

EDUCATING EUROPE

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CESIFO WORKING PAPER NO. 1114
CATEGORY 1: PUBLIC FINANCE
JANUARY 2004

PRESENTED AT CESIFO CONFERENCE ON “MIGRATION AND THE WELFARE STATE”
NOVEMBER 2003

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Abstract

The mobility of labor reduces national incentives to invest in internationally applicable education. The European Union could overcome this by allowing member states to institute graduate taxes or income-contingent loans, collected also from migrants. This paper presents calculations on how a graduate tax system could look for Finland. To protect citizens against Leviathan governments, graduate taxes or income-contingent loans could be based on voluntary contracts. Education would then be financed publicly only for those accepting also to share the returns. With EU enlargement, such reforms could generate a triple dividend.

JEL Classification: H24, H52, I28, F22.

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

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This paper was presented at the CESifo Economic Studies Conference on Migration and the Welfare State in Munich, November 7-8, 2003. I thank Gerald Willmann and other participants for valuable comments. I am grateful to Heikki Viitamäki at VATT for performing the calculations of a graduate tax for Finland. The responsibility for interpretations and possible mistakes is mine. I also thank former colleagues at VATT, Katarina Keller, Alexander Kemnitz, Marko Köthenbürger, Wolfram Richter, Silke Uebelmesser, Andreas Wagener, as well as participants of the European Public Choice conference in Aarhus, Denmark, April 2003, the European Economic Association annual meeting in Stockholm, August 2003, the International Institute of Public Finance Congress in Prague, August 2003, and a seminar at CEBR in November 2002 for helpful comments. I acknowledge financial support from the Danish Ministry of Economic and Business Affairs, without implicating the sponsors for the views expressed.

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.

There are four alternatives to maintain the current level of public financing of education in the European Union.² One is taxing immobile tax bases to finance the education of high-

¹For an extensive overview on the economics of immigration, see Borjas (1994).

²There are several justifications for not relying only on private financing or student loans. An obvious

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 European 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. In order to protect citizens against Leviathan governments, such contracts should be voluntary, allowing students to opt out. A drawback of voluntary graduate tax contracts or income-contingent loans is that they would introduce an adverse selection problem: Students with highest expected earnings would prefer to opt out. Limiting adverse selection problem requires a certain degree of subsidization out of general tax revenue to maintain a sufficient attractiveness also for those with relatively high expected income. Such subsidization could be viewed as a social insurance premium paid to protect citizens against a possibility of expropriation by a possible Leviathan government. This is part of a more general trade-off between balancing the adverse selection problem as concerns participation in social insurance and the moral hazard problem on the part of governments when participation is compulsory.

Australia, New Zealand and the United Kingdom have adopted income-contingent loan

one are external effects when different factors are complementary. These may arise either from production technology or from corporatist labor market structures, provided that the educated would not reap their full marginal productivity as their wage income. Public provision of education also implements risk-sharing among students. 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. In this paper, I do not compare private and public education, but focus on how migration affects higher education, in case it is publicly provided.

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.³ 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. (CSN 2002). Sweden abandoning its income-contingent loan system may reflect the pressures of increased labor mobility. Unlike income-contingent loans, annuity loans do not require cooperation 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. This raises a possibility of brain drain, discussed by Bhagwati and Hamada (1974). Accounting for brain drain would further strengthen the case for graduate taxes as concerns public provision of education.⁴

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

³For an analysis of the Australian Higher Education Contribution Scheme, see Chapman (1997).

⁴On the other hand, Beine et al. (2001) and Stark and Wang (2002) highlight that higher returns to skills available abroad increase private incentives to invest in those skills in developing countries.

by the government. This is, indeed, the case for the majority of young people in European 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.⁵ 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.⁶ Voluntary graduate tax contracts or income-contingent loans would solve a problem of missing private market for income risks related to education, thereby improving the working of the market mechanism rather than replacing it.

This paper is organized as follows. Section 2 develops a theoretical model of how the government invests in education of its young citizens when the migrants pay their wage taxes only to their residence country. This corresponds to the current European tax constitution. Section 3 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. It also presents a calculation of a graduate tax for Finland. Section 4 discusses the trade-off between an adverse selection problem on the part of citizens and moral hazard problem on the part of governments, the enlargement

⁵On the other hand, Kehoe (1989) argues that tax competition may offer a way to avoid the time-consistency problem. Andersson and Konrad (2003) and Thum and Uebelmesser (2003) suggest that labor mobility could increase investment in education as it serves as a commitment device to low taxation.

⁶In 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.

of the European Union, as well as administrative issues and possible synergies in other policy fields, most notably integrating pension systems and limiting tax evasion. Section 5 concludes.

2. Common Labor Market with Tax Competition

2.1. Game Structure

Without loss of generality, assume that there are two member states in a common labor market, labeled 1 and 2. I analyze a symmetric federation in which production functions, wage tax rates and costs of education are the same in both member states, commenting on how results would change in a federation of asymmetric member states in section 4.2.

In the first stage, national governments invest in the education they provide to their citizens. There are two types of education, labeled i and s . These subscripts refer to whether the education is internationally applicable (i) or country-specific (s). Only those with internationally applicable education may migrate. In the second stage, they choose in which member state they live and work. In the third stage, citizens supply labor and pay taxes in the member state they live in. Government collects wage taxes from the educated to finance exogenous public consumption and public education, and transfers the rest of the tax revenue to the owners of the other factors of production, like pensioners and the uneducated. In order to focus on the effects of the mobility of labor on investment in education, rather than the effects of migration on tax rates through tax competition, I assume that the tax rate of the educated is a constant t .⁷ Government budget constraint is then balanced by adjusting

⁷Keen and Marchand (1997) use the same assumption when they study the effect of fiscal competition on

transfers to the rest of the population. When education is publicly provided, students would generally be better off accepting publicly provided education, even if this does not maximize their gross income, than purchasing the other type of education themselves. From now on, I assume that it is optimal for all students to accept publicly provided education rather than buying a different education themselves. Without loss of generality, I focus on analyzing member state 1.

2.2. Production

The production function is linear in the two types of human capital. Both types of human capital may also generate positive externalities that cannot be appropriated by workers themselves. 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 the wage distribution, an increase in the marginal productivity of one worker need not be fully reflected in his or her wage rate. Aggregate production in member state 1 is given by

$$Y_1 = wH_i^1 + H_s^1 + e_iH_i^1 + e_sH_s^1,$$

in which w measures the coefficient with which human capital of type i is able to generate

the composition of public expenditure in the presence of mobile capital. They find that in a non-cooperative equilibrium, public expenditures are biased towards the provision of public inputs at the expense local public goods benefiting immobile residents.

production apart from externalities, H_k^1 , $k \in \{i, s\}$, is the post-migration stock of effective human capital, and e_k , $k \in \{i, s\}$, measures the coefficient of external effects generated by human capital of type k , with $e_k \geq 0$. These external benefits accumulate to other factors of production, like land, fixed capital and uneducated workers. The coefficient of human capital of type s is normalized to unity. These coefficients give as the gross rates of return to human capital of type s 1 and human capital of type i w .

Citizens differ in their productivity in case they would complete education i , while they have identical productivity in case they would complete education s . Human capital with education i for a citizen with ability a is in his or her home country:

$$h(a, i) = a,$$

while human capital created by completing education of type s is normalized to unity for all citizens. Effective human capital of migrants is specified in the following section. The resource cost of education k , $k \in \{i, s\}$, is c_k . Ability a follows a continuous distribution between 0 and 1, with density function $f(a)$.

I assume that the government is able to screen the students with highest ability to participate in ability-intensive education i . It is always optimal to do so, as productivity with country-specific education does not depend on ability. I denote the cutoff level of ability chosen by government 1 by \hat{a}_1 , below which citizens are educated in the field s and above

which in the field i . Thus, the stock of human capital s in member state 1 is

$$H_s^1 = F(\hat{a}_1),$$

and the pre-migration stock of human capital i is $\int_{\hat{a}_1}^1 f(a)ada$.

Wage rates correspond to gross rates of return in the production function, apart from externalities. Therefore, wage income of the educated with education s is 1, while the wage income of an educated citizen with education i and ability a is aw in his or her home country. 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 and individuals have 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 . For both types of education to be profitable from social perspective, I assume that $w + e_i - c_i > 1 + e_s - c_s$. This guarantees that the government maximizing production would educate a citizen with ability 1 in field i . Citizen with $a = 0$ always becomes educated in field s .

2.3. Migration

A share γ of internationally applicable education in one member state is applicable in the other member state in case of migration, satisfying $0 \leq \gamma \leq 1$. In order to account for a possibility of mutually beneficial brain exchange, assume that each individual faces an individual-specific random component related to productivity abroad, unknown to govern-

ment before education but known to the individual before migration. The random component takes a multiplicative form $1 + \varepsilon$, so that ε is uniformly distributed between -0.5 and 0.5 . In other words, some individuals would lose an individual-specific share of their productivity in case they emigrate, while others would benefit from a boost in their productivity abroad. An individual with internationally applicable education would then emigrate to the other member state if and only if

$$\gamma(1 + \varepsilon) > 1. \tag{1}$$

(1) defines the cutoff level of $\varepsilon_i = \frac{1}{\gamma} - 1$, below which citizens with internationally applicable education remain in their original member state. By symmetry, this cutoff level is the same in both member states. For simplicity, I assume that ε is not correlated with individual ability a . By this assumption and the properties of uniform distribution, the share of remaining internationally applicable human capital is given by $F(\varepsilon_i)$.

When there is some migration, $F(\varepsilon_i) = \frac{1}{\gamma} - \frac{1}{2}$ is the share of those with education i who do not migrate. The probability that an individual with education i would emigrate is then

$$p = \frac{3}{2} - \frac{1}{\gamma}. \tag{2}$$

As long as $\gamma > \frac{2}{3}$, there is migration. The probability of migration reaches its peak of 0.5 when $\gamma = 1$. As migration occurs only when the productivity of migrants is higher in the other member state, brain exchange increases the aggregate production. Thanks to mutually beneficial brain exchange, the average productivity of migrants with education i is b times

what it would have been if they would have stayed in their member state of origin, in which b is the product of γ and the average value of $(1 + \varepsilon)$ of those who migrate⁸:

$$b = \frac{3}{4}\gamma + \frac{1}{2}.$$

This average gain is the same for migrants from both member states. Post-migration internationally applicable human capital in member state 1 consists of share $(1 - p)$ of domestically created human capital and human capital of those who have immigrated from member state 2:

$$H_i^1 = (1 - p) \int_{\hat{a}_1}^1 f(a)ada + pb \int_{\hat{a}_2}^1 f(a)ada.$$

Here \hat{a}_k , $k \in \{1, 2\}$ is the endogenously determined cutoff ability in member state k under tax competition.

2.4. Public education

Government in each member state collects wage taxes at rate t from the educated to finance exogenous public consumption G and public education, and returns the rest of the tax revenue to the owners of the other factors of production, like the uneducated. The transfer in member state 1 is T_1 . In order to capture distortions arising from taxation, a share δ of potential tax revenue is lost.

⁸Remember that ε is uniformly distributed between -0.5 and 0.5 . The highest value of $1 + \varepsilon$ is $\frac{3}{2}$, while the lowest value with migration is $1 + \varepsilon_i^1 = \frac{1}{\gamma_i}$.

With tax competition and migration, the government budget constraint reads as

$$t(1 - \delta) [F(\hat{a}_1) + wH_i^1] = G + c_s F(\hat{a}_1) + c_i(1 - F(\hat{a}_1)) + T_1. \quad (3)$$

A central question when analyzing publicly provided education with migration is to determine how each government appreciates the utility of those of its citizens who emigrate.⁹ I assume that the weight on those citizens is α , $0 \leq \alpha \leq 1$. This formulation allows two polar cases: with $\alpha = 0$ each government cares only for its citizens who do not emigrate, and with $\alpha = 1$ the emigrants count with the same weight as citizens who stay. Utility of all citizens is linear in their consumption. The social welfare function of the government of member state 1 is

$$\begin{aligned} SWF_1^{TC} = & (1 - t)F(\hat{a}_1) + (1 - t)(1 - p)w \int_{\hat{a}_1}^1 f(a)ada \\ & + \alpha p(1 - t)bw \int_{\hat{a}_1}^1 f(a)ada + e_s H_s^1 + e_i H_i^1 + T_1. \end{aligned}$$

The first two terms give the after-tax income of the educated who stay, the third term is the social valuation of the utility of the educated who emigrate, the fourth and the fifth term give external benefits from education, and the sixth term is the lump-sum transfer for the rest of the population. Solving for T_1 from (3), the social welfare function can be presented solely as a function of \hat{a}_1 and \hat{a}_2 . The components determined by \hat{a}_2 measure positive externalities

⁹There is no need to specify how the government values the utility of immigrants, as immigrants have already received education from the other country when they arrive.

arising from the education provided in the other member state. As these are exogenous from the perspective of member state 1, the first-order condition of domestic policy for member state 1 is given by

$$1 - \delta t + e_s - c_s = (1 - p)(1 - \delta t)w\widehat{a}_1^{TC} + \alpha p(1 - t)bw\widehat{a}_1^{TC} + (1 - p)e_i\widehat{a}_1^{TC} - c_i.$$

On the left-hand side, we have the social surplus from providing education s , defined as a difference between the returns, consisting of after-tax income of the individual, marginal social external benefit, the marginal effect on the transfer, and the cost of resources devoted to provide education s . On the right-hand side, we have the social surplus from providing education i . The cut-off level for ability is then

$$\widehat{a}_1^{TC} = \frac{1 - \delta t + e_s - c_s + c_i}{(1 - p)[(1 - \delta t)w + e_i] + \alpha p(1 - t)bw}. \quad (4)$$

Comparative statics yield that investment in education i is increasing in w , e_i and c_s and decreasing in c_i and e_s .

Whether public investment in internationally applicable education is larger with or without migration, depends to a large extent on tax rates and on the social valuation of income accruing to emigrants. If tax rates are very high, then social valuation of the after-tax income of emigrants is low, and governments reduce investment in internationally applicable education when the probability of migration increases. It also holds:

Proposition 1 *Governments with $\alpha = 0$ always reduce investment in internationally ap-*

plicable education when its applicability increases.

Proof. Note that $\partial p / \partial \gamma > 0$. Setting $\alpha = 0$, $\partial \hat{a}_1^{TC} / \partial p > 0$ in (4). ■

Importantly, an increased mobility of labor need not always reduce total resources used to finance education. Whether this is the case or not depends on which type of education is more expensive. Also when internationally applicable education is less expensive, an increased probability of migration reduces individual government's incentives to invest in it.

When government attaches the same weight on emigrants as on citizens staying, increased mobility may lead to either larger or smaller investment in internationally applicable education. On the one hand, efficiency gains from brain exchange for emigrants encourage governments to invest more in the internationally applicable education. On the other hand, governments are pushed towards less investment because they lose tax revenue and potential external benefits from emigrants. An increased probability of emigration may encourage governments valuing the utility of emigrants highly to increase investment in internationally applicable education, but this requires that the expatriates earn a higher net wage abroad than their gross wage and external benefits that they might otherwise generate domestically. The government would also 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, even when the government values the utility of emigrants.

3. Federal Alternatives

3.1. 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.¹⁰ While there could be an exempted income below which the 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 graduate tax rate in both member states is t_g . The general wage tax rate with graduate taxes is t_w , so that $t_w = t - t_g$. As the aggregate tax rate is the same as in an economy with tax competition, migration rules derived in section 2.3 still apply. I also assume that graduate tax revenue is added into and public education financed out of general tax revenue, instead of assuming a separate budget run to finance education out of graduate tax revenue. This formulation allows government to still subsidize part of public education out of general tax revenue. Such subsidies could be used to internalize complementarity in production between the educated and other factors of production, as in Poutvaara and Kannianen (2000). They would also alleviate the adverse selection problem when students are allowed to opt out of graduate taxes and finance their education directly themselves.

Pre-migration stock of internationally applicable human capital is given by $\tilde{H}_i^{1GT} =$

¹⁰Already Friedman and Kuznets (1945) suggested financing professional education by students selling shares in their future earnings.

$\int_{\hat{a}_1}^1 f(a)ada$, and post-migration stock is

$$H_i^{1GT} = (1 - p) \int_{\hat{a}_1}^1 f(a)ada + pb \int_{\hat{a}_2}^1 f(a)ada.$$

The government budget constraint reads as

$$\begin{aligned} & t_w(1 - \delta) [F(\hat{a}_1) + wH_i^{1GT}] + t_g(1 - \delta) [F(\hat{a}_1) + (1 - p)w\tilde{H}_i^{1GT} + pbw\tilde{H}_i^{1GT}] \\ = & G + c_s F(\hat{a}_1) + c_i(1 - F(\hat{a}_1)) + T_1^{GT}. \end{aligned}$$

There are two differences compared to equilibrium under tax competition. First of all, each member state now receives graduate taxes also from emigrants. Secondly, they can levy only the ordinary wage tax rate t_w on immigrants. Citizens still face tax rate $t = t_w + t_g$ in both member states. The government of member state 1 maximizes

$$\begin{aligned} SWF_1^{GT} = & (1 - t)F(\hat{a}_1) + (1 - t)(1 - p)w \int_{\hat{a}_1}^1 f(a)ada \\ & + \alpha p(1 - t)bw \int_{\hat{a}_1}^1 f(a)ada + e_s H_s^1 + e_i H_i^1 + T_1^{GT}. \end{aligned}$$

Insert next T_1^{GT} from the government budget constraint and notice that immigrated human capital is independent of domestic education policy. The first-order condition yields

$$\widehat{a}_1^{GT} = \frac{1 - \delta t + e_s - c_s + c_i}{(1 - p) [(1 - \delta t)w + e_i] + \alpha p(1 - t)bw + t_g(1 - \delta)pbw}. \quad (5)$$

Parallel to Proposition 1, we can prove:

Proposition 2 *Governments invest more in internationally applicable education with graduate taxes than under tax competition. Investment in internationally applicable education is increasing in the graduate tax rate.*

Proof. The nominator of (4) and (5) is the same, while the denominator in the latter one exceeds that in the first one by $t_g(1 - \delta)pbw$. When $t_g > 0$, $\widehat{a}_1^{GT} < \widehat{a}_1^{TC}$. Furthermore, $\partial \widehat{a}_1^{GT} / \partial t_g < 0$. ■

Notice that this result is independent of the weight assigned to emigrants. Whether governments invest more or less in internationally applicable education with graduate taxes than without migration again depends on the conflicting effects: efficiency gains of brain exchange encourages such investments, while the incentives of keeping wage tax revenues as well as potential external benefits in the home country discourages them.

A central result is then:

Proposition 3 *Allowing member states to levy graduate taxes is welfare improving.*

Proof. Welfare effects of education policy of either member state can be divided into internalized effects and externalities on the other member state. By Proposition 2, $\widehat{a}_1^{GT} < \widehat{a}_1^{TC}$ (and $\widehat{a}_2^{GT} < \widehat{a}_2^{TC}$). By revealed preferences, internalized social welfare has to be at least as

high with \hat{a}_1^{GT} as member state 1 could still have chosen \hat{a}_1^{TC} but did not, and similarly for member state 2. As internationally applicable education also creates positive externalities in the other member state in the form of direct external effects and wage tax revenue from immigrants, both member states create larger positive externalities on the other member state, at the same time as they achieve at least as large internalized social welfare. ■

While I have so far assumed member states to be identical, graduate taxes are actually the more desirable as opposed to complete harmonization the more member states would differ. 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 opt 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.

If member states would differ and establishing a graduate tax would require reducing general wage taxes by a comparable amount, member states would face different trade-offs depending on whether they are net gainers or losers of tax base under tax competition. Those member states receiving considerable immigration without much emigration might prefer not to establish graduate taxes, as these would imply, in the form of lower general wage taxes, losing part of tax revenue that would otherwise be collected from immigrants. If member states are not very different, then it is optimal for both to establish the maximal graduate tax rate as this maximizes tax revenue from those citizens emigrating to the other

state, as well as encourages immigration and discourages emigration compared with the case with only wage taxes. The latter effects follow as a graduate tax collected also from emigrants renders emigration less attractive, as part of tax burden can no longer be avoided by emigration. At the same time, it encourages immigration by reducing the tax burden collected from immigrants. 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.

3.2. Income-contingent Loans

A less redistributive alternative to graduate taxes are income-contingent loans. 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 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. In the absence of income risks, income-contingent loans would be accepted only when the required repayment does not exceed the cost of private loans. In my framework, this would imply replicating educational choices under private investment in education.

3.3. Calculation for Finland

Finnish government expenditures for universities and student allocations, including housing allocation, totaled 1.1 billion euros in 2002.¹¹ When evaluating any proposals for a grad-

¹¹Total budget funding for universities was 1.127 billion euros, of which 49.5 percent was allocated to teaching and most of the remainder to research. This calculation includes only teaching. Student allocations equaled 324 million euros. All student housing allocation of 220 million euros is included, even though this

uate 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. 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 2,100 euros from each of them.¹² To collect such a tax revenue, the graduate tax rate would have to be 11,7 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 tax burden could be cut by an amount equal to 7.7 percent of income above 24,000 euros.

In net, a switch to a graduate tax would increase the tax burden of the university graduates earning more than 24,000 per year by 4.0 percent of their income above this threshold, while the tax burden of those earning more than 24,000 euros annually without university education would be decreased by 7.7 percent of the income above this level. While a graduate tax would increase marginal tax rates faced by those with university education, it would reduce the wage tax rate affecting migration decisions. As those with university education and subject to a graduate tax would have to pay the tax independently of their residence,

figure includes also allocations to students outside universities. (Ministry of Education 2003 and Ministry of Finance 2003)

¹²The 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. Calculations are based on gross taxable income.

such a tax would no longer affect migration decisions. The effects on average incomes are moderate. The increased costs of presented switch to a graduate tax for university graduates earning above 24,000 euros annually would be just 1.7 percent of their aggregate income.

Emigration from Finland has increased during the 1990s, varying between 12,000 and 14,000 in 1999, 2000 and 2001. Of Finnish emigrants over the 1990s, about 60 percent returned within 10 years. (Pirttilä 2003) 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) 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. If public expenditures are reduced in ratio to migration, then the net loss of one percent of Danish GDP would require an emigration of more than 13,500 30-year-olds.¹³ 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.

¹³Future tax revenues are discounted using a two percent interest rate, and then compared with the Danish GDP in the year 2001.

4. Discussion

4.1. Adverse Selection and Taming Leviathan

With benevolent governments that I have analyzed so far, there would be no efficiency justification for a system of voluntary risk-sharing contracts between students and governments as opposed to compulsory system of graduate taxes, collected independently of domicile. With voluntary contracts, a problem of adverse selection arises. Sinn (1997) shows that a voluntary insurance system may completely break down in the presence of private information due to adverse selection. Therefore, avoiding a break-down of voluntary risk-sharing contracts could then require a partial subsidy from the general tax revenue to those who participate.¹⁴ Most likely those with highest expected income would still find it optimal to purchase their education privately. Nonetheless, opting for voluntary contracts on graduate taxes is still likely to be an optimal constitutional arrangement in a federation, as opposed to binding nationality-based taxation. In a world where benevolence of governments is not universally guaranteed, constitutional design has to trade-off adverse selection problem and the need to tame Leviathan governments. 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. Accepting a certain degree of adverse selection would then be optimal, and could be interpreted as a federation's insurance premium against potential abuses by gov-

¹⁴Nerlove (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.

ernments.

Voluntary 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. This would solve also the problem of free-riding by mobile students when public education is tax-financed, highlighted recently by Del Rey (2001). Voluntary graduate tax contracts or income-contingent loans would favor the emergence of a genuine European market for higher education, establishing proper incentives for member states to provide education also for students from other member states.

4.2. 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. 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. 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. Increased labor mobility would then 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.

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. Finally, the old member states would benefit by receiving better educated immigrants. There are also two additional efficiency-improving mechanisms that are not captured by my model. First of all, an increased investment in internationally applicable education would allow new member states to benefit more extensively from brain exchange when part of emigrants return. With more efficient human capital investments, those returning would be even more productive. By transferring resources to the new member states, graduate tax payments could also reduce the need for other transfers.

4.3. 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 num-

ber could be constructed from existing national social security numbers by adding a country code in front of them, and deciding that the social security number received at birth 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.

Compared to the status quo with tax competition, a system of graduate taxes or income-contingent loans could produce winners and losers when member states differ. Introducing such a system might then require that member states gaining from such a new arrangement would compensate those losing. Due to overall efficiency gains, such a compensation scheme should be feasible. Implementing transfers between member states would suffer from the incentives of individual member states to avoid fulfilling their obligations, but these same problems are already present in implementing agricultural and regional policy. To deter cheating by member states, the European Union could implement a system in which member states caught cheating would face heavy fines, and individual civil servants exposing malpractice by their governments would receive immunity of prosecution related to exposing such offences, as well as a financial reward for exposing those. Such a reward could be a fraction of penalties imposed on the government caught violating rules, with a ceiling at, say, one to ten million euros, depending on the type of violation exposed. This same incentive scheme could be used to deter and detect malpractices in other programs, as well as inside EU administration.

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, including 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. 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. Giving member states a stake in efficiency gains also earned elsewhere would encourage governments to invest more in human capital benefiting also the other member states. A system of graduate taxes or

income-contingent loans should be based on voluntary contracts, in order to protect citizens against the possibility of excessive taxation by rent-seeking governments. Even though some 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 inescapable tax burden on the basis of where they were born. Implementing either graduate taxes or income-contingent loans would call for a European tax payer identification number, which could also be used to limit tax evasion.

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) and Sinn (2003) argue in favor of the delayed integration, in which migrants would be transferred from one redistribution system to another after a period of transition. Fölster (1997) and Sørensen (2003) suggest that part of individual's wage or social security taxes would be replaced by a mandatory social insurance contribution added to his or her mandatory individual savings account, used then to finance benefits smoothing consumption before retirement. These insights could be combined by making the balance of individual savings accounts 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. Even with such a principle of delayed integration with individual accounts, 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.

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