system independently of their future residence. The argument relies on the interpretation of the welfare state as an insurance mechanism for those lifetime career risks which cannot be insured privately. When this is the case, free mobility between different welfare systems involving ex post redistribution would undermine the insurance that these provide ex ante when future income realizations are still uncertain. Richter (2002) suggests as an alternative the Principle of Delayed Integration, in which migrants would be reassigned from the income redistribution system in their previous state to that in their new state after a delay. Such a rule is a compromise between the Origin or Home Country Principle advocated by Sinn (1994) and the current Employment Principle, in which citizens are assigned to the tax and welfare systems based on where they work.

While the effects of potential immigration to the current member states has received wide attention, the effects of emigration on the prospective new member states has been by and large ignored. However, there are several reasons to expect that the effects of migration, if widespread, could be much more severe at the origin of migration flows. First of all, it is plausible that a disproportionate share of emigrants would be those who are young and talented. A haunting possibility is that prospective new member states could react to the perceived threat of brain drain by investing too little in the human capital of prospective emigrants, especially by underinvesting in their language skills. Admittedly, they would have no incentives to stop investment in language skills completely due to their importance also in the domestic production and international trade. However, sub-optimal investment in human capital of prospective emigrants and a resource loss for the new member states due to brain drain would coexist with extensive agricultural and regional subsidies from the current member states. The introduction of graduate taxes in the new member states could offer a triple dividend, benefiting the emigrants, those left behind in the new member states and the old member states alike. By giving the country of origin a stake also in productivity gains created by emigrants elsewhere, a system of graduate taxes would encourage new member states to invest more efficiently also in internationally applicable human capital. Emigrants would benefit by receiving a better and more suitable education, enhancing their chances in the old member states in which their productivity could be several times higher. Those left behind could reap returns on human capital investment in the form of graduate tax payments from well-educated emigrants. They could also benefit more extensively from

brain exchange. With more efficient human capital investments, those returning would be even more productive. Finally, the old member states would benefit by receiving better educated immigrants. By transferring resources to the new member states, graduate tax payments could also reduce the need for other transfers.

6. Conclusion

The European model of social protection is under severe pressure. The member states of the European Union face incentives to cut welfare benefits and wage taxes in order to deter poor migrants and attract those with high incomes. Member states may free-ride by attracting skilled migrants with low taxes instead of paying for expensive education. This renders the financing of internationally applicable education less attractive for individual member states. In this paper, I suggest introducing graduate taxes or income-contingent loans, paid according to the same rules independently of future domicile. Implementing either would call for a European tax payer identification number, which could also be used to limit tax evasion. A system of graduate taxes or income-contingent loans should be based on voluntary contracts, in order to protect citizens against a possibility of excessive taxation by rent-seeking governments. Even though a part of the students would opt out, this would not threaten the system. By paying their own education, those opting out would not impose any burden on those signing the contract. Voluntary contracts would also enjoy a greater legitimacy than subjecting citizens, even in case of permanent emigration, to an unescapable tax burden on the basis of where they were born.

Graduate taxes or income-contingent loans could be a part of a wider reform to combine

in appearance conflicting aims of free mobility, the subsidiarity principle, the maintenance of social protection and a reduction of tax burden. Richter (2002) argues in favor of the Principle of Delayed Integration, in which migrants would be transferred from one redistribution system to another after a period of transition. Fölster (1997) and Sørensen (forthcoming) suggest that part of individual's wage or social security taxes would be replaced by a mandatory social security contribution added to his or her mandatory individual savings account, used then to finance benefits smoothing consumption before retirement. According to the Principle of Delayed Integration with Individual Accounts, the balance of individual savings accounts should be transferable between countries. During the transition period, benefits and payments would be made according to the rules of the country of origin. After the transition period, the remaining balance would be transferred into the new system. Again, it would seem optimal to have a separate account for education. While a general account would be used to finance consumption smoothing over lifetime, an income-contingent loan to finance education or a graduate tax contract would rather resemble a joint venture between a student and a government providing for public education. Giving member states also a stake in efficiency gains earned elsewhere would encourage governments to invest more in human capital benefiting also the other member states, and would favor the emergence of a genuine European market for higher education.

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Appendix.

Proof of Proposition 3

Proposition 2 already shows that increasing labor mobility may reduce investment in education. To prove that also the contrary is possible, assume that all citizens are of the same ability type and there are two educational fields, A and B. For simplicity, the educational investments are discrete, there are no external benefits, $\alpha_1 = 1$, $\alpha_2 = 0$, $0 < t < 1$, and $\mu = 0$. The costs and net present values of gross wage income are given by $c_A = 1$, $w_A^1 = 5$, $c_B = 2$, and $w_B^1 = 5$. If neither group is mobile, the government chooses education A. If $p_A = 0.25$ and $p_B = 0$, the government prefers to invest in the more expensive education B as this offers a higher expected surplus.

Proof of Proposition 4

Assume that all citizens are of the same ability type with $c_A = 1$, $w_A^1 = w_A^2 = 5$, $c_B = 2$, $w_B^1 = w_B^2 = 5$, $e_A^1 = e_A^2 = e_B^1 = e_B^2 = 0$, $t = \hat{t} = 0.5$, $\alpha_1 = \alpha_2 = 1$ and $\mu = 0$. The same holds symmetrically for the other member state. If $p_A = \hat{p}_A = 0.25$ and $p_B = \hat{p}_B = 0$, then both governments prefer to invest in the more expensive education B as this offers a higher expected surplus. Taking both emigration and immigration into account,

the expected surplus per citizen to be educated is 3 in both member states. Assume next that $p_A = \widehat{p}_A = 0.25$ and $p_B = \widehat{p}_B = 0.25$. Now both member states switch to education A, resulting in the expected surplus of 4 per citizen to be educated in both member states.

Proof of Proposition 5

Without graduate taxes, the maximizing of the social surplus $b(a_i, c_{ij}) - (1 + \mu)c_{ij}$ is implied by (1)

$$\begin{aligned} & (1 - p_j)\alpha_1(1 - t)\frac{\partial}{\partial c_{i,j}}w_j^1(a_i, c_{i,j}) + (1 - p_j)\beta\frac{\partial}{\partial c_{i,j}}e_j^1(a_i, c_{i,j}) \\ & + p_j\alpha_2(1 - \widehat{t})\frac{\partial}{\partial c_{i,j}}w_j^2(a_i, c_{i,j}) + (1 + \mu)(1 - p_j)t\frac{\partial}{\partial c_{i,j}}w_j^1(a_i, c_{i,j}) \\ & = 1 + \mu. \end{aligned}$$

The first-order condition with graduate taxes is, by (2), $t = t_w + t_g$, and $\widehat{t}_w = \widehat{t} - \widehat{t}_g$:

$$\begin{aligned} & (1 - p_j)\alpha_1(1 - t)\frac{\partial}{\partial c_{i,j}}w_j^1(a_i, c_{i,j}) + (1 - p_j)\beta\frac{\partial}{\partial c_{i,j}}e_j^1(a_i, c_{i,j}) \\ & + p_j\alpha_2(1 - \widehat{t} + \widehat{t}_g - t_g)\frac{\partial}{\partial c_{i,j}}w_j^2(a_i, c_{i,j}) + (1 + \mu)(1 - p_j)t\frac{\partial}{\partial c_{i,j}}w_j^1(a_i, c_{i,j}) \\ & + (1 + \mu)p_jt_g\frac{\partial}{\partial c_{i,j}}w_j^2(a_i, c_{i,j}) \\ & = 1 + \mu. \end{aligned}$$

The difference between these first-order conditions is that in the latter, there is an additional term $p_j [\alpha_2(\widehat{t}_g - t_g) + (1 + \mu)t_g] \frac{\partial}{\partial c_{i,j}}w_j^2(a_i, c_{i,j})$ on the left-hand side. By $\alpha_2 \leq 1$, this is positive. As w_j^1 , e_j^1 and w_j^2 are all assumed to be non-decreasing concave functions, this

implies an increase in $c_{i,j}$ as a result of a graduate tax when $p_j > 0$.

Proof of Proposition 6.

Assume that in both member states, all citizens are of the same ability type and there are two types of education, each requiring a discrete investment. To allow straightforward comparisons of efficiency, assume that $\mu = 0$, $\alpha_1 = \alpha_2 = \beta = 1$. Then each government maximizes the sum of disposable income and tax revenue of initial domestic citizens. The wage tax rate is 0.5 in both member states without a graduate tax and it is replaced by a general wage tax rate of 0.4 and a graduate tax rate of 0.1 in case of a graduate tax. $w_A^1 = w_A^2 = 9.75$, $w_B^1 = w_B^2 = 10$, $c_A = c_B = 1$, $e_A^1 = e_B^1 = e_B^2 = 0$, $e_A^2 = 2$, $p_A = 0.15$, $p_B = 0.2$, and similarly for the other member state with the exception that $\hat{e}_A^2 = 0$ and $\hat{e}_A^1 = 2$. Note that education of type A results in positive externality in the other member state, while there are no other external effects. Without graduate tax, both governments invest in education A and with a graduate tax, in B. Taking external effects from migration into account, the expected utility of both governments is higher without graduate tax.

Proof of Proposition 7.

Analyzing the decision problem of member state 1, assume first that the other state does not introduce a graduate tax. Then member state 1 introduces a graduate tax only if it increases its welfare. Assume next that member state 2 introduces a graduate tax. If member state 1 does not introduce a graduate tax and keeps investment in education the same, then it gains if member state 2 does not reduce investment in internationally applicable education. There are two potential sources of gain. First of all, if member state 2 increases

its investment in internationally applicable education, then member state 1 receives more human capital, generating higher tax revenues and potentially external benefits. Secondly, the expatriates from member state 1 earn higher after-tax income in member state 2 when it reduces its general wage tax rate by the amount of the graduate tax. It is never profitable to reduce investment in education when introducing the graduate tax compared with not introducing it. The reason for this is that when introducing the graduate tax, member state 1 gains $(1 + \mu - \alpha_2)t_g w_j^2$ from its expatriates living in the other member state now paying the graduate tax. By $\alpha_2 \leq 1$ this is always positive, implying that the presence of graduate tax increases returns to investment in internationally applicable education, while leaving returns to investment in internationally non-applicable human capital unchanged. The same argument holds for member state 2.

References

- [1] Andersen, T.M. (2002). Taxation and International Mobility of Labour. A paper presented at the Seminar on Tax Policy in International Framework, organized by Prime Minister's Office, Secretariat of the Economic Council of Finland, Helsinki, June 10, 2002.
- [2] Barr, N. (1993). Alternative Funding Resources for Higher Education. *Economic Journal* 103, 718-728.

- [3] Bennett, R., H. Glennerster, and D. Nevinson. (1992). Investing in Skill: To Stay or Not to Stay on? *Oxford Review of Economic Policy* 8, 130-145.
- [4] Borjas, G.J. (1987). Self-Selection and the Earnings of Immigrants. *American Economic Review* 77, 531-553.
- [5] Borjas, G.J. (1994). The Economics of Immigration. *Journal of Economic Literature* 32, 1667-1717.
- [6] Brennan, G., and J.M. Buchanan. (1980). *The Power to Tax: Analytical Foundations of a Fiscal Constitution*. Cambridge University Press.
- [7] Chapman, B. (1997). Conceptual Issues and the Australian Experience with Income Contingent Charges for Higher Education. *Economic Journal* 107, 738-751.
- [8] Chau, N.H. and O. Stark. (1999). Migration under Asymmetric Information and Human Capital Formation. *Review of International Economics* 7, 455-483.
- [9] CNS Faktablad 2002. <http://www.csn.se/>
- [10] Eaton, J., and H.S. Rosen. (1980). Taxation, Human Capital, and Uncertainty. *American Economic Review* 70 (4), 705-715.
- [11] Eklund, K. (1998). *Jakten på den försvinnande skatten*. In Swedish. SNS Förlag, Stockholm.

- [12] Eurostat. (2002). *Purchasing Power Parities and Related Economic Indicators for EU, Acceding and Candidate Countries and EFTA*. Available at <http://europa.eu.int/comm/eurostat/>
- [13] Friedman, M. and Kuznets, S. (1945). *Income from Individual Professional Practise*. NBER.
- [14] Fölster, S. (1997). Social Insurance Based on Personal Savings Accounts: A Possible Reform for Overburdened Welfare States? *European Economy* 4, 81-100.
- [15] García-Peñalosa, C. and K. Wälde. (2000). Efficiency and Equity Effects of Subsidies to Higher Education. *Oxford Economic Papers* 52, 702-722.
- [16] Kehoe, P.J. (1989). Policy Cooperation among Benevolent Governments May Be Undesirable. *Review of Economic Studies* 56, 289-296.
- [17] Lindahl, E. (1919). “Die Gerechtigkeit der Besteuerung - Positive Lösung”, reprinted as “Just Taxation - A Positive Solution” in R. Musgrave and A. Peacock (eds.) *Classics in the Theory of Public Finance*. Macmillan 1994, 168-176.
- [18] Musgrave, R. A. (1939). The Voluntary Exchange Theory of Public Economy. *Quarterly Journal of Economics* 53, 217-237.
- [19] Nerlove, M. (1975). Some Problems in the Use of Income-contingent Loans for Finance of Higher Education. *Journal of Political Economy* 83, 157-184.

- [20] Oksanen, J. (2002). E-mail communication with Juha Oksanen, Secretary for Educational Affairs at SEFE (the Finnish Association of Graduates in Economics and Business Administration).
- [21] Pirttilä, J. and S. Rajakangas (2002). Muuttoliike Suomesta ja Suomeen 1990-luvulla ja muuttoliikkeeseen vaikuttavat tekijät. (Migration to and from Finland). In Finnish. An Appenix to the report *Verotus kansainvälisessä toimintaympäristössä* (Taxation in an International Framework). Prime Minister's Office, Helsinki, Finland.
- [22] Poutvaara, P. (2000). Education, Mobility of Labour, and Tax Competition. *International Tax and Public Finance* 7, 699-719.
- [23] Poutvaara, P. (2001). Alternative Tax Constitutions and Risky Education in a Federation. *Regional Science and Urban Economics* 31, 355-377.
- [24] Richter, W.F. (2002). Social Security and Taxation of Labour Subject to Subsidiarity and Freedom of Movement. *Swedish Economic Policy Review* 9, 47-74.
- [25] Sinn, H.-W. (1994). How Much Europe? Subsidiarity, Centralization and Fiscal Competition. *Scottish Journal of Political Economy* 41, 85-107.
- [26] Sinn, H.-W. (1995). A Theory of the Welfare State. *Scandinavian Journal of Economics* 97 (4), 495-526.
- [27] Statistics Finland. (2002). Figures on migration for Finland. Quoted from Pirttilä and Rajakangas (2002).

- [28] Sørensen, P.B. (forthcoming). Social Insurance Based on Individual Savings Accounts. in S. Cnossen and H.-W. Sinn (eds.), *Public Finance in the New Millennium*, MIT Press.
- [29] Tammisto, S. (2002). E-mail communication with Soile Tammisto, Head of International Office at Tehy (Union of Health Professionals).
- [30] Tanzi, V. (2000). Globalization, Technological Developments, and the Work of Fiscal Termmites. IMF Working Paper 00/181.
- [31] Thum, C. and S. Übelmesser. (2001). Mobility and the Role of Education as a Commitment Device, CESifo WP 450.
- [32] Tiebout, C.M. (1956). A Pure Theory of Local Expenditures. *Journal of Political Economy* 64, 416-424.
- [33] Vaalgamaa, K. and J. Ohtonen. (2002). *Terveystenhoollon ammattihenkilöt 31.12.2001*. (The Professionals in Health Care December 31, 2001) In Finnish. Stakes, Helsinki, Finland.
- [34] Wicksell, K. (1896). “Ein Neues Princip der Gerechten Besteuerung”, reprinted as “A New Principle of Just Taxation” in R. Musgrave and A. Peacock (eds.) *Classics in the Theory of Public Finance*. Macmillan 1994, 72-118.
- [35] Wildasin, D. E. (2000). Labor Market Integration, Investment in Risky Human Capital, and Fiscal Competition. *American Economic Review* 90 (1), 73-95.