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Abstract

We contribute to the literature on taxation and international mobility by estimating the impact of labour income taxation on the migration decisions of the entire working population in a high-tax source country, Finland. We find that the average domestic elasticity of migration with respect to the domestic tax rate is very small (around 0.0005). We also examine the income gradient of the semi-elasticity of migration, shown to be the key sufficient statistic in Lehmann et al. (2014). Our estimates indicate that the migration semi-elasticities are increasing for top earners, but remain small at least up to top permille of income earners.

JEL-Codes: J610, H310.

Keywords: taxation, migration.

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1 Introduction

Potential migration responses of workers to income taxation are a major policy concern for high-tax countries. The problem could be especially severe for many European countries, because the policy package of free higher education and extensive public services financed by progressive taxation is not sustainable if a sizeable fraction of the high-income, high-skilled population emigrates. Emigration of these individuals would have negative consequences for tax revenue and human capital and hence for the productive potential of a country. Even further down the income distribution, potential emigration of certain occupational groups is of interest to policy-makers.

This study aims to answer a key question in both the academic and policy debate: How sensitive are the migration decisions of the working population, including individuals at different income levels and different occupational groups, to progressive labour income taxes?

Despite the importance of the topic, empirical studies on migration responses to taxation have focused on very specific occupational or income groups, while evidence on how migration of the working population at large is affected by cross-country tax rate differentials remains scarce. We aim to fill this gap by estimating the effect of changes in labour income tax rates on individual migration decisions using individual-level full-population administrative data from Finland, a Nordic welfare state with comparatively high and progressive income taxation.

We use data on income, education and other socio-demographic characteristics for 2003—2015, combined with information from emigration registers covering all migration events – both date and destination – for the individuals in the data. To form estimates for the earnings and corresponding tax rates for each person in the actual as well as potential destination countries, we supplement the Finnish register data with micro-data from the Luxembourg Income Study (LIS) and EU-SILC.[1] We then use detailed information on the

[1]We use earnings regressions on these micro-data to predict earnings in potential destination countries

tax codes in destination countries to calculate the individual-specific tax rate that each person would face in each destination. We also account for preferential tax schemes for high-income foreign workers applied in many countries.

We identify the effects of labour income taxes on migration from changes in income tax schedules that occur in different potential destination countries at different points in time, that is, from a series of tax changes or reforms that occur during the analysis period in the countries in our sample. Our key interest lies in the domestic elasticity, i.e. the percentage change in the number of individuals residing in a country with respect to the percentage change in the net-of-tax share of earnings in that country. We also provide the first empirical implementation of the theoretical results in Lehmann et al. (2014) who show that the sufficient statistic for setting a fully non-linear income tax schedule in the presence of migration is in fact the (income gradient) of the semi-elasticity of migration. While the simulation results in Lehmann et al. (2014) show that these theoretical insights may change policy lessons in important ways for a meaningful proportion of taxpayers, the implications for tax policy remain an open empirical question.

Our results indicate that the relationship between individual-level migration decisions and the net-of-tax rate is positive and statistically significant. However, the implied migration elasticities of residents with respect to the home country net-of-tax-rate are very close to zero (in the order of 0.0005), even for workers in the highest income decile as well as for all the different occupational groups that we analyze. Moreover, investigation of return migration patterns suggests that higher taxes at home do not reduce return migration.[2] We also examine cross elasticities with respect to foreign-country tax rates, and find that they are slightly higher, around 0.2, with the lower-income groups being somewhat less reactive.

In discussing the tax policy implications of migration, we provide an empirical im-

for each individual in the Finnish data. As a robustness check, we use an alternative method to predict earnings that explicitly accounts for the selection of emigrants.

[2]As we want to utilize full-population microdata, we do not consider immigration other than return-migration. The implications of this choice for our analysis are discussed in Section 2.

plementation of the Lehmann et al. (2014) theoretical results. We find that the semi-elasticity of migration is very low up to the top per mille of income earners. However, comparing responses for the top per cent and top per mille, the semi-elasticity is increasing, and we cannot rule out the possibility of high semi-elasticities for the very highest income groups. Hence, the optimal marginal tax rate may decline at the very top of the income distribution. However, up to the top per mille at least, our results indicate that the effect of migration concerns for setting the top tax rate is negligible.

In a recent survey, Kleven et al. (2020) note that more evidence on the impact of taxes on migration regarding new countries and, especially, new migrant groups, is needed. The impact of income taxation on international migration has been examined by Kleven, Landais & Saez (2013) for football players, Akcigit, Baslandze & Stantcheva (2016) for inventors. Muñoz (2020) studies migration responses of individuals in the top income decile in European countries to top tax rates. Kleven, Landais, Saez & Schultz (2013) examine how foreign experts reacted to the foreigners' special tax scheme in Denmark. Corneo & Neidhöfer (2021) examine how destination country redistribution (measured by the reduction in the Gini coefficient due to tax and benefit policies) influences the selection of Italian emigrants, but they do not focus directly on the effects of tax rates. Migration responses to taxation within a country have been examined by Agrawal & Foremny (2019) for Spain, Moretti & Wilson (2017) for the US, and Martinez (2022) and Schmidheiny & Slotwinski (2018) for Switzerland. However, evidence on the international migration responses of the overall working population to income tax rate differentials, as well as corresponding estimates for different income and occupational groups, remains scarce.

Our work is also related to the literature on migrant self-selection, initiated by Borjas (1987), which emphasizes the idea that work-related migration decisions should be driven by cross-country differences in returns to skills. High-skilled workers would benefit from the earnings opportunities in countries with higher earnings dispersion, whereas for those with lower skills it would be worthwhile to migrate to destinations with smaller income

differences. Recent studies on emigration in the contemporary European context support the hypothesis (Borjas, Kauppinen & Poutvaara (2019), Kauppinen & Poutvaara (2023), Parey, Ruhose, Waldinger & Netz (2017)). From the point of view of the self-selection literature, tax rate differentials are one determinant of cross-country differences in returns to skills, and thus one factor underlying the observed self-selection patterns. According to our findings, other economic incentives probably play a more central role.

We contribute to the literature on taxation and migration in the following ways. First, we examine the relationship between taxes and international migration for the entire working-age, full-time working population in a source country. Given that top-income individuals are of particular interest, we provide results separately for this group. However, it is not clear that emigration is a relevant issue only at the very top of the income distribution. Our descriptive analysis shows that the tendency to emigrate has actually increased notably among the bottom 90% of income earners. Further, in the policy discussion, there are often also concerns about the emigration of occupational groups such as healthcare professionals, not only top earners. Therefore, we provide elasticity estimates separately for a wide range of income and occupational groups.

Second, while all earlier papers have focused on estimating migration elasticities, ours is the first study to investigate the shape of the theory-based semi-elasticity and its income gradient at the top of the income distribution, which speaks directly to setting the optimal non-linear income tax schedule.

Finland provides an attractive setting to analyze these questions. Finland is a Nordic country with a heavily progressive income tax schedule, where the tax-related emigration incentives for high-income individuals are higher than in most countries. Finding close to zero elasticities in this context is of particular interest. More generally, the emigration rate overall is comparable to other European countries (see Section 3.1). The detailed, high-quality Finnish administrative data is key in allowing an exceptionally comprehensive analysis of the relationship between taxes and migration for the general population and

different subgroups.

The paper proceeds as follows. Section 2 provides a brief theoretical background to motivate our analysis. Section 3 introduces our data and provides descriptive evidence, including descriptives on the tax rate differences across and between countries which we use in the estimation. Section 4 turns to individual-level econometric analysis of migration decisions, based on a framework where individual utility from locating in a given country depends, among other things, on the tax rate in that country. The tax policy implications for setting the top tax rates are considered in Section 5, while Section 6 concludes.

2 Theoretical background

2.1 Individual behaviour

We first consider individuals' migration reactions to tax policy. Denote the utility $U_{i,t}^c$ of a person i living in country c as

$$u\left((1-\tau_{i,t}^c)w_{i,t}^c\right)+\mu_{i,t}^c,$$

or, using log utility

$$ln\left(1-\tau_{i,t}^c\right)+ln\left(w_{i,t}^c\right)+\mu_{i,t}^c, \tag{1}$$

where $\tau_{i,t}^c$ is the average tax rate in the country for individual i and $w_{i,t}^c$ the individual's gross earnings level in period t. In addition, $\mu_{i,t}^c$ denotes the net value of all other amenities offered by the location in that period[3]. The net value may also be negative. Comparing the domestic country (d) and a foreign country (f), and normalizing utility so that $\mu_{i,t}^d$ is

[3]This value is also net of migration costs.

zero, the person chooses to reside in a foreign country[4] if

$$\mu_{i,t}^{f} > u\left((1-\tau_{i,t}^{d})w_{i,t}^{d}\right) - u\left((1-\tau_{i,t}^{f})w_{i,t}^{f}\right),$$

i.e. if the net benefit μ is large enough, exceeding a threshold value $\widetilde{\mu}_{i}^{f}$. This threshold value makes the individual indifferent between living abroad or in the domestic country, in our case Finland. When taxes stay constant, a person might still move abroad if the net non-monetary benefit abroad increases. In other words, if $\mu_{i,t-1}^{f} < \widetilde{\mu}_{i}^{f}$, but $\mu_{i,t}^{f} > \widetilde{\mu}_{i}^{f}$, the person moves to a foreign country in period t.

On the other hand, when other migration determinants remain the same, but the tax rate in Finland is reduced, fewer residents move abroad. In addition, some individuals who used to reside abroad move back, since $(1-\tau_{i,t}^{d})w_{i,t}^{d}$ increases.

In the empirical part, we work with two samples, those initially residing in Finland and those who have previously emigrated and may consider return-migration. Let us denote the fraction of residents who stay in Finland by S_t and the fraction of those who return from abroad by R_t. It is important to note that we abstract from other types of immigration, besides return-migration; this is discussed further in the next subsection.

These fractions depend on the net-of-tax rate as follows:

$$\frac{\partial S_t}{\partial(1-\tau_t^d)} > 0, \ \frac{\partial R_t}{\partial(1-\tau_t^d)} > 0.$$

These give rise to elasticities $\eta^{S}_{d,(1-\tau_t^d)} = \frac{\partial S_t}{\partial(1-\tau_t^d)}\frac{(1-\tau_t^d)}{S_t}$ and $\eta^{R}_{d,(1-\tau_t^d)} = \frac{\partial R_t}{\partial(1-\tau_t^d)}\frac{(1-\tau_t^d)}{R_t}$. In order to assess how much the overall share of Finns[5] in Finland ($N_t = S_t + R_t$) reacts to taxation, one should estimate the total elasticity (accounting for both staying and return

[4]In practice, individuals choose between their home country and several potential foreign destinations. This is accounted for in our empirical analysis. Here, we simplify by modeling the choice between two countries, home and foreign, as the emigration decision is most crucial for our analysis and for domestic tax policy; see below. One may think of the foreign country here as the one yielding the highest utility among potential destination countries.

[5]"Finns" in this context refers to individuals who are found in our administrative data i.e. have resided in Finland at some point during the analysis period.

migration)

$$\begin{aligned}\eta^N_{d,(1-\tau^d_t)} &= \frac{\partial N_t}{\partial(1-\tau^d_t)}\frac{(1-\tau^d_t)}{N_t} = \frac{\partial S_t}{\partial(1-\tau^d_t)}\frac{(1-\tau^d_t)}{N_t} + \frac{\partial R_t}{\partial(1-\tau^d_t)}\frac{(1-\tau^d_t)}{N_t} \\ &= \frac{\partial S_t}{\partial(1-\tau^d_t)}\frac{(1-\tau^d_t)}{S_t}\frac{S_t}{N_t} + \frac{\partial R_t}{\partial(1-\tau^d_t)}\frac{(1-\tau^d_t)}{R_t}\frac{R_t}{N_t} \\ &= \frac{S_t}{N_t}\eta^S_{d,(1-\tau^d_t)} + \frac{R_t}{N_t}\eta^R_{d,(1-\tau^d_t)}. \end{aligned} \tag{2}$$

In other words, this is a weighted sum of the reactions of those staying in Finland and those returning from abroad. In practice, since a vast majority are stayers, the overall elasticity is governed by the reaction of the stayers. In what follows, we first focus on estimating the elasticity that captures the emigration decisions of those currently residing in Finland, $\eta^S_{d,(1-\tau^d_t)}$, but for completeness we also offer an investigation of return migration in Section 4.3.

While the domestic country cannot directly influence the way other countries set their taxes, the foreign elasticities of the type $\eta^S_{d,(1-\tau^f_t)} < 0$ are also of interest for understanding migration patterns.

2.2 Tax policy background

The key purpose of this paper is to estimate the net domestic elasticity, i.e. the percentage change in the probability of residing in a given country, with respect to the change in the net-of-tax rate of earnings in that country. This parameter is of crucial interest for policy, as it is one of the key parameters for setting marginal income tax rates in the presence of tax-induced migration.

Typically, tax-induced migration has been discussed in the context of the taxation of top incomes. Brewer et al. (2010) and Piketty & Saez (2013) demonstrate that the

revenue-maximizing top tax rate in the presence of migration is given by

$$\tau^* = \frac{1}{1 + a * e + \eta}, \tag{3}$$

where a is the Pareto parameter that describes the thickness of the top tail of the income distribution, e is the elasticity of taxable income, and η refers to the fraction of the population (net) staying in the domestic country, i.e. $\eta^N_{d,(1-\tau^d_t)}$ (cf. Equation (2)). Therefore, if the migration elasticity is significant and is not accounted for, top tax rates may be set too high from a welfare-maximizing point of view.

The above formula is applicable when the policy-maker sets a fixed marginal tax rate for a group of top earners. In practice, tax schedules are indeed typically piece-wise linear, i.e. the marginal tax rate is constant for a significant proportion of top earners above a given threshold. Lehmann et al. (2014), on the other hand, show that if a flexible functional form of the income tax schedule at the top can be used, and if migration responses are heterogeneous, knowledge of migration elasticities is no longer sufficient to determine the shape of the tax schedule. In this case, a key parameter to be estimated is instead a semi-elasticity, ξ, defined as the percentage change in the net share of people who stay in a country when consumption (c) or disposable income in a country increases, i.e:

$$\xi_{d,c^d_t} = \frac{\partial N_t}{\partial c^d_t} \frac{1}{N_t}. \tag{4}$$

They then link this semi-elasticity to a particular elasticity, namely $\nu_{d,c^d_t} = \xi_{d,c^d_t} * c^d_t$. The shape of the revenue-maximizing income tax schedule depends on how the semi-elasticity changes with income.[6] If the semi-elasticity ξ decreases with income – which would be the case if the elasticity ν is constant – or constant, the marginal tax rate is always positive. However, if the semi-elasticity is increasing in income, the marginal

[6]Lehmann et al. (2014) analyze optimal tax rates with Rawlsian governments, which for top incomes corresponds to the revenue-maximizing tax rate. This puts an upper bound on the optimal tax rate for other government objective functions.

tax rate may even turn negative after some income level. If the semi-elasticity tends to infinity when income becomes infinite, the marginal tax rate must be negative after a certain threshold.[7] Even though this result has not been investigated empirically in previous literature, the simulation results in Lehmann et al. (2014) show that the result is not a theoretical curiosity, in the sense that for sensible parameter values, it may imply profound changes to how taxes should be set for a meaningful proportion of top income earners. The practical significance for tax policy remains an open empirical question. In order to obtain information about the revenue-maximizing top tax rate in this setting, one therefore needs knowledge about the income gradient of the semi-elasticity.

In our empirical analysis, we mostly concentrate on estimating the migration elasticity, η, for the population as a whole and for many subgroups. This also helps to compare our findings with those of the earlier literature on taxation and migration, which has solely focused on estimating elasticities. However, when considering the implications of migration on the revenue-maximizing top tax rate, we also estimate semi-elasticities given by (4).

Two important remarks on our analysis are in order. First, our analysis focuses on individuals who are resident in Finland and consider emigrating; and individuals who have emigrated from Finland and consider return-migration. Our analysis therefore does not capture other types of immigration besides return-migration. The reasons for this are two-fold, one reason relating to data and the other to policy. Data-wise, we want to make full use of our total-population micro-data to analyze migration patterns of the general working population and several subgroups of interest. Similar data would not be available for (potential) new immigrants. Policy-wise, we regard policies to encourage new immigration as a separate question. In many countries, including Finland, there is special tax treatment of immigrant groups that the country wants to attract; see Kleven

[7]Lehmann et al. (2014) show that equation 3 is obtained as a special case of their optimal tax rule under the assumption of a constant migration elasticity for top earners. Blumkin et al. (2015) show, in turn, that the asymptotic marginal tax rate converges to zero when the migration costs are distributed identically and independently across income levels and the skill distribution is unbounded.

et al. (2013) for an empirical analysis of a relevant Danish tax scheme. Indeed, optimal policy likely calls for separate tax instruments to attract migrants; cf. also the discussion in Piketty and Saez (2013, p. 431). What we are interested in is the tax treatment of labour income of the general resident population.[8]

Second, both in the theoretical discussion above and the empirical analysis below, we only consider taxes on labour income. Finland operates a dual income tax with separate schedules for labour income and capital income, and there is very little progressivity in the taxation of capital incomes. Obtaining information about capital income tax rules for all countries in the data is not straightforward. More importantly, we only capture realized capital incomes in the Finnish tax administrative data. Hence, if a person moved abroad to realize capital incomes there, those incomes would not be captured by our data, rendering the analysis of capital income taxation in this context imperfect, or even misleading.

3 Data and descriptives

3.1 Data on migration and individual background

Our analysis uses individual-level full-population administrative data from Finland for the years 2003-2015. The main data source are the FOLK-longitudinal data modules on personal data (FOLK) provided by Statistics Finland. The data include information on the socio-economic characteristics of the individuals residing in the country. To focus on work-related migration, the analysis is restricted to individuals between 25 and 54 years of age and who were registered as employed for 12 months during the year they were included in the data. We also dropped all observations that have missing information

[8]Nevertheless, immigrants are naturally included in our analysis to the extent that they are part of the resident population whose emigration and return-migration responses are examined in the main analysis; that is, this analysis is in no way restricted to native Finns only.

on key variables.[9] Table 1 compares the summary statistics for the whole population and the estimation sample with the age and employment restrictions mentioned above. Compared to the whole-population data, the individuals in our estimation sample are somewhat younger and are more likely to be married and have children. In addition, the individuals in the estimation sample are more highly educated.

The data are merged with information on emigrations from the Statistics Finland migration register using statistical IDs based on individual social security numbers. The migration data include information on the date of migration and the destination country. It is possible to migrate without registering, but we expect that the share of migrants who migrate without registering is small, as the laws concerning social security and taxation should induce individuals to register when they emigrate.

We define an individual as an emigrant if he or she is found in one of the cross-sections of our data, and emigrates from Finland during the following year, and stays abroad for at least one year.[10] The rest of the observations are defined as non-migrants. In the obtained panel data set we have approximately 7 million male non-migrants, 7,000 male migrants, 7 million female non-migrants and 6,000 female migrants. As we are working in a full population panel setting, most individuals are included in the data multiple times.

Our data have information on all registered moves but we focus on 17 OECD countries[11] as possible destination countries for reasons of data availability. After conducting the above restrictions, our estimation data cover approximately 75% of all registered

[9]Dropping missing variables is crucial when predicting earnings for potential destination countries. This restriction mainly concerns the year 2003 in the case of occupation and industry variables and missing education information for all years. For 2001-2003, the Statistics Finland data do not have occupation or industry information at all. To keep the year 2003 in our estimation sample, we used occupation information for 2000 or 2004. The missing education data, in turn, concern mainly individuals who have obtained their education abroad and whose education information is not registered with the Finnish authorities. The remaining missing education information is most probably for Finnish residents whose highest completed education is comprehensive school.

[10]This restriction also ensures that the labour income of these individuals is indeed taxed in the destination country. International tax treaties and Finnish domestic legislation imply that labour income is in general taxed in the destination country for moves that last over 6 months.

[11]These countries are Austria, Canada, Czech, Denmark, Estonia, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland, UK and US.

moves. However, if we focus only on OECD countries, our estimation sample covers almost 85% of all emigrants. Thus, focusing on these 17 destination countries seems to cover a high share of relevant destination countries. Importantly, the data also cover several countries that are not popular as destination countries.

To ease computation in our individual-level analysis, we take a 2.5% random sample of the remainers, which leaves us with approximately 359,000 remainers. The descriptive statistics of the whole estimation sample and the random sample are given in the second and third columns of Table 1. The whole sample and the random sample are almost identical in terms of observables, as expected. Columns 4 and 5 of the table, in turn, provide descriptive statistics on the remainers and movers. The comparison between the remainers and movers is based on our estimation sample. The table shows that the migrants are younger and more educated than those who stay, and they also earn more. The self-selection pattern is similar to that found by Kauppinen & Poutvaara (2023) for Finland and Borjas et al. (2019) for emigration from Denmark, which is also a country with relatively high income taxes.

Figure 1 depicts the migration flows from Finland for the whole estimation sample, as well as separately for the top 10% of income-earners and the rest. While there has been a general increase in emigration, this increase has tended to take place among the bottom 90% of income-earners rather than the top earners[12]. By the end of the analysis period, more than 1,500 Finnish residents move abroad annually out of a population of around 5.5 million. Emigration rates from Finland are rather comparable to other Western-European countries. In 2014, the emigration rate in the age group 25 to 54 among the native-born was 0.25% (Eurostat (2022a) and Eurostat (2022b)). Corresponding rates for 2014 were 0.30% in Sweden, 0.31% in Denmark, 0.21% in Germany, 0.39% in the Netherlands, 0.18% in Spain and 0.20% in Italy (Eurostat (2022a) and Eurostat (2022b)).

[12]It should be noted that the years 2003 and 2004 are not completely comparable due to the missing information on occupation and industry variables. Thus, the large increase in the number of migrants between these years is somewhat higher than if we used the entire data for these years (ignoring missing observations on some variables in 2003).

Figure 2 provides information about the share of migrants going to each destination country in our data, again split by income. The countries are ordered on the basis of the average tax rates for the two groups (the lowest tax countries at the top). Bottom 90 migrants do not appear to move more often to low-tax destinations. For the top 10, some low-tax countries (such as the US) are among the main destination countries, but so are high-tax countries like Germany and Sweden.

Figures 3 and 4 offer cross plots between the log share of Finns abroad relative to Finland and the difference in the average net-of-tax rate between Finland and the potential destination countries, separately for the bottom 90% and top 10% of income earners. The different colours refer to different destination countries each year. There does not appear to be any clear pattern between the two, which reflects the fact that there are popular destination countries among both low and high-tax countries.[13]

3.2 Estimating earnings and taxes abroad

While we observe individuals in Finland before emigration, a key challenge is that we do not know how much they earn in their destination countries. Naturally, counterfactual earnings in potential destination countries that are not chosen would not be observed either under any circumstances. We therefore predict counterfactual earnings for all individuals in all the potential destination countries in our data.

Our main analysis uses harmonized and representative cross-national individual-level data provided by the Luxembourg Income Study (LIS)[14]. We run Mincer-type earnings regressions for each country covered by our analysis, and predict the earnings for each individual using the country-specific regression coefficients and their individual characteristics (from the Finnish admin data) for every year of the analysis period. A potential concern with the regression-based method is that if movers differ from the remainers in

[13] A more detailed analysis of the relationship between macro flows and taxes, including an event analysis of certain tax changes of interest, is included in an early working paper version (Kalin et al. 2022) of this paper.

[14] Luxembourg Income Study (2020)

characteristics like unobserved ability, which are not included in the regression model but affect individuals' income levels, the regression-based predictions could be systematically biased. For this reason, we use an alternative earnings-prediction method as a robustness check. Here, we use data fom EU-SILC, another individual-level data set covering multiple countries. This data set does not cover countries outside of the EU, which is why we regard LIS as our main source. We use EU-SILC as a robustness check in providing alternative earnings predictions for a subset of destination countries. Instead of basing the predictions on earnings regressions, we extract earnings levels for the percentiles of the earnings distribution for each country and year, and assume that a migrant in a given percentile in Finland would be located in the same percentile in the destination country. The benefit of this alternative approach is that the earnings predictions tend to compress the earnings distributions somewhat, whereas the percentile-based solution overcomes this issue. In essence, this method explicitly accounts for the self-selection of emigrants in characteristics that are not included in the regression model. A potential worry is that migrants may not necessarily reach the same income percentile in the destination as they do in Finland. In the absence of actual earnings data for destinations, neither of the two approaches is perfect. However, our key findings are robust to the choice of prediction method, which alleviates concerns on issues with predicted earnings.[15] The earnings prediction procedure is described in more detail in Appendix A. In the appendix, we also compare the actual and predicted earnings distributions for Finland visually.

Based on predicted gross earnings, we calculate the taxes that each individual would pay in each destination country. To determine the tax liabilities, we use the OECD tax-benefit calculation tools[16] that calculates taxes and social security contributions based

[15]Ideally we would have done a similar alternative earnings prediction with LIS data as an additional robustness check. However, as the LIS database only provides results in ASCII form, all the results first have to be manually converted to another format such as csv files. To manually create a data set containing 100 rows for each country and year would be particularly time-consuming given the number of countries and years we have in our analysis.

[16]We also utilized Alexandre Desbuquois's Stata package TAXBENEXTRACT. Unfortunately, the OECD has deleted this package and discontinued the maintenance of the TAXBEN model written for Stata due to the introduction of web calculators.

on employment income, taking into consideration standard tax reliefs automatically provided to qualifying taxpayers according to the rules specified in each country's legislation. Besides the tax rates offered by the calculation tools, we also incorporate consumption taxes to accurately represent the overall tax burden. Taxes are then linked to the data using a percentage of average earnings variable that is available in the data set provided by the OECD tax calculator[17]. When calculating taxes, unlike some earlier papers, we also take into account the special tax regimes that are in place in some of the destination countries for foreign experts. Earlier studies have only used the top marginal tax rate for tax information; this approach would not be valid in our case, as we work with all potential migrants. That is why we use the actual (average) tax rate corresponding to each individual's level of predicted earnings.

Figure 5[18] depicts the differences in average tax rates between countries, again by income. Finland is one of the countries levying the highest taxes, especially for top earners. The differences are marked, exceeding 20 percentage points. It is also noteworthy that the ordering of countries by average tax rate differs notably between the top 10 and the rest. One factor behind this is the special tax treatment of high income foreigners in some countries, which we account for in our analysis.

The average tax rates for the top and bottom group in Figure 5 are calculated based on earnings, illustrated in Figure 6. In terms of average PPP-corrected earnings, Finland is ranked slightly below the middle. The differences between average earnings are notable, especially in the case of top earners, which creates yet another incentive to migrate.

In much of our analysis, identification is based on approaches where we control for country fixed effects, and hence the extent of variation in tax rates within countries over time is key. This variation is illustrated in Figure 7, which presents the change in the

[17]To be more precise, first we link average earnings for each country each year to the data set. Based on these linked average earnings, we calculate the percentage of average earnings, which can then be used to link taxes.

[18]Figures 5-8 are constructed using macro analysis data where tax rates are calculated on the basis of estimated earning percentiles. These data produce higher earnings for top earners compared to LIS earnings predictions. Consequently, tax rates in this data set are slightly higher for the top group.

average tax rate for the two groups of income earners in each country from the start to the end of our data period. There have been some fairly large tax changes over time in some of the countries. For the top group especially, tax rates have typically been rising over time.[19] Figure 8 plots the distribution of annual changes in individual average tax rates within countries, which is the type of variation one would use in a specification with annual data with country fixed effects. There have been some tax changes, also some fairly sizeable ones, though there is also a considerable concentration around zero or small changes.

4 Econometric analysis

4.1 Econometric approach

Building on the theory background, an empirical counterpart of Equation (1) is

$$U_{i,t}^{c} = \beta ln\left(1-\tau_{i,t}^{c}\right) + \theta ln\left(w_{i.t}^{c}\right) + \alpha_i + \gamma_c + \delta_t + \zeta x_{c,t} + \eta y_t \gamma_c + \varepsilon_{i,t}^{c}, \tag{5}$$

where α_i depicts individual fixed effects, γ_c country fixed effects, δ_t year fixed effects, $x_{c,t}$ other possible country-level time-varying controls and $\varepsilon_{i,t}^{c}$ is the error term. In addition, the model also contains country-wise linear year trends. These are denoted by $y_t\gamma_c$.

Following the empirical approach of Agrawal & Foremny (2019), we estimate the model as a linear probability model, where the dependent variable ($m_{c,i,t}$) is an indicator that gets value one if individual i chooses to locate in a country c in year t and zero for all other cases. This variable replaces the left-hand side in Equation (5). Finland is included as one of the countries in the choice set and the analysis is carried out using the data covering both movers and remainers.

We modify the estimation equation by always including person-year dummies, $\alpha_{i,t}$. In other words, α_i is replaced by $\alpha_{i,t}$ and δ_t is dropped. The inclusion of the new dummies

[19] This tendency is more pronounced after the financial crisis in 2008.

implies that we identify the effects of net-of-tax rates and gross earnings from variation in these variables between countries within a given year. Including these dummies also makes sure that despite the possibility that the estimated probability to locate in a single country may not lie between zero and one, the estimated probabilities sum up to unity for each individual-year observation.[20] Since these dummies capture all individual characteristics that are constant for the person in a given year, we do not include demographic controls like age, gender, or family status. However, country dummies can be included to control for permanent differences between countries.

The main identification strategy is, therefore, one where the impact of taxes on migration is identified from a model including country fixed effects, person-time fixed effects, countrywise trends, and country-level time-varying controls. This model corresponds to an estimation equation given by

$$m_{c,i,t} = \beta ln\left(1 - \tau^c_{i,t}\right) + \theta ln\left(w^c_{i.t}\right) + \gamma_c + \alpha_{i,t} + \eta y_t \gamma_c + \zeta x_{c,t} + \varepsilon^c_{i,t}, \tag{6}$$

An alternative identification strategy is one where time-varying country-level controls and country dummies are replaced with country*year fixed effects, denoted by $\gamma_{c,t}$.[21] This alternative yields an estimation equation given by

$$m_{c,i,t} = \beta ln\left(1 - \tau^c_{i,t}\right) + \theta ln\left(w^c_{i.t}\right) + \gamma_{c,t} + \alpha_{i,t} + \varepsilon^c_{i,t}, \tag{7}$$

It is, however, not entirely clear whether including country fixed effects is always desirable. On the one hand, having them in the model takes into account such moving considerations that are related to, for example, the distance between a destination country and Finland and the language used in the destination. They also account for the quality of public services, to the extent that they are universally available for all inhabitants. On

[20] For details, see Agrawal & Foremny (2019), footnote 20.

[21] The two approaches in Equations (6) and (7) correspond to Identifications 1 and 2 in Akcigit et al. (2016), used in that paper as the main approaches to estimate the impact of taxes on the location decisions of inventors.

the other hand, if moving decisions depend on more permanent differences in the tax rates across countries, those considerations are neglected if permanent differences are controlled for. For completeness, we also report results from a model without country dummies.

The coefficients of interest, β and also θ, are not elasticities. Instead, these coefficients measure the impact of a 1% change in the net-of-tax rate and gross earnings on the probability of moving to a destination or staying in Finland. The coefficients need to be divided by the migration probability to arrive at an elasticity of migration.

The model is estimated for all individuals in the estimation sample and for various groups, including the top decile in the income distribution. In addition, subgroup analyses are conducted for several groups that may differ in their degree of mobility: gender, age, language, family status (singles vs. others; children vs. no children), citizenship, and different occupational groups and fields of education. The subgroup analysis is also conducted first for the whole sample and then separately for the top earners. The whole population analysis uses, again, a random sample of remainers and all movers, whereas the top group analysis includes all remainers and movers in that group. In addition, we explore the heterogeneous impacts by different income groups by estimating a model with interaction terms between the net-of-tax rate and different income deciles and top-income groups up until the top per mille of income earners.

4.2 Results

Main results

Tables 2, 3 and 4 report the results for all individuals in the sample, those belonging to the top 10% of income earners, as well as bottom 90% of income earners. In Columns (1) to (6) in each table, the main focus is on the log net-of-tax rate, but all these models also include the log of gross earnings. What should matter most for people is the net earnings level, but it is useful to proceed with a more flexible approach allowing for different coefficients for the net-of-tax rate and gross earnings. Models (1) to (6) all include the

person-year dummies. Model (2) adds a home country fixed effect, whereas Models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and Model (5) adds country*linear year trends. In Column (6), we replace all the above with country*year fixed effects. Models (5) and (6) correspond, therefore, to the main identification strategies in Equations (6) and (7) spelled out above. The subgroup analyses are carried out using Model (4) as the sample sizes are smaller and a more parsimonious approach is valuable.

The results suggest that without country fixed effects, the coefficient of the log net-of-tax rate is negative, probably because most people choose to locate in high-tax countries, including Finland. When the home country fixed effect is added, the effect is still negative but very close to zero, and the R squared jumps because most people stay in the home country. With a full set of country fixed effects, the impact of the net-of-tax rate on migration is positive and highly significant, but the magnitude is very small. Adding more controls, or replacing the added controls with country*year fixed effects, does not change this finding. The pattern in the results is the same in the separate analyses for the top decile and the rest of the population.

The domestic elasticity, i.e. the elasticity of the probability of locating in Finland when the home country net-of-tax rate changes, can be obtained by dividing the obtained regression coefficient by the probability of staying in Finland. These probabilities amount to 0.997 for the top 10 and 0.999 for the bottom 90, and hence the regression coefficient and the elasticity are almost equal. The main finding is that the impact of taxes on the probability of moving out of the home country is minimal. Even within the top 10 group, the domestic elasticity is not significantly different from that of the bottom 90 group (0.0004 compared to 0.0003).

The foreign elasticity, that is, the elasticity of the probability of Finnish residents locating in a foreign country when the foreign country net-of-tax rate changes is calculated as a weighted average of country-specific foreign elasticities. The obtained foreign elas-

ticity is higher than the domestic elasticity which is in line with the previous literature (Kleven, Landais & Saez (2013), Akcigit, Baslandze & Stantcheva (2016)). In addition, the foreign elasticity is higher for the top earners. However, the foreign elasticity is still rather small even for the top earners, approximately 0.2.

The results of the subgroup analyses are reported in Figures 9, 10 and 11. In all these figures, panel A shows the results for the whole sample and panel B shows the results for the top 10 earners. What stands out in Figure 9, Panel A, is the higher coefficient for the Swedish-speaking residents. This effect is also seen for the top earners in Panel B. However, the standard errors are quite large for this smaller group. While the effect is larger for this subgroup, the magnitude again remains small. One of the subgroups consists of Finnish citizens only, and for this group, the estimate is the same as for all, which is natural since there are not many foreigners.

The results for different sectors in Figure 10 do not show evidence of individuals in some sectors being significantly more mobile than in others. The point estimates for finance are larger, but the confidence bands are wide. The result holds for the whole sample in Panel A and for the top earners in Panel B. As for the different fields of education, Figure 11 shows that the least mobile field for the whole sample is services and the largest point estimates are obtained for natural sciences and humanities. Nevertheless, the confidence intervals overlap for most of the coefficients. Most of the estimates for the top group are not statistically significantly different from zero. Exceptions include engineering as well as humanities and social sciences, but the point estimates remain small for these groups too.

Heterogeneous impacts by different income groups are examined in Figure 12, which plots the interaction terms between the net-of-tax rate and different income deciles and top-income groups, also for top per mille of income earners. The migration responses seem to be quite similar across the groups, and elasticities only increase at the very top. We revert to this finding when discussing the implications of the results in Section 5.

Robustness checks

It is useful to consider the implications of the role of different earnings prediction methods. For this purpose, Tables (A1)-(A3) in Appendix B report regression results when using earnings predictions based on LIS data but for the subsample of countries for which we also have SILC data. The results are quite similar to the main results described above. Tables (A4) to (A6) report, in turn, the results for the same sample using earnings calculated on the basis of the percentiles in EU-SILC. The results for the population as a whole remain very similar, but the estimate for the top group in Column (6) of Table (A5) is over four times greater than the corresponding estimate in Table (3). A possible reason for this could be that the tax rate is higher for many of the destinations when using income percentiles rather than for earnings levels stemming from the Mincerian earnings regressions. This reduces the net-of-tax differences between these destination countries and Finland, which works towards increasing the coefficient estimate. However, its magnitude is still very small, approximately 0.0014. This discussion suggests that changing the earnings prediction method does not drive the conclusions that can be made on the basis of the results.

One related worry is that since the tax rates in destination countries are calculated on the basis of earnings predictions, they may contain measurement error. This may lead to attenuation bias, in other words the coefficients of the take-home rate could be artificially low. To explore this, we also use an IV approach, where the take-home rate, calculated using an average tax rate, is instrumented by (1 - marginal tax rate), where the marginal tax rate is the rate at a given income level. Since the marginal tax rate is constant across an income band, it is arguably less susceptible to measurement errors.

The results from these IV regressions are presented in Tables A7 and A8 for the whole sample and for the top 10 income earners, respectively. The first thing to note is that the null hypothesis according to which the first-stage would be underidentified is clearly rejected based on the Kleibergen-Paap test, and the first stage F test also indicates that

the instruments are strong. The coefficients for the take-home rate for the population as a whole are moderately affected, whereas they increase somewhat for the top 10 group. This can be seen by comparing the coefficient of Column 6 between Tables 3 and A8, which rises from 0.0003 to 0.0015.[22]

4.3 Return migration

In the analysis above, we have defined a person as an emigrant if they stay abroad for more than a year. Obviously, from the point of view of the sending country, it matters a great deal whether the migrants stay abroad more permanently or whether they return fairly rapidly after the first year abroad. This section therefore examines whether the return migration patterns of Finns are related to tax rates.

Annual migration flows are depicted in Figure 13[23]. The number of emigration events always exceeds return migration, but the difference is much larger for those in the bottom 90% of the income distribution. The net loss of this group also seems to increase towards the end of the analysis period. The annual net outflow of the top 10 population is only around 50 persons a year. Figure 14 provides information about the shares of emigrants from Finland who have stayed in their destination country for more than five years. As before, the countries are ordered by the average tax rate for the group, with high-tax countries at the bottom. Migrants do not appear to stay longer in lower-tax countries.[24]

We now turn to the actual regression analysis related to return migration. While we do not have access to the full population of Finns residing in foreign countries, we can capture a large part of the risk group since we have annual data of emigration at

[22]We also estimated the analysis corresponding to that in Table 5 using IV. The instrument for disposable income is constructed using (1-marginal tax rate) times gross earnings. The results confirm the qualitative pattern from the linear probability model estimated using OLS: The coefficient in the model with country*year fixed effects for the top 1% exceeds the average in the top 10, and the coefficient for the top per mille is again greater. The estimates are marginally larger than those in Table 5. These results are available by request.

[23]The same problem with missing occupation and industry variables for the year 2003 is also present in this figure.

[24]The high share of long-term migrants in some countries is due to a small number of Finns residing in these countries, some of whom choose to stay abroad for a long time.

the individual level starting from 1997. We can also observe, starting from the same year, those returning to Finland and the country that they come from. We can therefore calculate stocks of Finns in different foreign countries for the period of our analysis (2003 onward), which capture – given that few migrants stay abroad for a long period (Figure 14) – a very large share of those Finns staying in country c who could move back to Finland in year t.[25]

For this sample we run regressions similar to the estimation equations in (6) and (7), but now the dependent variable is whether the person chooses to stay in a foreign country or move back to Finland. Again, we use predicted earnings levels[26] at the individual level and average tax rates calculated using the predicted earnings levels. This is done for two countries, the country where the individual currently resides and Finland.

The results are reported in Tables 7, 8 and 9 for the whole sample as well as the top 10 and the bottom 90 groups. The columns correspond to the same specifications as those that were used above for the analysis of emigration. These results are much more volatile with respect to the chosen specification, probably because of the much smaller sample size. In the preferred specification, there is no support – in fact the opposite holds – that return migration is related to the net-of-tax rate for any of the groups examined. This also means that the net elasticity derived in Equation (2) is in fact lower than the elasticity of staying in the home country.

Quite why this result emerges is unclear; one hypothesis is that many Finns choose to come back despite the high tax rate at home. This could be the case, for instance, for those who work for a subsidiary of a Finnish company abroad for a fixed period. One additional explanation could be that special tax reforms aimed at foreign specialists are usually in force for a fixed period only. After the preferential tax scheme has ended, the incentives for staying in the destination country relative to returning to the home country

[25] Admittedly, we cannot observe whether individuals who stay abroad move to another foreign country, but this restriction arguably only affects a small group of people.

[26] Notice that now we are using covariates from the year of emigration as we cannot observe their characteristics after leaving Finland.

worsen; this type of a tax rate change will not be captured in our data as we do not allow for individual-specific tax rates contingent on the length of stay abroad.

The fact that many individuals return makes brain drain concerns related to out-migration less pronounced. In addition, it does not seem to be the case that return migration is deterred by the high tax rate in the home country. Of course, a separate issue, and one that would be an interesting topic for further research, is how much people gain from migration also in terms of greater earnings and the associated tax revenue impacts when they return.

5 Policy implications

In this section, we discuss the implications of our findings for tax policy. As we find small migration elasticities for a wide range of different income and occupational groups, concerns about migration do not appear to provide a reason to reconsider tax policy lessons in general. In this regard, our results are well in line with earlier empirical literature, surveyed in Kleven et al. (2020); Muñoz (2020) finds slightly higher but still modest migration elasticities.

Nevertheless, top income taxes warrant a separate and more detailed analysis. We provide two types of analyses. First, we consider a piece-wise linear income tax schedule, and use our empirical results together with the theoretical formulae provided by Brewer et al. (2010) and Piketty & Saez (2013), to analyze the implications for setting the top tax rate. Second, we provide a first empirical implementation of the theoretical results of Lehmann et al. (2014), who show that the optimal shape of the income tax schedule at the top depends on the gradient of the semi-elasticity of migration, as discussed in subsection 2.2. Previous empirical evidence on the relevant parameters for this type of analysis do not exist; indeed, it is a tremendous empirical challenge to estimate the relevant parameters for very top earners. With full-population data on migration, we are able to estimate

the relevant elasticity and semi-elasticity up to the top per mille of income earners, and derive (under certain assumptions that we discuss below) the policy implications from this approach.

Turning to the first approach, i.e. considering the tax rate in the top bracket of a piece-wise linear income tax schedule, the relevant elasticity for this calculation is around 0.001 (c.f. the elasticity plotted in Figure 12 for the top 1% of income earners). Given the discussion that this could be downwards biased due to possible measurement error, one could also consider, for example, an elasticity twice as high, 0.002. Even this greater elasticity would imply a very small adjustment to the revenue-maximizing top tax rate, given by Equation 3. With a Pareto parameter a equal to 2 and elasticity of taxable income e of 0.25, the revenue-maximizing top tax rate would amount to 66.7% without migration concerns. This would decline only marginally to 66.6% with a migration elasticity of 0.002. The effect of migration responses on the revenue-maximizing top tax rate is therefore negligible.

The second approach, however, indicates that if a more flexible functional form for the tax schedule at the top is used, we need knowledge about the shape of the semi-elasticity of migration at the top. That is why we proceed by estimating the reaction to disposable income (or consumption possibilities)

$$m_{c,i,t} = \beta c^c_{i,t} + \gamma_c + \alpha_{i,t} + \eta y_t \gamma_c + \zeta x_{c,t} + \varepsilon^c_{i,t}, \tag{8}$$

where c indicates disposable income, equal to one minus the tax rate times earnings. This equation corresponds to Identification 1 (i.e. Eq. 6). The corresponding change is made to Equation (7). The results of these regressions are reported in Table 5.

The estimations, conducted for the top 10 group, include interaction terms of the consumption term and whether the person belongs to the top per cent or top per mille of income earners. The results indicate that the consumption term and its interactions

are statistically significant and increasing in size. In these results, the coefficient for consumption is somewhat higher when only the Finland fixed effect is added, suggesting that longer-run tax differences may have a stronger link with migration choices.[27]

The implications for the domestic semi-elasticity – which can be obtained by dividing the coefficient by the share of population in the home country – are depicted in Table 6. The semi-elasticities are expressed as an increase in income of 100,000 € in the home country, and they are very small. Therefore, this exercise points to a similar conclusion as above: migration concerns are inconsequential for tax policy, at least up to the top per mille of income earners.[28]

Due to data reasons, it is clear that obtaining reliable estimates of semi-elasticities for higher-income groups is not possible. (Indeed, no paper will be able to estimate an elasticity for the top earner.) To derive policy implications for top taxes on the richest individuals, further assumptions need to be imposed. Using a linear extrapolation for higher incomes on the basis of the semi-elasticity for the top per cent and the top per mille indicates that the semi-elasticity is increasing and tends to infinity. If the linear extrapolation were reliable, this would imply that despite the small semi-elasticity, the revenue-maximizing marginal tax rates at the very top would decline.

Given that this is the first paper attempting an empirical implementation of the theoretical results of Lehmann et al. (2014), we find this type of analysis intriguing and important. The analysis points to the possibility that the semi-elasticity of migration may be increasing at the very top of the income distribution, which may call for a reconsideration of policy conclusions at least for this small group of income earners. Several caveats need to be borne in mind. First, the analysis is based on an extrapolation of

[27]We also estimated a version where the net-of-tax rate (in levels) and gross earnings enter independently, with interactions. The interaction terms of the net-of-tax rate and the top 1 or 0.1% indicators are significant and are larger, the higher up the person is in the income distribution. These results are available on request.

[28]These results are similar in spirit to those related to the reactions to a wealth tax repeal in Sweden, examined by Jakobsen et al. (2024): While top wealth-holding Swedes clearly react to the tax change, the overall impact of the tax repeal is limited because the baseline migration rate of the affected group is very low.

elasticity estimates for the top per cent and per mille of income earners, with the latter group already involving a small number of emigrants. Second, the linear extrapolation itself can of course be contested. Third, as elasticities are very small at least up to the top per mille, this means that the result of a potentially declining marginal tax rate applies to a very small group of individuals, and one may therefore question its relevance for aggregate tax policy. Nevertheless, the emigration of even a few very rich individuals for tax reasons may have significant revenue consequences. Finally, a further question is whether it would be politically feasible to lower marginal tax rates for the very richest individuals only, keeping taxes almost intact for people with high but not extremely high incomes. To reiterate, if one is constrained to set a constant top tax for the top 1% (or even top per mille), our results indicate that the migration responses for this group are very small on average, and do not provide a reason to lower the current top tax rate.

6 Conclusion

While the literature on the impact of income taxation on migration has expanded rapidly, earlier work has mostly focused on special groups, rather than the general population. We set out to fill this gap by examining the impact of labour income taxation on the migration patterns of the general population of workers. This is done in the context of Finland, a Nordic country where the tax-related motives for migration are high in international comparison. We also provide estimates for the income gradient of the semi-elasticity of migration.

We use Finnish full-population individual-level administrative data covering workers and their migration choices. We combine these data with predicted counterfactual earnings and net-of-tax rates for each individual in a number of potential destination countries. Our results indicate that the net-of-tax rate has a positive and significant impact on migration. However, the migration elasticity with respect to the domestic net-of-tax rate

is very close to zero (0.0005 or smaller) for the population as a whole. Our extensive data allows a rich analysis of elasticities for subgroups defined e.g. by fields of education, sector of employment, or income deciles, and the domestic elasticities are very small for all of these groups. In line with previous research, the foreign elasticities are larger, approximately 0.2. Our investigation of return migration decisions at the individual level indicates that the return migration choices are not related to tax levels.

We also find, however, that the migration elasticity and the semi-elasticity both increase at the very top of the income distribution. If this increase held above the income levels for which estimates can be obtained, this would imply that the revenue-maximizing marginal tax rate would decline at the top. This finding arises despite a very small migration elasticity even for the top 1% or per mille of income earners, and highlights the fact that relying on a low domestic elasticity may lead to misleading implications for setting taxes at the very top. While the potential importance of these considerations has been shown in theory work, ours is the first study to provide evidence of their empirical real-world implications.

Our analysis has concentrated on taxes as a migration determinant of the general population, while controlling for various other factors. There remain features which merit additional work: Our analysis pertained to those who are already in the work force, and examining the migration decisions of university students just at the time of graduation could be interesting. At the top of the distribution, the tax treatment of capital income will probably also matter, and including capital income in the analysis is a relevant avenue for future research. Finally, it is worth noting that tax rates are not the only public policy choice that influences migration patterns. It is likely that the other side of the coin – namely what people gain by paying taxes in terms of public services – also influences their choices, hence mitigating the possible negative impact of taxation.

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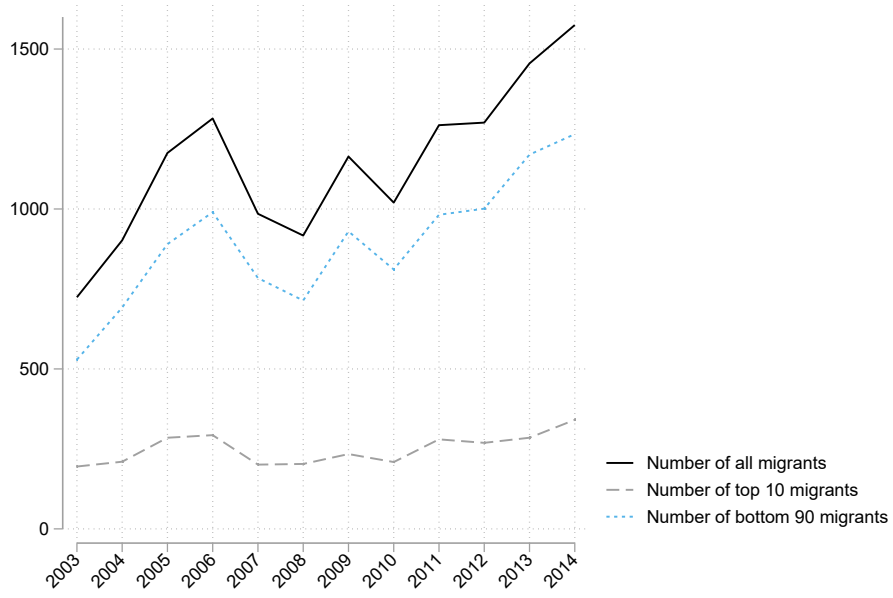
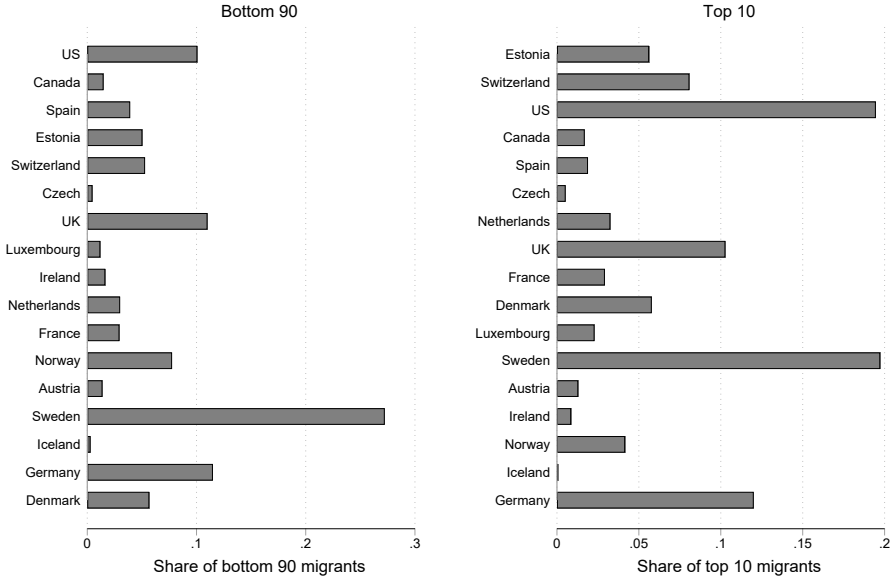
Figures

Figure 1: Migration flows from Finland



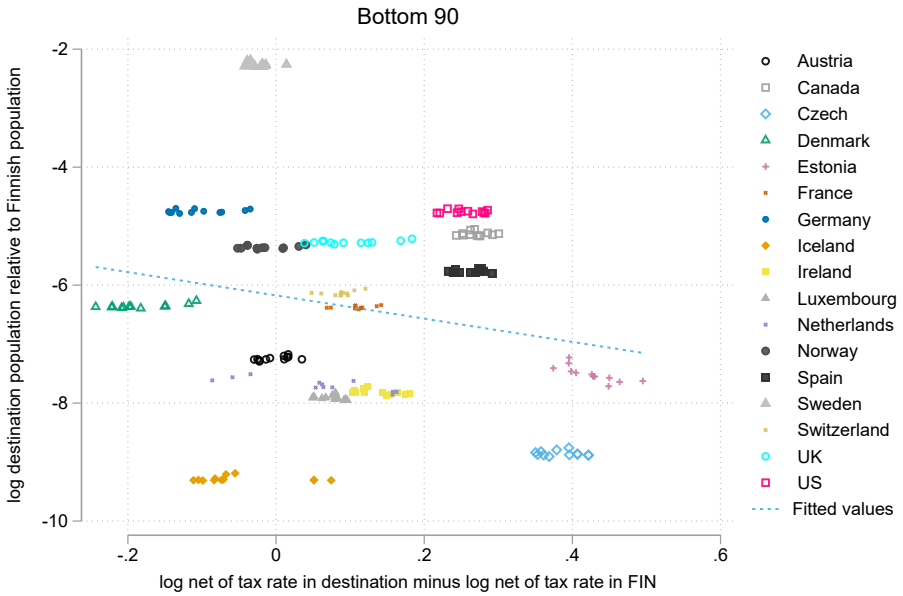
Notes: The Figure illustrates the migration flows from 2003 to 2014, showing the total number of all migrants, the top 10% migrants, and the bottom 90% migrants. The solid black line represents the total number of all migrants, the dashed grey line represents the number of top 10 migrants, and the dotted blue line represents the number of bottom 90 migrants.

Figure 2: The share of migrants moving to each destination country



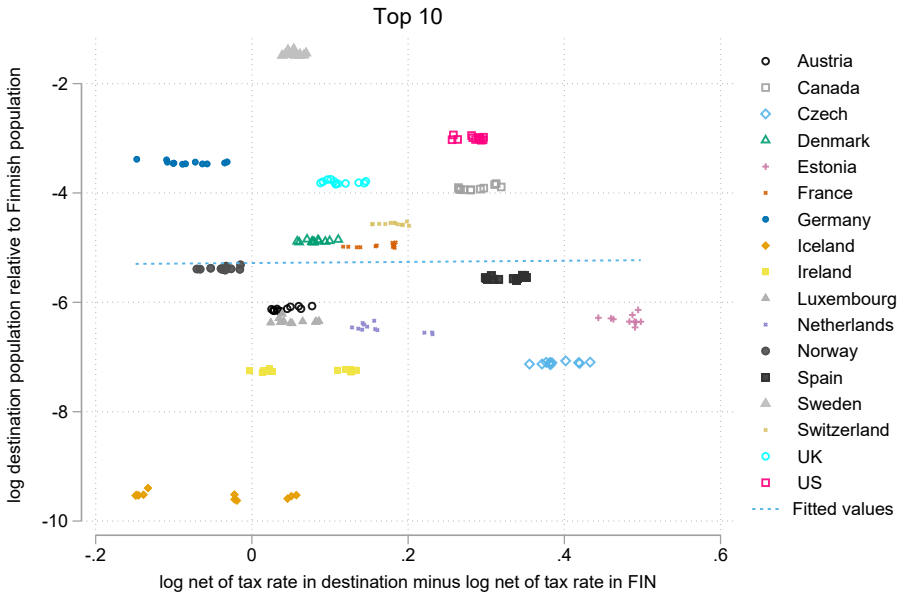
Notes: The figure displays the share of migrants moving to each destination country in our data. The left panel shows the shares for the bottom 90% of income earners, while the right panel shows the shares for the top 10. Each bar corresponds to a specific country, indicating the proportion of migrants from each group. The countries are ordered on the basis of the average tax rates for the two groups, with the countries with the lowest tax rates placed at the top.

Figure 3: Relation between the differences in (1-ATR) and stock of Finns abroad relative to at home, bottom 90



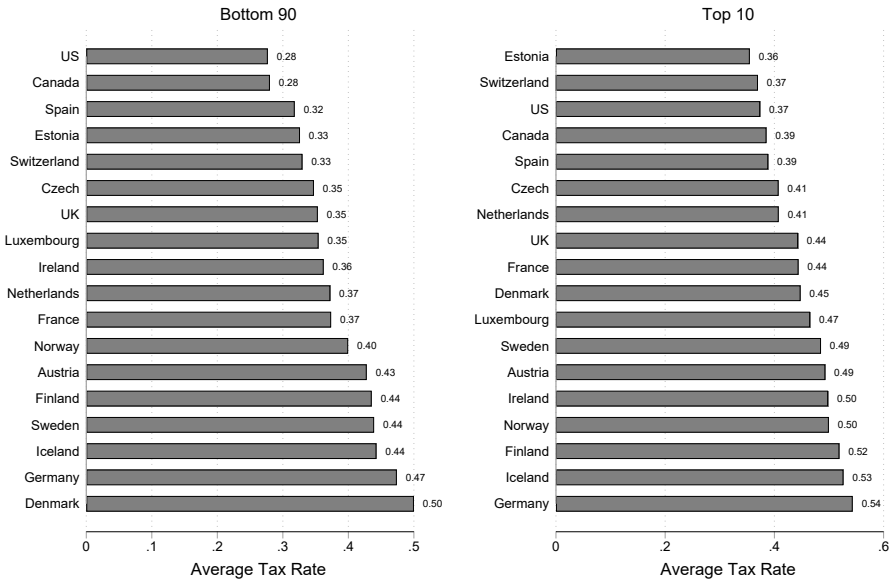
Notes: The Figure shows the relation between the differences in 1-ATR and and the quantity of Finns residing abroad compared to those residing within the country for the bottom 90% of income earners. The stock of Finns abroad is calculated as follows. We determine an initial percentage of Finnish residents in each country using our administrative data from 1997 to 2002. This is motivated by the finding that only a very small fraction of movers stay abroad for over 5 years. Starting in 2003, this percentage is regularly adjusted by incorporating individuals arriving in and departing from each country. The difference in 1-ATR between the destination countries and Finland is plotted on the x axis. Average tax rates include taxes on earned income, social security contributions and consumption taxes.

Figure 4: Relation between the differences in (1-ATR) and stock of Finns abroad relative to at home, top 10



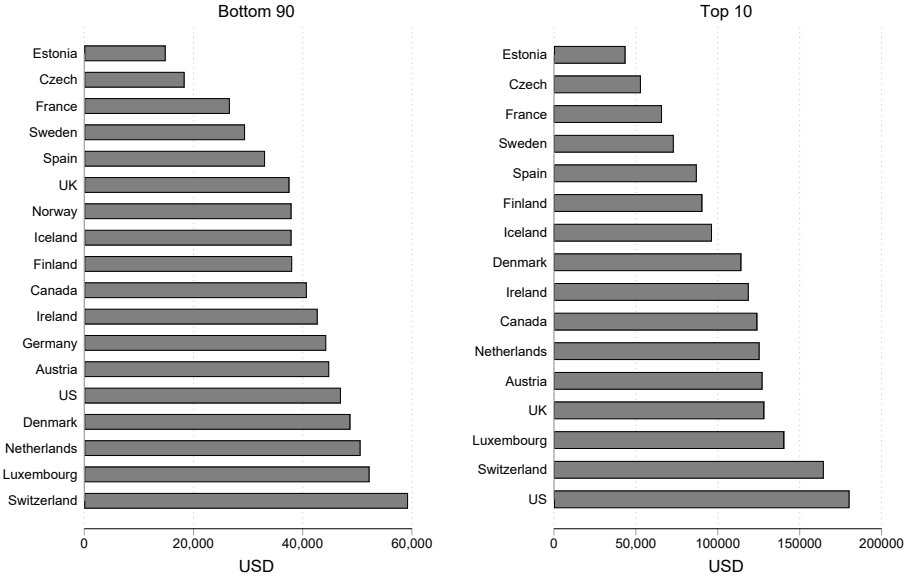
Notes: The Figure shows the relation between the differences in 1-ATR and and the quantity of Finns residing abroad compared to those residing within the country for the top 10% of income earners. The stock of Finns abroad is calculated as follows. We determine an initial percentage of Finnish residents in each country using our administrative data from 1997 to 2002. This is motivated by the finding that only a very small fraction of movers stay abroad for over 5 years. Starting in 2003, this percentage is regularly adjusted by incorporating individuals arriving in and departing from each country. The difference in 1-ATR between the destination countries and Finland is plotted on the x axis. Average tax rates include taxes on earned income, social security contributions and consumption taxes.

Figure 5: Average tax rates across countries



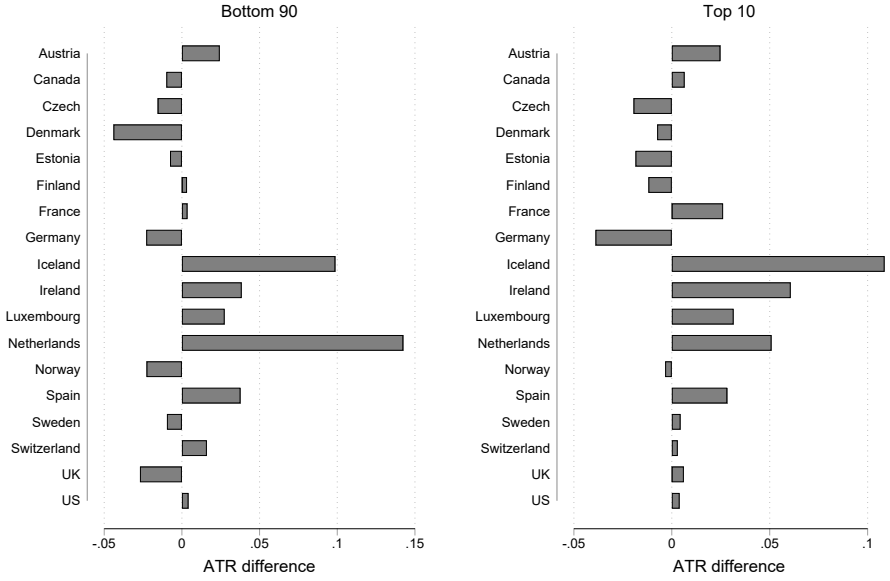
Notes: The Figure shows average tax rates across various countries, with a split between the bottom 90% and the top 10% of earners. The left panel of the figure shows the average tax rate for the bottom 90% of earners, while the right panel shows the average tax rate for the top 10% of earners. Average tax rates include taxes on earned income, social security contributions and consumption taxes. Each panel ranks the countries from the lowest to the highest tax rate.

Figure 6: Earnings across countries



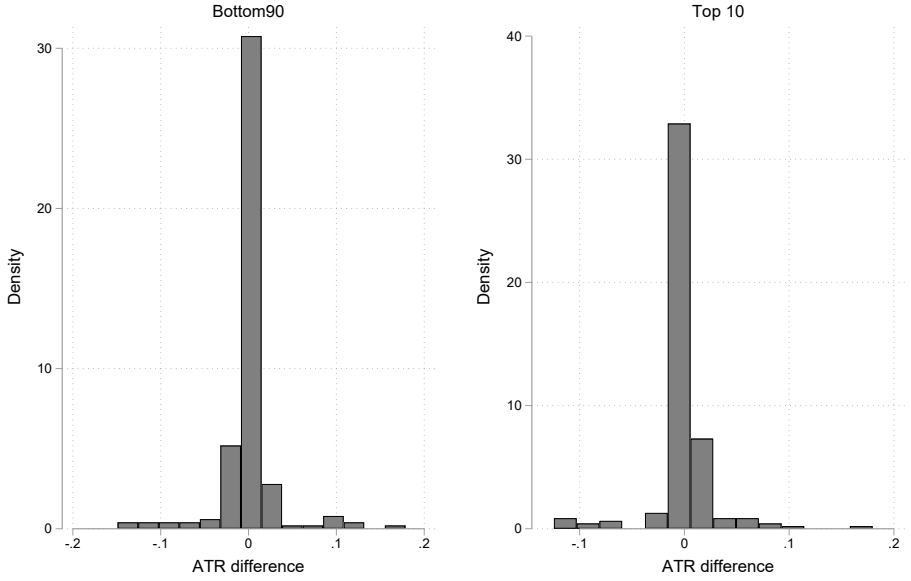
Notes: Figure displays average earnings across various countries, segmented into two categories: the bottom 90% and the top 10% of earners. The left panel shows average earnings for the bottom 90%, while the right panel details average earnings for the top 10%. Earnings are adjusted for both CPI and PPP, using 2011 as the reference year.

Figure 7: Difference in average tax rates across countries



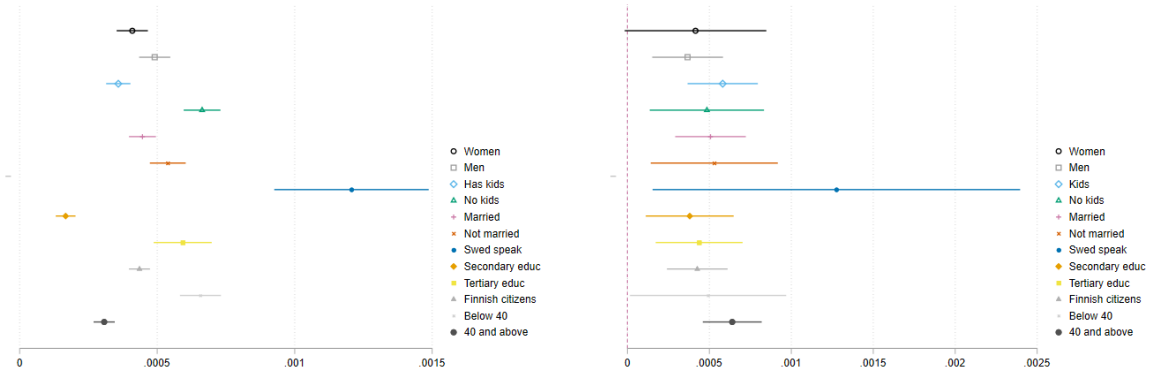
Notes: The Figure depicts the differences in average tax rates across countries over the estimation period 2003–2014. The left-side Figure shows data for the bottom 90% of earners while the right-side Figure pertains to the top 10% of income earners. Average tax rates include taxes on earned income, social security contributions and consumption taxes.

Figure 8: Year-to-year variation by countries in average tax rates



Notes: The Figure displays a histogram depicting the yearly differences in average tax rates within countries throughout the estimation period from 2003 to 2014, separately for both the bottom 90% and top 10% income groups. Average tax rates include taxes on earned income, social security contributions and consumption taxes.

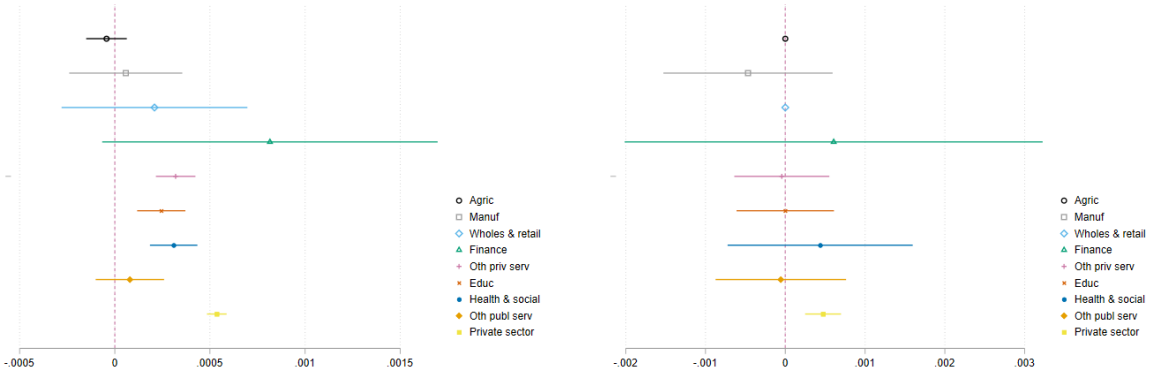
Figure 9: Subgroup analysis: demographics



(a) Whole sample **(b)** Top 10%

Notes: The Figure displays subgroup results for different demographics, separately for the bottom 90% and top 10% income earners. The plotted estimates correspond to coefficient β in Equation 6. This Equation is estimated separately for each subgroup. The model corresponds to the main identification strategy that includes country and person-time fixed effects, country-wise trends, and country level and time-varying controls.

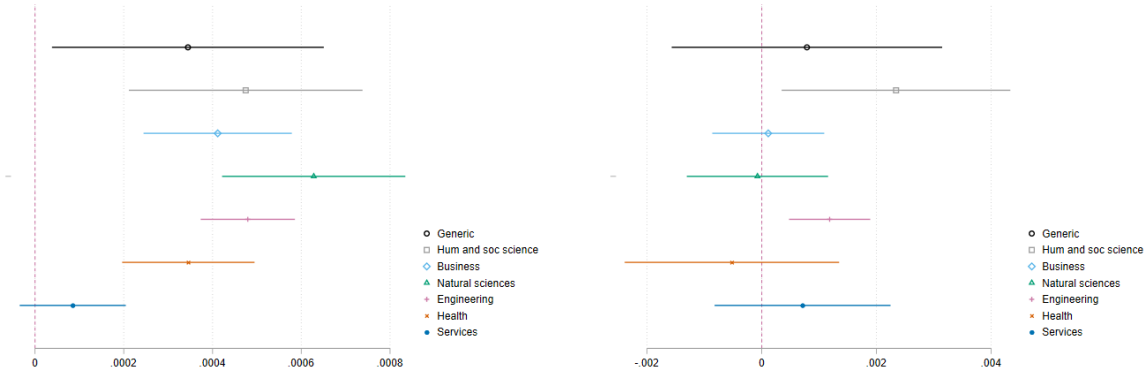
Figure 10: Subgroup analysis: sectors



(a) Whole sample **(b)** Top 10%

Notes: The Figure displays subgroup results for different sectors, separately for the bottom 90% and top 10% income earners. The plotted estimates correspond to coefficient β in Equation 6. This Equation is estimated separately for each subgroup. The model corresponds to the main identification strategy that includes country and person-time fixed effects, country-wise trends, and country level and time-varying controls.

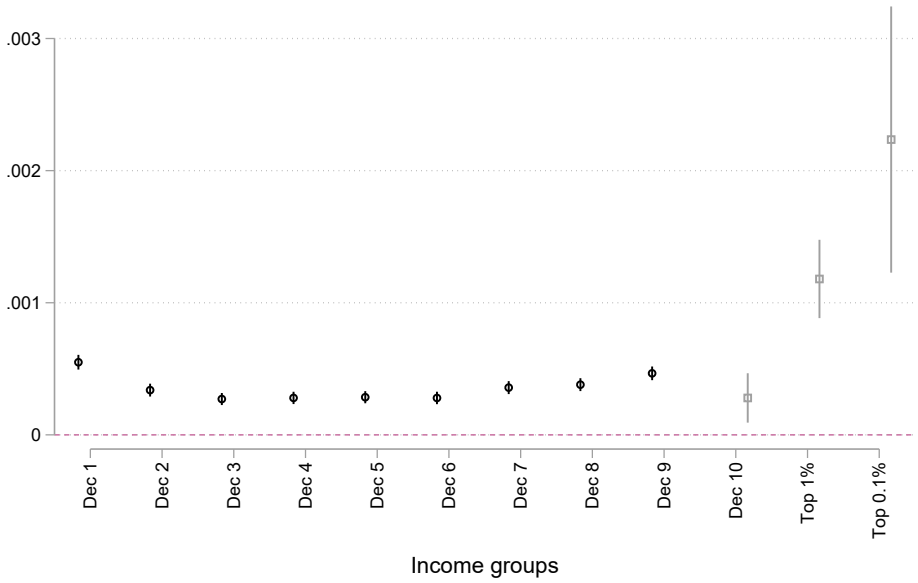
Figure 11: Subgroup analysis: education fields



(a) Whole sample **(b)** Top 10%

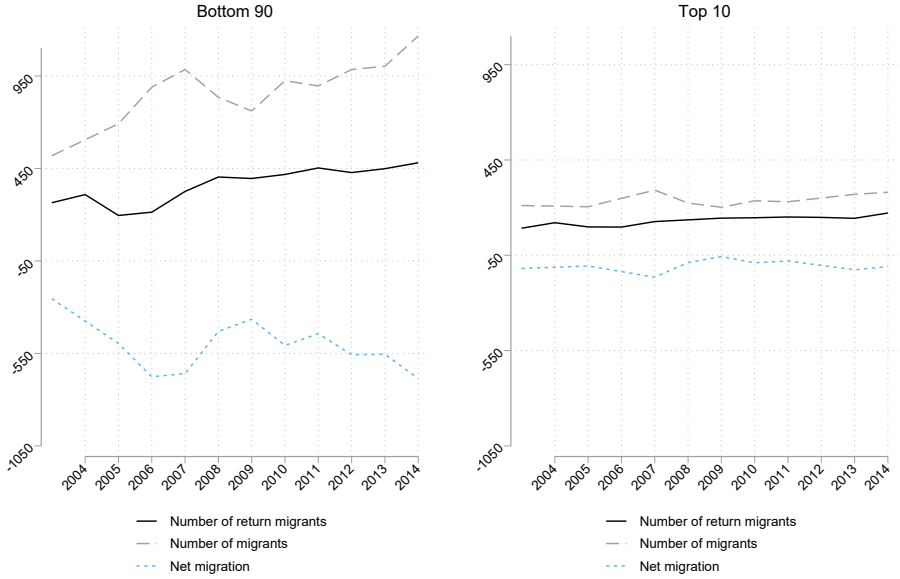
Notes: The Figure displays subgroup results for different education fields, separately for the bottom 90% and top 10% income earners. The plotted estimates correspond to coefficient β in Equation 6. This Equation is estimated separately for each subgroup. The model corresponds to the main identification strategy that includes country and person-time fixed effects, country-wise trends, and country level and time-varying controls.

Figure 12: Interaction terms between income group and log net-of-tax rate



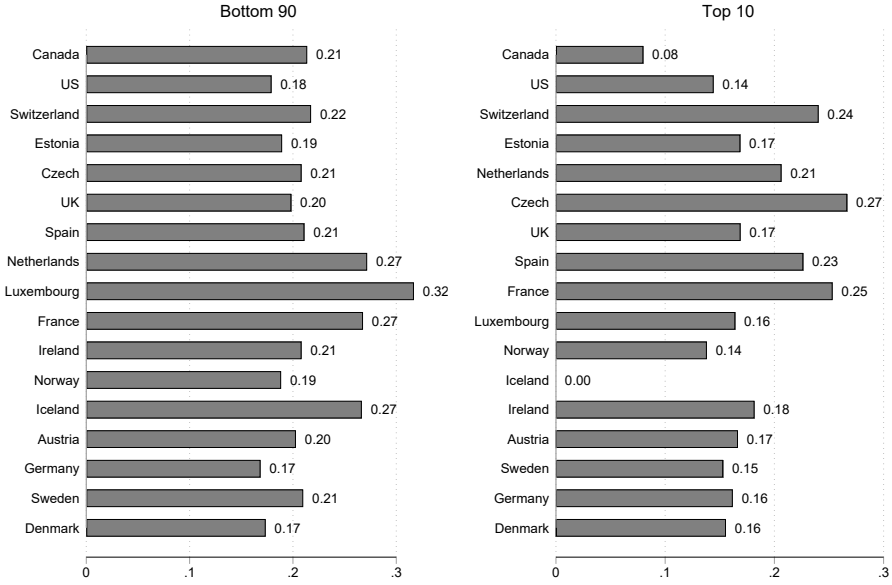
Notes: This figure plots heterogeneous impacts by different income groups. The plotted estimates represent the interaction term between the net-of-tax rate and the respective income group, estimated with a model similar to Equation 6. This analysis is distinctive in that it incorporates decile-specific interaction terms into the natural logarithms of $\ln(1-\tau^c_{i,t})$ and $\ln(w^c_{i,t})$. Similar to the main identification strategy, country and person-time fixed effects, country-wise trends, and country level and time-varying controls are added.

Figure 13: Net migration by income decile



Notes: This figure presents the trends in net migration categorized by income groups in 2003–2014. The left panel shows data for the bottom 90% of the income earners, while the right panel focuses on the top 10%. The solid line represents the number of return migrants, individuals who have emigrated and then returned to Finland. The dashed line indicates the number of migrants, which includes all individuals who have moved from Finland to another country. Finally, the dotted line illustrates the net migration, calculated as the difference between the number of migrants and the number of return migrants.

Figure 14: Share of migrants who stay over 5 years abroad



Notes: The Figure shows the shares of migrants who have spent more than five years in different countries, categorized by income groups: the bottom 90% and the top 10%.

Tables

Table 1: Descriptive statistics of whole population and the estimation sample.

	Whole population	Full sample: all	2.5% sample: all	2.5% sample: stayers	Full sample: migrants
Male	0.49	0.50	0.50	0.50	0.53
	(0.500)	(0.500)	(0.500)	(0.500)	(0.499)
Age	40.65	40.27	40.06	40.26	34.42
	(23.21)	(8.389)	(8.421)	(8.391)	(7.197)
Married	0.37	0.55	0.54	0.55	0.44
	(0.484)	(0.498)	(0.498)	(0.498)	(0.497)
Has children	0.65	0.70	0.70	0.70	0.69
	(0.476)	(0.459)	(0.459)	(0.459)	(0.463)
Number of children	1.11	1.16	1.16	1.17	0.96
	(1.268)	(1.126)	(1.125)	(1.125)	(1.107)
Comprehensive	0.46	0.01	0.01	0.01	0.00
	(0.498)	(0.100)	(0.0994)	(0.100)	(0.0679)
Vocational	0.26	0.41	0.41	0.41	0.14
	(0.437)	(0.493)	(0.491)	(0.493)	(0.351)
High school	0.06	0.06	0.06	0.06	0.11
	(0.240)	(0.242)	(0.245)	(0.242)	(0.317)
Lowest tertiary	0.09	0.19	0.18	0.19	0.08
	(0.286)	(0.389)	(0.386)	(0.389)	(0.269)
Bachelor	0.07	0.16	0.16	0.16	0.23
	(0.252)	(0.366)	(0.369)	(0.366)	(0.419)
Master	0.06	0.15	0.16	0.15	0.37
	(0.238)	(0.361)	(0.367)	(0.360)	(0.483)
PhD	0.01	0.01	0.02	0.01	0.06
	(0.0795)	(0.119)	(0.125)	(0.118)	(0.241)
Earnings	16769.42	37813.42	38057.45	37742.63	46848.91
	(24330.3)	(25930.3)	(26090.9)	(25273.6)	(42108.1)
Capital income	1739.76	1794.13	2220.62	2151.30	4156.49
	(56477.9)	(76346.4)	(276269.5)	(280615.3)	(93483.2)
Migrant	0.00	0.00	0.03	0.00	1.00
	(0.0435)	(0.0347)	(0.183)	(0.000)	(0.000)
Observations	64,337,176	14,487,278	374,700	361,746	12,954

Notes: The table presents key descriptive statistics. Column (1) details figures for the whole population, Column (2) for the full estimation sample, Columns (3) and (4) show data for a 2.5% sample of all individuals and stayers respectively, and Column (5) focuses on migrants within the full estimation sample. Standard deviations are in in parenthesis.

Table 2: Individual-level estimates: whole sample

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.4183***	-0.0001***	0.0004***	0.0005***	0.0005***	0.0005***
	(0.00016)	(0.00001)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Log Earnings	-0.0529***	0.0000***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.00006)	(0.00000)	(0.00000)	(0.00000)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.4369	-0.0001	0.0004	0.0005	0.0005	0.0005
Foreign elasticity	-190.2149	-0.0440	0.1903	0.2119	0.2064	0.2071
N	6758712	6758712	6758712	6758712	6758712	6758712
R-squared	0.040	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect, whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls, and model (5) country-year linear trends. Base categories for year and country are not included in column (5). In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table 3: Individual-level estimates: annual earnings in the top decile

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.3967***	0.0000	0.0004***	0.0004***	0.0005***	0.0003**
	(0.00007)	(0.00002)	(0.00009)	(0.00010)	(0.00012)	(0.00014)
Log Earnings	-0.0554***	0.0001***	0.0000**	0.0001**	0.0001**	0.0001**
	(0.00004)	(0.00001)	(0.00002)	(0.00002)	(0.00003)	(0.00003)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.4144	0.0000	0.0004	0.0005	0.0005	0.0004
Foreign elasticity	-202.7444	0.0019	0.2090	0.2285	0.2436	0.1770
N	26056386	26056386	26056386	26056386	26056386	26056386
R-squared	0.043	0.996	0.996	0.996	0.996	0.996

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010.

Table 4: Individual-level estimates: annual earnings below the top decile

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.4213***	-0.0001***	0.0003***	0.0004***	0.0003***	0.0003***
	(0.00018)	(0.00000)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Log Earnings	-0.0526***	0.0000***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.00006)	(0.00000)	(0.00000)	(0.00000)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.4401	-0.0001	0.0003	0.0004	0.0003	0.0003
Foreign elasticity	-186.1722	-0.0517	0.1389	0.1565	0.1372	0.1297
N	6059088	6059088	6059088	6059088	6059088	6059088
R-squared	0.040	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table 5: The response of migration to consumption (=disposable income), in 100,000 euro

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Consumption	-0.2739***	0.0003***	0.0001	0.0000	0.0001	0.0002*
	(0.00014)	(0.00003)	(0.00006)	(0.00007)	(0.00008)	(0.00009)
Top 1 × cons	0.0643***	0.0008***	0.0008***	0.0008***	0.0008***	0.0008***
	(0.00041)	(0.00012)	(0.00012)	(0.00012)	(0.00012)	(0.00012)
Top 0.1 × cons	0.0274***	0.0012***	0.0012***	0.0012***	0.0012***	0.0012***
	(0.00108)	(0.00046)	(0.00046)	(0.00046)	(0.00046)	(0.00046)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
N	26056386	26056386	26056386	26056386	26056386	26056386
R-squared	0.013	0.996	0.996	0.996	0.996	0.996

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * p<0.10, ** p<0.05, *

Table 6: Semi-elasticity at the top of the distribution

Top	Earnings	Coeff	N	Semi-elast, in 100,000 €	Cons	Semi-elast, in €	Elasticity
10	64604	0.0002	0.9675	0.0002	38720	2.067E-09	0.0001
1	11785	0.0010	0.9819	0.0010	56039	1.018E-08	0.0006
0.1	366428	0.0022	0.9353	0.0024	177891	2.2521E-08	0.0042
0.01	547621	0.0028*	0.9353	0.0032*	265776	3.244E-08	0.0086
0.001	1650000	0.0091*	0.9353	0.0097*	820248	9.712E-08	0.0797
max	12000000	0.0418*	0.9353	0.0493*	5400000	4.611E-07	2.4899

Notes: The earnings levels are computed directly from the data. The corresponding consumption levels (Cons) are calculated using the tax calculator. The coefficients and the corresponding semi-elasticities are based on estimates until the top 0.1% income level and extrapolated linearly for income levels exceeding 0.1. The extrapolated semi-elasticities are marked with *. The semi-elasticity reported in Column 5 is from estimations where incomes are expressed in hundred thousand euro, and the semi-elasticity in euro is depicted in Column 6. The corresponding elasticity is calculated by multiplying the semi-elasticity with the consumption level.

Table 7: Return migration results for all

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log net-of-tax Rate	2.4629***	0.0070	0.1851***	-0.0610	-0.2947***	-0.2933***
	(0.02093)	(0.01932)	(0.06632)	(0.07670)	(0.08153)	(0.09649)
Log Earnings	1.1663***	-0.0095	0.0101	-0.0178	-0.0625***	-0.0558***
	(0.01112)	(0.00785)	(0.01636)	(0.01735)	(0.01822)	(0.02021)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	2.5739	0.0073	0.1935	-0.0637	-0.3080	-0.3065
N	122456	122456	122456	122456	122456	122456
r2	0.271	0.651	0.651	0.652	0.654	0.656

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person stays in their residence country or moves back to Finland. All models include the person-year fixed effects. Model (2) adds a home country fixed effect whereas Models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and Model (5) adds country*linear year trends. In Column (6), all the above are replaced with country*year fixed effects. Individual year clustered standard errors are in parentheses.*p<0.10 **p<0.05 ***p<0.01.

Table 8: Return migration results for the top 10

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log net-of-tax Rate	2.1631***	0.0540	-0.1601	-0.3826**	-0.4993**	-0.5106**
	(0.03932)	(0.03853)	(0.16435)	(0.18549)	(0.20312)	(0.24413)
Log Earnings	0.8856***	-0.0176	-0.0530	-0.0691	-0.0833*	-0.0764
	(0.02330)	(0.01667)	(0.04053)	(0.04260)	(0.04591)	(0.05162)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	2.2606	0.0565	-0.1673	-0.3999	-0.5218	-0.5336
N	26674	26674	26674	26674	26674	26674
r2	0.250	0.582	0.583	0.584	0.585	0.592

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person stays in their residence country or moves back to Finland. All models include the person-year fixed effects. Model (2) adds a home country fixed effect whereas Models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and Model (5) adds country*linear year trends. In Column (6), all the above are replaced with country*year fixed effects. Individual year clustered standard errors are in parentheses.*p<0.10 **p<0.05 ***p<0.01.

Table 9: Return migration results for bottom 90 migrants

	(1)	(2)	(3)	(4)	(5)	(6)
	decision	decision	decision	decision	decision	decision
	b/se	b/se	b/se	b/se	b/se	b/se
Log net-of-tax Rate	2.6302***	0.0165	0.3413***	0.1056	-0.1756*	-0.1637
	(0.02464)	(0.02238)	(0.07344)	(0.08652)	(0.09159)	(0.11020)
Log Earnings	1.2624***	-0.0042	0.0303*	0.0019	-0.0547***	-0.0479**
	(0.01255)	(0.00887)	(0.01800)	(0.01927)	(0.02012)	(0.02257)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	2.7488	0.0172	0.3567	0.1104	-0.1835	-0.1711
N	95782	95782	95782	95782	95782	95782
r2	0.282	0.670	0.671	0.672	0.674	0.676

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person stays in their residence country or moves back to Finland. All models include the person-year fixed effects. Model (2) adds a home country fixed effect whereas Models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and Model (5) adds country*linear year trends. In Column (6), all the above are replaced with country*year fixed effects. Individual year clustered standard errors are in parentheses.*p<0.10 **p<0.05 ***p<0.01.

Online Appendices

A Earnings Predictions

In the individual-level analysis, to be able to predict earnings for each individual in each possible destination country, we first need to estimate an augmented Mincerian earnings regression:

$$lnw_i = \beta_0 + \beta_1 education_i + \beta_2 X_i + \epsilon_i, \tag{A1}$$

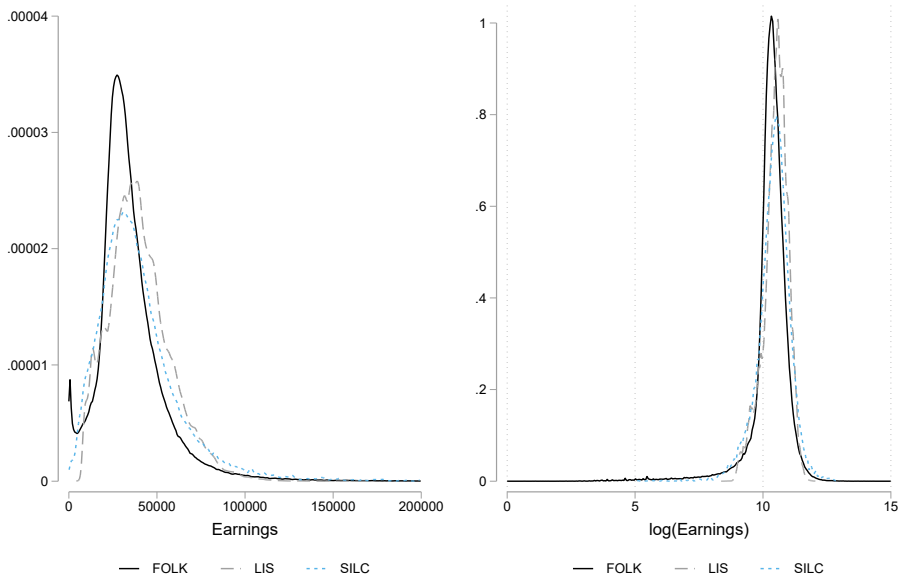
where lnw_i is the logarithm of annual earnings for individual i, $education_i$ is a dummy variable for primary, secondary or tertiary education, X_i is a set of covariates and ϵ_i is the disturbance term of the earnings regression, which includes all the unobservable characteristics. The covariates included are age, age squared, gender, whether married, whether any dependent children, industry[29], occupation[30] and an interaction term[31] between occupation and education. In addition, a year dummy is included for each LIS wave year. Equation A1 is estimated separately for each country using LIS data. The coefficients estimated from Equation A1 are then linked to FOLK data to obtain a prediction of earnings for each individual in each possible destination country. Figure A1 illustrates Kernel densities for the observed and predicted earnings in Finland. The earnings distributions are depicted through the Epanechnikov Kernel, utilizing bandwidths of 750 for earnings levels and 0.02 for logarithmic earnings. Our main prediction method that utilizes the LIS data tends to slightly overestimate the earnings.

[29]Industry categories are: agriculture, mining, construction, retail, transport, financial, real estate, public administration, other community. Norway, Canada and Estonia do not have an industry variable available or the information on industry is missing in LIS

[30]The categories are based on the ISCO-10 occupation classification and are: managers, professionals, technicians, clerical, service, agricultural, forestry, craft, plant and machine operators, elementary occupations, and armed forces occupations. Sweden, Norway, Canada and Estonia do not have an occupation variable available or information on occupation is missing in LIS.

[31]If occupation is missing, the interaction term is taken between industry and occupation. If both occupation and industry are missing, there is no interaction term for the country.

Figure A1: Observed vs. predicted Kernel earnings distributions in Finland



Notes: The Figure illustrates the observed and predicted earnings distributions. The earnings predictions are detailed more comprehensively in this Appendix and in Section 3.2. The solid black line shows the observed earnings distribution using FOLK data. Predictions based on EU-SILC data are indicated by a blue dotted line, while those utilizing LIS data are depicted with a dashed grey line. The left panel illustrates earnings distributions in levels, whereas the right panel depicts earnings using a logarithmic scale. The earnings distributions are depicted through the Epanechnikov Kernel, utilizing bandwidths of 750 for earnings levels and 0.02 for logarithmic earnings.

B Additional regression analyses

Table A1: Individual-level estimates using LIS for EU-SILC-countries : whole sample

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.5230***	-0.0002***	0.0004***	0.0004***	0.0004***	0.0004***
	(0.00030)	(0.00001)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Log Earnings	-0.0703***	0.0000***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.00008)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.5551	-0.0002	0.0004	0.0005	0.0004	0.0004
Foreign elasticity	-162.6159	-0.0622	0.1263	0.1369	0.1271	0.1222
N	5158095	5158095	5158095	5158095	5158095	5158095
R-squared	0.040	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * p<0.10, ** p<0.05, *** p<0.010.

Table A2: Individual-level estimates using LIS for EU-SILC-countries: annual earnings in the top decile

	(1)	(2)	(3)	(4)	(5)	(6)
	decision	decision	decision	decision	decision	decision
	b/se	b/se	b/se	b/se	b/se	b/se
Log Retention Rate	-0.4760***	-0.0003***	0.0004***	0.0004***	0.0004***	0.0003**
	(0.00011)	(0.00003)	(0.00009)	(0.00010)	(0.00013)	(0.00015)
Log Earnings	-0.0693***	0.0000***	-0.0001**	-0.0000*	-0.0001**	-0.0001**
	(0.00004)	(0.00001)	(0.00002)	(0.00003)	(0.00003)	(0.00004)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.5052	-0.0003	0.0004	0.0004	0.0004	0.0003
Foreign elasticity	-179.0159	-0.1074	0.1356	0.1573	0.1465	0.1111
N	21519150	21519150	21519150	21519150	21519150	21519150
R-squared	0.043	0.996	0.996	0.996	0.996	0.996

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. * p<0.10, ** p<0.05, *** p<0.010.

Table A3: Individual-level estimates using LIS for EU-SILC-countries: annual earnings below the top decile

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.5287***	-0.0002***	0.0003***	0.0004***	0.0003***	0.0003***
	(0.00032)	(0.00001)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Log Earnings	-0.0702***	0.0000***	0.0001***	0.0001***	0.0001***	0.0001***
	(0.00008)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.5611	-0.0002	0.0003	0.0004	0.0003	0.0003
Foreign elasticity	-155.2620	-0.0577	0.0964	0.1049	0.0900	0.0834
N	4620270	4620270	4620270	4620270	4620270	4620270
R-squared	0.040	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table A4: Individual-level estimates using EU-SILC: whole sample

	(1)	(2)	(3)	(4)	(5)	(6)
	decision	decision	decision	decision	decision	decision
	b/se	b/se	b/se	b/se	b/se	b/se
Log Retention Rate	-0.5426***	-0.0002***	0.0004***	0.0005***	0.0004***	0.0004***
	(0.00035)	(0.00001)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Log Earnings	-0.0350***	-0.0000**	0.0000***	0.0000***	0.0000***	0.0000***
	(0.00015)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.5667	-0.0002	0.0005	0.0005	0.0004	0.0004
Foreign elasticity	-230.4668	-0.0688	0.1849	0.2002	0.1792	0.1682
N	5632260	5632260	5632260	5632260	5632260	5632260
R-squared	0.046	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table A5: Individual-level estimates using EU-SILC: annual earnings in the top decile

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.5028***	-0.0002***	0.0008***	0.0009***	0.0012***	0.0014***
	(0.00015)	(0.00003)	(0.00009)	(0.00009)	(0.00011)	(0.00013)
Log Earnings	-0.0846***	0.0000***	0.0004***	0.0004***	0.0007***	0.0011***
	(0.00003)	(0.00001)	(0.00005)	(0.00005)	(0.00007)	(0.00010)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.5251	-0.0002	0.0008	0.0009	0.0012	0.0015
Foreign elasticity	-259.3641	-0.0862	0.4181	0.4668	0.6162	0.7187
N	21713655	21713655	21713655	21713655	21713655	21713655
R-squared	0.060	0.996	0.996	0.996	0.996	0.996

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table A6: Individual-level estimates using EU-SILC: annual earnings below the top decile

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.5499***	-0.0002***	0.0002***	0.0003***	0.0002***	0.0001***
	(0.00038)	(0.00001)	(0.00002)	(0.00002)	(0.00002)	(0.00002)
Log Earnings	-0.0310***	-0.0000***	-0.0000***	-0.0000***	-0.0000***	-0.0000***
	(0.00016)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.5743	-0.0002	0.0003	0.0003	0.0002	0.0001
Foreign elasticity	-220.6453	-0.0748	0.0997	0.1105	0.0720	0.0497
N	5049240	5049240	5049240	5049240	5049240	5049240
R-squared	0.046	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level linear probability model regressions where the outcome is whether the person moves to a particular country. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table A7: Instrumental variable results for the entire sample

	(1)	(2)	(3)	(4)	(5)	(6)
	decision	decision	decision	decision	decision	decision
	b/se	b/se	b/se	b/se	b/se	b/se
Log Retention Rate	-0.6956***	-0.0001***	0.0004***	0.0005***	0.0006***	0.0007***
	(0.00058)	(0.00001)	(0.00003)	(0.00004)	(0.00005)	(0.00006)
Log Earnings	-0.0838***	0.0000***	0.0001***	0.0001***	0.0002***	0.0002***
	(0.00014)	(0.00000)	(0.00001)	(0.00001)	(0.00001)	(0.00001)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.7265	-0.0001	0.0005	0.0005	0.0006	0.0008
Foreign elasticity	-316.3515	-0.0541	0.1988	0.2179	0.2753	0.3302
KP stat	345178	340947	183340	164321	157064	143762
KP p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Weak id test	1676668	1589619	149991	141547	102089	85759
N	5708877	5708877	5708877	5708877	5708877	5708877
R-squared	0.065	0.998	0.998	0.998	0.998	0.998

Notes: The table reports individual-level IV regressions where the outcome is whether the person moves to a particular country. Log net-of-tax rate is instrumented with 1 - marginal tax rate. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. Kleibergen-Paap test statistic and the associated p value, with the null of the 1st stage being underidentified, are presented at the bottom of the table. The weak identification test is the Kleibergen-Paap first stage F test. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.

Table A8: Instrumental variable results for the top 10 group

	(1) decision b/se	(2) decision b/se	(3) decision b/se	(4) decision b/se	(5) decision b/se	(6) decision b/se
Log Retention Rate	-0.3915***	-0.0002***	0.0005***	0.0005**	0.0010***	0.0015***
	(0.00073)	(0.00002)	(0.00019)	(0.00020)	(0.00034)	(0.00054)
Log Earnings	0.0249***	0.0000***	0.0000**	0.0000*	0.0001**	0.0002***
	(0.00002)	(0.00000)	(0.00001)	(0.00001)	(0.00002)	(0.00008)
Finland FE	No	Yes	No	No	No	No
Country FE	No	No	Yes	Yes	Yes	No
Country*Year FE	No	No	No	No	No	Yes
Country-trends	No	No	No	No	Yes	No
GDP	No	No	No	Yes	Yes	No
Unemployment rate	No	No	No	Yes	Yes	No
Domestic Elasticity	-0.4155	-0.0002	0.0005	0.0005	0.0010	0.0016
Foreign elasticity	-130.2478	-0.0603	0.1624	0.1722	0.3211	0.4989
KP stat	34374	34353	18557	17197	9241	4345
KP p-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Weak id test	854703	783167	25874	24322	12214	5226
N	698716	698716	698716	698716	698716	698716
R-squared	0.064	0.996	0.996	0.996	0.996	0.996

Notes: The table reports individual-level IV regressions where the outcome is whether the person moves to a particular country. Log net-of-tax rate is instrumented with 1 - marginal tax rate. All models include person-year fixed effects. Model (2) adds a home country fixed effect whereas models (3) to (5) add country fixed effects. Model (4) contains, in addition, time-varying macro controls and model (5) country-year linear trends. In column (6), the covariates in (1) to (5) are replaced with country-year fixed-effects. Individual-year-clustered standard errors are in parenthesis. The analysis uses a 2.5% random sample of non-migrants and corresponding inverse-probability weights for non-migrants. Kleibergen-Paap test statistic and the associated p value, with the null of the 1st stage being underidentified, are presented at the bottom of the table. The weak identification test is the Kleibergen-Paap first stage F test. * $p<0.10$, ** $p<0.05$, *** $p<0.010$.