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Working Paper Series

How does Economic Integration Change Personal Income Taxation? Evidence from a new Index of Potential Labor Mobility

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Working Paper 12-20

November 2012

How does Economic Integration Change Personal Income Taxation? Evidence from a new Index of Potential Labor Mobility*

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Abstract

In this paper, I estimate the effect of increasing labor mobility on personal income tax schedules. I combine rich data on effective personal income tax levels in a panel of OECD countries for the period 1986-2005 with a new Index of Potential Labor Mobility. This index allows to tackle issues of reverse causality and potentially confounding effects from strategic competition. Estimates show that increasing labor mobility accounts for a considerable part of lower tax burdens. Furthermore, the reduction is found to be constant across brackets of taxable income.

JEL Classification: H24; F22; J61
Keywords: Personal Income Taxation; Economic Integration; Labor Mobility

*I would like to thank Robin Boadway, Christina Gathmann, Eckhard Janeba, Kai A. Konrad, Simon Loretz, Florian Scheuer, Laurent Simula, and seminar participants at the University of Mannheim and the Oxford University Centre for Business Taxation for helpful comments and discussions. Parts of this paper were written while I was visiting the Max Planck Institute for Tax Law and Public Finance, Munich, whose hospitality is gratefully acknowledged. Financial support from the Deutsche Forschungsgemeinschaft (DFG) through SFB 884 "Political Economy of Reforms" is gratefully acknowledged.

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1 Introduction

In OECD countries, personal income taxation accounts for roughly 35-40 per cent of government revenues, whereas taxes on capital income collect only about 10-15 per cent of total revenues.[1] Despite the apparent importance of personal income taxation, the literature on tax competition has so far mostly focussed on competition in capital taxation. This focus has been supported by the widespread notion that labor was virtually immobile between countries (Wilson 1999). However, a rapidly growing literature on international migration has shown that labor, and in particular high-skilled labor, is far from being immobile: Defoort (2006) estimates that on average between five per cent (below college education) and ten per cent (at least college education) of world population have emigrated to one of the six main receiving countries (Australia, Canada, France, Germany, the UK, and the US) since the mid 70s. Furthermore, recent theoretical research by Simula and Trannoy (2010) shows that even modest increases in the international mobility of high-skilled can have considerable effects on the optimal personal income tax schedule. The increasing number of preferential tax treatments for foreign high-skilled (e.g. in Denmark or Singapore), which are explicitly designed to increase the international mobility of high-skilled labor, highlight that tax policy makers are aware of labor mobility and its effects on domestic tax bases. Thus, it is worthwhile to quantitatively assess the effect of increasing labor mobility on domestic personal income taxation.

This paper provides estimates of the effect of (an) increasing (threat of) emigration on the level and the shape of personal income tax schedules in 26 OECD countries between 1986 and 2005. Estimating these effects, the paper makes two main contributions:

First, I account for heterogenous effects of mobility on taxes paid by high and low-income earners. Since international mobility is quite heterogenous across skill and thus income groups, the effect of increased labor mobility may not only affect the level but also the shape of the tax schedule. More precisely, a flattening of the schedule is to be expected if skilled labor is most mobile, potentially involving higher tax levels at the bottom of the income distribution. I can capture this effect by using rich data on the shape of personal income tax systems which includes information on average and marginal tax rates at various points of the income distribution. This approach allows to account for heterogenous effects at different points of the tax schedule.

Second, I construct a new Index of *Potential* Labor Mobility, containing yearly information on 26 OECD countries, 1986-2005. The index is based on country-pair specific information and contains both push factors (i.e. factors influencing an individual's decision to leave its current country of residence) and pull factors (i.e. factors influencing an individual's decision to settle in a specific country). Compared to using observed labor flows, this index has several advantages: The first advantage is the ability to cope with reverse causality. Taxation is known to have an impact on individual migration decisions (Abramitzky 2009; Kleven et al. 2011). This concern is of major relevance as the sign of the estimates changes with the direction of causality: Higher taxation increases emigration, but more emigration lowers the optimal tax

[1] Excluding social security contributions. OECD averages 1986-2005 from OECD.stat Government Revenue Statistics.

level. Using the Index of Potential Labor Mobility helps to disentangle these two channels: In addition to economic criteria, the index is based on indicators which are not under the control of current tax policy, such as cultural and geographical proximity, family values, or the ability to speak foreign languages. Therefore, reverse causality is hardly an issue when using this index. Second, the index allows to account for the effects of strategic competition in personal income taxation. As in the well-documented case of capital taxation, policy makers may react to increasing potential mobility of workers by adjusting tax systems such that no labor flows occur. Since the Index of Potential Labor Mobility represents the economic concept on which policy makers base their decisions, it allows to address this channel as well. The third advantage of the index is that it allows to link the empirical analysis closer to the theory. Existing theoretical models of the effect of labor mobility on income taxation (e.g. Simula and Trannoy (2010)) represent changes in the mobility of labor by variations in the cost incurred when relocating. My Index of Potential Labor Mobility is an indicator for the net costs associated with migration and thus the empirical counterpart of the core parameter in these models.

The descriptives of the index show some interesting features: First, potential labor mobility is quite low, with values averaging at about seven per cent of its theoretical maximal value. This highlights the scope of the topic to gain in policy relevance. Second, potential mobility has increased considerably over the last two decades, particularly after the fall of the iron curtain. Third, cross-country differences are more pronounced than variation over time.[2] Finally, countries in Scandinavia and Southern Europe known for high levels of taxation show relatively low levels of potential mobility, whereas low tax "anglo-saxon" countries have relatively mobile populations. Taken together, these stylized facts hint at a growing importance of labor mobility and a connection with tax issues.

The results of the empirical tests are in line with the main hypothesis of this paper: Increasing potential labor mobility lowers the tax burden on labor income. However, there is no robust evidence on heterogeneity across brackets of taxable income. The estimated effect is of considerable size: The German workforce experienced the largest increase in potential labor mobility during the period 1986 to 2005. This increase led to a reduction of the average tax burden for incomes of about 100,000 Euros per year in 2005[3] by at least five percentage points, depending on specification. For the US, increasing international labor mobility can explain roughly a quarter of tax reductions in that period. The general patterns of the effects are robust to the inclusion of a variety of economic and political controls, accounting for indirect effects through the general budget or "spill-overs" from capital taxation, and for an alternative specification of the index. Furthermore, I show that the effect of the index on personal income taxation cannot be replicated when using standard measures of economic integration. Measures of actual emigration are prone to severe reverse causality.

This paper is structured in the following way: In the next section, I discuss mostly theoretical literature on the relationship between economic integration and personal income taxation to derive hypotheses on how integration can be expected to change the shape of personal income

[2] This is true even when abstracting from time-invariant components of the index.

[3] Four times average GDP per capita.

tax schedules. Furthermore, I present arguments in favor of using measures of potential labor mobility instead of actual factor flows. Afterwards, I present the data I use in the empirical investigations. Most notably, I give a detailed overview of the construction on the index, its components, and the rationale for including these components. The third section is concluded by presenting descriptive statistics of the index. The fourth section presents and discusses the results of regressing the tax indicators on my Index of Potential Labor Mobility in a variety of specifications and robustness checks. In the fifth section, I re-estimate the regressions of the fourth section using an alternative version of the index which uses weights estimated from migration data. Finally, I conclude.

2 Theory

This section serves two main purposes: First , I argue why international economic integration, and in particular labor mobility, is an empirically relevant determinant of the level and shape of personal income tax schedules. Second, I discuss two measures of labor mobility, namely observed mobility and potential mobility, and argue why potential labor mobility is a more appropriate explanatory variable, both from an economic and a statistical point of view.

2.1 The Role of Economic Integration in Shaping Income Taxation

Economic integration can affect the system of personal income taxation through various channels. This study focusses on a particular direct channel, namely how increased mobility of labor changes the optimal income tax schedule. However, there are also other channels present, which I briefly discuss at the end of this section.

To provide a theoretical framework for the empirical analysis, I briefly review the approach taken by Simula and Trannoy (2010)[4] who model the optimal tax schedule as outcome of a mechanism design problem.[5] In a nutshell, they extend the classical Mirrlees (1971)-framework and allow for intensifying economic integration to shift individuals' constraints for the participation in national tax systems inwards.

In their model, Simula and Trannoy (2010) study the optimal nonlinear income tax schedule in a Mirrleesian economy which is populated by a continuum of individuals who can emigrate to a foreign country with a given tax and redistribution policy. A key assumption of the model is that the attractiveness of the outside option increases in individual productivity. The government is assumed to maximize the net income of the worst-off individual, taking both domestic labor supply and emigration incentives into account.

The emigration incentives are represented by a migration or participation constraint in an otherwise standard mechanism design problem. This participation constraint for an individual

[4]Compare Simula and Trannoy (2011) for a somewhat more general version of Simula and Trannoy (2010).

[5]Compare Salanié (2011) for an extensive treatment of optimal taxation and Saez et al. (2012) for a survey on the literature on the elasticity of taxable income.

of productivity θ is given by

$$R(\theta) = V_H(\theta) + c(\theta) - V_F(\theta).$$

Individuals are assumed to emigrate if and only if $R(\theta) < 0$, that is when the indirect utility in foreign exceeds the sum of the home indirect utility and the cost of migration. All three terms are assumed to increase in productivity θ. This participation constraint already provides some structure for the empirical approach to labor migration: It has to consist of measures for (i) economic opportunities at home (called push-factors by migration scholars), (ii) economic opportunities abroad (pull-factors), and (iii) some cost of migration.

While solving the tax design problem described above, Simula and Trannoy (2010) make several assumptions on the shape of the tax schedule, disutility of labor, and costs of migration. However, independent of these assumptions, one important result prevails: Individuals pay taxes that are the lower the more credibly the can threat to emigrate (c.p.).

Docquier and Marfouk (2005) document that observed international mobility of highly-skilled individuals is considerably larger than the mobility of low-skilled workers.[6] Simula and Trannoy (2010) explicitly look at the tax schedule in this case[7] and derive that individuals with higher productivity can face lower (marginal) tax rates than individuals with lower productivity if the possibility of migration increases in skills. That is, the progressivity of income taxation can be expected to decrease in countries with an internationally mobile workforce.

Hypothesis 1 The higher the (potential) mobility of a country's labor force, the lower the personal income tax rates it faces (level effect). The tax schedule will become less progressive when (potential) mobility is increasing in taxable income (shape effect).

In addition to this direct channel of labor mobility, there are also more indirect ones through which economic integration affects personal income taxation. First, economic integration has an effect on capital mobility and thereby capital income taxation.[8] Reductions in the taxation of capital income spill over to the taxation of personal income since personal income can be partially reclassified as capital income, particularly at higher incomes. Thus, policy makers who aim at discouraging such "arbitrage" have to adjust personal income taxation in response to capital tax competition. Furthermore, capital taxation affects the capital stock in an economy. If the availability of capital affects the level and distribution of labor incomes, then the optimally chosen tax schedule is again a function of capital taxation.

Second, economic integration affects governments budgets, e.g. as a result of capital tax competition. When the previously optimal mix of tax instruments is no longer generating sufficient tax revenues, governments may be forced to raise additional revenues by shifting a higher burden to less mobile tax bases such as labor income (cf. Hines and Summers 2009).

[6] Abramitzky et al. (2012) document that a reverse pattern in the era of mass migration before World War I and discuss some explanations for the subsequent reversal.

[7] Assuming that the correlation between skill level and income is sufficiently strong.

[8] See Wilson (1999) for a survey on this literature.

Furthermore, economic integration may raise expenditure requirements (cf. Rodrik 1998), which in turn may be met by adjustments in personal income taxation.

Third, economic integration implies an intensified exchange of goods and services and potentially offshoring of jobs. The effects of integration on labor market outcomes have been a well-studied phenomenon for some time.[9] More recently, heterogenous effects across the income distribution ("job market polarization" according to Autor et al. (2006)) have received growing attention in the wake of research combining trade models à la Melitz with labor market matching models.[10] These combined models show that economic integration increases incomes at the extremes of the income distribution, but erode those of the middle class. A policy maker who is concerned about the distribution of disposable incomes should thus adjust the shape of the tax schedule accordingly.

Since these indirect channels are not at the core of this paper, I restrict myself to controlling for them without scrutinizing every chain of these arguments in detail.

2.2 Observed Labor Mobility vs. Potential Labor Mobility

In this paper, I analyze the link between the mobility of labor and the level and shape of personal income tax systems. A rather straightforward approach is to use observed labor mobility as main explanatory variable. However, in this case the issue of reverse causality potentially arises since it is well possible that the degree to which governments seize individual income, e.g to achieve redistributive aims, has an effect on individual migration decisions. Using data on Israeli kibbutzim, Abramitzky (Abramitzky 2008, 2009) shows that an exogenous increase in the extent of redistribution (i.e. an increase in taxation/contributions, given that kibbutzim aim at equalizing consumption levels) induces highly skilled individuals to leave, i.e. emigrate, and low-skilled to arrive, i.e. immigrate. Kleven et al. (2011) use a Danish scheme according to which highly-skilled non-natives pay lower income taxes for the first three years of their stay. They demonstrate that a significant share of them leaves the country as soon as this preferential treatment expires.[11] These results suggest that taxation affects location decisions. Therefore, using actual labor flows as regressor can be expected to bias the estimates considerably upwards.

As a first empirical test for the validity of these concerns, I regress the top marginal tax rate on two indicators for observed labor mobility, namely the rates of skilled and total emigration as a measure of realized factor flows. Results are presented in Table 1.

In this rather reduced regression, both regressors have a statistically significant and positive effect on the top marginal tax rate. At first sight, this seems to imply that *observed* labor mobility leads to higher tax rates. However, in the light of reverse causality these results have a rather different interpretation: Higher taxation induces emigration decisions. This first result is in line with the theoretical prediction and highlights the need to cope with reverse causality.

Employing an index of potential labor mobility helps in tackling reverse causality. In addi-

[9] Compare Cahuc and Zylberberg (2004, pp.582) for a survey on classic approaches to that topic.
[10] Compare e.g. Helpman et al. (2010a), Helpman et al. (2010b), and Helpman et al. (2011).
[11] When the tax scheme expires, the top marginal tax rate applied to immigrants' incomes more than doubles.

Table 1: Partial Correlations with Index

	Dep. Var.:	
	Top Marginal Tax Rate	
skilled emigration	1.62***	
	(0.31)	
all emigration		2.23***
		(0.57)
Cons	0.31***	0.33***
	(0.02)	(0.03)
Country FE	yes	yes
Year FE	yes	yes
$R^2_{overall}$	0.01	0.01
F-stat	68.16	65.02
Obs.	307	307

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

tion to economic criteria, the index is based on indicators which are not under the control of current tax policy, such as cultural and geographical proximity, family values, or the ability to speak foreign languages. The index approximates migration decisions by relating the economic and social benefits from moving to the costs associated with this action.

Hypothesis 2 Estimates using observed labor flows are upward biased, potentially reversing the sign of the effect. Thus, it is necessary to use a measure of potential labor mobility instead of observed mobility.

Using potential rather than actual labor flows as an explanatory variable has several several further advantages: The index allows to account for the effects of strategic competition in personal income taxation. Strategic competition is well-documented in the case of capital taxation: Policy makers react to increasing potential mobility of capital by adjusting tax systems such that no capital flows occur. Suppose that strategic competition is also relevant in the area of personal income taxation. Regressing income tax indicators on observed labor flows then yields insignificant estimates, although labor mobility is causally affecting personal income taxation. This problem can be tackled with my Index of Potential Labor Mobility since it represents the economic concept on which policy makers base their decisions to adjust income taxation in the case of strategic competition.

Furthermore, the index allows to link the empirical analysis closer to existing theory. In most theoretical models of the effect of labor mobility on income taxation (e.g. Simula and Trannoy (2010)), individuals incur a cost when relocating from one country to another. Economic integration is then represented by reducing this cost. Although my Index of Potential Labor Mobility does not measure the monetary costs of migration, it nonetheless represents a trade-off between expected labor market success abroad and the current economic situation at home. It is therefore an indicator for the economic net cost associated with migration and thus the empirical counterpart of the core parameter in these models.

3 Data

3.1 Index of Potential Labor Mobility

Developing a measure for the potential mobility of labor is one of the main contributions of this paper. This index captures the value of the outside option, i.e. to start working in a country other than the current country of residence. The more valuable this outside option, the more credible is the threat of labor to migrate and thus the more responsive policy makers need to be to prevent an erosion of a country's tax base.

3.1.1 Determinants of Migration Decisions

The empirical literature on the determinants of migration has identified several economic and non-economic factors as relevant for this decision. These can be grouped into push factors (i.e. effects which make staying in the home country less attractive) and pull factors (i.e. effects which make a particular country attractive as host). Ortega and Peri (2012) collect data on annual migration flows between 120 sending countries and 15 OECD destinations 1980-2006. Using this data, they show that income per capita and immigration policies in the destination are major determinants of migration flows. Grogger and Hanson (2011) look at global migration to OECD countries and show that emigrants select into host countries depending on the wage premium paid for their human capital. Mayda (2010) uses panel data on bilateral migration flows to identify major drivers of inflows into 14 OECD countries 1980-1995. The main determinants of labor flows are found to be economic opportunities in the host country, geographical distance, and a young labor force in source countries. Mitchell et al. (2011) conduct a similar analysis for inflows into the UK. They confirm a significant explanatory power of economic conditions. In addition, they can explain roughly a quarter of overall flows by former colonial ties and existing emigrant networks.[12] Findings by Beine et al. (2011) confirm the importance of networks: Using data on migration from almost all countries to 30 OECD countries in 1990 and 2000, they conclude that the existence of immigrant communities in a potential host makes migration considerably more likely. Bartz and Fuchs-Schündeln (2012) show that language borders are a major obstacle to flows of labor within the European Union. Two other papers focus on the interaction between economic and social factors in determining the value of migration: Using US-(Lewis 2011) and Canadian data (Goldmann et al. 2011), these papers show that the ability to communicate in the predominant language in a labor market (English, but also French and Spanish) is crucial for the returns to immigrants' human capital. Results of all these papers stress the importance of economic and social integration into host societies for migration decisions.

[12] Mitchell et al. (2011) provide a rather detailed and concise discussion of potential reason for migration.

3.1.2 Construction of the Index

Based on the findings of the empirical literature, I focus on four components when measuring the attractiveness of migrating to potential host countries: The first two measures how attractive it is for an individual to migrate to a specific other country by accounting for the economic prosperity and openness to immigration of host countries. The third part measures the geographical and cultural proximity of source and host country. The fourth component relates to characteristics of the national workforce affecting the likelihood to migrate, given opportunities in other countries.

The first block deals with the economic situation in the potential host country. Here, the wage level in the potential host country, the growth rate of host's economy, and whether the economic and legal conditions of host's labor market allow to absorb new entrants play a role.[13] Second, the openness of a potential host country for new immigrants plays a role. Issues such as impediments to acquiring a staying and working permit are a major determinant of migration. However, comparable measures of legal openness are hard to generate. Thus I focus on a set of measures to approximate openness to immigration such as attitudes to immigration, the share of English speakers and and the share of foreign born in the population (as a measure of past openness).[14] Third, cultural and geographical proximity are included. Cultural proximity captures the cost of integration into a new social environment. Factors such as a common language, a common legal system, or a large number of immigrants from the source country (immigrant network) can be expected to lower the costs associated with integration. Geographical proximity is measured by the distance between source and host country and a common border.

Even when there are several host countries which are attractive for potential immigrants, international labor mobility requires labor to be willing to leave its current country of residence. Therefore, the overall index adds to the measure for the attractiveness of potential hosts a second measure for the general mobility of a nation's workforce. First, it consists of a measure for the share of non-native workers and English-speakers, both of which can be expected to exhibit an above-average (return) mobility. Second, I add information on the strength of family ties[15] and the number of children which reduce the level of mobility.[16] Third, I use the same proxies for labor market conditions as used to describe host countries.

Expressed in formal terms, the index measuring the potential mobility of labor in country

[13] A further important economic determinant of mobility can be the portability of social security claims. However, assessing the corresponding bilateral legal rules quantitatively is quite challenging, not at the core of this paper, and thus left for further research.

[14] In a robustness check, I replace these proxies by a direct measure of legal barriers to immigration.

[15] Using Italian data, Alesina et al. (2011) show that individuals with strong family ties are less mobile, even within a country.

[16] The strength of family ties and the number of children can also foster emigration when parts of the family are already abroad and those left home are interested in a family reunion. Although a relevant channel, I do not include it in my index, since it is hard to imagine why such family reunions should affect domestic tax policy.

i at time t is constructed in the following way:

$$\begin{aligned} PLM_{it} &= \max_j \left[\text{attractiveness}_{jit} \cdot \text{workforce}_{it}\right] \\ &= \max_j \left[\text{econ condition}_{jt} \cdot \text{openness}_{jt} \cdot \text{proximity}_{ijt} \cdot \text{workforce}_{it}\right] \end{aligned} \tag{1}$$

with j denoting all countries but i.

Although all components are indexed by t, some indicators like the one for on cultural and geographic proximity show very little time variation, if any. Similarly, most variation in the sub-indices on openness to immigration and the mobility of the workforce is cross-sectional. Therefore, most variation in the index over time stems from changes in the economic conditions of host and source countries.

Concerning the construction of the index, I would like to draw attention to the fact that the sub-categories of the index are linked multiplicatively, whereas the components within each sub-category are combined in an additive way.[17] Combining components within sub-categories in an additive way reflects the view that these components are substitutes: Higher wages may compensate for higher unemployment in a host country or a common border for a different language. The multiplicative structure of the overall index, however, mirrors a complementary view on the sub-categories: Good economic conditions in and proximity of a potential host are of little worth if this country is not open to immigration, and vice versa.

Each component is restricted to take a value between zero and one for each potential host country. In some cases (shares, rates, binary indicators) this is naturally given. In other cases (e.g. growth rates and hourly wages) this is achieved by dividing all entries by the largest value in the overall sample. Every sub-category contains at least one component that takes strictly positive values. Therefore, the value for each *host-origin pair* is restricted to the domain (0,1]. The same holds true for the index itself by construction. Choosing the value of the most attractive host-origin pair as index value for a origin in a given year reflects that individuals can only migrate to one other place at a time. Thus, only the best alternative counts and values of countries which are dominated by the best one are irrelevant for an individual's decision.

Reading the description of the composition of this index, one immediate concern comes to mind, namely whether the criteria mentioned before apply to all kinds of potential emigrants. Academic researchers or managers of large companies, for example, may base their location decisions on rather different criteria. Franzoni et al. (2012) conduct a survey among more than 17,000 emigrant researchers asking them for their reasons to migrate. The reasons cited as being most important were quite specific to the academic world (e.g. "better availability of research funds") but still fit into the broad categories defined above.[18] Furthermore, even if reasons to migrate of these special groups were quite different from others, one should keep in mind that these groups are too small to affect the whole income tax schedule. As Kleven et al. (2011) document for foreign researchers and high income earners in Denmark and Kleven

[17] Definitions, sources, and weights for all components are listed in Table 7.

[18] See also Gibson and McKenzie (2011) who use panel data on very high-skilled individuals from New Zealand, Papua New Guinea, and Tonga to study determinants of migration and return decisions.

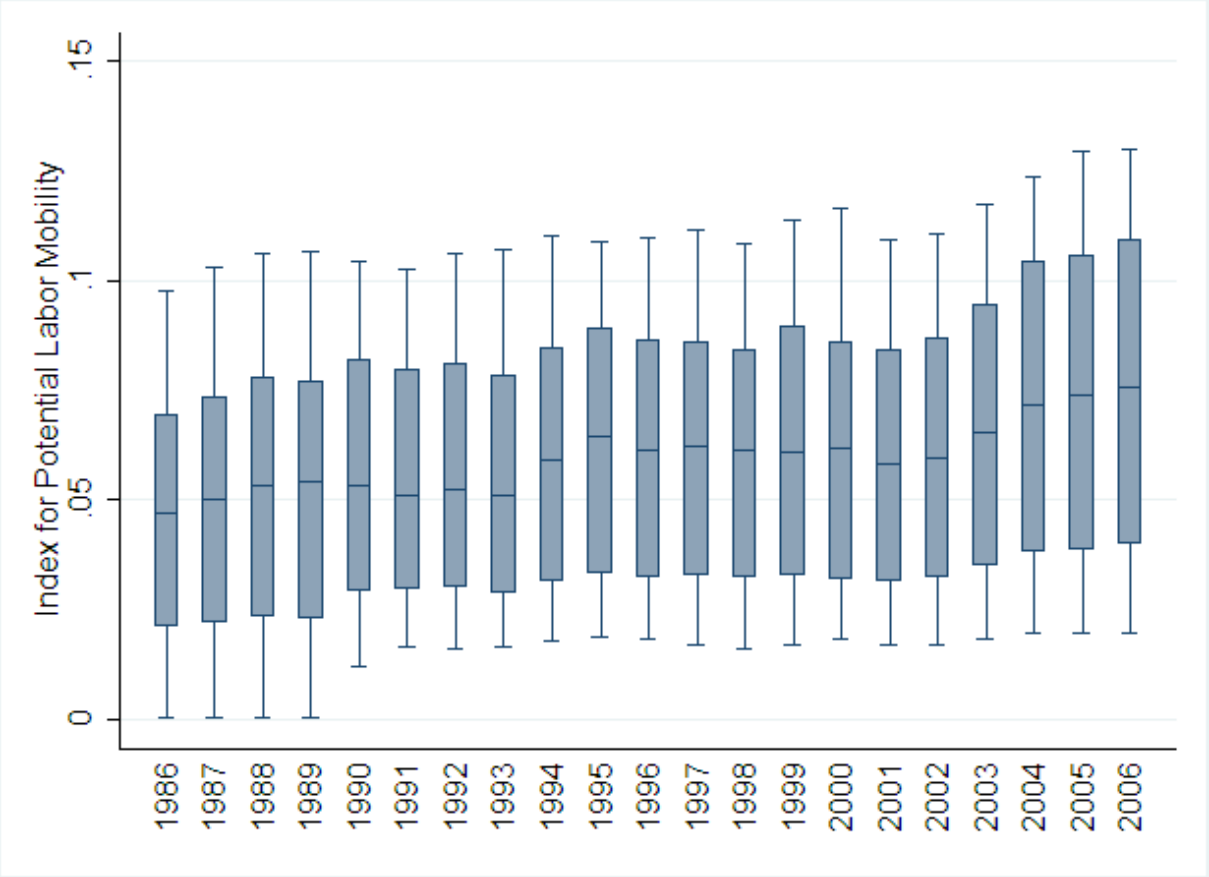

Figure 1: Median, 75% range, and 95% range for Index of Potential Labor Mobility, yearly averages across countries between 1986 and 2006, restricted to countries with observations in all years; Source: Own calculations based on own index

et al. (forthcoming) for the taxation of European football players, such groups are more likely to be targeted by preferential tax arrangements rather than a change in the entire income tax system. Thus, the criteria introduced above seem to be of sufficient relevance for describing mobility patterns affecting the shape and structure of national income tax systems

3.1.3 Descriptive Statistics for the Index

The index covers 26 OECD countries[19] between 1986 and 2005. Due to lacking information on some components of the index, there is no value of the index for some countries prior to 1994.[20] Thus, there are in total 502 entries in the index. These entries take values between virtually zero and roughly 0.13, averaging at 0.057. To put these values into perspective, one should remember that by construction the index is bound by zero and one. This comparison highlights that labor, although not immobile, is far less mobile than capital.[21] On the other

[19] Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom, United States

[20] See Table 8 for the detailed data of the index.

[21] Lane and Milesi-Ferretti (2007) estimate that, on average, non-domestic portfolio equity and FDI constitute between 25 and 45 percent of total assets in industrial countries, 1985-2004. Although not directly comparable to my index, these figures illustrate the high international mobility of capital.

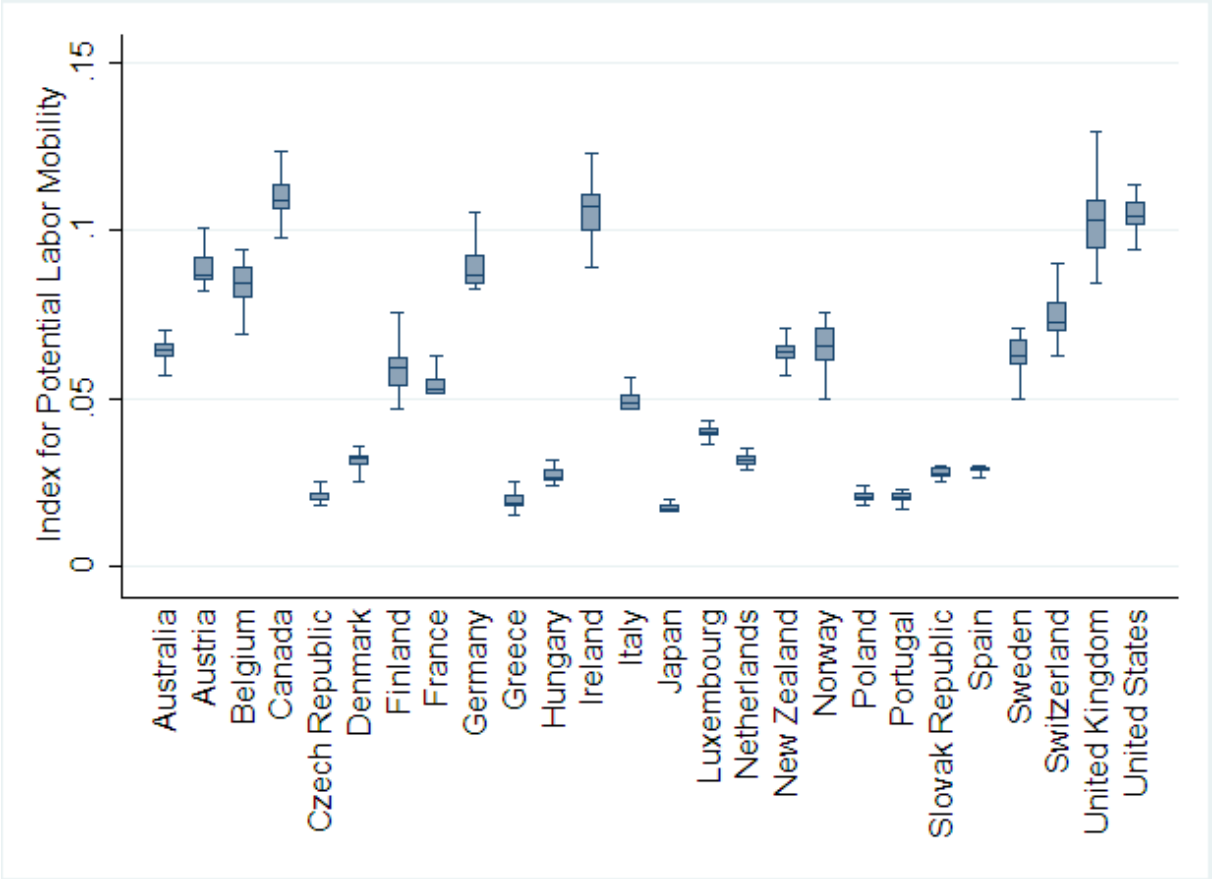

Figure 2: Median, 75% range, and 95% range for Index of Potential Labor Mobility, by source country 1986 - 2006; Source: Own calculations based on own index

hand, however, the variation in labor mobility between OECD countries is more pronounced than variation in capital mobility in the same group of countries.

When looking at the development of the index over time in Figure 1, one features catches the eye: There is a general upwards trend in potential labor mobility, which accelerates after 2000. Furthermore, variation in potential mobility decreased after the fall of the Iron Curtain but widened again over the last 5 years of the sample period.

To identify the drivers of this development, it is worthwhile to have a look at the values of single countries in Figure 2. There are two main observations to be made when looking at the raw data: First, variation across countries seems to be far more pronounced than variation within countries. Second, one can broadly classify countries into high (index > 0.1), middle, and low (index < 0.05) mobility ones. Low mobility countries are mostly found in Southern Europe (Greece, Italy, Portugal, and Spain) and Eastern Europe (Czech Republic, Hungary, Poland, and the Slovak Republic). On the other hand, most mobile countries belong to the "anglo-saxon" group (Canada, Ireland, the UK, and the US) which is known for lower tax burdens. These stylized facts lend some first tentative support to my initial assertion that potential labor mobility has an effect on the taxation of labor incomes.

Figure 3 presents some graphical illustration of the relevance of the four sub components of the index for the final value of the index. The four graphs show the values of the sub-indices

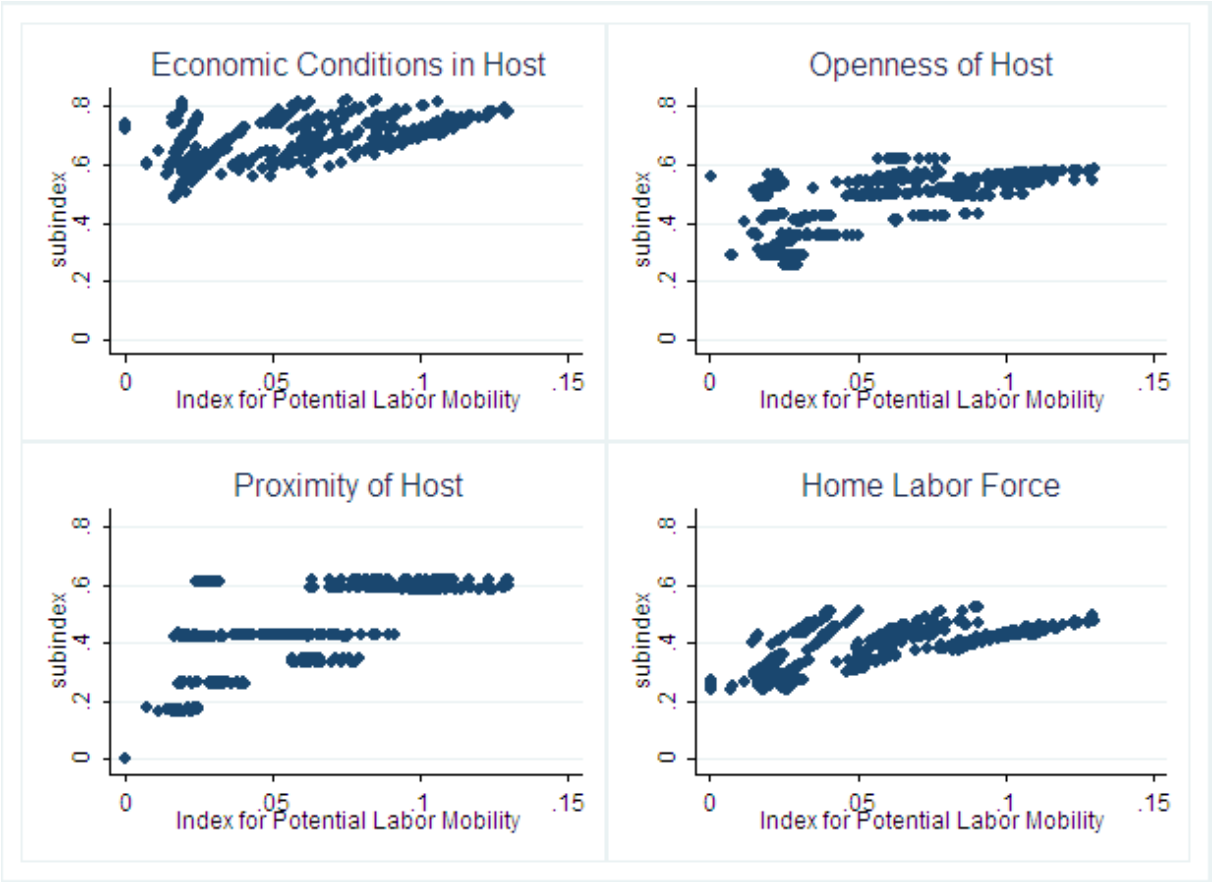

Figure 3: Plots of the four subcomponents of the index against the index. Source: Own calculations based on own index

for the country pairs which enter the index. The relatively high values for each subindex show that the low values for the overall index are mainly driven by its multiplicative composition. Furthermore, the most attractive potential host seems to offer quite attractive economic conditions (index values typically between 0.6 and 0.8) but the low mobility of the home labor force drives down the whole index (values around 0.4). Values for the sub-index on proximity look clustered, reflecting that the effects of common languages and a common border dominate factors such as the inverse geographical distance.

Another important criterion for assessing the reliability of the Index of Potential Labor Mobility is its correlation with actually observed flows of labor. From a theoretical point of view, one would expect a positive relation between the two measures. For several reasons, however, this relation should not be too strong as well: First, individual decisions about migration are rather complex and more involved that the aggregate measures used for constructing this index. Second, it takes time to realize changes in the fundamentals underlying migration decisions, and additional time to process the new information. Third, when potential migration increases, policy makers can enact measures to counter increasing outflows of labor. Finally, from an econometric point of view, a high correlation might raise doubts on whether the Index of Potential Labor Mobility helps curing the problems of reverse causality discussed above.

In Table 2 we look at the correlations between the index and the share of emigrants at various skill levels. The correlation coefficient is strongly positive in all cases, but not too high

Table 2: Correlation between Actual Emigration and Index of Potential Mobility

	Index of Potential Labor Mobility					
	(L0)	(L1)	(L2)	(L3)	(L4)	(L5)
Skilled Emigration	0.257	0.258	0.261	0.265	0.272	0.281
	(339)	(314)	(289)	(264)	(239)	(234)
All Emigration	0.275	0.276	0.278	0.280	0.283	0.287
	(339)	(314)	(289)	(264)	(239)	(234)

Number of observations in parenthesis. (L1) denotes the first lag of the index, and so on. Sources: Own index and emigration data from Defoort (2006).

as to raise concerns on reverse causality. Furthermore, the size of the correlation is increasing in the number of lags. This suggests that it takes time for changes in migration possibilities to translate into actual labor relocations. Thus, the index meets the criteria stated above.

3.2 Tax System Indicators

The data to describe the shape of countries' personal income tax schedules is taken from Peter et al. (2010). This data set provides information on average and marginal tax rates an individual faces when earning multiples of nominal national GDP per capita. These rates account for tax allowances and deductions, tax credits, and significant local taxes. Since they cannot account for allowances granted on the basis of individual characteristics such as marriage status or the number of children, the tax data represents effective tax rates for single individuals. Furthermore, the data set contains the top marginal tax rate and some descriptive statistics on the progressivity of the tax schedule. It covers more than one hundred countries on a yearly basis between 1981 and 2005.

The main advantage of this data set is that it provides information on various relevant indicators on the taxation of incomes above average GDP per capita which is comparable both across countries and time. On the downside, however, we learn nothing about the taxation of incomes below average GDP per capita. Information on incomes below average GDP is relevant since it covers a considerable part of tax payers, although it is less relevant in terms of corresponding tax revenues. Furthermore, information on tax payments covers only parts of individuals' gross contributions to financing governments (social security payments, e.g., are omitted) and an even smaller part of net contributions, since the data totally abstracts from transfers or public good provision.[22] However, net contributions cannot be calculated without detailed individual level data.

Figure 4 shows some descriptive statistics on average tax rates for incomes at multiples of national GDP per capita. Two main features come to mind when looking at the dispersion of average tax rates in Figure 4: First, the variation in the tax rates has decreased considerably since the mid 1980s, in particular at higher income levels.[23] Second, there has been a general downward trend in average tax rates at all four tax levels since the mid 1980s, and particularly

[22]The focus on gross contributions is a common feature of empirical papers on (capital) tax competition.
[23]The low tax rates for high income earners are from Chile, Korea, and Mexico.

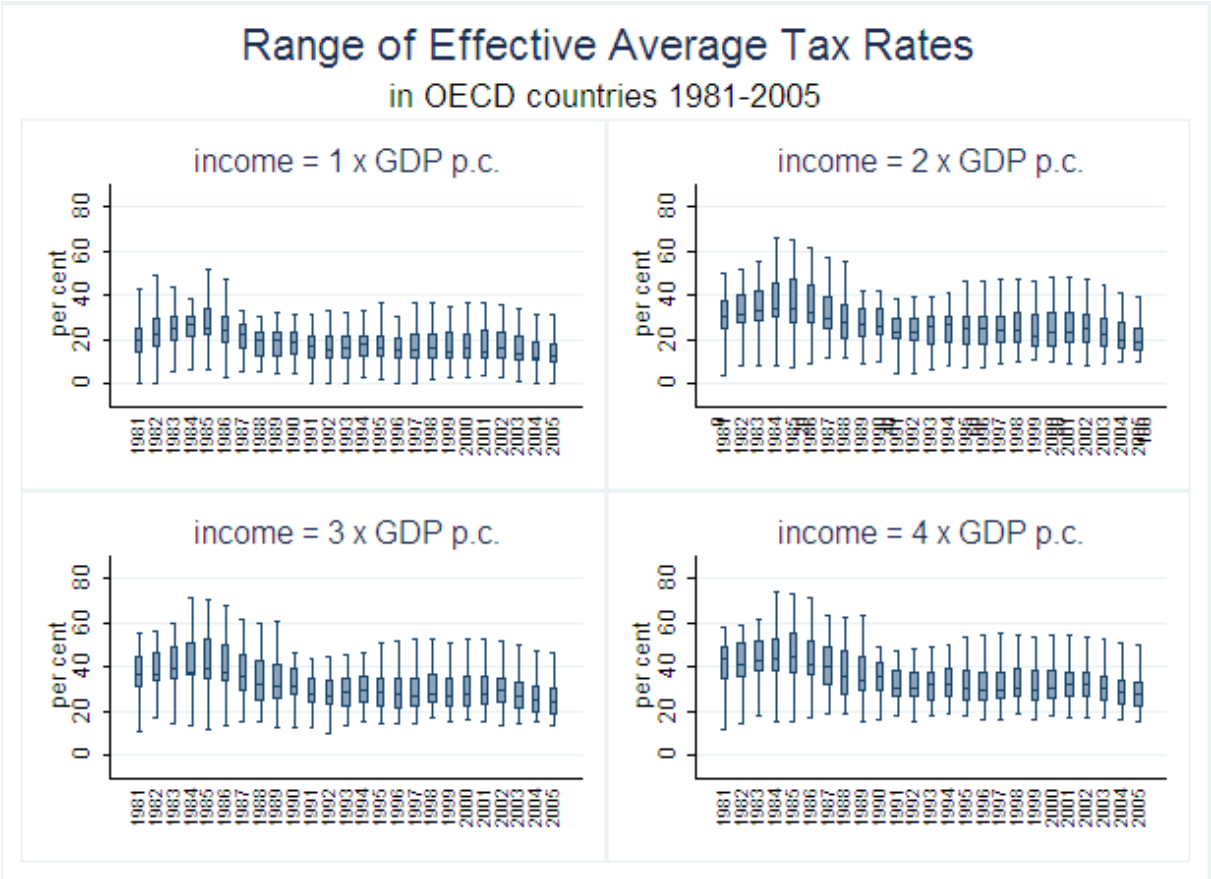

Figure 4: Median, 75% range, and 95% range for average tax rates at different income levels; Source: Own calculations based on Peter et al. (2010)

after 2000. These were also the periods of most pronounced increases in the Index of Potential Labor Mobility.

4 Empirical Results

4.1 The Effect of Potential Labor Mobility on Personal Income Taxation

In this section, I test the hypotheses stated above in a first set of regressions. Here, as in the following regressions, I employ five dependent variables: First, the effective average tax rate (EATR) at incomes of average GDP per capita, at twice the average GDP per capita, three times and four times. Second, the top marginal tax rate. Although Peter et al. (2010) provides additional information on marginal effective tax rates, I focus on EATRs since the different types of tax rates are relevant in different decision situations: The effective average tax rate is particularly relevant for decisions at the extensive margin, i.e. whether to work at all. The focus of this study is on these tax measures because the decision at the extensive margin corresponds to the migration decision in an international context. The top marginal tax rate is included since it is quite relevant for individuals at the very end of the income distribution and furthermore of particular political interest.

Expressed in formal terms, the regression equation which I estimate subsequently takes the following functional form:

$$tax_{it} = \alpha + \beta IndexLaborMobility_{it} + \gamma X_{it} + \mu_i + \nu_t + \epsilon_{it} \tag{2}$$

where i denotes the country and t the year. tax is one of the five tax indicators and X_{it} the set of controls. The set of controls is the same for all tax indicators in a given specification but may vary for all of them across specifications. The main focus of the regressions is on obtaining estimates for β.

In the first set of regressions, I regress each of these five tax indicators on the Index of Potential Labor Mobility and several political control variables. A first focus on political controls seems reasonable, since tax policy is known to be a major issue in the political arena and driven by many non-economic considerations. The control variables focus on time-varying characteristics of the political system such as the political orientation of the central government, institutional constraints on the government, and the legislative fractionalization. Indicators on constitutional aspects (e.g. presidential system) are not included as they show hardly any variation in my sample and are thus absorbed by country fixed effects.

Results of the regressions are presented in Table 3. The estimates for the Index of Potential Labor Mobility support my hypothesis: They are all significantly negative, and the stronger the higher the income at which the estimation is performed.[24] The latter is in line with predictions

[24] As a caveat, one should note that the estimates for the effect of potential labor mobility at different points of the tax schedule are not statistically different.

Table 3: Regressions with Political Controls

	Dependant Variable:				
	Average effective tax rate at income of				Top marg. tax rate
	1 x GDP p.c.	2 x GDP p.c.	3 x GDP p.c.	4 x GDP p.c.	
index of labor mobility	-1.77***	-2.10***	-2.21***	-2.20***	-2.33***
	(0.28)	(0.30)	(0.31)	(0.31)	(0.37)
left government	-0.00	0.01	0.01**	0.01**	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
institutional constraints	-0.01**	-0.02***	-0.02***	-0.02***	-0.05***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
legislative fractionalization	-0.09**	-0.16***	-0.18***	-0.19***	-0.14**
	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
constant	0.38***	0.55***	0.63***	0.68***	0.77***
	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Country FE	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes
$R^2_{adj.}$	0.13	0.19	0.23	0.25	0.32
F-stat	22.29	31.44	37.59	40.65	55.64
Obs.	420	420	420	420	422

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

given that high-income earners are internationally more mobile.

The political controls are in line with expectations: Left governments reduce the tax burden at the lower end of the taxable income distribution (although not statistically significantly) and increase taxes on the rich. Governments operating under more severe institutional and legislative constraints impose lower taxes on their citizens. The latter effect might reflect more institutional inertia.

However, political variables are not the only determinants of tax policy. When setting the tax policy, policy makers also need to account for the state of the economy (economic growth, GDP per capita, unemployment), characteristics of the population (dependency ratio, degree of urbanization, population density), or the economic structure of the economy (capital intensity of production, share of employees in service sector). Thus, I include all these regressors in estimations presented in Table 4.[25]

Not surprisingly, the size of the estimated coefficients for the Index of Potential Labor Mobility decrease considerably, but remain significantly negative. Still, the economic size of the coefficient is non-negligible: Germany is the country with the greatest absolute change in mobility (+0.07). This change corresponds to a reduction in the top marginal tax rate of about 5 percentage points, accounting for roughly a third of the reduction in this tax rate observed in the sample period.

Turning to the economic controls, four variables seem to be of particular relevance: Economies with a lower dependency ratio charge their workers lower taxes (i.e. finance a given budget requirement more evenly). Richer economies charge lower taxes on labor, potentially reflecting

[25]Two of the economic control variables (GDP growth and unemployment, both in the source country) are also part of the Index of Potential Labor Mobility since they affect both domestic taxation and migration decisions. To counter concerns about collinearity, I re-estimate all regressions in Table 4, dropping these two economic controls from the estimations. As a result, the size of my coefficients of interest increases slightly, but qualitative results are unaffected.

Table 4: Regressions with Economic and Political Controls

	Dependant Variable:				
	Average effective tax rate at income of				Top marg. tax rate
	1 x GDP p.c.	2 x GDP p.c.	3 x GDP p.c.	4 x GDP p.c.	
index of labor mobility	-1.17***	-1.18***	-1.20***	-1.06***	-0.76*
	(0.35)	(0.38)	(0.39)	(0.40)	(0.45)
left government	-0.01*	0.00	0.01	0.01	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
institutional constraints	0.00	0.00	-0.00	-0.00	-0.02**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
legislative fractionalization	-0.05	-0.10**	-0.12**	-0.13***	-0.11*
	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
real GDP per capita	-0.00***	-0.00***	-0.00***	-0.00***	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP growth	0.20**	0.19**	0.20**	0.19**	0.17*
	(0.08)	(0.08)	(0.09)	(0.09)	(0.10)
unemployment rate	-0.33***	-0.44***	-0.46***	-0.45***	-0.05
	(0.11)	(0.12)	(0.13)	(0.13)	(0.15)
capital intensity	0.00	0.00	0.00	0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
employment share of service	-0.07	-0.02	-0.04	-0.09	-0.79***
	(0.12)	(0.13)	(0.14)	(0.14)	(0.16)
population density	0.00***	0.00	0.00	-0.00	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
rural population	-0.00	-0.00*	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
population aged 15-64	-0.28	-0.56**	-0.58**	-0.54*	-0.13
	(0.26)	(0.28)	(0.29)	(0.29)	(0.33)
constant	0.45**	0.88***	1.02***	1.09***	1.48***
	(0.22)	(0.24)	(0.24)	(0.25)	(0.28)
Country FE	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes
$R^2_{adj.}$	0.20	0.27	0.29	0.31	0.42
F-stat	11.64	15.28	17.07	18.29	27.94
Obs.	416	416	416	416	418

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

a more balanced use of various tax instruments. Economies with growth rates above their long-run average levy higher taxes on their workers. With progressive tax schedules, this observation can be rationalized by the effect of the so-called cold progression. Finally, a higher level of unemployment is associated with lower taxes on labor. This observation can be rationalized if contributions to unemployment insurance and taxation of labor incomes are substitutes, i.e. higher financial need of the unemployment insurance system force the policy makers to partly compensate individuals with lower taxes on labor income.[26]

In general, the regressions presented support to the main hypothesis of this paper: An increasing ability of an economy's workforce to emigrate to other countries induces governments to lower taxes on labor income in order to counter an erosion of the tax base. However, the adjustments in personal income taxes do not differ across income levels although high-skilled individuals, typically earning higher incomes, are known to be relatively more mobile than low-skilled ones. Thus, there is no evidence of a reduction in the progressivity of the personal income tax schedule.

4.2 Robustness

After having presented the baseline results, I turn to some robustness checks in order to validate my results against potentially confounding effects of other channels. In the first two robustness checks, I turn to the indirect channel through which economic integration might affect taxes on personal income: Either through changes in the general budgetary requirements or via the prevention of arbitrage between capital and personal income taxation. Therefore, I include measures of general government outlays and receipts (Robustness 1) and of revenues from corporate income taxation (Robustness 2) into the previous set of regressions. Estimation results presented in Table 5 suggest the relevance of these additional indirect channels: The size of estimated coefficients decreases slightly. Most importantly, the general pattern remains unchanged, suggesting that the previously measured effects were not driven by the indirect channels. One caveat, however, has to apply here: In these robustness checks, I measure capital and indirect taxation as the shares of their revenues in GDP. Constant shares do not imply that the tax burden imposed on an individual with a given income remains unchanged. One can have, e.g., a revenue neutral shift in the burden of indirect taxes by reducing the set of goods taxed at a lower rate or even exempted from indirect taxes. Similarly, the introduction of dual income taxes can reduce the tax burden of those with high capital incomes. These shifts are accounted for neither in my dependent variable nor in capital tax revenues. Coping with these caveats would require information on individual capital income and consumption baskets across the income distribution, what is both beyond the scope of this paper.

Another issue of concern relates to the question whether the Index of Potential Labor Mobility measures a distinct feature of economic integration or whether it serves as proxy for general economic integration. Therefore, I test in the third and fourth robustness check

[26] Of course, there are a lot more ways of interpreting results for controls when taking account of reverse causality.

Table 5: Robustness

	Dependant Variable:				
	Average effective tax rate at income of				Top marg. tax rate
	1 x GDP p.c.	2 x GDP p.c.	3 x GDP p.c.	4 x GDP p.c.	
	Robustness 1: Budget Incidence				
index of labor mobility	-1.15***	-1.14***	-1.13***	-0.99**	-0.68
	(0.35)	(0.37)	(0.38)	(0.39)	(0.46)
government outlays	-0.15*	-0.16	-0.21**	-0.23**	-0.44***
	(0.09)	(0.10)	(0.10)	(0.10)	(0.12)
government receipts	0.33***	0.45***	0.51***	0.53***	0.31**
	(0.10)	(0.11)	(0.11)	(0.11)	(0.13)
$R^2_{adj.}$	0.22	0.29	0.33	0.35	0.40
Obs.	416	416	416	416	418
	Robustness 2: Other Tax Revenues				
index of labor mobility	-1.14***	-1.16***	-1.15***	-1.01**	-0.76*
	(0.36)	(0.39)	(0.40)	(0.40)	(0.45)
Corporate Income Tax	0.00	0.00	0.00	0.00	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Indirect Taxes	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$R^2_{adj.}$	0.20	0.27	0.30	0.31	0.41
Obs.	413	413	413	413	415
	Robustness 3: Other Integration Measure				
index of labor mobility	-1.20***	-1.21***	-1.22***	-1.09***	-0.91**
	(0.35)	(0.38)	(0.39)	(0.40)	(0.45)
economic globalization	0.08	0.07	0.06	0.02	-0.31***
	(0.05)	(0.05)	(0.05)	(0.06)	(0.06)
$R^2_{adj.}$	0.21	0.26	0.29	0.31	0.42
Obs.	416	416	416	416	418
	Robustness 4: Actual Emigration Flows				
skilled emigration	0.56**	0.77***	0.83***	0.78***	-0.24
	(0.23)	(0.24)	(0.24)	(0.25)	(0.25)
$R^2_{adj.}$	0.25	0.31	0.35	0.38	0.55
Obs.	395	395	395	395	399
	Robustness 5: Heterog. Effects for Gov.s with Diff. Pol. Orientation				
index of labor mobility	-1.10***	-1.14***	-1.20***	-1.09***	-0.85*
	(0.36)	(0.39)	(0.40)	(0.41)	(0.48)
(index) x (left government)	-0.26	-0.16	-0.05	0.01	0.03
	(0.19)	(0.20)	(0.21)	(0.21)	(0.25)
left government	0.00	0.01	0.01	0.01	0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
$R^2_{adj.}$	0.20	0.26	0.29	0.31	0.38
Obs.	416	416	416	416	418
	Robustness 6: Sum of all Hosts in Measure of Potential Labor Mobility				
Sum of Labor Mobility	-0.19**	-0.16*	-0.17*	-0.18*	-0.25**
	(0.08)	(0.09)	(0.09)	(0.09)	(0.11)
$R^2_{adj.}$	0.19	0.25	0.28	0.30	0.39
Obs.	416	416	416	416	418

Robust standard errors in parentheses. All regressions contain the same set of controls as in Table 4. In addition, Robustness 1 controls for government outlays and receipts in per cent of GDP, Robustness 2 for government revenues from corporate income taxation and indirect taxation in per cent of GDP, Robustness 3 for a broad measure on economic globalization, and Robustness 4 for the share of skilled emigrants in countries populations. Robustness 5 includes interaction between index and political orientation of government. Robustness 6 replaces the index of potential labor mobility by the sum of all hosts. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

whether the inclusion of a broad measure of economic integration (Dreher 2006) affects the estimates for the index, and whether the same pattern of coefficients can be obtained by using actual emigration rates instead of the Index of Potential Labor Mobility. Results in Table 5 show that neither of the two concerns is of empirical relevance. Adding the broad measure of economic integration has hardly any effect on the size or the statistical significance of the coefficients.[27] Furthermore, actual emigration measures yield significantly positive estimation coefficients, lending empirical support to my concerns about reverse causality.

In Robustness 5, I look at potential heterogeneity in the effect of potential labor mobility on tax burdens. Using survey data on German members of parliament, Heinemann and Janeba (2011) show that the perception of factor mobility strongly depends on MP's political orientation. Thus, the political orientation of governments can shape its reaction to changes in potential labor mobility. Thus, I add an interaction term between the Index of Potential Mobility and the measure for the political orientation of the government to my estimation. However, this interaction turns out to be insignificant, lending no further support to this hypothesis.

In the sixth robustness check, I replace the index by another measure of potential mobility. This version of the index contains the sum of all values of migrating to potential hosts rather than the maximal value as before. The idea behind this alternative measure is that, in reality, we observe people migrating to a lot of different places. Apparently, there is a heterogenous evaluation of or a heterogeneity in preferences for the situation in other countries. Since policy makers can enact only one single tax code, they need to take account of the attractiveness of a variety of potential host countries. Furthermore, the index can take higher values when the number of countries increases, reflecting that a higher number of countries expands the choice set of a potential migrator. Results of regressions when replacing the maximal value of labor mobility by the sum of values for all hosts are presented in Robustness 6. As it turns out, qualitative results are robust to this alternative specification of the index.

In the seventh robustness check, I use a further alternative specification of the index. In this version of the index, I replace the set of proxies for openness to immigration[28] by a direct measure of legal impediments to immigration. This direct measure is taken from Ortega and Peri (2012), which is, to my knowledge, the only paper providing a quantitative account of immigration laws. They normalize every country to zero in 1980 and increase this score by one if a country's legislation passed a law reducing barriers to immigration, and vice versa. In principle, this is the measure to be directly included in my index. However, I restrict myself to use it merely as robustness check for two reasons: First, it does not account for the effects of the new law, since every change is coded in the same way. Countries score the better, the more they slice legal changes into small laws. Second, it covers only fifteen countries.[29]. That is, I restrict the set of potential host countries even further. The results of robustness check 7 are presented in Table 6. The size of the estimated coefficients grows slightly, but the alternative

[27] Estimates yield the same qualitative results when including the measure by Dreher (2006) alone instead using it together with my index, as in Robustness 3.

[28] Compare Table 7 in the appendix.

[29] Australia, Belgium, Canada, Denmark, Finland, Germany, Italy, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, United States

Table 6: Robustness (continued)

	Dependant Variable:				
	Average effective tax rate at income of				Top marg. tax rate
	1 x GDP p.c.	2 x GDP p.c.	3 x GDP p.c.	4 x GDP p.c.	
	Robustness 7: Index with Immigration Laws				
index of labor mobility	-0.48***	-0.33*	-0.38*	-0.40**	-0.78***
	(0.18)	(0.20)	(0.20)	(0.20)	(0.23)
$R^2_{adj.}$	0.20	0.25	0.28	0.30	0.43
Obs.	416	416	416	416	416
	Robustness 8: Measure of Trade Effects on Wages				
index of labor mobility	-0.35***	-0.33***	-0.31***	-0.29***	-0.43***
	(0.09)	(0.10)	(0.10)	(0.10)	(0.07)
Heckscher-Ohlin Effect	0.47	0.40	0.25	0.19	-0.70***
	(0.29)	(0.31)	(0.31)	(0.29)	(0.23)
$R^2_{adj.}$	0.15	0.13	0.12	0.13	0.43
Obs.	258	258	258	258	260
	Robustness 9: Interaction between Skills of Workforce and Index				
index of labor mobility	-0.36***	-0.33***	-0.31***	-0.28***	-0.39***
	(0.10)	(0.10)	(0.10)	(0.10)	(0.07)
(index) x (dummy high-skill)	-0.02	0.02	0.02	-0.02	-0.12**
	(0.07)	(0.07)	(0.07)	(0.07)	(0.05)
$R^2_{adj.}$	0.12	0.15	0.16	0.19	0.49
Obs.	265	265	265	265	267
	Robustness 10: Alternative Index				
low-skilled labor mobility	-0.50	-1.80	-1.71	-1.05	4.29**
	(1.44)	(1.53)	(1.56)	(1.58)	(1.71)
high-skilled labor mobility	26.20***	27.43**	24.43**	18.64*	-23.52**
	(10.04)	(10.65)	(10.86)	(11.00)	(11.73)
$R^2_{adj.}$	0.25	0.31	0.34	0.36	0.48
Obs.	418	418	418	418	420

Robust standard errors in parentheses. All regressions contain the same set of controls as in Table 4. Robustness 7 uses a modification of the Index of Potential Labor Mobility with a measure of legal barriers to immigration. Robustness 8 includes a measure of the Heckscher-Ohlin effect. In Robustness 9, an interaction of the index with a dummy indicating an above-median share of individuals with tertiary education in total workforce is added. In Robustness 10, the Index of Potential Labor Mobility is replaced by an alternatively constructed index as described in App. B. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp.

specification of the index does not change the qualitative results.

In robustness check 8, I investigate the third indirect channel from economic integration to personal income taxation: The effects of trade in goods on the distribution of domestic incomes. Unfortunately, data availability limits my ability to test the implications of trade effects, as theories stressing the heterogeneity of firms or workers require more disaggregated data. However, classical models such as Heckscher-Ohlin can be tested in principle. In these tests one should keep in mind, however, that the expected effects concentrate on individuals with low incomes (unskilled labor as scarce factor) which are not covered by the tax data I use. The indicator for the Heckscher-Ohlin effect is constructed by interacting the share of trade with non-OECD countries and the share of the workforce with primary education.[30] Estimation results show that qualitative results are not affected.

In the ninth robustness check, I control for whether the strength of the effect of labor mobility depends on the skill structure of the workforce, as high-skilled individuals are known to be more mobile. To test for this effect, I construct a dummy which takes the value one if an economy's workforce has an above-median share of workers with tertiary education, and zero otherwise.[31] Then, I interact this dummy with the Index of Potential Labor Mobility. Results presented in Robustness 9 indicate that the estimates for the index itself remain qualitatively unchanged. The interaction term is insignificant, suggesting that the strength of the effect of potential labor mobility on taxes is not moderated by the skill composition of the workforce.

So far, I have imposed exogenous weights on the different components on my Index of Potential Labor Mobility. Although based on existing literature, this rather ad hoc approach can hardly be beyond reproach. To counter concerns about exogenous weights driving my estimation results, I present an alternative version of the index in which weights are obtained by regressing observed migration on the set of explanatory variables described above. The data on observed migration is taken from Docquier et al. (2011). They collect information on stocks of bilateral migration between 194 countries in the years 1990 and 2000. Furthermore, Docquier et al. (2011) distinguish between migrants with college and below-college education.

This approach has several advantages over my previous strategy: First, weights do no longer depend on my opinion on appropriate weighting. Second, since data covers both different skill levels and different years, estimated weights can vary along these two dimensions. Varying weight allow to increase variation over time relative to variation between countries. Furthermore, different weights for different skill groups should facilitate the identification of shape effects.

However, there are also disadvantages associated with the estimation of weights: First, they do not follow a clear economic concept and are thus less closely linked to the theory on determinants of migration. Second, and more important, estimated weights provide a better fit to *observed* mobility, not *potential* mobility. In previous sections, I have argued why these

[30] Data is taken from OECDstat (trade) and the Key Indicators of the Labour Market (ILO, 7th ed.), resp. The KILM data set starts only in 1988 and does not provide information for every country in my data set for every year.

[31] Data based on Table 14a (age groups older than 15 and both sexes) from the Key Indicators of the Labour Market (7th ed.), provided by the International Labor Organisation.

two concepts are different (e.g. because of strategic interaction) and why measures of observed mobility are more prone to issues of reverse causality. Therefore, estimated weights provide additional information and increase the replicability of results at the price of increasing concerns of reverse causality. Details on the construction of this alternative index and some descriptives can be found in appendix B.

These indicators for low-skilled and high-skilled labor mobility are then used to estimate the effect of labor mobility on personal income taxation. Regressions are analogous to the ones in Table 4, except for replacing the Index of Potential Labor Mobility by the alternative measures of labor mobility.

Results presented in Robustness 10 show two distinct features: First, the estimates of the effect of low-skilled mobility are insignificant. Non-significant effects of low-skilled mobility can be interpreted in the light of often limited knowledge spill-overs from low-skilled and often negligible net contributions to the government budget. Second, estimates of the effect of high-skilled mobility are significant, but positive. This effect is apparently driven by reverse causality. We have already touched the issue of reverse causality when using observed migration data in Robustness 4 in Table 5. When using the Index of Potential Labor Mobility in Table 4, I could identify the effect of labor mobility on personal income taxation because the values of the index showed a sufficiently low correlation with observed migration data. The alternative index, however, is constructed by weighting its components to fit observed migrant stocks as good as possible. Apparently, the fit is sufficiently good to cause problems of reverse causality.

5 Conclusion

In this paper, I quantify the effect of labor mobility on personal income taxation in OECD countries between 1986 and 2005. Using observed migration as explanatory variable creates severe problems of reverse causality, as I demonstrate in this paper. Furthermore, observed flows do not allow to account for effects of strategic tax competition. To tackle both problems I create a new Index of Potential Labor Mobility. This new index is based on existing evidence on determinants of migration decisions and consists of components which are (in the short-run) not influenced by government tax policy. In addition to handling the problem of reverse causality, this index also allows to quantify the extent of labor mobility which used to be assumed to be zero in the tax competition literature.

I find robust empirical support for the hypothesis that labor mobility reduces effective average tax rates on personal income. In the case of Germany, the country with the largest increase in the sample period, higher labor mobility reduced effective average tax rates by at least five percentage points, accounting for roughly a third of the overall reduction since the mid 80s. However, I do not find evidence for heterogenous reductions across the distribution of taxable income. This result is somewhat unexpected given that high income earners are known to be most mobile. The absence of heterogenous effects might reflect political economy considerations in tax setting. In addition to exploring this channel more deeply, it might also

be worthwhile to employ more elaborate estimation methods as more comprehensive data on migration flows becomes available.

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A Supplementary Information on Index for Potential Labor Mobility

A.1 Description of Variables in Index for Potential Labor Mobility

Economic Growth Indicator of the economic growth rate in potential host countries. First, the minimal value of this indicator is added to ensure the non-negativity of the index. Second, the index is normalized by dividing all values by the maximum, such that all values are bound by zero and one, with one describing the maximal growth rate.

Hourly Wages Based on exchange rate converted measures of average hourly wages in manufacturing, provided by the US Bureau of Labor Statistics. Normalization analogously to "Economic Growth". Missing values are imputed using data on real per capita GDP, taken from the Penn World Tables 7.0 (analogously constructed). These GDP values show a correlation with average hourly wages of 0.79 in my sample.

Employment Ratio Share of the total labor force that is in any kind of official employment.

Labor Market Flexibility Based on the employment protection index of the OECD. Consists of 21 items measuring the costs and procedures associated with individual or collective firings as well as obstacles to temporary employment. Values between 0 (no employment protection) and 6 (extreme employment protection). Recoded by a linear transformation to take values between 0 (extreme employment protection) and 1 (no employment protection). An extensive discussion of the underlying data is provided by Venn (2009).

Openness to Immigration Based on questions on openness to immigration from the 2003 wave of the International Social Survey Programme (ISSP 2003). Average with equal weights of responses to "Immigrants increase crime rate" (v50), "Immigrants are generally good for [COUNTRY'S] economy" (v51), "Immigrants take jobs away from people who were born in [COUNTRY]" (v52), and "Immigrants improve [COUNTRY NATIONALITY] society by bringing in new ideas and cultures" (v53). If necessary, answers were recoded such that higher values indicate more openness to immigration. In the last step linearly scaled down to the range [0,1], with 1 indicating maximal openness to immigration.

Share of Foreign Born Based on data on migrant stocks from the World Development Indicators of the World Bank. Provides information on the share of foreign-born in countries' total populations. Data available every five years for each country, separately linearly interpolated within each gap.

Share of English Speakers Share of individuals in the total population who have a knowledge of English sufficient for at least basic conversations. Single cross-section for early 2000s.

Common Language Indicator that takes the value 1 if a language is the *mother tongue* of at least 9 per cent of the population in both countries of a country pair, zero otherwise.

Common Legal System Based on La Porta et al. (1999). Indicator that takes the value 1 if two countries have a legal system of the same origin, zero otherwise. Legal systems are: British, French, Socialist, German, Scandinavian.

Immigrant Networks Based on data of bilateral migration stocks in 1990 from Ortega and Peri (2012). A network of migrants from a source country i in a host country j is measured as the ratio of migrants from source i living in host j over the total population in source i.

Common Border Indicator that takes the value 1 if two countries share a common inland border, zero otherwise.

Inverse Geographical Distance Calculates the bilateral distance between two countries based on distances between their biggest agglomerations. These inter-agglomeration distances are weighted by the share of the agglomeration in country's overall population. To obtain an inverse measure (i.e. larger values indicating greater proximity) between zero and one, I calculate $invdist_{ij} = \frac{\min(distw_{ij})}{distw_{ij}}$, where $distw_{ij}$ is the measure of the population-weighted distance between countries i and j provided by the CEPII-dataset, and $\min(distw_{ij})$ is the smallest value for all i, j $(i \neq j)$ in this data set.

Number of Children Measured by the share of individuals aged 0-14 in the total population.

Family Values Based on the questions on "More Emphasis on Family Life" and "How important is family in your life" from the first four waves of the World Values Survey. Highest agreement is coded as one, highest disagreement as zero, values assigned linearly in between. Values for each country in each year are obtained by summing the frequency-weighted answers. When both questions have been asked, the un-weighted average of both questions is used. When only one question has been asked, this response is taken for the overall index. Missing values are filled by fitting a fourth-order polynomial separately on the data for each country. Means of actual data and of fitted values are not statistically significantly different for any country used in this analysis. Values are finally normalized as before such that they are between 0 and 1, with 1 corresponding to minimal possible family attachment and 0 to maximal possible family attachment.

Table 7: Components of Index for Potential Labor Mobility

Sub-Category	Component	Weight	Specific to	Mean	Std	Min	Max	Obs.	Source
Economic Conditions	Hourly Wages in Manufacturing	1/4	Host	0.35	0.2	0.05	1	16841	Bureau of Labor Statistics, (Penn Tables)
	Economic Growth	1/4	Host	0.65	0.08	0	0.92	16762	Heston et al. (2011)
	Employment Ratio	1/4	Host	0.92	0.04	0.76	0.99	15234	OECD Stat
	Labor Market Flexibility	1/4	Host	0.65	0.17	0.3	0.96	13186	OECD Stat
Openness of Host	Openness to Immigration	1/3	Host	0.6	0.05	0.47	0.69	13088	ISSP (2003)
	Share of Foreign Born	1/3	Host	0.1	0.09	0.01	0.38	15130	World Development Indicators
	Share of English Speakers	1/3	Host	0.55	0.31	0.05	0.98	17160	Crystal (2003), EuropeanCommission (2006)
(Cultural) Proximity	Common Language	1/6	Host/Origin	0.1	0.29	0	1	17160	Head et al. (2010)
	Common Legal System	1/6	Host/Origin	0.2	0.4	0	1	17160	Head et al. (2010)
	Immigrant Networks	1/6	Host/Origin	0	0.01	0	0.14	17160	Ortega and Peri (2012)
(Geographical) Proximity	Common Border	1/4	Host/Origin	0.07	0.26	0	1	17160	Head et al. (2010)
	Inverse Geographical Distance	1/4	Host/Origin	0.01	0.02	0	0.13	17160	Head et al. (2010)
Characteristics of Workforce	Number of Children	1/12	Origin	0.81	0.03	0.71	0.86	17160	OECDstat
	Family Values	1/12	Origin	0.06	0.03	0	0.19	17160	World Values Survey
	Non-native Workers	1/6	Origin	0.09	0.07	0.01	0.34	17160	World Development Indicators
	Share of English Speakers	1/6	Origin	0.55	0.31	0.05	0.98	17160	Crystal (2003), EuropeanCommission (2006)
	Hourly Wages in Manufacturing	1/6	Origin	0.41	0.19	0.06	1	17160	Bureau of Labor Statistics, (Penn Tables)
	Economic Growth	1/6	Origin	0.65	0.06	0.44	0.9	17160	Heston et al. (2011)
	Unemployment Rate	1/6	Origin	0.08	0.04	0.01	0.24	17160	OECD Stat

All values are either naturally defined on [0,1] or normalized to that range. Sample consists of observations at host-origin pair level. Observations were dropped from sample when (a) there was no full information on origin in a given year or (b) there was not a single host country with full information in a given year.

Table 8: Data of Index of Potential Labor Mobility

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	avg.	Δ '86-'05
Australia	0.057	0.060	0.062	0.062	0.060	0.061	0.062	0.062	0.065	0.065	0.066	0.066	0.065	0.066	0.065	0.064	0.065	0.070	0.073	0.078	0.065	0.021
Austria									0.085	0.092	0.089	0.084	0.087	0.085	0.084	0.082	0.085	0.092	0.100	0.101	0.090	0.016
Belgium	0.069	0.073	0.078	0.077	0.082	0.079	0.081	0.078	0.085	0.089	0.086	0.086	0.084	0.089	0.086	0.084	0.087	0.095	0.105	0.106	0.086	0.037
Canada	0.098	0.103	0.106	0.107	0.105	0.102	0.106	0.107	0.110	0.109	0.110	0.112	0.108	0.114	0.116	0.109	0.110	0.117	0.124	0.129	0.111	0.031
Czech Rep.								0.018	0.019	0.020	0.020	0.018	0.019	0.019	0.019	0.020	0.020	0.022	0.024	0.024	0.021	0.006
Denmark	0.023	0.024	0.024	0.025	0.030	0.030	0.030	0.029	0.032	0.034	0.033	0.033	0.032	0.033	0.032	0.031	0.033	0.036	0.039	0.040	0.032	0.017
Finland	0.047	0.050	0.053	0.054	0.053	0.050	0.051	0.051	0.059	0.065	0.061	0.062	0.062	0.061	0.062	0.058	0.059	0.065	0.072	0.074	0.059	0.027
France	0.021	0.022	0.023	0.023	0.024	0.051	0.052	0.051	0.055	0.057	0.056	0.053	0.055	0.054	0.053	0.051	0.053	0.056	0.061	0.061	0.047	0.040
Germany					0.035	0.083	0.084	0.083	0.089	0.095	0.092	0.087	0.088	0.086	0.085	0.084	0.086	0.093	0.100	0.101	0.087	0.066
Greece	0.015	0.015	0.017	0.017	0.018	0.018	0.017	0.017	0.018	0.019	0.019	0.019	0.019	0.021	0.021	0.021	0.021	0.023	0.024	0.024	0.019	0.009
Hungary							0.007	0.008	0.026	0.026	0.026	0.028	0.026	0.024	0.025	0.026	0.027	0.028	0.030	0.031	0.025	0.024
Ireland	0.089	0.095	0.099	0.100	0.102	0.096	0.099	0.099	0.102	0.107	0.108	0.111	0.107	0.111	0.109	0.108	0.111	0.116	0.123	0.129	0.107	0.040
Italy	0.027	0.028	0.029	0.029	0.030	0.050	0.050	0.046	0.050	0.052	0.051	0.049	0.050	0.049	0.048	0.048	0.049	0.052	0.057	0.056	0.046	0.029
Japan	0.000	0.000	0.000	0.000	0.012	0.016	0.016	0.017	0.018	0.019	0.018	0.017	0.016	0.017	0.018	0.017	0.017	0.018	0.020	0.020	0.014	0.020
Luxembourg	0.037	0.037	0.040	0.040	0.039	0.039	0.038	0.038	0.040	0.041	0.041	0.039	0.039	0.042	0.040	0.037	0.039	0.043	0.046	0.048	0.041	0.011
Netherlands	0.015	0.016	0.017	0.016	0.031	0.030	0.030	0.029	0.031	0.033	0.032	0.033	0.032	0.033	0.032	0.031	0.032	0.035	0.038	0.038	0.030	0.023
New Zealand	0.057	0.060	0.063	0.062	0.060	0.061	0.061	0.064	0.066	0.066	0.066	0.065	0.061	0.065	0.062	0.063	0.064	0.071	0.074	0.079	0.065	0.022
Norway	0.050	0.055	0.057	0.060	0.063	0.062	0.061	0.060	0.065	0.070	0.070	0.069	0.065	0.071	0.075	0.065	0.068	0.076	0.086	0.089	0.068	0.039
Poland							0.018	0.018	0.021	0.021	0.021	0.021	0.019	0.019	0.019	0.020	0.020	0.022	0.023	0.023	0.021	0.005
Portugal	0.019	0.019	0.019	0.019	0.020	0.019	0.019	0.017	0.020	0.020	0.021	0.021	0.021	0.022	0.021	0.021	0.022	0.023	0.025	0.027	0.021	0.008
Slovak Rep.									0.026	0.026	0.026	0.027	0.026	0.025	0.027	0.028	0.029	0.029	0.029	0.030	0.027	0.004
Spain	0.027	0.028	0.029	0.028	0.029	0.028	0.028	0.026	0.028	0.030	0.029	0.029	0.029	0.029	0.028	0.027	0.028	0.030	0.032	0.033	0.029	0.006
Sweden	0.050	0.055	0.055	0.057	0.060	0.060	0.060	0.057	0.061	0.066	0.067	0.066	0.062	0.067	0.071	0.061	0.063	0.071	0.080	0.084	0.065	0.034
Switzerland							0.063	0.064	0.063	0.073	0.078	0.076	0.071	0.073	0.072	0.071	0.069	0.072	0.079	0.086	0.087	0.074	0.024
UK	0.085	0.090	0.094	0.094	0.097	0.091	0.094	0.094	0.097	0.102	0.103	0.107	0.104	0.109	0.109	0.107	0.111	0.115	0.122	0.128	0.104	0.043
US	0.094	0.099	0.102	0.103	0.101	0.098	0.102	0.101	0.104	0.104	0.104	0.106	0.104	0.109	0.112	0.105	0.107	0.114	0.120	0.125	0.106	0.031
avg.	0.046	0.049	0.051	0.051	0.052	0.057	0.054	0.051	0.056	0.058	0.058	0.057	0.056	0.057	0.057	0.055	0.057	0.061	0.066	0.068		

Table 9: Descriptive Statistics of Variables in Sample

Variable	Mean	Std. Dev.	Min	Max	Obs.	Definition	Source
index of labor mobility	0.06	0.03	0	0.13	416	see Appendix A.1	own calculation
sum of labor mobility	0.2	0.12	0	0.48	416	see Appendix A.1	own calculation
avg. eff. tax rate at 1xGDP pc	0.18	0.09	0	0.47	416	see source	Peter et al. (2010)
avg. eff. tax rate at 2xGDP pc	0.27	0.1	0.05	0.62	416	see source	Peter et al. (2010)
avg. eff. tax rate at 3xGDP pc	0.32	0.1	0.1	0.68	416	see source	Peter et al. (2010)
avg. eff. tax rate at 4xGDP pc	0.36	0.09	0.15	0.71	416	see source	Peter et al. (2010)
top marg. tax rate	0.42	0.14	0.12	0.72	416	see source	Peter et al. (2010)
left government	0.27	0.44	0	1	416	1 if government dominated by left-wing parties, 0 else	Armingeon et al. (2011)
institutional constraints	2.45	1.32	0	5	416	number of veto players	Armingeon et al. (2011)
legislative fractionalization	0.68	0.11	0.41	0.89	416	$= 1 - \sum_{i=1}^{m} s_i^2$, where s_i: share of seats for party i, m: number of parties	Armingeon et al. (2011)
real GDP per capita	23.37	8.52	7.56	68.91	416	in tsd of USD, PPP converted	OECD stat
GDP growth	0.05	0.03	-0.03	0.22	416	annual growth rate of nominal GDP	OECD stat
unemployment rate	0.08	0.04	0.01	0.24	416	share of registered unemployed in civilian labor force	OECD stat
capital intensity	0.17	0.76	0	7.98	416	capital in production per worker, in tsd. of USD	OECD stat
employment share of service	0.66	0.07	0.43	0.79	416	share of workers in service sector in civilian labor force	OECD stat
population density	130.24	125.84	2.09	483.41	416	inhabitants per km^2	OECD stat
rural population	0.25	0.11	0.03	0.54	416	share of rural population in total population	OECD stat
population aged 15-64	0.67	0.02	0.6	0.70	416	share of population aged 15-64 in total population	OECD stat
government outlays	0.46	0.08	0.31	0.71	416	share of government outlays in GDP	OECD stat
government receipts	0.44	0.08	0.28	0.63	416	share of government receipts (ex. debt) in GDP	OECD stat
corporate income taxation	3.15	1.47	0.27	11.74	413	share of revenue in GDP	OECD stat
indirect taxation	10.89	2.96	3.67	17.22	416	share of revenue in GDP	OECD stat
economic globalization	0.77	0.12	0.44	0.99	416	see source	Dreher (2006)
skilled emigration	0.08	0.07	0	0.38	307	see source	Defoort (2006)
year	1995.85	5.68	1986	2005	416		

Descriptives for sample used to estimate regressions with EATRs as dependent variable in Table 4

B Estimation of Weights and Descriptives for the Alternative Index of Labor Mobility

The weights for the alternatively constructed Index of Labor Mobility are derived by regressing measures of observed migration on the components of the Index of Potential Labor Mobility. Data on migration is taken from Docquier et al. (2011) who provide information on bilateral migration stocks for 194 countries in 1990 and 2000. This data distinguishes between migrants with at least college education (high-skilled) and those without a corresponding degree (low-skilled). Information on the regressors can be found in Table 7 in the appendix. To allow for some comparison between both indices, I use the share of migrants in the total population of the sending country rather than the number of migrants as dependent variable. Using this data has the advantage that I can link information on both the host and the origin country to each observation. On the downside, Docquier et al. (2011) provide information on stocks rather than flows. Furthermore, one would like to calculate the ration of high-skilled migrants over the high-skilled population rather than the total population. However, data on the skill composition of native populations in all OECD countries over the last two decades is not available.

Results from regressing migration shares on the set of explanatory variables are presented in Table 10 in the appendix. Looking a the effects of specific regressors, labor market flexibility in the destination country and a common legal systems show the most consistent pattern across time and skill groups in fostering migration. Other factors are of significance only in some years (real GDP growth in 2000, employment rate in 1990, or a common border in 2000), or for a certain skill group (openness to immigration and language related regressors only for high-skilled migration).

These results are then taken to predict migrant stocks for every country pair in each year. Predictions are restricted to the domain [0,1]. Since I have estimated the stock of migrants with high or low skills using both data from 1990 and 2000, I predict two different values migrant stocks for each country pair and skill-group based on these two estimates. These two predictions per skill group are then condensed into a single values by linear interpolation for years 1990 to 2000. These country pair-year specific values are then transformed into indices in the same way as described previously for the Index of Potential Labor Mobility.

Some descriptives for the alternatively calculated Index of Labor Mobility are shown in Figure 5. Two features of the index catch the eye: First, values for low-skilled mobility are always higher than for high-skilled individuals. This result is caused by the construction of the index since I have to normalize the number of migrants by total population rather that population with the same educational attainment due to data restrictions. However, the differences in educational participation are captured by country fixed-effects in the regressions unless there are huge changes over time and/or countries significantly deviate from the general path of educational expansion.

Second, English-speaking countries continue to show high levels of mobility and southern-European ones and Japan the lowest. However, differences are much smaller than previously,

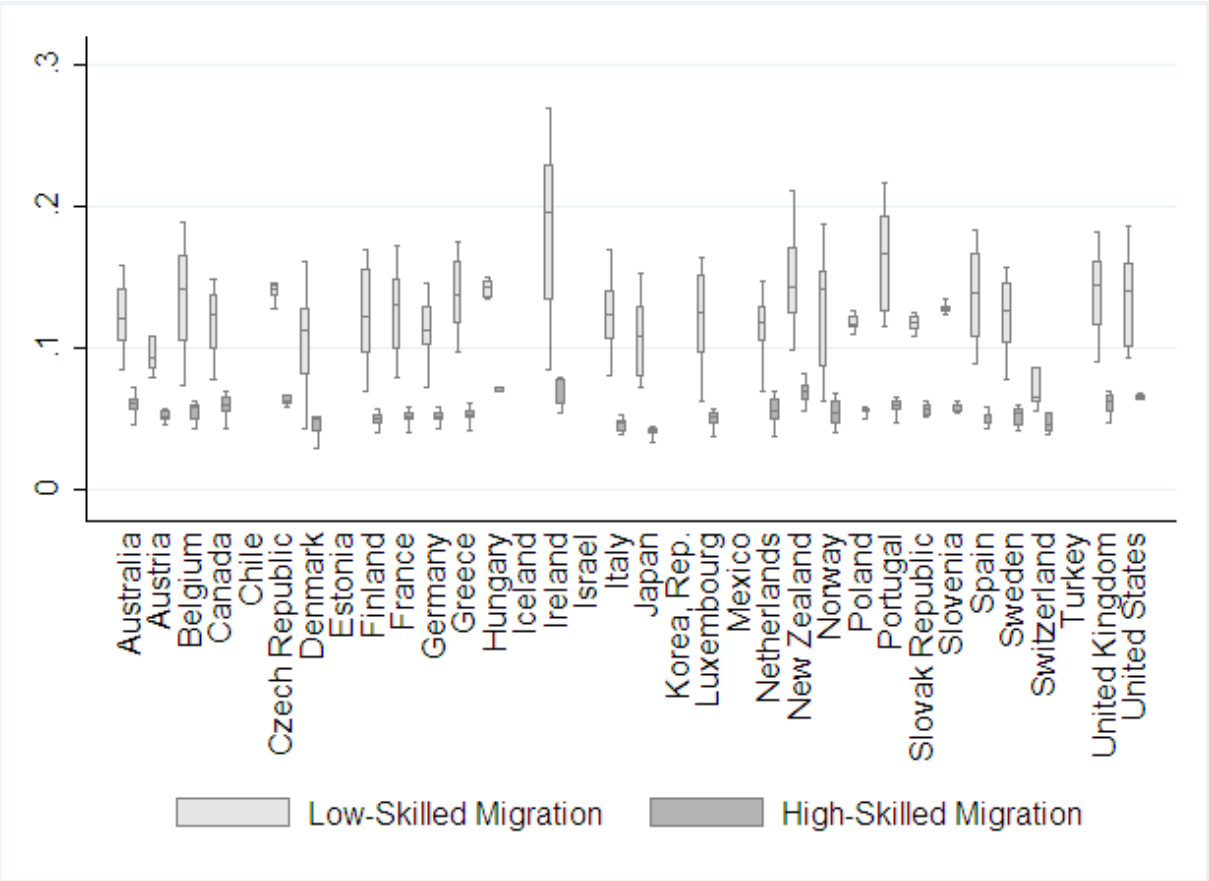

Figure 5: Median, 75% range, and 95% range for Alternative Index of Labor Mobility, by source country 1986 - 2006 and for individuals with above and below college education; Source: Own calculations based on own index

in particular for the mobility of low-skilled individuals. Third, the low-skilled are considerably more mobile than the high-skilled in some countries such as Poland.

Table 10: Determinants of Migration Flows

	Dependant Variable: Share of Migrants in Population					
	total migration		low-skilled migration		high-skilled migration	
	1990	2000	1990	2000	1990	2000
hourly wages (dest.)	-0.005	0.001	-0.005	0.001	0.001	0.000
	(0.009)	(0.001)	(0.008)	(0.001)	(0.001)	(0.000)
real GDP growth (dest.)	-0.007	-0.012***	-0.007	-0.008**	0.000	-0.004***
	(0.012)	(0.004)	(0.010)	(0.003)	(0.002)	(0.001)
employment rate (dest.)	0.018*	-0.000	0.012	-0.001	0.006***	0.000
	(0.010)	(0.006)	(0.008)	(0.005)	(0.002)	(0.002)
labor market flexibility (dest.)	0.010***	0.004**	0.006**	0.002	0.003***	0.003***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)	(0.001)
openness to immigration (dest.)	0.000	0.004	-0.008	0.000	0.008**	0.003**
	(0.022)	(0.005)	(0.019)	(0.004)	(0.003)	(0.001)
share of foreign born (dest.)	0.013	-0.003	0.014	0.000	-0.001	-0.003
	(0.017)	(0.011)	(0.014)	(0.008)	(0.004)	(0.003)
share of english speakers (dest.)	-0.001	0.003	-0.001	0.001	0.000	0.001**
	(0.003)	(0.002)	(0.002)	(0.001)	(0.000)	(0.000)
common language	0.001	0.002	0.000	0.001	0.001	0.001**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.000)	(0.001)
common legal system	0.003**	0.003***	0.002*	0.002**	0.001***	0.001***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
common border	0.007	0.005**	0.006	0.003**	0.001	0.001*
	(0.004)	(0.002)	(0.004)	(0.002)	(0.001)	(0.001)
inverse geograph. distance	0.111	-0.011	0.106	0.001	0.005	-0.013**
	(0.076)	(0.017)	(0.065)	(0.013)	(0.014)	(0.006)
share of population age 0-14 (origin)	-0.064	-0.008	-0.056	-0.001	-0.009	-0.007
	(0.055)	(0.020)	(0.048)	(0.015)	(0.008)	(0.007)
family values (origin)	-0.019	0.010*	-0.017*	0.004	-0.002	0.006***
	(0.013)	(0.005)	(0.010)	(0.004)	(0.004)	(0.002)
non-native workers (origin)	-0.010*	-0.005	-0.008*	-0.004	-0.001	-0.001
	(0.005)	(0.004)	(0.004)	(0.003)	(0.001)	(0.001)
share of english speakers (origin)	0.002	0.002	0.001	0.001	0.001***	0.001*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
hourly wages (origin)	-0.006	-0.007**	-0.006	-0.005**	-0.001	-0.002***
	(0.006)	(0.003)	(0.005)	(0.002)	(0.001)	(0.001)
real GDP growth (origin)	0.019	0.008	0.016	0.006	0.003	0.002
	(0.018)	(0.006)	(0.015)	(0.004)	(0.003)	(0.002)
unemployment rate (origin)	-0.013	-0.011	-0.012	-0.008	-0.000	-0.003
	(0.011)	(0.011)	(0.010)	(0.009)	(0.002)	(0.002)
constant	0.026	0.005	0.034	0.003	-0.008	0.003
	(0.051)	(0.017)	(0.045)	(0.012)	(0.007)	(0.007)
$R^2_{adj.}$	0.17	0.14	0.15	0.11	0.23	0.20
F-stat	2.15	4.45	1.81	3.68	2.70	4.74
Obs.	324	576	324	576	324	576

Robust standard errors in parentheses. Statistical significance at the 10, 5, 1 percent levels denoted by *, **, *** , resp. Compare Table 7 for further information on regressors.