Taxation, migration and location of innovative activity

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1. Introduction

Innovative activity is an important determinant of economic growth.[1] An increased relative magnitude of innovative activity[2] combined with its high profitability makes it interesting from both company and country perspective.[3] From a country point of view the possible positive spillovers further boost the attractiveness of this activity.[4] Due to the spillovers, attracting innovative activity from other countries into its own territory, for instance by using a preferential tax treatment, is likely to increase economic activity of a country by more than what the profit-shifting margin alone would suggest. The positive prospects in turn increase incentives for countries to participate in base eroding tax competition taking place by reduced tax rates and special tax regimes.[5] However, even if a country succeeds in attracting suitable investments, in order to enjoy the economic boost from the innovative activity it also needs to attract suitable labor force, and in the absence of either one of these this growth enhancing activity is frustrated.

The possible lack of relative competitiveness in attracting both the innovative activity and the most important companies of large multinational enterprises (MNEs) into its territory has recently been debated in Finland. Regarding the location of companies, HS (30.3.2016) reports that the number of leading companies (within a MNE) located in Stockholm region is more than 6-times

[1] For a recent overview of intangibles and growth, see Andrews and de Serres (2012).
[2] For an illustration of an increased relative magnitude of innovative activity, see Hall (2001).
[3] In addition to high profits following from the high profitability of this activity, it may also provide new profit-shifting possibilities for companies.
[4] The objectives of firms and society differ as the firms maximize their private returns (profits) whereas the society maximizes its social returns (profits + taxes).
[5] Tax competition between countries has shown to provide incentives for tax rate race to the bottom (for theoretical reasoning, see Zodrow and Mieskowski 1986 and Wilson 1986; for empirical evidence of strategic behavior between governments in choosing their corporate income tax rates, see Devereux et al. 2008 and Devereux and Loretz 2013). The tax competition has been seen as a major problem which causes base erosion and a problem that a single country cannot resolve by itself, but a broader approach is required. OECD has tackled this problem by its Base Erosion and Profit Shifting (BEPS) project that provides suggestions for countries in order them to reform their tax systems to become more resilient against base erosion and profit-shifting (OECD 2013a,b). In line with the OECD initiatives, the European Union (EU) has also been active in the fight against profit-shifting and base erosion by providing two directives. The Anti-Tax Avoidance Directive (ATAD) describes the details that will be later implemented in the national tax laws (EC 2016a). The other directive suggests moving into a Common Consolidated Corporate Tax Base (CCCTB), which would reduce the possibilities for profit-shifting taking place via highly mobile tax bases. (EC 2016b,c).

the number of those in Helsinki region.[6] This difference arises despite the similarities between regions: they both have attracting features, like a good infrastructure and a stable environment for companies to operate.[7] One way to affect the attractiveness of a country from a company location perspective is by affecting its taxation.[8] This mimeo sheds light on how taxation affects the location of innovative activity.

The mimeo begins by providing reviews on two branches of economic literature. The first of these (section 2.1) focuses on the underlying determinants of emigration (movements of labor force). The second literature review (section 2.2) concentrates on the effects of taxation on locations of companies and their intangible assets, like patents. The literature reviews are followed by a descriptive analysis on emigration flows from Finland (section 2.3). Section 3 concludes.

2. Taxation, migration and location of innovative activity

2.1 Emigration from rich and redistributive countries – Literature review

Economic literature on international migration has been interested in the determinants of migration and the factors influencing individual migration decisions. One of the central ideas in the literature is that economic migrants tend to be *self-selected* so that they differ in their individual labor market characteristics from those who do not migrate. In case of positive self-selection, that would mean that the migrants would be, on average, better educated, more able or ambitious, or otherwise have characteristics that are beneficial in the labor market. Conversely, in case of *negative self-selection* the migrants would be less educated and less able. Whether migration flows are characterized by such selection patterns is an important question, as economic and social consequences of migration for both sending and receiving countries depend on the nature of selection.

The literature on self-selection of migrants is largely based on the human capital theory that sees migration as an investment into one's own human capital. The connection between migration and human capital was first made by Sjaastad (1962), who argued that a prospective migrant compares the value of the earnings opportunities available in the labor market at each alternative destination to the earnings in the home country, and chooses the destination which maximizes the net present value of lifetime earnings net of the cost of moving. The framework is best suited for analyzing labor migration, as it ignores the fact that people migrate for numerous reasons other than income maximization, like family reunification, seeking refuge, or being attracted by culture or climate in the destination. As both gains and costs for migrating differ between people

[6] Helsingin Sanomat (30.3.2016) reports that the number of leading companies (within a MNE) located in Stockholm region is 125, whereas in Helsinki region the corresponding number is only 19.
[7] For a comparison of the similarities between Finland and Sweden, see Korkman and Suvanto (2013).
[8] Sweden has recently had some difficulties in keeping companies in its territory. Due to an increase in the stability-related payments, a large banking group, Nordea, made a choice to relocate its' headquarter from Sweden to Finland. (YLE 16.3.2017, Taloussanomat 6.9.2017)

with different individual characteristic, migrants can differ systematically from the populations in the sending countries. Many of the studies on self-selection rely on the Roy model of occupational choice that was first applied to international migration by Borjas (1987). The basic idea of the model is that as long as skills are sufficiently transferable across countries, migrant selection is determined by the relative return to skill in the sending and destination countries. Individuals compare earnings opportunities in different countries, and if return to skill, net of migration costs, is higher in the destination country, migrants would be drawn from the top end of the source country's skill distribution. Conversely, if the destination country exhibits lower returns to skill, migrants would come disproportionately from the lower end of the source country's skill distribution.

The empirical results by Borjas (1987) do indeed suggest a negative cross-section correlation between the earnings of immigrants in the United States and income inequality in the source countries. The seminal paper was followed by a body of literature focusing on the U.S. context and on migration flows from poor to rich countries. The studies typically compare earnings distributions of migrants and non-migrants and they have provided mixed evidence on the predictions of the Roy model. Chiquiar and Hanson (2005) study Mexican migrants to the United States and find that they are drawn from the middle of the Mexican skill distribution, despite the fact that income inequality is higher in Mexico than in the United States. The analysis merges information from the U.S. census on the characteristics of the Mexican migrants with information from the Mexican census on the characteristics of the Mexican non-migrants. Because the merged data did not report the earnings of migrants *prior* to the move, pre-migration earnings were predicted based on observable characteristics of the migrants. However, more recent studies on migration from Mexico to the United States by Fernández-Huertas Moraga (2011) and Kaestner and Malamud (2014) use survey data that report the *actual* pre-migration earnings and find evidence of negative selection. They also conclude that one explanation for the different finding could be that the migrants differ from non-migrants in ways that are not observed in the data, and the predicted earnings would underestimate the degree of negative selection.

Partially conflicting evidence is also offered by Grogger and Hanson (2011) who find that migrants between different source-destination country pairs are positively self-selected in terms of education. The study uses data on migrant stocks residing in 15 high-income OECD destinations by source country and education level as of 2000, combined with measures for skill-group specific earnings in the source and destination countries. The authors suggest that the observed positive selection is best accounted for by a variant of the Roy model that explains migration decisions with absolute wage differences between source and destination countries, whereas in Borjas (1987) selection is driven by relative wage differences. This difference between two variants of a theoretical model proves to be important when the aim is to explain migration from poor to rich countries, as absolute skill-related earnings differences are typically larger in rich destination

countries.[9] A further difference between the models is how they treat migration costs. Borjas (1987) assumes that migration costs are a constant fraction of individual earnings in the country of origin, whereas in the model suggested by Grogger and Hanson (2011) the costs are fixed. Other theoretical models that have challenged the way the cost are modelled in Borjas (1987) include Chiswick (2000), who shows that allowing for high fixed migration costs or allowing higher ability to lower migration costs can lead to positive selection. Also other factors like liquidity constraints may contribute to positive selection of migrants (see e.g. McKenzie and Rapoport 2010, Belot and Hatton 2008). In spite of the differences in both theoretical and empirical results on the nature of selection, Grogger and Hanson (2011) also support the basic hypothesis that cross-country differences in earnings opportunities are central in driving international migration. Further, the study finds that migrants for a source-destination country pair are more educated relative to non-migrants, the larger the skill-related difference in earnings between the destination country and the source, a result in line with the predictions of the Roy model as applied in Borjas (1987).

When it comes to migration from a rich and redistributive country like Finland, the theoretical predictions from different variants of the model are similar; as the returns to skills in Finland are relatively low, the emigrants should be positively selected. If migration costs were fixed or negatively correlated with skills, this would only strengthen the positive self-selection.[10] Similarly, it does not matter for the qualitative predictions of the model whether migration is assumed to be driven by absolute or relative wage differences. Even when the theoretical predictions are relatively straightforward, there have been few empirical studies of the self-selection of migrants from a relatively egalitarian country to see whether the migrants are indeed positively self-selected. Many studies on migration from European countries study selection issues in a historical context; see Wegge (1999, 2002), Abramitzky and Braggion (2006), Abramitzky, Boustan, and Eriksson (2012) and Ferrie (1996). A number of studies using contemporary data sources support the hypothesis that migrants from rich and relatively redistributive countries should be positively selected.

Parey et al.(forthcoming) focus on graduates from German universities to study self-selection of high-skilled emigrants from Germany. The study uses survey data on German University graduates and divides destination countries to countries with lower and higher returns to high skills based on a measure of earnings inequality among university graduates. As the data doesn't have information on the earnings of emigrants in Germany, the study compares distributions of predicted earnings between migrants and non-migrants. The predicted earnings are constructed by estimating earnings regressions for graduates who work in Germany and then using estimated

[9] The model that explains migration with absolute wage differences is consistent with individuals having linear utility functions, whereas the model where migration is driven by relative wage differences is consistent with individuals having log-linear utility functions.

[10] For comparisons of gross wage premia from tertiary education across countries see Boarini and Straus (2010). A recent paper studying returns to cognitive skills is Hanushek et al. (2015). The study finds significant cross-country differences, with relatively low returns in Denmark and other Nordic countries.

return to observed individual characteristics to construct an estimate of earnings independently of whether the individual works in Germany or abroad.[11] The study then compares cumulative distribution functions of predicted earnings between graduates who work in Germany, graduates in less equal countries (countries with higher returns to skill) and graduates in more equal countries (countries with lower returns to skill). According to results, migrants to less equal countries are positively self-selected, and migrants to more equal countries are negatively selected, consistent with Borjas (1987). The study also decomposes predicted earnings to identify the characteristics that explain the observed self-selection patterns. Migrants to less equal countries had better University grades and had attended better Universities, and tended to come from families with higher socio-economic backgrounds. Migrants to more equal countries had studied academic subjects with lower labor market returns, were more likely to be female, and had attended universities with lower labor market prospects.

Study by Borjas et al. (forthcoming) on Danish emigrants provides an extensive analysis of the self-selection patterns of emigrants in the Nordic context. The paper examines the self-selection of working age emigrants using administrative data for the entire Danish population from 1995 to 2010.[12] Because returns to skills in Denmark are relatively low, the canonical Roy model predicts that the emigrants should be positively selected in the sense that the expected earnings of the migrants exceed the expected earnings of the stayers. The theoretical part of the paper extends the Roy model to show that the same conditions that predict that migrants are positively self-selected in the sense of a difference in expectations of the income or ability distributions also predict that the distributions for the migrants will first-order stochastically dominate the distributions for those who choose to stay. The modified theoretical framework also distinguishes between selection in observable and selection in unobservable characteristics. The empirical analysis uses administrative data to investigate how migrants and non-migrants differ in their education, pre-emigration earnings and other characteristics. The study also investigates how migrants and non-migrants differ in terms of unobservable earnings ability, as measured by residuals from earnings regressions controlling for education and a typical selection of background characteristics. The empirical results are in line with the theoretical predictions. That is, Danish emigrants are higher educated than those who stay, and positively self-selected both in terms of earnings and in terms of residuals from the wage regressions. Further, there is also evidence of a stochastic dominance relationship for both earnings and wage regression residual distributions between migrants and non-migrants. Intuition for the stochastic dominance result is that it implies that there is positive selection throughout the income distribution. That is, the self-selection doesn't take place for instance only among high-earners, but throughout the income

[11] The method of using predicted earnings can lead to biased results if migrants are non-randomly self-selected in a way not captured by the observable variables used in the earnings regressions. The authors deal with the problem using sample-selection correction (Heckman (1979)).

[12] A caveat of the paper is, that is focuses on migrants that have been working full-time the year before migration, as it uses annual earnings as the main ability measure that is compared between groups. Therefore, much can't be said about self-selection of groups like students or unemployed.

distribution. Even among those with low earnings or education levels, those who earn a little bit more are a little bit more likely to migrate. Further, self-selection to other Nordic countries is also positive, but weaker than to other destinations. This finding is also in accordance with the Roy-model, as returns to skill are relatively low in all Nordic countries. The analysis concentrates on long-term migrants who have spent at least five years abroad, but self-selection patterns for migrants who have returned within five years are also analyzed. Selection patterns for shorter term migrants are qualitatively similar to long-term migrants, but the selection is somewhat weaker. The finding is in line with the Borjas and Bratsberg (1996) implication that return migration accentuates the type of selection of the initial immigrants.[13] Nonetheless, the differences between short-term and long-term migrants are small compared to the differences between migrants and non-migrants.

Also Gould and Moav (2016) analyze self-selection of emigrants from a rich country in terms of residual earnings. The empirical part of the paper uses data on Israeli emigrants before migration to analyze how the level of income inequality within a country attracts and retains high-skilled workers. The propensity to emigrate from Israel increases with education. However, the study does not observe an increase in the emigration rates with wages or residual wages that are obtained after controlling for education, age, occupation and other controls. Rather, Israeli emigrants tend to come from the middle of the residual wage distribution. On the theory side, the authors propose a model that allows unobservable skills to have two components, one internationally applicable and one country-specific. In contrast to the model in Borjas et al. (forthcoming), the direction of self-selection with respect to residual income is a priori unclear. The paper also investigates whether selection patterns vary systematically across different industries and occupations. According to the results, differences in returns to skills across sectors can explain the observed self-selection patterns.

An early study on migration from Finland is Lundborg (1991). The paper examines migration flows from Finland, Denmark and Norway to Sweden in 1968-1985. The study finds that the destination country real income, employment, and the level of social welfare subsidies are positively correlated with migration flows, whereas corresponding source country characteristics and migration flows are negatively correlated. A more recent study on emigration from Finland is Pirttilä (2004). The study uses combined micro data from the labor force survey and emigration statistics from 1990-1999 to analyze individual level factors explaining emigration and return migration. Controlling for background characteristics, highly educated individuals were five times more prone to emigrate than individuals with only secondary education. Analysis of return migration does not reveal a similar pattern. The study also analyses country-level panel data on OECD countries for 1990-2000 to study whether destination country characteristics like growth, employment and overall tax rate can explain the allocation of Finnish emigrants. According to the analysis, the migration has not been directed to countries with low tax rates. In contrast, the

[13] See Dustmann and Görlach (2016) for an excellent survey on temporary migration.

study offers weak evidence that countries with high taxes and public expenditure attracted Finnish migrants. Destination country characteristics explaining Finnish migration included higher growth rate and GDP, shorter distance from Finland, large population and high foreign direct investment. English as an official language in the destination country also increased migration for all migrants, but not for the highly educated. In general, the results are in line with what one would expect based on economic theory: the highly educated tend to migrate more often and they tend to go to rich and fast-growing large countries that are close to the home country.

Analysis of migration behavior of dual earner couples by Junge et al. (2014) utilizes full population administrative data from Denmark. The paper presents a theoretical model of migration decision of dual-earner couples and shows that the home-country earnings of the primary earner should increase the probability of migration whereas the effect of the earnings of the secondary earner could go either way. Using administrative data, they study separately migration decisions for couples in which men earn more and couples in which women earn more and show that the elasticity of the probability of emigration with respect to the earnings of the primary earner is indeed large, whereas the elasticity with respect to the secondary earner's income is smaller and varies in sign.

Even if numbers of migrants leaving a rich and redistributive country might not be alarming, positive selection of migrants can be a problem for public finances if highly skilled individuals with high tax payments emigrate. The theory of tax competition predicts that the overall level of redistribution should be lower when labor is mobile (e.g. Cremer et al. (1996) provide a survey). In the theoretical framework of the Roy-model outlined above, cross-country differences in taxation are a determinant of the earnings dispersion and returns to skills that are driving migration decisions. Even though theoretical arguments concerning the effects of tax differentials to migration are relatively straightforward, there is very little empirical research on the topic.[14] This is partly due to lack of applicable micro data and methodological challenges in estimating causal effects.

An interesting study on the effects of redistribution on internal migration is Abramitzky (2009). The study uses longitudinal data to analyze the extent to which extensive redistribution practiced by kibbutzim affects the self-selection of those who leave and of those who enter. During the period of analysis, kibbutzim fully equalized their members' incomes, providing an ideal setting to test self-selection of those who leave an egalitarian community. The study finds strong support for the hypothesis that migrants' self-selection depends on returns to skills in the origin and in the destination. Kibbutz-leavers were more skilled than those who stayed and other rural migrants

[14] A small literature has studied the mobility of people between jurisdictions. Kirschgassner and Pommerehne (1996) and Liebig, Puhani, and Souza-Poza (2007) both study mobility across Swiss Cantons in response to Canton taxes; Feldstein and Wrobel (1998), Bakija and Slemrod (2004), and Young and Varner (2011) on mobility across US states as a response to state income taxes.

and those who had left a kibbutz had higher residual earnings than other rural migrants and non-migrants living in cities at a later point.

An important study on migration effects of taxes in the Nordic context is Kleven et al. (2014). The study analyzes the effects of a preferential tax scheme for high-skilled foreigners in Denmark. The scheme was introduced in 1991 and it allows new immigrants with high earnings to be taxed at a considerably lower tax rate for a duration of three years. The scheme also applies to Danish citizens who have lived abroad and had tax residence abroad for at least 3 years, and at least 10 years since 2011. According to the results, the scheme doubled the number of highly paid foreigners in Denmark relative to slightly less paid foreigners who were not eligible for the scheme. Further, the study finds a negative effect of the reduction in the tax rate on pretax earnings of the foreign migrants. Importantly, migrants who stayed in the country beyond the three year scheme experienced a sharp earnings increase with the increase in the tax rate. It should be noted however, that the scheme targets workers with very high earnings and the tax reduction is very generous. Eligibility for the scheme required earnings above a threshold corresponding roughly to 99th percentile of the distribution of individual earnings in the country and it reduces the tax rate on labor earnings to a flat rate of about 30%, whereas workers above the threshold would have average tax rates of about 55%.

Two recent papers study the effects of taxation to migration decisions of particularly high skilled highly mobile groups. Kleven et al. (2013) study the migration of professional football players across European clubs and find evidence of strong mobility responses to tax rates. There is also evidence that high-ability players displace low-ability players, and that players are sorted according to their ability as location elasticities are negative at the bottom of the ability distribution and positive at the top. As professional football players are a particularly mobile group of workers, it is unclear how much one can generalize from the findings. The authors suggest that the results provide an upper bound on the migration response for taxes. As the upper bound is large, the results suggest that tax induced mobility might be of economic significance on labor markets as well. Akcigit et al. (2016) study the effect that taxation has on mobility of top inventors. They use international panel data on European and US Patent Offices combined with data on international marginal top tax rates. The study finds that top tax rates strongly affect location choices of top 1% inventors. The type and structure of companies where inventors work also seem to affect migration decisions, as inventors working for multinationals are more likely to respond to tax differentials by migrating. Further, inventors are less likely to migrate if their employer has a significant share of its innovative activity in the current country of residence. Similarly to football players, also top inventors are much more mobile than most workers.

An alternative way to investigate whether migration decisions can be supposed to depend on taxation is to use survey evidence. Kauppinen and Poutvaara (2012) use survey evidence on Danish emigrants to study how attitudes towards income redistribution in Denmark differ

between those who stay and those who have migrated to different destinations and lived there for at least 5 years. The study finds a striking gender difference among emigrants. Majority of emigrant men are opposed to increasing income redistribution in Denmark, whereas majority of emigrant women support it. The gender difference is smaller among those who stay in Denmark. Importantly, the study finds that men who have migrated to destinations outside Nordic countries and men who have migrated for work related reasons are more negative towards redistribution.

A natural conclusion from the literature on migrant self-selection is that there is no clear tendency toward one type of self-selection of migrants, but that various country-level features play an important role. However, there is clear evidence that self-selection from a country like Finland, where incomes are relatively equally distributed and highly redistributed, is probably positive with respect to various factors. This is already confirmed in Pirttilä (2004) for the 1990's with respect to education levels. What types of self-selection patterns take place currently is a subject for further empirical work. However, the economic and social consequences of self-selection are less clear and generally poorly understood. Even if the migrants are more able or educated than those who stay, a further question is whether the degree of self-selection and number of migrants are large enough to matter for the sending country. Biavaschi and Elsner (2015) use non-parametric and calibrated simulation methods to quantify the impact of self-selection in case of two mass migration episodes from Norway in the 19th and from Mexico in the 20th century. The study compares the income per capita under self-selection to a counterfactual scenario in which the migrants are selected neutrally from the sending country population. According to their findings, self-selection only accounted for a 0-1% absolute difference in GDP per capita, and the authors note that their results do not support the often heard claim that migrant self-selection would have significant welfare implications for the sending and receiving countries. They also show in simulations that for migrant self-selection to have a significant welfare impact, the skills of migrants would have to differ substantially from those of non-migrants or the shares of migrants would have to be dramatically larger than they were.

Further, the evidence on the impact of taxes on international migration is still scarce. The aforementioned studies providing clear evidence of tax-induced migration of football players and top inventors focus on exceptionally mobile, highly-skilled and high-earning segments of the labor force, and whether one can learn much about the mobility decisions of individuals in other occupations and industries is questionable. It is also not theoretically clear whether highly progressive income taxation provides an incentive for the high-skilled to migrate, as also the high-skilled consume tax-funded public goods and services that are characteristic to the Nordic model. Further, political ideology can play a role as well. Even the fiscal net payers might prefer to participate in the highly redistributive system, if it corresponds with their views of a just society.

It is also important to note, that even if the central aspects of international migration can be accounted for using an economic model where differences in returns to skill and migration costs determine migration behavior, better understanding of both causes and consequences of

migration are needed to guide policy**.** Pekkala Kerr et al. (2016) provide an extensive discussion of factors determining international high-skilled migration flows. The authors argue that factors like advantages of agglomeration, productivity spillovers, intra-firm relocation of workers in multinational enterprises, and the links between higher education abroad and overseas job-opportunities both affect migration flows and make the consequences of migration unclear. Even though emigration of high-skilled workers increases concerns over brain drain, high-skilled emigration can also create connections to global sources of knowledge and capital. Further, some of the migrants will return with increased skills and social capital.

2.2 Taxation and location of companies and their intangible assets – Literature review

Tax differences between countries provide a MNE with additional possibilities to affect its tax bill. Profits in a low-tax country are subject to lighter taxation which encourages investing in such countries. The motivation to locate the intangible assets, like patents and trademarks, at an affiliate in a low-tax country is supported, in addition to the general incentive derived from maximizing the overall net-of-tax profits of the corporate group, by two specific issues.[15] First, intangible assets are seen as a major driver of corporate profits. Choosing a low-tax country for their location provides a favorable tax treatment for the income arising from these assets. Second, due to the difficulties of tax authorities in determining their arm's length prices, the intangible assets also constitute a major source for profit-shifting opportunities of companies. In addition, compared to tangible assets they are also in many cases easier to relocate.

The economic literature has pinpointed several ways the MNEs have responded, in line with their incentives, to tax differences between countries. The two main channels by which the taxation has been shown to affect MNE behavior are profit-shifting and investment decisions (geographical distribution of investments).[16] While engaged in profit-shifting a MNE exploits the tax rate differences between countries and the profits are transferred into low-tax countries typically by transfer pricing, debt-shifting or intangible assets. The investment decisions in turn include both extensive and intensive margin choices. The extensive margin choice refers to the discrete location choice of an investment and the intensive margin choice to the size of the investment, given its location. The location decisions of both the companies and their intangible assets may be considered to be related to both the profit-shifting and investment decision channels.[17] This section reviews the economic literature regarding the effects of taxation on investment decisions

[15] Both of these issues also provide countries incentives to attract these investments into their territories.

[16] Taxation has been shown to affect along several margins, like the choices of organizational form and financial form, the amount of profit-shifting from high-tax countries to low-tax countries and the investment decisions, with the two last ones being considered the most relevant ones (see De Mooij and Ederveen 2008). Devereux (2007), Dharmapala (2014, 2016) and Egger and Stimmelmayr (2017) provide excellent reviews on the other margins.

[17] Grubert and Slemrod (1998) show that the intangible assets are major determinants of both profit-shifting and investment.

and profit-shifting of companies.[18] From a country point of view these effects are of importance as they affect its tax base and without knowledge about their magnitudes the country remains incapable for choosing its tax parameters in an optimal way.

Investment decisions and headquarter locations

FDI investments provide one margin along which the taxation affects the company behavior.[19] Buettner and Ruf (2007) study the FDI location decisions among German MNEs and show that especially statutory tax rate has a strong effect on these decisions. Also not only the overall FDI, but both the extensive and intensive margins of FDI are shown to be affected by taxation.[20] De Mooij and Ederveen (DE 2008) find a semi-elasticity of -0.8 for the intensive margin and -3.2 for the extensive margin.[21] Feld and Heckemeyer (FH 2011) find an overall semi-elasticity for FDI to be -3.35 (the corresponding estimate in DE is -3.3).[22] DE and FH also share the conclusion that the location decision is more responsiveness to tax differences than the size of the investment. Davies et al. (2016) also study the FDI responses to taxation and find that both intensive and extensive margin decisions are affected by taxation, and that the extensive margin is the more responsive one. In addition to the quantity also the FDI quality has shown to respond to the corporate tax rates. Becker, Fuest and Riedel (2012) study the European multinationals and show that the quality effects account for up to 40% of the total corporate tax effects on the corporate tax base. Thus, the governments should not only care about the size of inbound FDI flows, but also their quality.

[18] Note that even if we concentrate on taxation issues, also non-tax related issues, like the size of foreign market, its growth prospects, wage and productivity levels abroad, the foreign regulatory and legal environment, and distance from parent country are observed to affect the location decisions. For other than tax-related determinants underlying the location decisions, see reviews of Görg and Greenaway (2004), Barrios et al. (2005) and Mayer and Ottaviano (2007). Also, in addition to research on particular margins (FDI, profit-shifting, etc.), few studies have estimated the elasticity of corporate taxable income (Gruber and Rauh 2007, Dwenger and Steiner 2012, Devereux, Liu, Loretz 2014). They all find that the tax bases respond negatively to the corporate tax rates.

[19] These incentives arise also without profit-shifting motive.

[20] For early contributions, see Slemrod (1990), Hines (1996) and Devereux and Griffith (1998); for reviews, see Hines (1997, 1999), de Mooij and Ederveen (2003, 2006, 2008), Feld and Heckemeyer (2011) and Kari and Ropponen (2014). Egger et al. (2009) show that the outbound of FDI is positively related to the parent and host country tax burden and negatively associated with bilateral effective tax rates.

[21] Semi-elasticity of -0.8 tells that a 10 percentage-point increase in tax rate is related to 8% decrease in the size of investment.

[22] As the semi-elasticities do not straightforwardly show the relation to Laffer curve, let us try to illustrate this relationship. The tax rate (τ) increase affects the government tax revenue $T = \tau I(\tau)$ as follows: $\frac{dT}{d\tau} = I(\tau) + \tau\frac{dI(\tau)}{d\tau} = I(\tau) + \tau I(\tau)\frac{dln(I(\tau))}{d\tau} = I(\tau)[1 + \tau\frac{dln(I(\tau))}{d\tau}]$, where $I(\tau)$ is the tax base and $\frac{dln(I(\tau))}{d\tau}$ the semi-elasticity of the tax base. Thus, a tax rate increase implies a tax revenue increase if the semi-elasticity times tax rate ($\tau\frac{dln(I(\tau))}{d\tau}$) is in absolute terms less than 1. Combining the Finnish corporate tax rate of 20% with the semi-elasticity for the FDI (assuming FDI semi-elasticity (-3.3) and the semi-elasticity of tax base to coincide) suggests a tax rate increase in order the tax revenue to be maximized. Note that here we do not take into account the externalities and the assumption about the similarity of the semi-elasticities may be questioned. Note also that the elasticity estimates are not sufficient statistics for the welfare calculations in the presence of sheltering of income and in the presence of deductions (see Chetty 2009, Saez et al. 2012 and Doerrenberg et al. 2017).

In addition to the general FDI investment responses to taxation, let us now consider a particular location-related response to taxation, relocation of headquarters. Voget (2011) studies the relocations of headquarters in the context of international taxation.[23] He shows that an additional tax due in the home country upon repatriation of foreign profits has a positive effect on the probability of relocation. An increase in the repatriation tax by 10 percentage points raises the share of relocation by 2.2 percentage points. Barrios et al. (2012) also study the international taxation and multinational firm location decisions. According to their results both host and additional parent country taxation have a negative impact on the location decisions of MNEs, with the marginal effect being between -0.6 and -0.9. Dishinger, Knoll and Riedel (2013) study the role of headquarters in multinational profit-shifting strategies in Europe. They show that profit-shifting activity from subsidiaries to parents is larger when the parent has a lower corporate tax rate than the subsidiary, compared to cases where the parent's tax rate is higher (profit-shifting towards the parent). Nakata (2017) studies the characteristics of companies that relocate their headquarters and finds that younger and larger companies are more prone to headquarter relocations. Moreover, the size of headquarter is positively related to the likelihood of relocation.

The effects of taxation on FDI are shown to vary with respect to some details of a tax system, especially according to anti-tax avoidance measures. Buettner et al. (2014) study the effects of two anti-tax avoidance regulations, thin-capitalization rules (TCRs) and transfer pricing (TP) regulations, on FDI. They find that the presence of TCRs doubles the tax-rate sensitivity of FDI, compared to not having a TCR.[24] The reduced profit-shifting possibilities following from TCRs makes the FDI location decisions more important for companies. With respect to TP regulations Buettner et al. (2014) do not find any significant effects on FDI. Egger and Wamser (2015) study the impacts of German CFC rule on German MNEs. They show that the CFC legislation has a significant and economically large effect on MNEs' real activity abroad. According to their results, the CFC legislation not only affects passive income (in line with the original purpose), but also active income making the use of these rules less effective. It is also worth noticing that the CFC rules may have differing effect depending on whether countries use credit or exemption method for their repatriated profits.[25]

Arulampalam et al. (2017) study the impact of taxes on international location of targets in mergers and acquisition (M&A). They find that the host country tax rate has a significant negative impact on the probability of an acquisition in that country. According to their results a 10%

[23] Two clear incentives for multinationals to relocate their headquarters across borders occur. First, they have an incentive to avoid controlled foreign company (CFC) rules, which restricts their ability to defer taxes and shift profits within the group. The results support this hypothesis as the probability of relocating headquarters is larger in the presence of CFC legislation. Second, multinationals under the tax credit (as opposed to tax exempt) have an incentive to avoid residual taxes on their foreign source dividends.

[24] Finland has applied from 2014 on an interest barrier (IB) that is targeted, like the TCRs, to prevent such profit-shifting activity, which takes place via debt-related instruments.

[25] Altshuler and Grubert (2001) study the effects on the location decisions of the US MNEs in case US replaced its credit system by a more common exemption system. They conclude, however, that they do not find consistent evidence that the FDI location decisions would be significantly changed as a response.

reduction in the tax rate of a country increases the probability of an acquirer choosing that country by about 10%. They also find that the size of the effect depends on the characteristics of both the company and the country.

Profit-shifting and innovative activity

The literature on profit-shifting has well established the negative relationship between taxation and outward profit-shifting from the country. This literature has largely emerged from studies following an influential research paper by Hines and Rice (1994), which studies how the tax rates relate to the pre-tax profits.[26] The first set of these studies employs macro-level data and provides in absolute value larger negative effects than the more recent studies employing micro-level data.[27] However, independently of the data being employed, numerous studies in this literature have confirmed the negative relationship between taxation and profit-shifting behavior (see e.g. Dharmapala 2014).[28] Also, while the earlier studies provide indirect evidence of profit-shifting behavior with the interpretation being that firms exercise profit-shifting by using transfer pricing or debt-shifting, the more recent studies, like Dishinger and Riedel (2011), provide direct evidence on the profit-shifting behavior by showing another way for profit-shifting: the choice of locations of intangible assets. This branch of literature is reviewed below.

Innovative activity shows itself in several ways. Large amounts of intangible assets, intellectual property (IP), patents or R&D investments within a company are typically considered as an indication of high level of innovative activity. The availability of data on these measures for researchers has boosted the literature considering their responses to taxation. This branch of literature has well established the negative relationship between taxation and the measures for innovative activity. Next we discuss about research on each of these measures in turn.

Dishinger and Riedel (DR 2011) show with the AMADEUS data that the European MNEs locate their *intangible assets* within a group in relatively low tax rate countries. A decrease in the average tax differential to other group affiliates by 1 percentage point is estimated to raise a subsidiary's intangible property investment by around 1.7% on average (semi-elasticity of -1.7).

[26] Pre-tax profits are considered to represent the sum of "true" and "shifted" income in their approach.

[27] Barrios and d'Andria (2016) show in their study that the reduction in profit-shifting can be traced back to business cycle movements and conclude that there is no long-term reduction in profit-shifting. They also find that the sectoral differences in profit-shifting are a serious concern for the welfare. In addition they show that the largest part of profit-shifting takes place via transfer pricing.

[28] The studies following the Hines-Rice -approach find negative semi-elasticities with the consensus estimate being around -0.8 (Heckemeyer and Overesch 2013 and Dharmapala 2014). According to this estimate a 10 percentage point higher tax rate differential (between high-tax parent and low-tax subsidiary) is related to 8 percent higher pre-tax profits of an affiliate in a low-tax country. Huizinga and Laeven (2008) provide in their study also country-specific estimates for the response to tax rate differences. For Finland they report a semi-elasticity of -0.58 and thus according to their estimate the reaction to the Finnish tax rate seems to be close to the average consensus effect. Compared to the consensus estimate the earlier studies provide larger semi-elasticities (e.g. Hines and Rice: -2.25) than the more recent studies (e.g. Huizinga and Laeven 2008, Dharmapala and Riedel 2013, Heckemeyer and Overesch 2013).

Beer and Loeprick (2015) employ the ORBIS database to study the drivers of global profit-shifting by MNEs (intangible asset endowments and supply-chain complexity). They show that the intangible asset endowments of subsidiaries of MNE groups explain aggregate profit-shifting trends. They show that subsidiaries with no intangibles react to an incremental increase of the tax rate by reducing reported profits by 0.76%, whereas subsidiaries with above median intangible endowment decrease their profits by 1.2%.

The availability of the data on patent applications and other patent-related information has made researchers capable for studying the relationship between corporate income tax rate and *patent-related activity*.[29] This literature, which focuses on a particular type of intangible assets, has well established the negative relationship between the level of corporate income tax rate and the location of patent-related activity.[30]

Ernst and Spengel (2011) combine the AMADEUS data with the European Patent Office (EPO) data to study the effects of R&D tax incentives and the corporate tax rates on patenting. They find a positive impact of R&D tax incentives and a negative impact of the statutory corporate income tax rate on patenting. A ten percentage point decrease in the corporate income tax rate is estimated to increase average count of patent applications of an average company by 0.09.

Karkinsky and Riedel (2012) also use AMADEUS data on European MNEs and the EPO data to study whether and to what extent corporate taxation affects the location of patents within a multinational group. They show that both the corporate tax rate and the tax rate differential to other group affiliates exert a negative impact on the firm's number of patent applications. A one percentage point CIT rate increase reduces the number of patent applications by 3.5% among the European multinational affiliates (semi-elasticity of -3.5). The result supports the view that the MNEs distort the location of patents in favor of affiliates with relatively low corporate taxes.

Böhm et al. (2015) study the effects of corporate taxes on R&D investments and patent holdings (also with EPO). They show that high patent income tax rate increases the probability of relocating patent ownership to other countries. They also find that countries with low patent income taxes attract ownership of especially such foreign-invented patents that have a high earnings potential. A 10 percentage point increase in the patent income tax is estimated to increase the relocation probability by 0.3 percentage points (or 3.7%, at the sample mean).

Dinkel and Schanz (2015) analyze the impact of taxation on the location of patents within multinational groups. They show that the statutory tax rate, the taxation of royalties, R&D

[29] Patents in turn constitute a substantial part of IP. (Griffith et al. 2014)

[30] Hines and Jaffe (2001) show that tax incentives influence patenting patters, and that foreign and domestic innovative are complements at the firm level. Mutti and Grubert (2008) provide indirect evidence on the locations of patent ownership and license agreements by considering the locations of royalty payments. They provide evidence that US MNEs structure their operations in a way that royalty income is allocated to the low-tax countries. Hall and Harhoff (2012) provide a survey on the economics of patents and Hall et al. (2014) on the economic literature on the choice of intellectual property protection by firms.

incentives, and transfer pricing rules explain the patent-location choices of MNEs. In more detail, they show that a parent located in a country with average tax rates on royalties has a 41% higher marginal probability of locating patents abroad than parents in countries with the lowest tax rates in the sample. Their overall conclusion is that multinationals take the taxation of countries into account when making the patent location decisions.

While the locations of patents are shown to respond to taxation, the same holds also for *R&D activity*. Hines (1994) studies the effects of US tax treatment of R&D activities on US MNEs. He shows that the R&D activity is responsive to its tax treatment, with the own-price demand elasticity being between -1.2 and -1.8. Bloom et al. (2002) study the tax impacts of R&D tax credits and show that these tax incentives are effective in increasing R&D intensity among the nine OECD countries employed. They find that a 10% fall in the R&D costs increases the level of R&D with 1% in the short-run, and with about 10% in the long-run. Grubert (2003) also provides evidence supporting the locational responsiveness of R&D to its tax incentives. He shows that the R&D tax incentives affect the relocation of R&D-based intangibles among the US parent corporations and their manufacturing subsidiaries. Wilson (2009) studies the effects R&D incentives among U.S states. He shows that these incentives are effective in increasing in-state R&D, but that close to all of this increase is due to R&D being drawn away from other states. Thomson (2017) studies the effectiveness of R&D tax credits. By exploiting the differences in the average capital-labor ratio of R&D investment across industries he discovers a short-run elasticity of 0.5 for R&D investments.

Ernst et al. (2014) also study the impact of tax incentives on corporate R&D activity. Unlike earlier studies they assess the impact of corporate tax incentives on the *quality* of R&D projects (their innovativeness and earnings potential). Using AMADEUS and EPO data they find that a low tax rate on patent income raises the average profitability and innovation level of the projects undertaken in a country. A 10 percentage point decrease in the patent income tax rate raises patent quality by around 1–5 % on average. Generous R&D tax credits and tax allowances are in contrast found to have a negative impact on project quality.

Pfeiffer and Spengel (2017) study the tax incentives for R&D and their use in tax planning. They argue that the input-oriented R&D tax incentives (like tax credits and tax super-deductions) outperform the output-oriented incentives (like IP-boxes), because the input-oriented R&D incentives have shown to have positive effects on innovative activity and because the output-oriented incentives are prone to tax planning.

Griffith et al. (2014) studies how influential corporate income taxes are in determining where firms choose to legally own *intellectual property* (IP). They show that the recent reforms that give preferential tax treatment to income arising from patents have on average significant effects on the location of ownership of new intellectual property. They also conclude that these reforms could lead to substantial reductions in tax revenue.

As opposed to the above mentioned literature, which focuses either exclusively on patents or does not distinguish between different *types of intangibles*, Dudar and Voget (2016) study the elasticities of different types of intangibles. They employ both the European and US patent and trademark data applications to estimate separate tax elasticities for these two types of intangibles. According to their results the trademarks are more tax sensitive than patents: a one percent increase in royalty income tax rate will on average result into -0.05% to -0.85% decrease in the number of patents and a -0.77% to -3.14% decrease in the number of trademarks in a country.

In addition to corporate tax rates also *patent boxes* as special tax regimes are shown to affect the amount of intangibles assets. As the tax competition using tax rates has levelled off recently and turned into competition employing special tax regimes, like patent boxes, the results regarding responses to these regimes have become highly interesting.[31] Alstadsaeter et al. (2015) disentangle the effects of corporate income taxation from the advantages of patent boxes to study the impacts of patent boxes on R&D and patent locations. They find that patent boxes exert a strong effect on attracting patents (mostly due to their favorable tax treatment). They also find that high-quality patents are more sensitive to taxes than other patents. Evers et al. (2015) study the intellectual property (IP) Box regimes in 12 European countries. They show that the treatment of expenses relating to IP income is an important factor in determining the effective tax burden. In more detail, they find that regimes that allow expenses to be deducted at the ordinary corporate income tax rate, as opposed to the lower IP Box tax rate, may result in negative effective average tax rates. These regimes may thereby provide a subsidy to unprofitable projects. Bradley et al. (2015) find in their study that the patent box regimes yield a 3 percent increase in new patent applications for each percentage point reduction in the tax rate on their income. Schwab and Todtenhaupt (2016) study the cross-border externalities of patent box regimes within MNEs. They find that the spillover effect of foreign patent box (tax cut) raises domestic R&D investment. According to their results the implementation of foreign tax haven increases domestic research activity by 2.3% per tax differential.[32] They also find that patent boxes generate negative spillovers on average patent quality.

To sum up, even if several measures can be used to provide insight on innovative activity, like intangible assets, intellectual property (IP), number of patents and R&D activity, the research regarding each of these measures points to the same direction: taxation seems to affect the amount (and quality) of the innovative activity enhancing issues.

[31] The rapid decrease in the corporate tax rates has recently levelled off (see, e.g. Kari and Ropponen 2014), yet the tax competition between countries has taken other forms, like an increase in the use of patent boxes. Note that despite their increased popularity, the use of patent boxes causes tax base erosion and is therefore considered to be restricted. Actions 5 and 9 (OECD 2015a,b) of the BEPS project Action Plan suggest several anti-tax avoidance measures and are especially concerned about the harmful tax practices (like patent boxes). However, Keen (2001) shows that the special tax regimes, like patent boxes, are not necessarily always undesirable.

[32] An implementation of a foreign patent haven raises on average the R&D activity from one patent every three years to one patent every one and a half years.

2.3 Emigration Finland – Descriptive Analysis

Graph 1a depicts development of annual number of individuals migrating to and from Finland and net immigration for all nationalities. Graph 1b presents corresponding figures concentrating on Finnish citizens. The figures stem from migration statistics provided by Statistics Finland and they describe the moving of individual persons. The data suffers from some undercoverage, as only registered migrations are included. The statistical unit is move, so a person may appear in one year's statistics several times.[33] Looking at graph 1a, the number of immigrants of all nationalities moving to Finland has been rising since the beginning of the 1990's. Also the number of emigrants has been rising more lately, but throughout the period 1990-2016 more individuals have been immigrating than emigrating. Looking at the corresponding figure for Finnish citizens in graph 1b, a somewhat different pattern emerges. Both immigration and emigration have risen, though modestly in comparison to the development of migration for all nationalities. Further, net-immigration stays negative throughout most of the period, being slightly positive only in 1990-1991 and 2008-2009. In 2016, 10 603 Finnish citizens emigrated from the country and 7631 immigrated to Finland.

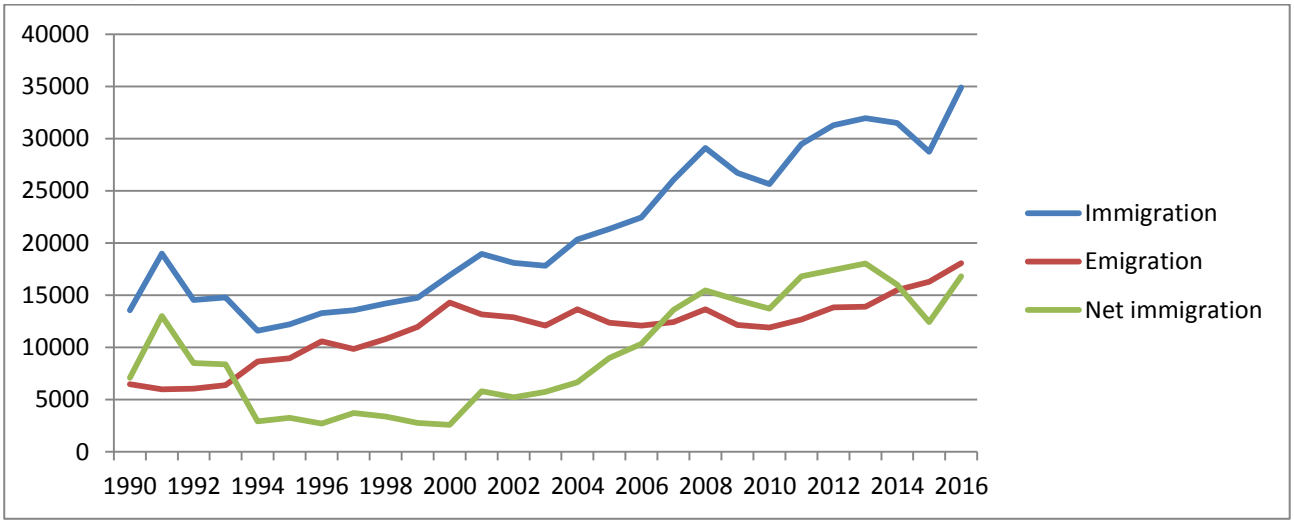
The Database on Immigrants in OECD and non-OECD Countries (OECD 2011) allows comparing emigration rates between countries. Table 1 presents emigration rates, defined as the share of the native population of the country that is living abroad that year, for a selection of European countries. To shed light on selectivity of migration, the emigration rates are calculated separately for three educational categories identifying the level of the highest completed education.[34] The United States is included to provide information on the characteristics that are special for European emigration. For most countries the emigration rate for the tertiary educated is higher than the total emigration rate. Comparing United States to European countries, a notable feature is that the total emigration rate is significantly lower. Further, although the emigration rate for the tertiary educated is higher than the total rate in the United States, the difference is not as pronounced for many European countries. These findings suggest positive selection of migrants in many European countries in general. For Finland, the share of the population living abroad is somewhat higher than for other Nordic countries. However, as the shares describe stocks of citizens living abroad, the difference might be explained by the earlier migration wave from Finland to Sweden that took place in the 1960's and 1970's. The same goes for the differences in the rates for different education categories. Similarly, the differences between the shares of

[33] The data suffers from some undercoverage as the statistics are based on move notifications made by persons permanently resident in Finland on the day of the move. Immigration into Finland from abroad is included if an administrative court approves the place of residence reported by a persons in a move notification as his or her permanent place of domicile.

[34] Education refers to highest education completed and is classified corresponding to the International Standard Classification of Education (ISCED) and education is aggregated in three categories: *basic, secondary and tertiary education.* See UNESCO (2006), International Standard Classification of Education 1997.

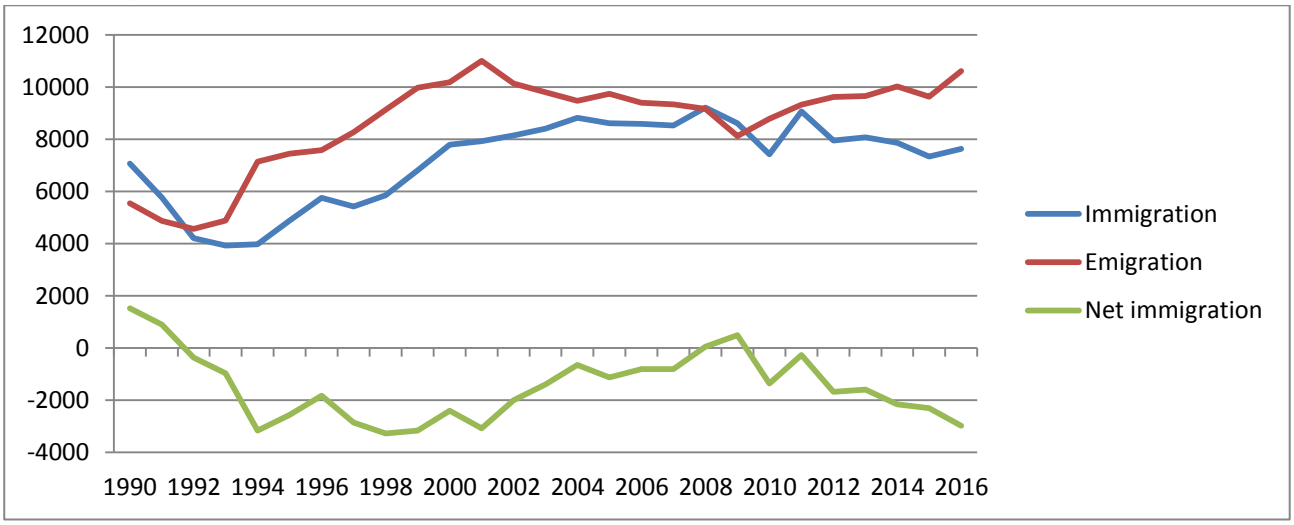
tertiary educated and secondary educated are pronounced for most European countries and reflect positive selection into migration, whereas for Finland the share of the tertiary educated is smaller. Most importantly, the share of the tertiary educated living abroad, that can be interpreted as a rough measure of brain drain, is similar to other West-European countries.

Graph 1a) Numbers of migrants to and from Finland, all nationalities



Source: Statistics Finland.

Graph 1b) Numbers of migrants to and from Finland, Finnish citizens



Source: Statistics Finland (2017).

As the OECD data describes the migrant stocks and not the current flows, it is more informative to use other data sources to study the characteristics of migration flows from Finland. Graph 2a presents numbers of Finnish citizens migrating to and from Finland in 2014 using the Statistics Finland migration statistics. To investigate selectivity of migration, the emigration rates are calculated separately for six educational categories identifying the level of the highest completed education. According to the statistics, the total of 8469 Finnish citizens aged 15 and over emigrated from Finland in 2014. Correspondingly, 6049 citizens aged 15 or over migrated to Finland from abroad, leading to negative net migration of 2420. The absolutely numbers of

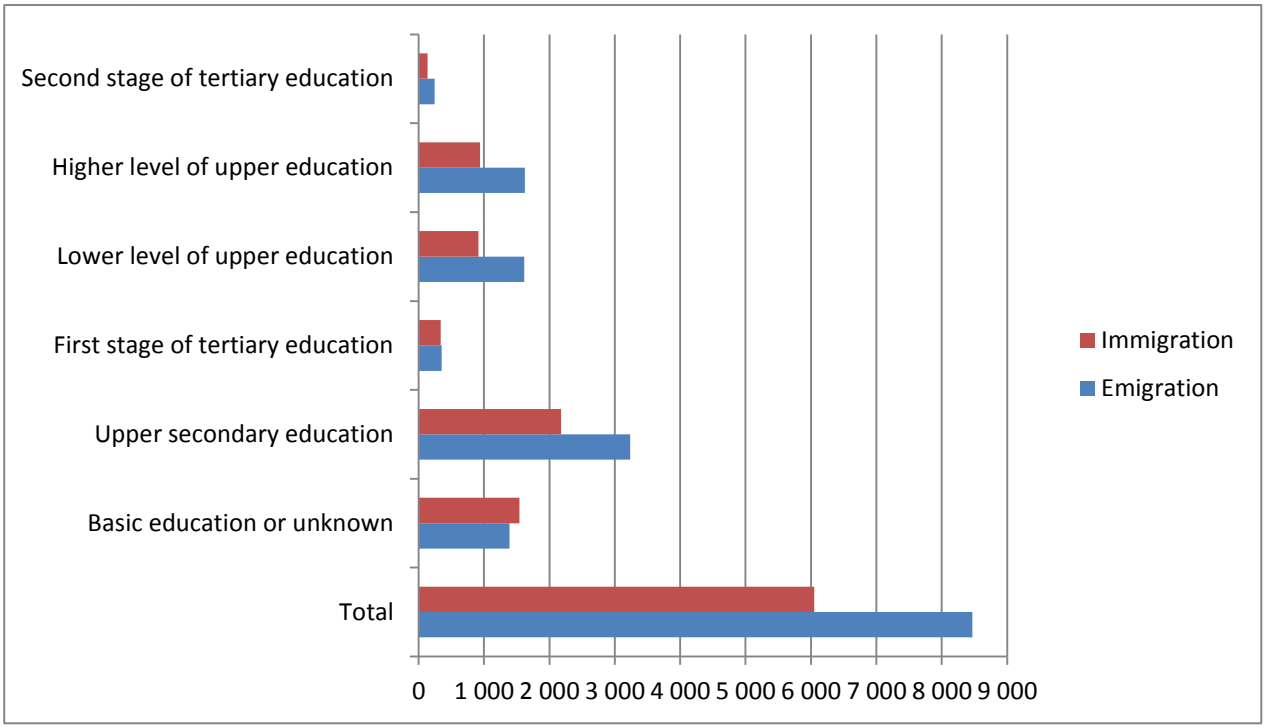
migrants are smaller with higher education levels, reflecting the smaller shares of the population with higher education. Net immigration is slightly negative for most education levels. Graph 2c presents the number of Finnish citizens migrating to most popular destination countries in 2014. The most popular destination is Sweden with 2539 migrants, followed by the United Kingdom (1067 migrants), Germany (7555 migrants) and the United States (719 migrants). The popularity of Sweden with its comparatively heavy income taxation does not support the idea that migration from Finland would be driven by differences in taxation. Sweden is probably attractive partly due to its close geographical and cultural proximity, but the popularity of the other three countries support the idea that differences in returns to skills and taxation could be driving migration decisions. Graph 3a compares corresponding annual emigration rates between education categories. The results point to positive self-selection in terms of education as the rates are higher in higher education categories as the rates for those with higher education are considerably larger than for those in other categories. There are also differences between the higher education categories. For instance, the emigration rate for individuals with PhD or licenciate degrees (second stage tertiary education) was 0,6 %, whereas for lower and higher level of upper education it was 0,4 %. Graph 3b presents the 2014 emigration rates by age groups. Younger and working age individuals are more likely to migrate, the highest rate being 0,5 % for the 25-34 years old.

Table 1. Emigration rates for the non-migrant population aged 15 and over by education level for a selection of countries (in %)

	Total	Primary-educated	Secondary-educated	Tertiary-educated
Finland	6.0	4.6	6.9	6.1
Denmark	4.0	2.2	3.6	6.5
Sweden	3.2	2.3	2.3	5.1
Norway	3.7	4.0	2.5	5.1
Estonia	11.6	6.8	12.6	15.5
Latvia	11.3	6.0	10.4	24.7
Germany	5.4	5.6	4.2	7.7
France	2.7	1.8	2.2	5.1
Romania	6.0	4.1	6.3	12.3
Czech Republic	3.4	3.4	2.5	7.7
Slovakia	8.0	11.1	6.0	9.9
Italy	5.4	5.1	4.9	7.5
Spain	3.2	2.7	5.1	3.0
Greece	7.9	8.2	6.4	8.5
United Kingdom	7.5	3.9	9.6	11.5
United States	0.6	0.6	0.4	1.0

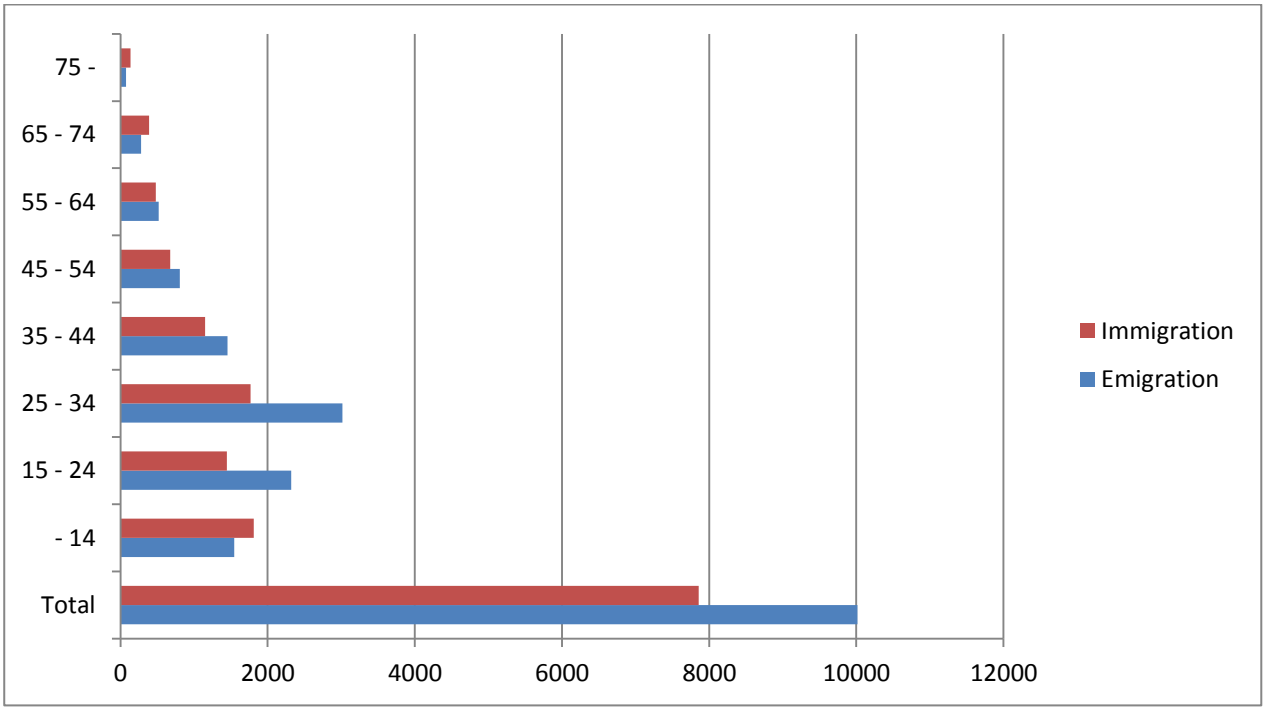
Source: oecd (2011). The table presents emigration rates, defined as the share of the native population of the country that is living abroad that year

Graph 2a) Numbers of immigrated and emigrated Finnish citizens aged 15 or more in 2014



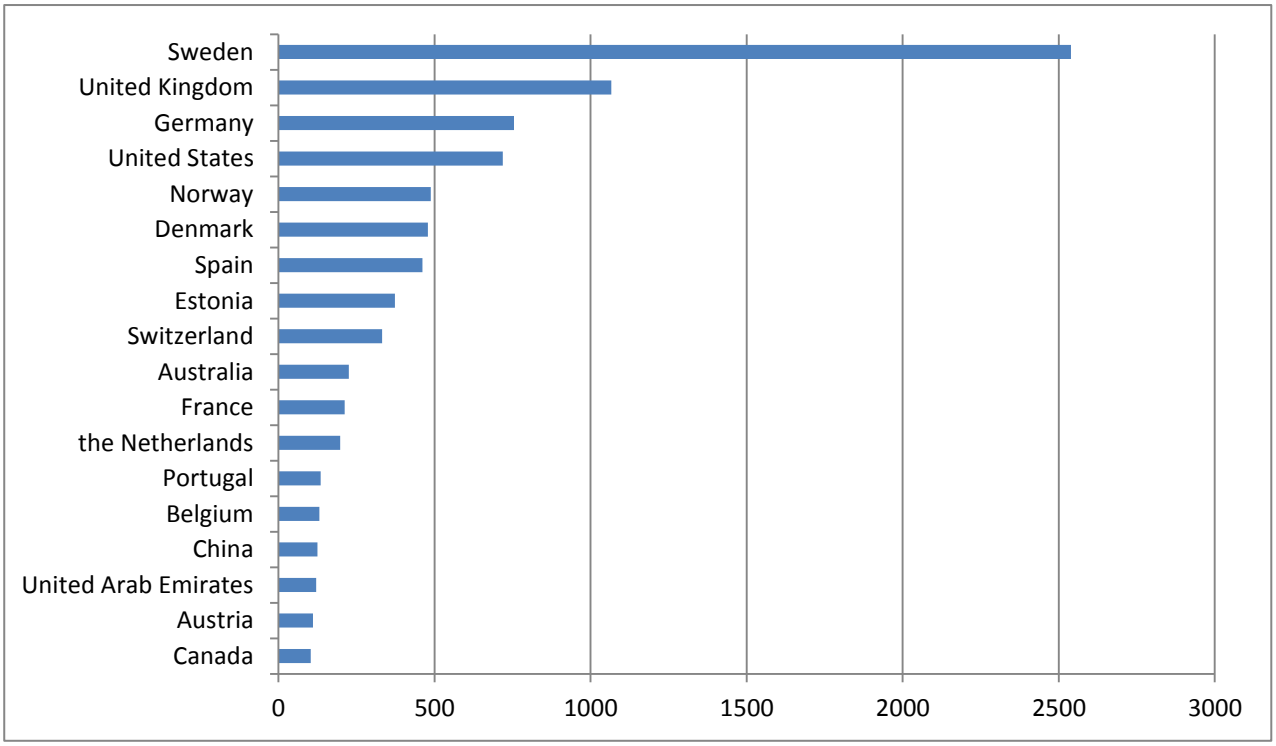
Source: Statistics Finland (2017). The table presents numbers of immigrants and emigrants by education levels. Education is classified according to 1997 Statistics Finland educational classification.

Graph 2b) Numbers of immigrated and emigrated Finnish citizens by age in 2014



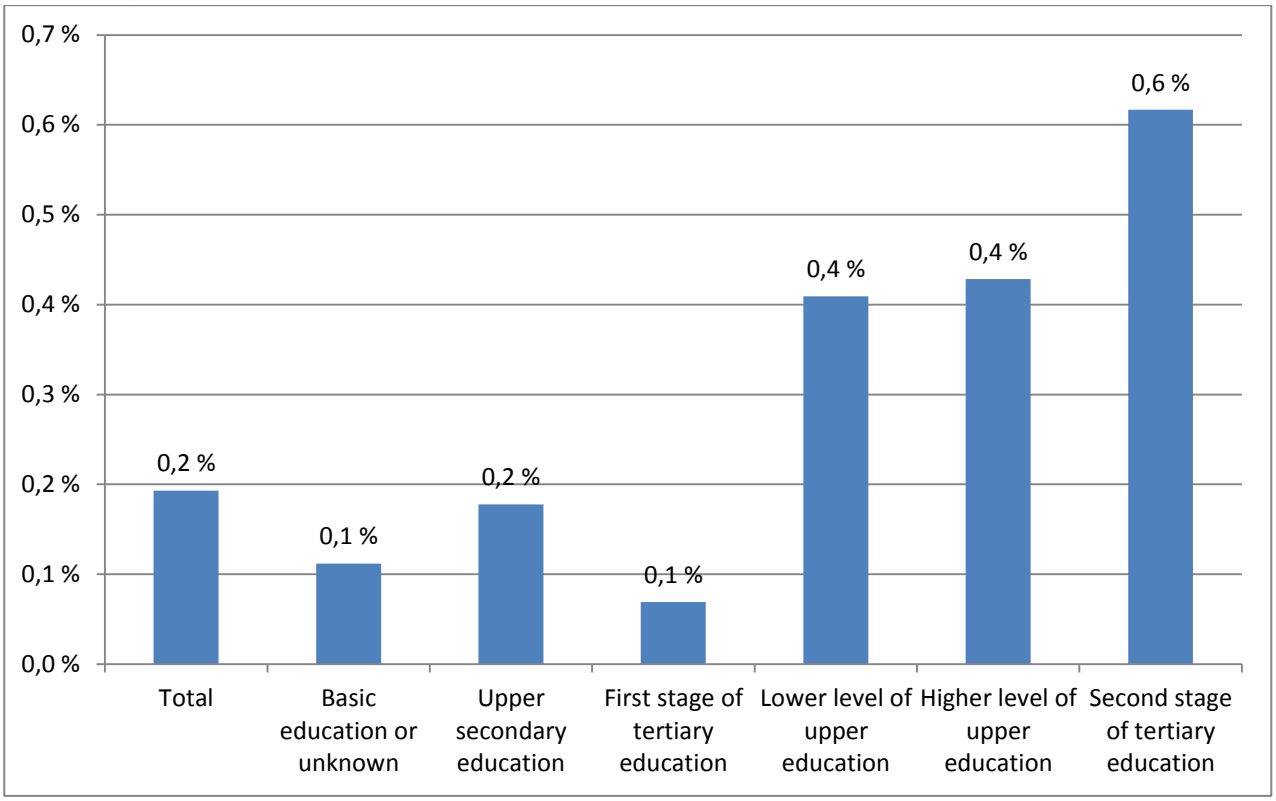
Source: Statistics Finland (2017). The table presents numbers of immigrants and emigrants by age categories.

Graph 2c) Numbers of emigrated Finnish citizens to most popular destination countries in 2014



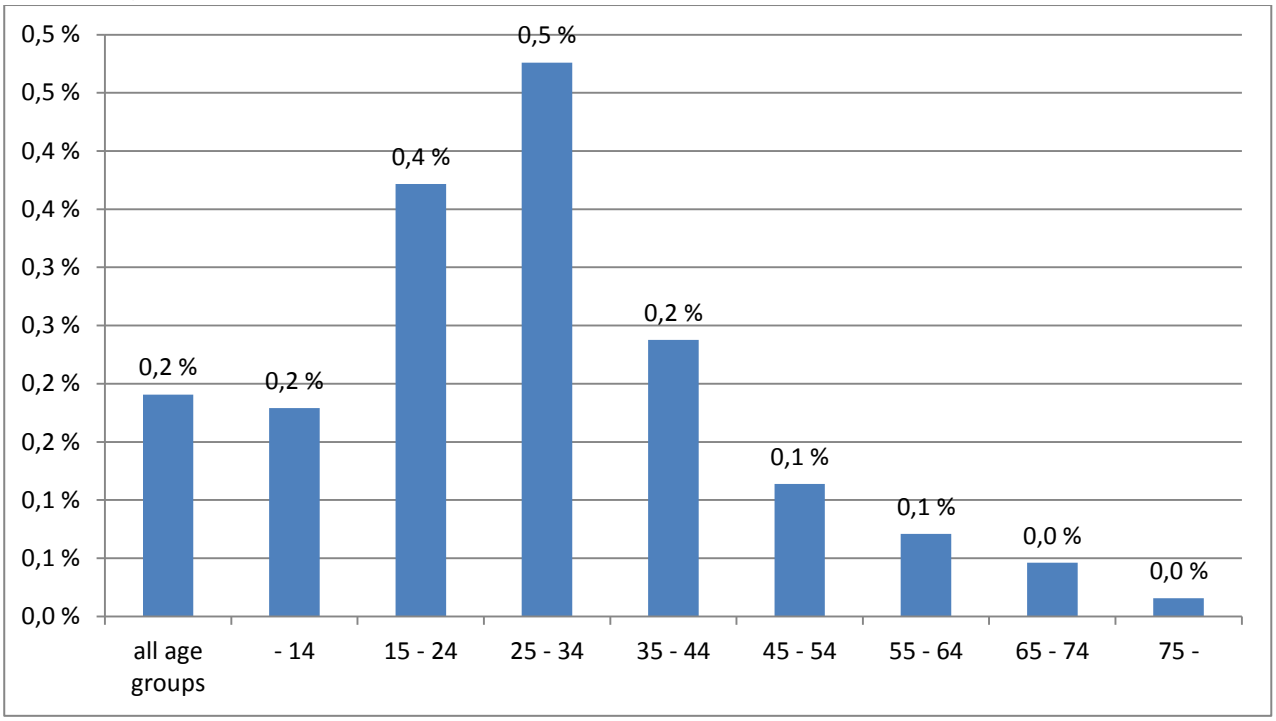
Source: Statistics Finland (2017). The table presents numbers of migrants to a selection of destination countries.

Graph 3a) Emigration rates by education level for Finnish citizens aged 15 and older



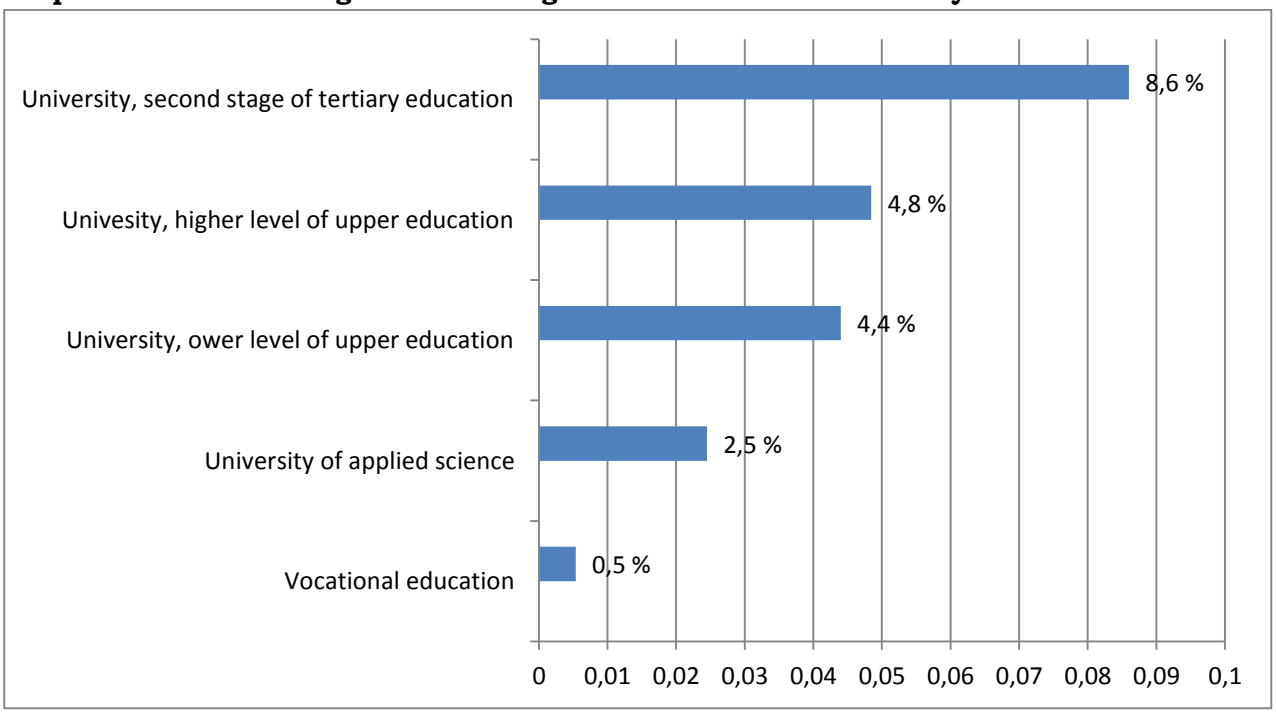
Source: Statistics Finland (2017). The table presents emigration rates defined as a share of the population emigrating during the year. Education is classified according to 1997 Statistics Finland educational classification.

Graph 3b) Emigration rates by age groups for Finnish citizens in 2014



Source: Statistics Finland (2017). The table presents emigration rates defined as a share of the population emigrating during the year.

Graph 4. Share of 2011 graduates living abroad in the end of 2014 by level of education



Source: Education Statistics Finland (2017).

Education Statistics Finland[35] provides a different way of comparing emigration between different education levels[36]. Graph 4 uses these data to present the shares of those who have graduated from different education levels in 2011 living abroad in 2014. Also these figures suggest positive selection in terms of education, as those with higher education are clearly more likely to live abroad three years after graduating.

To sum up the descriptive results so far, the numbers of Finnish citizens emigrating from Finland have been rising slowly, and the numbers of emigrants exceed the numbers of Finnish citizens who move to Finland for most years. There is also positive selection to migration in terms of education, as those with higher education are more likely to migrate. To get a more complete understanding of how different individual characteristics are related to emigration from Finland we present regression analysis results from Battisti and Kauppinen (2017). The study uses 2011 full-population cross section from the Finnish Longitudinal Employer-Employee Data (FLEED) provided by Statistics Finland. The data is merged with information of emigrations that took place during 2012. Tables 2 and 3 present logit regressions where the dependent variable is a dummy that gets value 1 if the individual emigrated during 2012.[37]

Regressions in table 2 use educational attainment as a measure of individual skill. Column (1) presents a regression for Finnish men and women aged 15-70. To study the self-selection in terms of income, column (2) adds annual gross income to the model and restricts the analysis to Finnish working age (25-54 years) men and women who were employed and had positive income. Columns (3) and (4) present corresponding analyses for men and women separately. Comprehensive schooling or less serves as the omitted educational category, and the results are reported as odds ratios. Higher education is a significant determinant for emigration, and especially those in the education category PhD or Equivalent are more prone to emigrate than those in other categories. For men, higher income explains subsequent migration even when the education level is controlled for, whereas for women this is not the case.

[35] The statistics are based on registers of the Statistics Finland, the Ministry of Culture and Education and the Finnish National Board of Education.

[36] *Upper secondary education* degrees include high school degrees and occupational degrees that require 1-3 years of training. *First stage of tertiary education* includes degrees that require 2-3 years of training after *upper secondary education*. These include for instance technician and nursing degrees from school that are no universities of applied sciences. *Lower level of upper education* includes bachelor level degrees form universities and universities of applied science, and *higher level of upper education* includes master's degrees –level degrees. *Second stage of tertiary education* includes Licenciate and PhD degrees.

[37] As is the case with the other analyses using Statistics Finland migration statistics, the data suffers from undercoverage as only registered migration is included

Table 2. Emigration estimation results with educational categories

	(1) Men & Women b/se	(2) Men & Women b/se	(3) Men b/se	(4) Women b/se
Age	0.9515***	0.9344***	0.9422***	0.9283***
	(0.001)	(0.002)	(0.003)	(0.003)
Female	1.2635***	0.9629		
	(0.031)	(0.033)		
Married	1.2357***	1.1407***	1.2935***	0.9807
	(0.041)	(0.050)	(0.085)	(0.061)
Children	0.4372***	0.5605***	0.5699***	0.5522***
	(0.014)	(0.024)	(0.034)	(0.033)
Vocational	0.7095***	0.5382***	0.4825***	0.6221***
	(0.030)	(0.037)	(0.045)	(0.064)
High School	2.2498***	1.7779***	1.8934***	1.5764***
	(0.088)	(0.120)	(0.175)	(0.157)
Lowest Tertiary	1.1433**	0.7820**	0.7951	0.8313
	(0.073)	(0.081)	(0.120)	(0.123)
Lower Degree Tertiary	2.1668***	1.6655***	1.7312***	1.6162***
	(0.091)	(0.113)	(0.162)	(0.168)
Higher Degree Tertiary	3.3437***	3.0148***	3.7055***	2.6667***
	(0.145)	(0.204)	(0.329)	(0.312)
PhD or Equivalent	6.8750***	6.7246***	7.5157***	6.2432***
	(0.567)	(0.723)	(1.014)	(1.255)
Annual Y/1000		1.0020***	1.0019***	0.9972
		(0.000)	(0.000)	(0.003)
N	3738563	2327358	1160532	1166826
Pseudo R^2	0.0626	0.0731	0.0692	0.0816

Logit regression results reported as odds ratios. The dependent variable is a dummy that gets value one if the individuals emigrated during the following year. An odds ratio of 1 means that the variable does not increase the propensity emigration relative to the reference person. Robust standard errors in brackets; *, ** and *** symbolise significance at 10, 5 and 1% level. Married is a dummy for being married or in a registered partnership. Column (1) presents a regression for Finnish men and women aged 15-70 and column (2) for Finnish men and women aged 25-54 who were employed and had positive income, and columns (3) and (4) present corresponding analyses for men and women separately. Children is a dummy for having at least one child aged under 18 in family. Annual Y/1000 is annual income in 1000 euros. Education dummies refer to the highest educational qualification based on the Statistics Finland educational classification. Categories are comprehensive schooling, high school, lowest level tertiary, lower degree level tertiary and doctoral or equivalent. Comprehensive schooling or less serves as the omitted category.

Regressions in table 3 use occupational category as a measure of individual skill. Column (1) presents a regression) for Finnish men and women aged 25-54 who were employed and had positive income, and columns (2) and (3) present corresponding analyses separately for men and women. Elementary occupations serve as the omitted category, and the results are reported as odds ratios. Like education, also occupation is a significant determinant of emigration, and especially managers and professionals are more prone to emigrate. Similarly to regressions with education, higher income explains subsequent migration for men but not for women.

Table 3. Emigration estimation results with occupational categories

	(1) Men & Women b/se	(2) Men b/se	(3) Women b/se
Age	0.9213***	0.9305***	0.9135***
	(0.002)	(0.003)	(0.003)
Female	0.8911***		
	(0.035)		
Married	1.1645***	1.3224***	1.0047
	(0.053)	(0.089)	(0.065)
Children	0.5272***	0.5246***	0.5325***
	(0.023)	(0.033)	(0.034)
Armed Forces	1.5862	2.0623**	1.0000
	(0.462)	(0.642)	(.)
Managers	6.7539***	7.6219***	6.3258***
	(0.769)	(1.273)	(1.181)
Professionals	3.9611***	5.1439***	3.2022***
	(0.375)	(0.775)	(0.418)
Associate Professionals	2.1529***	2.7869***	1.7656***
	(0.212)	(0.435)	(0.229)
Clerks	2.3268***	2.5337***	2.1032***
	(0.250)	(0.463)	(0.283)
Service and Care	1.5560***	1.8183***	1.2879**
	(0.151)	(0.294)	(0.157)
Agricultural and Fishery	0.6154**	0.5607*	0.7951
	(0.152)	(0.195)	(0.280)
Operators and Assemblers	0.6082***	0.7456*	0.7908
	(0.077)	(0.128)	(0.229)
Elementary Occupations	0.7692**	0.8957	0.8960
	(0.097)	(0.157)	(0.198)
Annual Y/1000	1.0022***	1.0020***	1.0005
	(0.000)	(0.000)	(0.003)
N	2135428	1059139	1075830
Pseudo R^2	0.0696	0.0665	0.0765

Logit regression results reported as odds ratios. The dependent variable is a dummy that gets value one if the individuals emigrated during the following year. An odds ratio of 1 means that the variable does not increase the propensity emigration relative to the reference person. Robust standard errors in brackets; *, ** and *** symbolise significance at 10, 5 and 1% level. Married is a dummy for being married or in a registered partnership. Column (1) presents a regression) for Finnish men and women aged 25-54 who were employed and had positive income, and columns (2) and (3) present corresponding analyses separately for men and women separately. Children is a dummy for having at least one child aged under 18 in family. Annual Y/1000 is annual income in 1000 euros. Occupation dummies refer to occupation according to 1-digit occupation codes in the Classification of Occupations of Statistics Finland 2001. Elementary occupations serve as the omitted category.

To sum up the descriptive analysis, the numbers of Finnish citizens emigrating from Finland have been rising slowly since 1990s, and the numbers of emigrants exceed the numbers of Finnish citizens who move to Finland for most years. There is also positive selection to migration in terms of education, as those with higher education are more likely to migrate. Also according to regression evidence, those with higher educational qualifications are more prone to emigrate. Similarly, those working in managerial and professional positions emigrate more often. Annual gross income is positively associated with emigration after controlling for education or

occupational position for men, but not for women. However, the effect is small so a natural interpretation is that the independent effect of income, after controlling for education or occupational position, is small.

3. Conclusions

This report has studied the location decisions of innovative activity and migration from Finland. Even if there are also other factors influencing these issues, we focus on the effects of taxation. Our considerations take into account both the company and the worker responses to taxation.

Based on the economic literature on international migration, there are good reasons to expect that high-skilled workers would be more likely to emigrate from Finland. This positive selection is both predicted by theoretical models and confirmed empirically for other European and Nordic countries. However, there is less evidence on whether the skilled migration is driven by tax-differences between countries. The empirical evidence from Finland presented in this report also supports the idea that high-skilled workers are more likely to emigrate: in 2014 the emigration rates for those with bachelor's or master's degree level education (lower or higher level of upper education) aged 15 and over was 0,4%, whereas the total emigration rate for all education categories was only 0,2%. Also according to regressions results from Battisti and Kauppinen (2017), those with higher educational qualifications as well as those in managerial and professional positions are more prone to emigrate. Annual gross income is positively associated with emigration after controlling for education or occupational position for men, but not for women. However, the independent effect of income is very small also among men. The most popular destination for Finnish emigrants in 2014 was Sweden, followed by the United Kingdom, Germany, and the United States. The popularity of Sweden with its comparatively heavy income taxation does not support the idea that migration from Finland would be driven by differences in taxation, but the popularity of the other three countries supports the idea that differences in returns to skills and taxation could be driving migration decisions.

There are also considerable numbers of Finnish citizens migrating to Finland from abroad, so skilled migration can be beneficial for the Finnish economy if the migrants return with new skills and extended networks to work in Finland. However, the number of emigrants exceeds the numbers of those moving to Finland in all the higher educational categories, and this type of migration pattern can lead to harmful brain drain in the longer term if Finland is not able to compensate the loss by attracting skilled workers from abroad.

For policy advice, it would be important to identify occupations and industries that have most outward mobility and study more closely, what are the reasons driving migration and whether it should be considered harmful or beneficial for the Finnish economy. Evaluating empirically what are the factors affecting migration decisions is difficult. Labor migration seems to be driven by a

complex combination of factors ranging from differences in earnings opportunities and availability of interesting jobs to individual tastes and supply of amenities. Taxes are one of the many factors driving migration decisions, but their relative importance has to be investigated by further research. High-skilled migration from Finland can be also compensated by inflows of skilled workers from abroad, and it would be of importance to make the country more attractive for foreign experts. As the evidence from the preferential tax treatment in Denmark shows, tax-policy can be a central mean in increasing the attractiveness. Finland has special tax-rules that apply to the employment of foreign citizens defined as key employees.[38] According to these rules, a key employee may be taxed at the 35% flat rate instead of the usual progressive tax. Unfortunately, comprehensive analysis of the effects of the Finnish special tax rules is lacking. However, it should be noted that even the flat 35% tax rate faced by those taking up the scheme is high in international comparison.

Regarding the location decisions of firms and their intangible assets, the economic literature provides evidence on their responsiveness to taxation. The negative relationship between FDI and taxation is well-established as well as the negative effect of taxation on the MNE headquarter location decisions. An increase in the repatriation tax by 10 percentage points is found to raise the share of relocation by about 2 percentage points. Regarding the innovative activity, the results on European MNEs show that a one percentage point reduction in the tax rate relative to other countries increases subsidiary's intangible property by around 1.7% in that country. Different types of intangibles, like patents and trademarks, have also been studied. Even if they each react negatively to taxation, some differences in their sensitivity to taxation are observed. In addition, not only does the level of innovative activity respond to taxation, but also the quality. Regarding the quality of R&D activity, patent income tax rate reductions (output-oriented R&D incentives) are shown to increase the patent quality, whereas the results regarding R&D tax credits and tax allowances (input-oriented R&D incentives) are mixed. However, the output-oriented R&D tax incentives are considered to be more prone to tax planning.

In sum, taxation is an important parameter regarding migration and innovative activity. For location decisions of workers, the evidence of the importance of tax considerations is scarcer. However, the importance of differences in earnings opportunities in driving migration is well established, and the cross-country differences in taxation further add to these differences. However, the considerations of this report point to the direction that from the Finnish economy point of view it is important to take the taxation considerations into account.

[38] The rules apply if the tasks require special expertise and the employee earns regular cash salary of at least 5800 euros per month. For working at an institute of higher education in a teaching position or as a researcher, there is no minimum salary requirement. Further, the work has to be for a Finland-based employer and be mainly performed in Finland, the employee has to become a Finnish tax resident as soon as the work starts and cannot have had Finnish citizenship or have been a tax resident in Finland during the five years preceding the year of accepting employment.

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