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Immigration and Income Inequality in Sweden

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Immigration and Income Inequality in Sweden

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Abstract

Income inequality has been on the rise in many industrialised countries since around the 1980's. In Sweden the increase of income inequality has been particularly large. This in spite of Sweden's extensive redistribution system and public policy that prioritize equality among its population. This paper investigates a potential factor for the rise in inequality that is yet fairly unexplored, namely immigration. As inequality has increased in Sweden, so has also immigration. Sweden experienced large refugee inflows after the 1970's, the largest flow consisting of *circa* 100 000 Yugoslavs during the Bosnian war. This study provides indications on what way immigration shapes the income distribution and lays the ground for prospective studies. Results show that the inflow of new migrants during the early 1990's in Sweden raises income inequality and it is almost entirely due to increased dispersion in the lower tail of the income distribution.

Key Words

Income inequality
Disposable income
Immigration
Political refugee
Demographic shifts
Multinomial Probit
Sweden

1.Introduction

Income inequality has been on the rise in many industrialised countries since around the 1980's. In Sweden the increase of income inequality has been particularly large. This in spite of Sweden's encompassing redistribution system and public policy that prioritize equality among its population. Why income inequality is unfavourable for a nation has both economic and normative sides. While early studies imply that inequality has a positive relationship with economic growth, more recent studies have found negative links between the two (see for example Alesina and Rodrik, 1994 cited in Rodríguez C., 2000, paragraph 2.1). There are several theories in favour of a relationship between low inequality and higher long-term growth. Mainly it is believed that a redistribution of income to the poor will lead to more spending on healthcare and education which are both positively associated with economic growth. The poor will also stay out of violence and protests that otherwise would restrict investment and in turn growth. Further, a polarized economy will experience problems making necessary reforms that are important in a growth process (Rodríguez C., 2000). When inequality reaches higher levels it becomes a violation of human rights. The life expectancy is longer for rich than for poor and poor individuals are more likely to have health issues than those who are rich (Therborn, 2013). A study by Atkinson *et al*. (cited in Aaberge *et al*., 2000, p78) shows that Sweden was among the countries with the lowest income inequality in the late 1980's. After a comparatively large increase, Sweden still has a relatively small income inequality (OECD, 2011). However, because of the increasing pattern, research regarding causal factors of variation in income inequality is needed. It is essential to acquire knowledge on what groups of the population to target in order to efficiently reduce income inequality and limit the consequences of it.

There exists a large amount of studies with the aiming at analysing factors related to the increase of income inequality, and many of these factors have been identified. Yet how immigration effects income inequality is still somewhat unexplored. This paper investigates the impact immigration has on income inequality in Sweden and lays the ground for further studies within the field. Theories and earlier empirical work imply that immigration can increase income inequality through direct and indirect effects. Direct effects occur when immigrants display large income disperison within their own distribution, and/or when there exists income gaps between immigrants and natives. Indirect effects arise from the impact immigration has on natives' wages and employment (Lemos, 2014; Borjas, 1995).

This paper uses data from the Luxemburg Income Study to derive actual and fictitious inequality measures. The fictitious measures represent the income inequality in a population without immigrants, which are compared to the actual measures. These comparisons only take into account direct effects that immigration has on income inequality. This paper is a first attempt to assess the extent to which immigration impacts upon income inequality in Sweden. The full effect (direct and indirect effects) of immigration on income inequality is left for future studies to assess.

In addition, the income distribution is decomposed into three income classes and the likelihood of belonging to the lower and upper income class is estimated by a multinomial probit regression analysis. Including an immigrant dummy variable reveals whether immigrants are more or less likely to belong to the lower and upper income class as compared to natives. This will give information regarding any income gap existing between immigrants and natives.

The rest of this paper is structured as follows; Section 2 gives a background to income inequality in Sweden, a review of previous studies, an introduction to the theoretical framework and a background to immigration in Sweden. Section 3 is devoted to data and methodology. Section 4 reveals findings from comparisons of inequality measures followed by regression results. Section 5 concludes.

2. Literature Review and Theoretical Framework

2.1 The evolution of inequality in Sweden

The trend in income inequality over the last five decades has been fairly similar in most industrialized countries. There was a decline in income inequality up until the early 1980´s when it then took a turn. The Organisation for Economic Co-operation and Development, OECD (2011) states that the average gini-coefficient[1] for the OECD countries increased from 0,28 in the mid 1980´s to 0,31 in the late 2000´s.

[1] The gini-coefficient is a measure of inequality ranging from 0 to 1, taking the value of 0 in the absence of inequality and the value of 1 in the presence of perfect inequality.

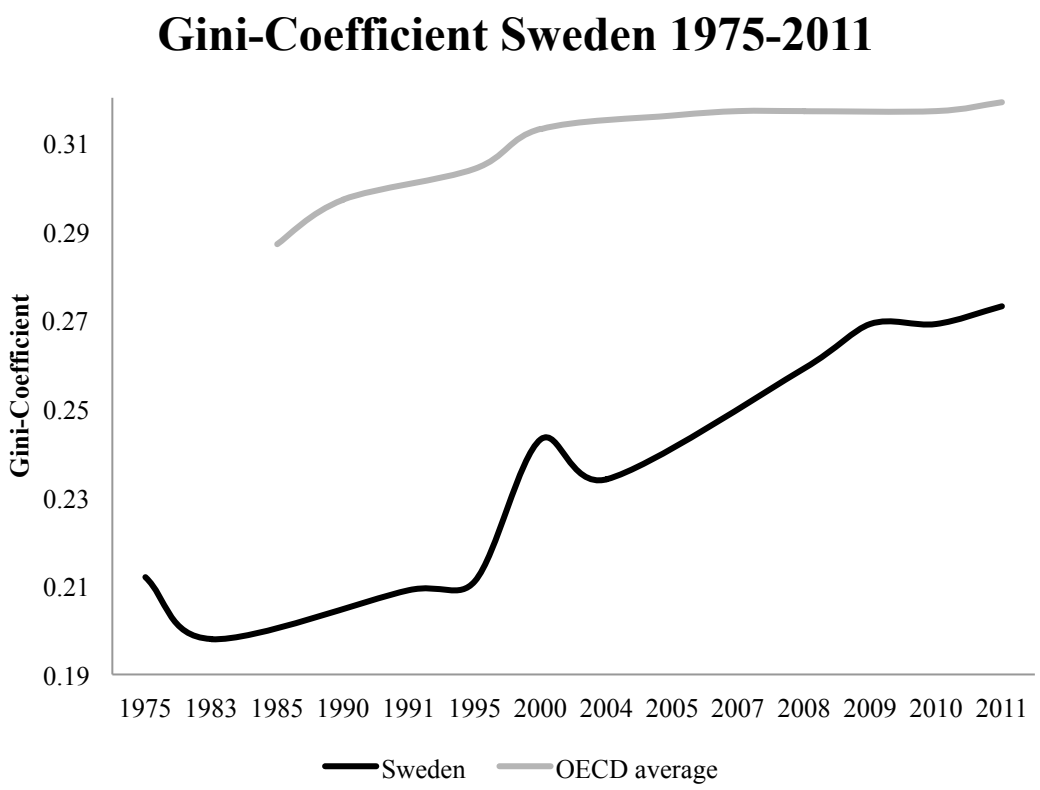

Figure 1. Note: the vertical axis does not display the whole scale from 0 to 1. Data source: OECD (2015), Income inequality (indicator). doi: 10.1787/459aa7f1-en (Accessed on 18/05/15).

Figure 1 shows the development of the income inequality in Sweden and the average measure for the OECD countries from 1975 to 2011. The decrease in inequality in Sweden traces back to the late 1960´s even though its not captured by the figure. Between the 1960's and the early 1980's the unions associated with centralized wage bargaining and collective agreements on the labour market raised wages at the bottom of the distribution, which reduced the gap between low- and high-wage earners. Sweden also had extremely high marginal tax rates before they were reduced by the several tax and benefit reforms initiated during the 1980's and 1990's. The first reform taking place in 1983 (Albrecht *et al*., 2011; Björklund et al., 1995). The Swedish income inequality started rising in the 1980´s. Based on OECD data the Swedish gini-coefficient has increased with 7,5 percentage points between 1983 and 2011. Although it is a large increase compared to most countries, income inequality in absolute terms remains lower in Sweden as shows by figure 1.

2.2 A complicated search for determinants, prior studies

The search for causal determinants of changes in income inequality is a complicated one. Gustafsson and Johansson (1999) carried out a study accounting for 16 industrialized countries in which they tried to identify the crucial factor, which they called *the smoking gun* that would stand for the variation in income inequality. Instead they found several interrelated factors affecting income inequality in different ways. These factors include compositional changes of industries and demographic shifts in the population, changed sizes of imports from developing countries, the size of the public sector and the influence of unions. There exists a vast amount of previous studies with the aim of determining what drives income inequality, but the literature regarding the relationship between immigration and income inequality is scarce, especially for Sweden. This subsection continues with a discussion of previous work from Sweden.

Disposable income consists of several income components (see appendix A for a full definition of disposable household income used in this study). Roine and Waldenström (2012) show that including realised capital gains [2] in the definition of disposable income yields a gini coefficient that is about 20 percent larger on average than when realised capital gains are excluded. Capital gains matter almost exclusively in the top one percentile and are somewhat irrelevant further down in the income distribution. Increases or decreases in realised capital gains hence have an impact on inequality. The authors for example established that the Swedish tax reform in 1991 led to a vast increase in the income share of the top percent as capital gains were taxed at a flat rate separately from other incomes.

Moreover, by definition disposable income is earnings after taxes and benefits. Björklund *et al*., (1995) provide descriptive statistics that shows gini coefficients with taxes and benefits included and then excluded. The authors find that the gini-coefficient is larger before inclusion of taxes and benefits, somewhat smaller after the inclusion of taxes and the smallest when including both taxes and benefits. This finding confirms the importance of redistribution for income equality.

Björklund (1991) studies how unemployment and inflation affect income inequality. He describes that it is rational to believe that unemployment harms those with less earnings capability the most and that this would lead to an increase of inequality. When using disposable

[2] A realised capital gain is the profit obtained from selling an asset at a price higher than the purchase price.

household income as the income measure the author finds no significant impact from unemployment or inflation for the period 1975-1988 and suggests that this could be due to the *added worker effect*[3]. Aaberge et al (2000) provide answers to why unemployment has such little effect on income inequality in Sweden and the other Nordic countries. The authors exploit the large rise in unemployment starting in the beginning of 1990 to determine what offset the increasing effect. Björklund's suggestion of the added worker effect is rejected in their study. However, they find a counteracting effect from unemployment insurances.

Albrecht *et al* (2011) explore the impact unions have on the Swedish wage distribution. Swedish collective agreements covers and applies to everyone at a workplace if there is an agreement between an employer and a union. Nevertheless, individual offers and agreements can be made between workers and employers beyond the collective agreements. The authors show a link between inequality and union patterns. Inequality decreased between 1968 and 1981, which is when blue-collar unions, associated with centralized bargaining, made up a large fraction of all union memberships. The union patterns changed from 1981 to 2000, the fraction of white-collar unions grew while the fraction of blue-collar unions declined. Put more into context; central wage bargaining declined and wages became more dispersed.

Lindquist (2005) concludes in his study that the capital-skill complementarity process can be applied on the Swedish case. Investments in more efficient capital, due to improvements in technology, together with a lower growth rate of high-skilled workers had an increasing impact on the income inequality in Sweden between 1970 and 1999. The capital-skill complementarity process raises the demand for highly skilled workers, which in turn raises the returns to higher education and increases the gap between low and high skilled.

Lastly, Domeij (2008) finds that much of the increase in wage inequality between 1999 and 2002 in Sweden can be explained by demographic shifts in the population. When wage inequality differs between educational groups, gender and industries, a compositional change in any of these will impact the total wage inequality. In other words, when one demographic group have more dispersed wages than another, and the workforce become more represented by the former, wage inequality of the total workforce increases. The author finds that shifts in

[3] The *added worker effect* occurs when members of a household who are not the *main breadwinners* take on work when the household head gets unemployed.

educational groups and industries account for a large part of the variation in wage inequality, in turn impacting income inequality, within Sweden in the years studied.

2.3 Immigration and Income inequality - relationship and theory

The impact of immigration can have on income inequality is broken down into direct and indirect effects. Direct effects are associated with the income of immigrants themselves in the host country. Immigrants tend to cluster at the bottom and/or top of the earnings distribution, which is in turn due to their polarized human capital. Lemos (2014) finds that immigrants in the UK are either highly educated or very low skilled. She concludes that this is also reflected in the wages of immigrants. The inclusion of immigrants in the total economy consequently has an increasing effect on income inequality. Card (2009) finds the same pattern of immigrant characteristics in one of his studies in the US:

> "Overall, my interpretation of the evidence is that immigration has not had much effect on *native* wage inequality in the United States. Nevertheless, because immigrants are clustered at the high and low ends of the education distribution [...] wage inequality over all workers in the economy is higher than it would be in the absence of immigration." (Card, 2009 ,p19)

Indirect effects arise through the *immigrant surplus*[4] process. An immigrant surplus occurs only when immigration supresses the market wage, which is the native wage. The magnitude of change in native wages depends on to what extent the immigrant flow differs from the native labour available in the host country in terms of skills (Borjas, 1995). A recent study by Amuedo-Dorantes and Rica (2013) confirms that assuming perfect substitution between natives and immigrants yields a smaller immigration surplus than assuming imperfect substitution. The cheap labour (due to suppression of wages) will also raise earnings at the top of the distribution as lower costs yield higher profits. Thus the immigration surplus process creates dispersion in wages both at the bottom and top of the distribution (Hyde et al., 2014; Borjas, 1995).

[4] The national economic gain from immigration. See Borjas, G.J., 1995. The Economic Benefits from Immigration. *Journal of Economic Perspectives*, 9 (2), 3-22 for theory and calculation of the immigrant surplus.

2.4 Immigration in Sweden

Sweden was, until about 1930 a net emigration country. This changed mainly due to a decline in emigration from Sweden. Subsequently, immigration to Sweden was fairly low even after 1930 and most of it consisted of Swedes that returned home from North America. Immigration started to increase after the Second World War and stayed on a high level up till 1990 with only a few drop downs in 1972-1973 and 1981-1983 (Ekberg and Andersson, 1995; Migrationsverket, 2015). Immigration continued to increase after 1990; Ekberg (2011) reports that the immigration share of the total Swedish population was 14% in 2009, this figure accounts only for foreign born individuals, so-called first generation immigrants.

The ethnic composition of the immigrant population has also changed over time in Sweden. The migrants after the Second World War up until the 1970's were mainly labour force immigrants. They were predominantly in their working ages and had a high employment rate, at times higher than natives'. Immigration started to be regulated and restricted in Sweden in the late 1960's, less work permits were issued and the labour force immigration declined. The regulations of the labour force immigration along with an increase in refugee inflows resulted in a declining employment rate among foreign-born individuals in Sweden after 1970. The inflow of political refugees accelerated during the 1990's when Sweden received around 100 000 former Yugoslavs (Ekberg, 2011; Migrationsverket, 2015).

Another change regarding the characteristics of the immigrants is their country of origin. In 1970, a large majority of immigrants, around 60 percent, were from the neighbouring Nordic countries, mainly Finland. Around 30 percent were from the rest of Europe and the remaining; around 7 percent, were from outside Europe. In contrast, in 1994 the Nordic immigrants only accounted for around one third, another third came from the rest of Europe and a third came from outside Europe (Ekberg and Andersson, 1995). In the data used in this study, the immigrant share increased from around 4 percent to 14 percent between 1992 and 2005 and the data should be representative.

Table 1 provides descriptive statistics on educational attainment among natives and immigrants in the sample used in this study. Immigrants have a larger proportion of their population in the lower education category in all years except 1995 when it equal to natives'. Further, immigrants have a larger share of their population in the high education category in 1995 and 2005 while it is equally large in 2000 and 2 percentage points smaller in 1992.

Table 1
Education level composition

	1992		1995		2000		2005	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
Education Level								
Low	36%	40%	32%	32%	28%	32%	24%	30%
Medium	43%	41%	45%	42%	52%	47%	52%	44%
High	20%	18%	23%	27%	21%	21%	25%	26%

Source: LIS database.

The link between the educational level of immigrants and their incomes in Sweden requires some attention. Immigrants in Sweden face barriers of getting into the labour market upon arrival. This is especially true for political refugees. Reasons can be associated with invalid transferability of immigrants' human capital and/or discrimination (Hammarstedt and Shukur, 2007). Hence, the educational patterns of immigrants might not necessarily translate into similar income patterns.

3. Description of Data and Method

In a first step, micro data from the so-called Luxemburg Income Study (LIS) is used to analyse the potential augmenting impact of immigration on income inequality in Sweden with help of derived inequality measures. In a second step the LIS data is used to estimate the likelihood of immigrants being in the bottom and top income class compared to natives. This section presents a description of the data followed by methods and a discussion about variables used in the regression.

3.1 Data

The LIS database provides micro data on the household and personal level for a series of countries. The database is especially relevant for cross-country research since data is harmonized over countries to allow valid comparisons. The database includes variables needed for studies of inequality and poverty such as income, wealth, employment, and demographics. Data for Sweden is available from 1967-2005. The sample in this study, however, is limited to the later part of this year span since the first survey including immigrant information did not appear until 1992. This leaves data for a period of 14 years. A drawback of the LIS datasets is that the data only is provided in intervals of approximately five years for Sweden. This means that the time span of 14

years only includes data for four points in time, 1992, 1995, 2000 and 2005. Ideally one should use data with more points in time, such as annual data, to capture any increases or decreases in inequality between for example 1995 and 2000. The datasets include fairly many observations, the full person datasets contains between around 28 000 to 37 000 observations per survey. The sample is restricted to only include head of households and spouses. It is further restricted to individuals within the age-range 18 to 95 years. For the regression, which will be described in the coming subsection, the datasets are pooled and the resulting sample includes 76944 observations.

The income distribution of the sample is decomposed into income classes that are calculated from equivalised disposable household income, meaning disposable household income divided by the square root of the number of household members.[5] Three income classes are used for the decomposition of the income distribution; a lower, middle and upper class. Anyone who has an income between 0 and 60 percent of the median equivalised disposable income belongs to the lower income class. The middle class lies between 60 and 200 percent of the median equivalised disposable income. Anyone with an income above this belongs to the upper income class. The LIS suggestion of adjusting for extreme outliers is followed and a bottom code is created at 0,01 times the mean equivalised disposable income and a top code at 10 times the median unequivalised disposable income.

3.2 Methodology

With the purpose of exploring what effect immigration has on income inequality, the ideal method would be to visualise the income distribution of time t if the immigrant share and characteristics were fixed at the level of time t-1 . DiNardo et al. (1996) provides a methodological framework for this. Their aim is to see the effect of different factors, such as de-unionization and minimum wage, on inequality in the United States. To give a visual effect of the impact of various variables they estimate a counterfactual (fictitious) distribution that shows how the distribution of wages would have looked in a later period if the variable in question had remained at its level of an earlier period. This approach would take into account all possible

[5] Weighting follows the LIS database method, the LIS database calculate all their key-figures using a person-level adjusted weight, which is the normalised household weight times the number of household members.

effects (direct and indirect) of immigration. The use of such a method is cumbersome and therefore left open for prospective studies.

Inequality measures are derived to establish if there is any direct effects of immigration impacting income inequality. Measures are derived from two samples, the first including all observations and the second sample including only native observations. Inequality measures derived from the first sample are hereafter called *actual* measures whilst inequality measures derived from the latter sample are called *fictitious* measures. The fictitious measures represent the income inequality in a population consisting of only natives. What needs to be addressed here is that simply excluding the observations that are immigrants from the calculations will *only* reveal direct effects from immigration on income inequality. Indirect effects are not captured by these fictitious measures. According to the theoretical framework we should expect inequality to be larger when immigrants are accounted for, i.e the fictitious inequality measures should be smaller than the actual. Results are presented and analysed in subsection 4.1.

A second approach estimates the likelihood of belonging to a certain income class using a multinomial probit model[6]. The dependent variable is categorical with each category representing a certain income class. There are three outcomes of the regression; a person can belong to the lower, middle or upper income class. The base outcome of the model is the middle income class. The dependent variable is regressed on a number of explanatory variables that are presented in subsection 3.3. The multinomial probit regression yields coefficients that are merely to be interpreted by sign. A positive coefficient of a continuous variable indicates that a one-unit increase in the variable of question increases the likelihood of belonging to that certain income class (of question) compared to the base outcome. A positive dummy coefficient indicates a higher likelihood compared to the benchmark group of belonging to the income class of question compared to the base outcome. Marginal effects are estimated for all variables, which unlike the coefficients, can be interpreted by magnitude. The marginal effect for a continuous variable is the partial derivative of the dependent variable with respect to the independent variable. The marginal effect for a dummy variable is the change in likelihood resulting from a discrete change from the benchmark group. All marginal effects are calculated with the other covariates fixed at their means. The marginal effect for a continuous variable is interpreted as the percentage change

[6] For a revision of the probit models see William H.G., 2012. *Econometric Analysis*. 7th edition. Boston; Person International Edition. Or any previous edition.

in the likelihood resulting from a unit change in the variable of question. The interpretation of the marginal effect of a dummy variable is the percentage point difference from the benchmark group of the dummy.

The standard way of calculating marginal effects (with all other covariates held at their means) is perhaps not reflecting any realistic marginal effects if many of the variables included are categorical, as in this case. The education variable for example includes three categories and the mean refers to an education category that does not exist. Additional marginal effects have therefor been calculated where dummy variables are fixed at selected categories. Results are reported in section 4.2.

3.3 Independent variables and regression expectations

The likelihood of belonging to the lower or upper income class compared to the middle income class depend, in this model, on several independent variables. The complete model takes the form;

$$y_i=\beta_0+\beta_1 Imm_i+\beta_2 Age_i+\beta_3 Age_i^2+\beta_4 NotEmp_i+\beta_5 Reti_i+\beta_6 Educ_i+\beta_7 LowEdu_i+ \beta_8 HighEdu_i+$$
$$+ \beta_9 1995_i+ \beta_{10} 2000_i+\beta_{11} 2005_i+\beta_{12} 1995_i*Imm_i+\beta_{13} 2000_i*Imm_i+\beta_{14} 2005_i*Imm_i+\varepsilon_i \ .$$

The first explanatory variable of particular interest is Imm_i, which is a dummy variable that takes the value 1 if an individual is an immigrant and 0 otherwise. The coefficient β_1 will reveal whether immigrants are more or less likely compared to natives to belong to the income class of question compared to the middle income class. Theory implies that immigrants cluster at the ends of the income distribution and we would therefore expect β_1 to be positive for both the first outcome (the lower income class) and the third outcome (the upper income class). However, taking into consideration findings from studies of the immigrant native gap and immigrant assimilation in Sweden (see for example Kesler, 2014; Hammarstedt and Shukur, 2007) we can expect immigrants' incomes to be lower than natives' over the whole distribution. The coefficient β_1 should thus be positive for the lower income class and negative for the upper income class.

The second set of coefficients of particular interest is β_{10}, β_{11} and β_{12} that belong to interaction terms between each year dummy and the immigrant dummy. The year variable has one category for each year with the base category being 1992. The interaction terms will tell if

there is any increasing or decreasing effect additional to β_1 as we move from 1992 to each respective year. These coefficients are of special interest as they will tell weather there is an increasing, decreasing or stabile difference over time between immigrants' and natives' likelihood of belonging to the lower and upper income class compared to the middle income class. Other control variables included in the regression are Age_i and Age_i^2, representing the age earning profile.

The variables $NotEmp_i$, $Reti_i$, and $Educ_i$ are three dummies representing the labour market status of individuals. $NotEmp_i$ takes the value of 1 when an individual is either unemployed, not mainly employed or disabled, $Reti_i$ takes the value of 1 if a person is retired and $Educ_i$ takes the value of 1 if an individual is in education. They are all compared to the benchmark group, which are those who under the period of observation carried out any type of job, regardless of duration.

$Lowedu_i$ and $Highedu_i$ are education dummies, which are compared to the medium education category. The three different education levels function as proxies for skill levels. More ideal would be to have skill levels based on occupation groups. As has been discussed above, a high-skilled worker doesn't necessarily have a high income due to labour market barriers. There is unfortunately not any suitable variable included in the data sets. The education variable is defined by the LIS database and has the three categories low, medium and high. Included in the low education level are those with no education, pre-primary, primary, lower secondary, any compulsory education and initial vocational education. The medium education class includes those with upper secondary, basic and secondary vocational education and post-secondary education such as preparatory years for university education. The high education group includes individuals with specialized vocational, university, and postgraduate educations.

1995_i, 2000_i, and 2005_i are year dummies. The year variable with base category 1992 is included to see whether individuals on average become more or less likely to belong to the lower or upper income class over time. Table 2 shows summary statistics for all variables included in the regressions.

Table B in appendix B shows descriptive statistics for all variables used. Descriptive statistics is shown for the full sample, only natives and only immigrants. Mean equivalent disposable income is larger in the native sample than in the immigrant sample. Minimum and

maximum equivalent disposable income are also larger in the native sample. This indicates that native's incomes are larger than immigrants' over the whole distribution.

Immigrants have a vastly larger share of not employed individuals as compared to natives, 25.2% and 8.9% respectively. Moreover, 40.5% of all immigrants included in the sample were surveyed in 2000. The large percentage is most likely due to the inflows of political refugees during the 1990's (Migrationsverket, 2015).

4. Results and Analysis

4.1 Evidence from inequality measures

Table C in the appendix shows the distribution of earnings by percentiles for natives compared to immigrants. The median equivalised disposable income is around 20 percent higher for natives than immigrants for all years. Seeing that immigrants have larger shares of highly educated individuals than natives as seen in table 1, it can be concluded that immigrants' human capital is not fully reflected in their incomes in Sweden. It is as previously discussed most likely due to the various labour market barriers that immigrants face. What is more interesting is the distribution of incomes when immigrants are included in the population, which is shown in appendix D. The first percentile, the median and the 99th percentile are all smaller when immigrants are accounted for.

Figure 2 presents the development of the gini-coefficient calculated with and without immigrants (actual and fictitious gini coefficients). Indeed, the gini-coefficient would have been lower without immigrants. There is a larger effect from 2000 and onwards[7], which is consistent with the increasing immigration in Sweden. In the sample used for derivations the immigrant share increased from around 5 percent in 1995 to 12 percent in 2000.

[7] Appendix E contains a table with the calculated measures as it is hard to identify the exact numbers from the graph.

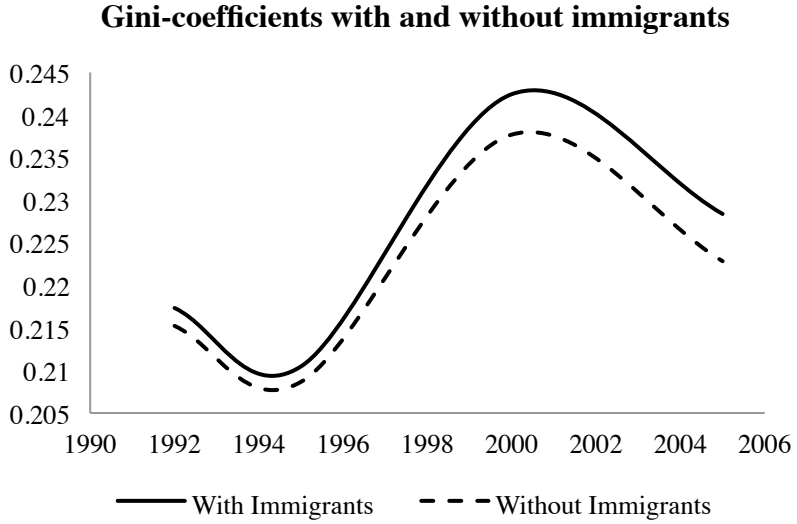

Figure 2. Gini-coefficient for Sweden between 1992 and 2005. Note: The y-axis does not display the whole scale. The fictitious gini-coefficients were calculated simply by removing the observations that are immigrants hence do not take into account any indirect effects. Source: LIS Database (Accessed 14/04/15), own calculations.

The gini-coefficient is merely a measure of the overall inequality in the population; it does not provide any information on where in the distribution the inequality increases or decreases[8]. Therefore it is informative to analyse additional measures of inequality. Figure 3 shows relative percentile gaps[9] with and without immigrants (actual and fictitious percentile gaps) (see table F in appendix for the percentage gaps in a table). The vertical axis shows fictitious percentile gaps/actual percentile gaps. Consequently, any number above 1 means that the actual measure is larger than the fictitious measure i.e. percentile gaps are larger when immigrants are accounted for. Four gaps are included in the graph. The 99/1-gap covers the full income distribution, the 90/10-gap excludes the two tails of the distribution and the 99/90-gap and 10/1-gap measures the inequality in the right and left tail respectively. The 99/1-gap is significantly larger when immigrants are included in the population than the 90/10-gap, indicating that the impact immigration has on income inequality is located in the tails. Immigration has a larger impact from 2000 and onwards which is expected as the immigrant share increased vastly between 1995

[8] The gini-coefficient is calculated as the area between a 45° curve and the *lorenz curve*.
[9] A percentile gap is a measure of the difference between two points in the income distribution; for example, the 90/10 -gap is the income of the person of the 90th percentile divided by the income of the person on the 10th percentile.

and 2000. Comparing the dashed lines in the graph or the upper and lower tail it becomes evident that immigration matters almost exclusively in the bottom of the income distribution.

The conclusion that can be drawn from the different inequality measures is that immigrants affect income inequality by dragging out the bottom tail of the distribution while the top of the distribution remains fairly unaffected, which results in an overall larger inequality in Sweden when immigrants are accounted for.

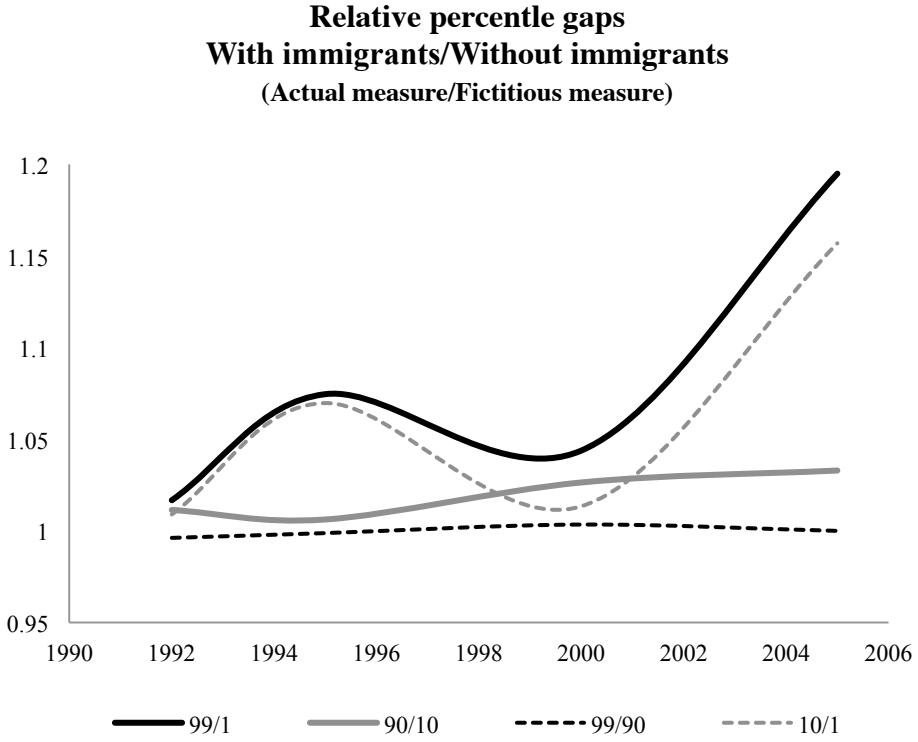

Figure 3. Relative percentile gaps (actual percentile gap/fictitious percentile gap). Note: the fictitious percentile gaps were calculated simply by removing the observations that are immigrants hence do not take into account any indirect effects. Source: LIS database (Accessed 14/04/15), own calculations.

4.2 Regression results

The multinomial probit regression results from the model excluding interaction terms are presented in table 2 along with marginal effects. The estimations from the full model are reported in appendix H. The null hypothesis that all coefficients are simultaneously equal to zero is rejected at the 1% level in both models.

Table 2
Multinomial probit coefficients and marginal effects

Variable	Lower income class (1)		Upper income class (2)	
	Coefficient	Marginal Effect	Coefficient	Marginal Effect
(β_0)Constant	2.255*** (0. 121)	-	- 5.557*** (0. 263)	-
(β_1)Immigrant	0. 446*** (0. 042)	0. 053*** (0. 006)	-0. 368*** (0. 053)	-0. 012*** (0. 001)
(β_2)Age	-0. 178*** (0. 006)	-0. 017*** (0. 001)	0. 063*** (0. 012)	0. 003*** (0. 000)
(β_3)Age^2	0. 002*** (0. 000)	0. 000*** (0.000)	-0. 000 (0. 000)	-0. 000*** (0.000)
(β_4)Not Employed	1. 207*** (0. 034)	0. 172*** (0. 006)	-0. 410*** (0. 061)	-0. 020*** (0. 002)
(β_5)Retired	0. 357*** (0. 062)	0. 037*** (0. 007)	-1.416*** (0. 079)	-0. 026*** (0. 001)
(β_6)In Education	1. 534*** (0. 044)	0. 248*** (0. 010)	-0. 679*** (0. 189)	-0. 024*** (0. 002)
(β_7)Low Education	0. 380*** (0. 028)	0. 044*** (0. 003)	-0. 420*** (0. 040)	-0. 010*** (0. 001)
(β_8)High Education	-0. 206*** (0. 032)	-0. 022*** (0. 002)	0. 723*** (0. 028)	0. 032*** (0. 002)
(β_9)1995	-0. 208*** (0. 029)	-0. 027*** (0. 003)	0.050*** (0. 051)	0. 001* (0. 001)
(β_{10})2000	-0. 390*** (0. 031)	-0. 051*** (0. 004)	0. 831*** (0. 045)	0. 026*** (0. 001)
(β_{11})2005	-1. 190*** (0. 047)	-0.102*** (0. 003)	1.262*** (0. 044)	0. 064*** (0. 002)
Number of observations	76944			
Wald chi2(22)	7914.75			

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Source: LIS database, own calculations.

The estimates for outcome 1 (the lower income class) are shown in column (1) and the estimates for outcome 3 (the upper income class) are shown in column (2). The coefficient of the immigrant dummy variable is positive for outcome 1 and negative for outcome 2, which is consistent with our expectations. It implies that immigrants are more likely than natives to belong to the lower income class compared to the middle income class and less likely compared to natives to belong to the upper income class compared to the middle income class over the period studied. The marginal effects of the immigrant dummy variable tell the magnitudes in the differences of likelihood between immigrants and natives. Immigrants are 5.3 percentage points

more likely than natives to belong to the lower income class compared to the middle income class. This number is more than 4 times larger than the difference in likelihood between immigrants and natives for the upper income class, which is 1.2 percentage points. The β_1 coefficient for outcome 1 is still significant at the 1 percent level when the interaction terms are added to the model (the estimates for the full model can be found in appendix H). Nevertheless, the same coefficient for outcome 3 is no longer significant in the full model. The conclusion is that immigrants have lower incomes compared to natives over the whole distribution, although the gap is larger at low incomes than high incomes.

Individuals that are not employed, retired or in education have a higher likelihood compared to employed individuals to belong to the lower income class compared to the middle income class. The estimates for the upper income class show the opposite. Those with the labour status not employed and in education are particularly more likely than those employed to belong to the lower income class compared to the middle income class. The difference in likelihood is 17.2 and 24.8 percentage points respectively. The magnitudes of the marginal effects of these variables for the upper income class remain around 2-3 percentage points for all groups.

The coefficients of the three year dummies show that in our selected sample it was over time less likely (compared to the benchmark group 1992) to belong to the lower income class compared to the middle. There is also an increase in the likelihood of belonging to the upper income class compared to the middle over time. Older individuals are less likely to belong to the lower income class and more likely to belong to the upper income class, both compared to the middle income class. Lower skills (low education compared to medium education) raise the likelihood of belonging to the lower income class compared to the middle income class and higher skills (high education compared to medium education) lowers the likelihood of belonging to the lower income class compared to the middle income class. The same coefficients show the opposite for the upper income class.

Table 3 shows the partial derivatives with respect to the immigrant dummy variable. The estimates in column (1) were derived holding all covariates at their means. Specific values have been assigned the dummy variables for the remaining estimations.

Table 3
Marginal effects

Year	(1)		(2)		(3)		(4)		(5)	
	Lower income class	Upper income class	Lower income class	Upper income class	Lower income class	Upper income class	Lower income class	Upper income class	Lower income class	Upper income class
1992	0.074***	-0.004***	0.059***	-0.006***	0.117***	-0.001***	0.078***	-0.000***	0.124***	-0.000***
	(0.008)	(0.000)	(0.007)	(0.001)	(0.011)	(0.000)	(0.009)	(0.000)	(0.012)	(0.000)
1995	0.063***	-0.005***	0.049***	-0.007***	0.110***	-0.002***	0.067***	-0.000***	0.120***	-0.001***
	(0.007)	(0.000)	(0.006)	(0.0019	(0.011)	(0.000)	(0.008)	(0.000)	(0.012)	(0.000)
2000	0.055***	-0.019***	0.042***	-0.023***	0.104***	-0.009***	0.058***	-0.002***	0.116***	-0.004***
	(0.006)	(0.002)	(0.005)	(0.00)	(0.010)	(0.001)	(0.007)	(0.001)	(0.011)	(0.002)
2005	0.021***	-0.032***	0.014***	-0.037***	0.063***	-0.023***	0.025***	-0.005***	0.080***	0.014***
	(0.003)	(0.004)	(0.002)	(0.004)	(0.006)	(0.003)	(0.003)	(0.003)	(0.008)	(0.005)

(1) All other covariates fixed at their means
(2) Medium skilled and employed, all other covariates fixed at their means
(3) Medium skilled and not employed, all other covariates fixed at their means
(4) Medium skilled and retired, all other covariates fixed at their means
(5) Medium skilled and in education, all other covariates fixed at their means

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Source: LIS database, own calculations.

The magnitudes in table 3 shows the percentage point difference in likelihood of belonging to the lower and upper income class between natives and immigrants compared to the middle income class, i.e. a positive marginal effect implies that immigrants are more likely than natives to belong to the income class of question and a negative marginal effect implies that immigrants are less likely compared to natives to belong to the income class of question, both compared to the base outcome. All columns showing the marginal effect for outcome 1, which is the lower income class, indicates a decreased difference in the likelihood between immigrants and natives over time. The difference is particularly smaller in 2005. The coefficients of the interaction terms in table H (appendix H) similarly suggests that immigrants have not seen an increased likelihood compared to natives of belonging to the lower income class.

The marginal effects in column (3) and (5) are larger than the marginal effects in column (2) and (4). In other words, the difference in the likelihoods of belonging to the lower income class between natives and immigrants are not as large for those who are employed and retired as for those who are not employed and in education. For all specifications there is no large difference between immigrants and natives likelihood of belonging to the upper income class. There is a slight increase in the magnitude over time, which is consistent with the coefficients of the interaction terms in table H (appendix H).

In conclusion, the findings of the derived inequality measures and the regression results show that income inequality in Sweden rises when immigrants are accounted for and it is due to increased dispersion in the lower part of the income distribution. This is consistent with the fact that immigrants have lower incomes compared to natives over the whole distribution. Analysing the likelihood of belonging to the lower income class compared to the middle income class over time shows that immigrants have not experienced an increased risk of belonging to the lower income class over time in comparison to natives. It might be the case that those immigrants belonging to the lower income class in later years have more dispersed incomes than those of earlier years, creating the increasing effect in income inequality that derived inequality measures indicate. However, the derived percentile gaps shown in Table F in appendix F show a decrease in the native 10/1-gap rather than an increase in the same gap of immigrant incomes. It can moreover be concluded that those immigrants with the labour status not employed and in education face a much larger likelihood of belonging to the lower income class than those immigrants who are employed or retired.

5. Conclusion and suggestions for further research

This paper has examined the impact of immigration income inequality in Sweden. The data used come from the Luxemburg Income Study database and captures a period of 14 years between 1992 and 2005, a period where income inequality increased significantly in Sweden. Comparisons between derived inequality measures of the whole sample and a sample excluding immigrants show that the income inequality in Sweden increases when immigrants are accounted for and it is almost entirely due to dispersion in the lower part of the distribution. The results differ from findings of previous studies in the US and Spain. Card (2009) and Lemos (2014) both found a pattern of clustering at the high and low ends of the wage distribution among immigrants, which stretches out the distribution in both ends and increases inequality. Why findings differ between countries most probably has to do with selection in the type of immigrants a country receives. Sweden received large inflows of political refuges during the 1990's and the employment rate of Swedish immigrants has declined since the 1970's.

Those immigrants that are not employed or in education face a much higher likelihood of belonging to the lower income class compared to natives than those who are retired or employed. Hammarstedt and Shukur (2007) consistently established that the assimilation of immigrants in

Sweden is more an issue of getting into the labour market than reaching high earnings. Subsequently those groups that should, especially, be targeted and taken into consideration for policy making in order to reduce income inequality are immigrants that are not employed or in education.

This paper hopefully inspires future research. Much more has to be done within the subject since the literature is extremely scarce. The derived inequality measures show only direct effects from immigration that are associated with immigrants' own incomes. Theory implies that immigration can have indirect impacts on income inequality that is associated with how immigration shapes the earnings of natives. DiNardo et al., (1996) introduced a method, which yield clear visualizations of the effect from a certain factor of choice on the income distribution. Such a method would be ideal to examine the full impact of immigration.

Appendix

A. The LIS definition of disposable household income

Disposable household income consists of the sum of monetary income from labour, non-monetary income from labour, monetary income from capital, monetary social security transfers (including work-related insurance transfers, universal transfers, and assistance transfers), and non-monetary social assistance transfers, as well as monetary and non-monetary private transfers, minus income taxes and social contributions paid.

B. Summary statistics of the variables included in regressions.

Table B
Summary Statistics

Variable	Full sample Mean/ Percentage	Full sample St.Dev/ Cum. Percentage	Full sample Min	Full sample Max	Natives Mean/ Percentage	Natives St.Dev/ Cum. Percentage	Natives Min	Natives Max	Immigrants Mean/ Percentage	Immigrants St.Dev/ Cum. Percentage	Immigrants Min	Immigrants Max
Equivalent Disposable Income	169055.3	84661.8	1729.1	2309960	170647.7	84932.7	1746.3	2309960	154047.3	80378.1	1579.1	1274140
Age	44.0	13.6	18	74	44.2	13.7	18	74	42.0	11.9	18	74
Income classes												
Lower	10.4%	10.4%	-	-	9.9%	9.9%	-	-	11.6%	11.6%	-	-
Middle	85.2%	95.6%	-	-	85.7%	95.6%	-	-	83.3%	95.6%	-	-
Upper	4.4%	100.0%	-	-	4.4%	100.0%	-	-	5.2%	100.0%	-	-
Demographics												
Native	90.4%	90.4%	-	-	-	-	-	-	-	-	-	-
Immigrant	9.6%	100.0%	-	-	-	-	-	-	-	-	-	-
Employed	76.8%	76.8%	-	-	78.3%	78.3%	-	-	62.3%	62.3%	-	-
Not Employed	10.5%	87.3%	-	-	8.9%	87.2%	-	-	25.2%	87.5%	-	-
Retired	8.8%	96.1%	-	-	9.3%	96.5%	-	-	4.6%	92.1%		
In Education	3.9%	100.0%	-	-	3.5%	100.0%	-	-	7.9%	100.0%		
Low Education	25.0%	25.0%	-	-	24.5%	24.5%	-	-	29.5%	29.5%	-	-
Medium Education	50.4%	75.4%	-	-	51.0%	75.5%	-	-	45.2%	74.7%	-	-
High Education	24.6%	100.0%	-	-	24.5%	100.0%	-	-	25.3%	100.0%	-	-
Years												
1992	26.1%	26.1%	-	-	27.3%	27.3%	-	-	14.9%	14.9%	-	-
1995	25.4%	51.5%	-	-	26.5%	53.8%	-	-	14.7%	29.6%	-	-
2000	28.4%	79.9%	-	-	27.2%	81.0%	-	-	40.5%	70.1%	-	-
2005	20.1%	100.0%	-	-	19.0%	100.0%	-	-	29.9%	100.0%	-	-
Number of observations		76944				70530				6414		

Source: LIS database, own calculations.

C. Equivalent disposable income of natives and immigrants separately for selected percentiles.

Table C
Descriptive Statistics

Percentiles	1992		1995		2000		2005	
	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants	Natives	Immigrants
1%	23739.0	18838.9	19328.0	5196.2	37476.7	27073.0	64365.3	30996.4
5%	64439.4	49197.0	68447.3	41674.9	80167.0	64075.0	104615.7	74994.1
10%	79078.0	69663.0	86477.0	71892.0	97702.0	79270.8	122634.0	93745.2
20%	98163.4	77791.0	104573.3	89735.0	119549.1	94130.0	148699.6	113497.0
25%	104769.2	82603.5	110248.6	94507.5	128477.8	101776.8	158687.6	122108.0
30%	110938.4	86914.0	115491.5	98013.5	135961.0	108324.1	169166.1	131949.7
40%	122040.0	98470.3	125114.2	104525.8	150177.9	123711.9	186566.7	148054.7
50%	133047.5	109514.0	135623.3	110788.1	164552.0	136081.5	203441.9	165019.1
60%	145383.8	123507.5	145924.9	118308.2	180196.0	151060.8	222160.9	185438.5
70%	158642.2	138979.8	159214.0	129575.0	198903.5	171189.8	244546.5	207071.0
75%	166649.3	147552.5	167561.0	134817.9	211444.0	182756.7	258058.3	218818.1
80%	176282.7	155674.2	177874.3	144203.0	225047.1	195275.0	273138.8	232787.3
90%	206041.5	186122.3	208949.3	173388.0	269950.0	237626.9	323913.1	275843.5
95%	238932.8	211668.0	239351.8	201878.3	319878.8	283032.9	375303.7	311311.0
99%	323673.2	286869.7	343242.5	280226.0	469472.2	408234.0	561265.5	431298.4

Nominal annual equivalent disposable income reported in Swedish Krona. Source: LIS database, own calculations.

D. Equivalent disposable income of natives and the total sample separately for selected percentiles.

Table D
Descriptive Statistics

Percentiles	1992		1995		2000		2005	
	Natives	Total	Natives	Total	Natives	Total	Natives	Total
1%	23739.0	23100.0	19328.0	17849.0	37476.7	35426.0	64365.3	52683.0
5%	64439.4	64025.0	68447.3	67337.1	80167.0	77421.0	104615.7	97753.27
10%	79078.0	77647.4	86477.0	85427.2	97702.0	93612.5	122634.0	116125.0
20%	98163.4	96378.6	104573.3	103020.2	119549.1	115319.2	148699.6	141591.8
25%	104769.2	103203.0	110248.6	108772.1	128477.8	124428.9	158687.6	152158.5
30%	110938.4	109288.3	115491.5	114070.5	135961.0	131823.4	169166.1	162457.5
40%	122040.0	120720.0	125114.2	123645.3	150177.9	146722.5	186566.7	181526.2
50%	133047.5	131626.1	135623.3	134003.8	164552.0	161141.2	203441.9	198619.2
60%	145383.8	144473.8	145924.9	144601.2	180196.0	176451.4	222160.9	216888.0
70%	158642.2	157884.0	159214.0	157915.5	198903.5	195647.5	244546.5	239085.0
75%	166649.3	165772.7	167561.0	166390.0	211444.0	207603.0	258058.3	252405.6
80%	176282.7	175297.0	177874.3	176315.0	225047.1	221120.5	273138.8	268057.1
90%	206041.5	204657.2	208949.3	207636.3	269950.0	265450.7	323913.1	316834.0
95%	238932.8	236983.3	239351.8	237631.0	319878.8	315423.0	375303.7	366692.8
99%	323673.2	320235.9	343242.5	340633.1	469472.2	463241.5	561265.5	548955.0

Nominal annual equivalent disposable income reported in Swedish Krona. Source: LIS database, own calculations.

E. Gini coefficients

Table E
Gini-coefficients

	Total	Natives	Immigrants
1992	0.21737	0.21522	0.23506
1995	0.21047	0.20866	0.21516
2000	0.24245	0.23770	0.25899
2005	0.22838	0.22283	0.23943

Source: LIS database, own calculations.

F. Percentile gaps

Table F
Percentile gaps

Percentile gaps	1992			1995			2000			2005		
	Total	Natives	Immigrants	Total	Natives	Immigrants	Total	Natives	Immigrants	Total	Natives	Immigrants
99/1	13.863	13.635	15.228	19.084	17.759	53.929	13.076	12.527	15.079	10.420	8.720	13.914
90/10	2.636	2.606	2.672	2.431	2.416	2.412	2.836	2.763	2.998	2.728	2.641	2.942
50/10	1.695	1.682	1.572	1.569	1.568	1.541	1.721	1.684	1.717	1.710	1.659	1.760
90/50	1.555	1.549	1.700	1.549	1.541	1.565	1.647	1.641	1.746	1.595	1.592	1.672
99/90	1.565	1.571	1.541	1.641	1.643	1.616	1.745	1.739	1.718	1.733	1.733	1.564
10/1	3.361	3.331	3.698	4.786	4.474	13.835	2.642	2.607	2.928	2.204	1.905	3.024

Source: LIS database, own calculations.

G. Yearly immigrant shares of the total population

Table G
Immigrant shares

Year	Immigrant share
1992	3.8
1995	4.7
2000	11.8
2005	14.2

Source: LIS database, own calculations.

H. Estimates from multinomial probit regression including interaction terms

Table H
Multinomial probit coefficients and marginal effects

	Lower income class		Upper income class	
Variable	Coefficient	Marginal Effect	Coefficient	Marginal Effect
(β_0)Constant	2.250*** (0.121)	-	-5.583*** (0.264)	-
(β_1)Immigrant	0.532*** (0.123)	0. 048*** (0. 006)	-0.011 (0.222)	-0. 008*** (0. 001)
(β_2)Age	-0.178*** (0.006)	-0. 017*** (0. 001)	0.064*** (0.011)	0. 003*** (0. 000)
(β_3)Age^2	0.002*** (0.000)	0. 000*** (0.000)	-0.000 (0.000)	-0. 000*** (0.000)
(β_4)Not Employed	1.217*** (0.034)	0. 173*** (0. 006)	-0.412*** (0.061)	-0. 020*** (0. 001)
(β_5)Retired	0.365*** (0.062)	0. 038*** (0. 007)	-1.416*** (0.079)	-0. 026*** (0. 001)
(β_6)In Education	1.538*** (0.044)	0. 248*** (0. 010)	-0.661*** (0.189)	-0. 024*** (0. 002)
(β_7)Low Education	0.378*** (0.028)	0. 044*** (0. 003)	-0.418*** (0.040)	-0. 010*** (0. 001)
(β_8)High Education	-0.202*** (0.032)	-0. 021*** (0. 002)	0.724*** (0.028)	0. 041*** (0. 002)
(β_9)1995	-0.177*** (0.029)	-0. 028*** (0. 003)	0.056 (0.052)	0. 001* (0. 001)
(β_{10})2000	-0.415*** (0.032)	-0. 053*** (0. 004)	0.824*** (0.045)	0. 026*** (0. 001)
(β_{11})2005	-1.168*** (0.050)	-0.102*** (0. 003)	1.292*** (0.045)	0. 064*** (0. 002)
(β_{12})Immigrant*1995	-0.413*** (0.146)	0.015 (0.010)	-0.102 (0.321)	-0.002 (0.003)
(β_{13})Immigrant*2000	0.066 (0.135)	0.074*** (0.008)	-0.182 (0.237)	-0.014*** (0.003)
(β_{14})Immigrant*2005	-0.166 (0.154)	0.018*** (0.005)	-0.571** (0.233)	-0.046*** (0.004)
Number of observations	76944			
Wald chi2(22)	8058.90			

Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. Source: LIS database, own calculations.

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