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## Income gaps between natives and immigrants in Sweden: Are there differences in labor market sectors?

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## **Abstract**

Earning gaps between natives and immigrants in Sweden have been a widely discussed issue in the literature. The previous studies that examined the wage gaps mostly focused on educational attainment, tenure, generation of immigrants and ethnic origins. The distribution of immigrants' income within different labor market sectors is almost unexplored. The paper analyzes several determinants of income among natives and immigrants. The effect of education and origin within different labor market sectors is of particular interest. The study reveals that employment within the manufacturing sector has more possibilities of income generation for immigrants and leads to diminishing income gaps among natives and immigrants. Being employed in manufacturing sector also shows the upward growth of income for every region of origin and for increase of educational attainment. Tertiary education has a pronounced positive effect on income growth. It was also found that immigrants from Africa and Asia substantially lag behind natives in terms of income from work. The most similar effect of three-way interactions "origin \* industry \* education" is observed for natives and European immigrants.

Key words: income differentials, labor market sector, origin, education, Sweden, immigrants

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## **1. Introduction**

### **1.1. Problem discussion**

Sweden has become a net immigration country after the great depression in the 1930s. Evidently, the issues of migration and integration, cultural and social assimilation are crucial and relevant. It is worth stressing, that integration can have several forms from cultural to labor market assimilation. The acceptance of new immigrants caused a need for integration into the Swedish labor market and Swedish society. Nevertheless, while opening many opportunities, the immigration may also cause many challenges.

“Swedish Model” includes social security, human rights respect and decent payment for every worker. Moreover, Swedish labor market gives priority to the focus on worthy assessment of human capital and stands for equality of opportunities (Schön 2008).

Migration policy goes hand-in-hand with integration policy. Evidently, immigrants are expected to gain the same labor market entry and remuneration as native Swedes. However, the position of immigrants is weak as in most European countries. The immigrants are subject to lower wages and lower employment rates.

The present study analyzes income gaps between natives and immigrants within different labor market sectors. It focuses on interrelationship between income, labor market sectors, origin, education and other factors that could impact the income differentials between natives and immigrants. It adds to overall understanding of wage gaps and it sheds light on possible reasons behind the differences in labor market outcomes.

The previous studies that examined the wage gaps mostly focused on educational attainment, tenure, generation of immigrants, language proficiency and ethnic origin. The importance of the country of origin is stated in many studies regarding immigrants’ labor market outcomes (Hammarstedt & Palme 2005, Rooth & Ekberg 2006, Le Grand & Szulkin 2000.). The role of education is also pointed by many scholars (Hansen & Lofstrom 2003, Duvander 2001, Nekby et al. 2007). The interaction between immigrants’ wages and industrial sectors is partly explored. The occupational segregation and industrial distribution of immigrants were viewed in several studies (Becker et al. 2008, Helgertz 2010, Parasnis 2006, Lundh and Ohlsson 1994).

The distribution of immigrants’ income within the labor market sectors is of particular interest. Firstly, it gives additional understanding of wage gaps characteristics. Secondly, the detection of “immigrant favorable” sector would help to identify characteristics which drive employers’ intentions of hiring immigrants. Finally, the analysis will contribute to overall understanding of “capital saturated” industries.

The present analysis extends previous researches to labor market sectors. The detection of factors impacting individual income is a rather complex issue from theoretical and empirical perspectives. The literature does not clearly specify the way labor market sector affects wages. The magnitude of industrial<sup>1</sup> influence has not been studied deeply and empirically assessed. The empirical analysis of immigrants-natives wage gaps was mainly based on variables education, origin, language proficiency, country specific skills, generation of immigrants.

Generally thinking, labor market of the country of destination is one of the determinants of the decision to leave the country of origin (the statement does not apply to refugee migrants). The search of better opportunities and higher income, lack of financing in industrial sectors positively impact the decision to migrate. The study looks at three sectors in order to identify whether the income changes within different groups of individuals. The present research presumes a theoretical assumption that labor market sector matters in income gaps between immigrants and natives. The analysis of income differentials within sectors would help to foresee perspective productivity and capital investments for Swedish labor market sectors.

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<sup>1</sup> By industry I mean labor market sector. The study has three “industries” for the analysis: agriculture, manufacturing, service sector. The detailed description is given in section 3.4. Variable design

## ***1.2. The aim and scope***

The main objective of the thesis is to assess the earning gaps between immigrants and native Swedes within Swedish labor market sectors. Additional aim is also to examine the impact of educational level and origin on wage gaps. Meanwhile, the study aims to shed light on income differentials within labor market sectors taking educational attainment and region of origin into consideration. The additional expected outcome of the study is to clarify the distribution of educational demands within different sectors of Swedish economy as well as the immigrants' contribution to different industries. The overview of the immigrants with different educational level and different countries of origin within the industries helps to distinguish an appropriate explanation for labor market assimilation of immigrants in Sweden. Moreover, the study aims to detect an inadequate human capital assessment within the industrial sectors and to identify the drawbacks of labor market assimilation for groups of immigrants with different countries of origin.

The study of the immigrants within labor market sectors has several advantages. Firstly, it tries to explain wage gaps from different perspectives and deepen the existing knowledge of work remuneration between natives and immigrants. Secondly, it deals with human capital valuation. Finally, it estimates obstacles to labor market assimilation for different groups of immigrants. Additionally, the paper will contribute to analysis of industries where the immigrants are widely represented. Moreover, it will help to identify the existing problems in adaptation of immigrants with different educational level.

To common sense, the topic is relevant in a way to better understand income differentials issues. Therefore, characterizing the wage gaps from different perspectives could result in better understanding of immigrants' assimilation into Swedish society. Further, a deeper overview of origin, educational attainment and labor market sectors as the main determinants of income differentials will add to estimation of future inflows of migrants and policies application towards them. In addition, the paper aims to examine other factors that could impact income in order to draw a substantial conclusion in the end.

## ***1.3. The context of the study***

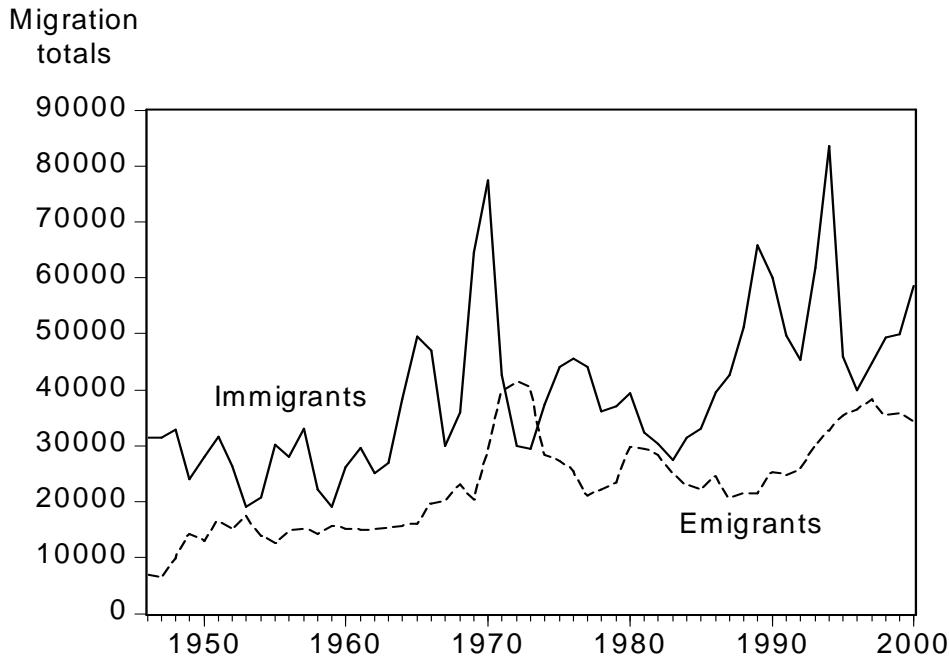
### ***1.3.1. Historical background***

The immigration in Sweden began after the Second World War. Figure 1 gives an overview of general patterns of immigration. The labor immigration period refers to 1945-1975. Generally, the labor migration was dominated by Nordic citizens. Also during the 1950s immigrants came from Germany, Austria and Italy and in the 1960s from Yugoslavia, Greece and Turkey. The expanded service sector after World War II demanded labor force and as a result in 1950 every fifth employee in the hotel and restaurant sector was a foreign citizen. The absence of borders between Nordic countries and the need of labor force for the country development also favoured immigration to the country (Bengtsson and al. 2005).

The refugee immigration period refers to 1970-2004. In 1960s a lot of immigrants who were seeking protection after the military takeover came from Greece. After the oil crisis asylum seekers came from Latin America, after the 1980s from Middle East. A big inflow of refugees arrived from former Yugoslavia in 1990s. The largest group in the beginning of 2000 was Iraqis. In 1994, Sweden joined the Common European Labor Market and therefore, labor market mobility for European citizens became easier. (Lemaitre 2007).

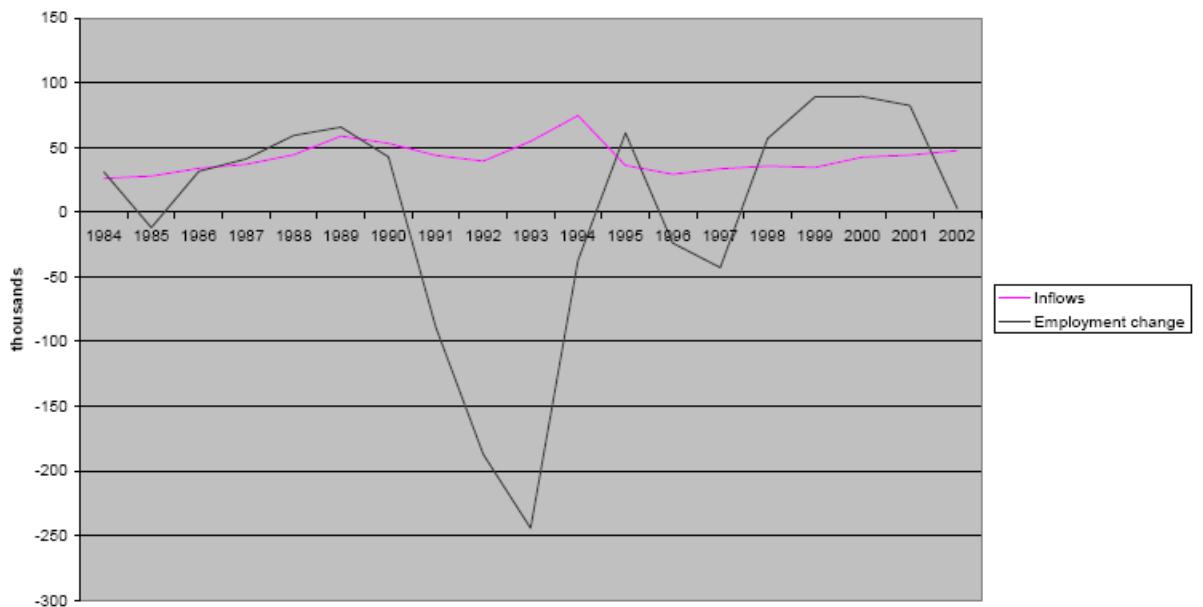
As seen from the Figure 2, migration is not in line with labor market needs. Thus, for the period 1990-1994 the country has experienced a sharp drop in employment, followed by the second drop in 1996-1997. The influx of immigrants was noticeably higher than the needs of the labor market.

Figure 1. Sweden's migration exchange, 1946-2000.



Sources: SOS Befolkningsrörelsen; SOS Folkmängdens förändringar; SOS Befolkningsförändringar; SOS Befolkningsstatistik, adopted from : Bengtsson and al. (2005)

Figure 2. Inflows of foreign citizens and year-to-year employment change, Sweden, 1984-2002.



Source: Lemaitre (2007)

In the 1990s Sweden experienced a deep economic recession with increase in unemployment. Thus, the downturn of immigrant groups was reflected in their earnings and employment opportunities. The employment rate fluctuations evidently refer to the most vulnerable social groups, where the immigrants represent the risk group. It could be concluded that the employment change has a greater impact on immigrants than on native-born population. In addition, the increase of unemployment causes the problems of assimilation of immigrants.

### *1.3.2. Policies and facilitating procedures of assimilation*

Assimilation of immigrants is an emerging issue for every country of immigration. Sweden has made several attempts to facilitate the integration procedures and to establish a favourable atmosphere for the labor immigrants.,.

“The Swedish Immigration Board was established in 1969 and took over the responsibilities for immigration from the Swedish Labor Market Board, which had been the responsible authority until then. In 1970 the government decided to introduce free language training, including for “tourist immigrants”. Two years later a Government bill was passed guaranteeing newly arrived immigrants the right to 240 hours of salaried language training. The development of integration policy continued as the number of immigrants in the country rose” (Lemaitre 2007, p.15).

Sweden has developed integration programs of immigrants’ assimilation. The policies are based on multiculturalism and on the objectives of equality, freedom of choice and partnership. They also include the right of individuals to cultural and ethnical identification, the government subsidized “introduction programs” consisting of paid employment under “trainee positions for immigrants” program and free language courses. Additionally, for asylum seekers two-year “introduction program” that includes Swedish language training, vocational programs and the development of a plan to find employment is available.

### *1.3.3. Problems and possible obstacles of assimilation in Sweden*

Barriers for immigrants’ integration are discussed in several studies. Thus, Helgertz (2008) underlined several difficulties of labor market integration. Hence, individual’s skills are not “necessarily being perfectly transferable from origin to destination country” (Helgertz 2010, p.12). For employers it is hard to recognize the true productivity of the immigrant especially in the first time of their arrival. Therefore, immigrants experience mismatches of skills and status compared to their home country. Moreover, the country of origin and destination countries differ in terms of institutions, language and cultural perceptions and the integration gap tends to grow.

The motivation of immigrants to assimilate in the country of destination can be interfered by linguistic differences. Helgertz (2008) states that for the immigrant with language skills and orthography different from the Latin alphabet (for example Iranian and Greek immigrants that have Arabic and Greek alphabets) it is more problematic to adapt to Swedish language. Consequently, in order to socialize and write in Swedish they need to learn new alphabet. On the contrary, Northern European and North American immigrants have more prerequisites to learn Swedish language.

Religious perception also impacts immigrants’ behaviour. For example it influences education, wages, fertility and marital patterns. “Religious beliefs can be assumed to be strongly linked to an individual’s values and henceforth influencing many aspects of his or her behaviour in everyday life, possibly also the attitudes towards work and career” (Helgertz 2008, p.8)

However, the level of immigrants’ assimilation into the labor market also depends on the economic situation in the country. Thus, Åslund and Rooth (2007) analyzed the long-term effects of labor market conditions on immigrant earnings and immigrant employment. The focus of the study is on two types of refugees in Sweden: those who arrive during the economic downturn and those who arrive during the economic growth period. The research question is two folded: firstly, the authors want to look at favourable national labor market conditions upon arrival of immigrants and their outcomes; secondly, they want to investigate the impact of different local market conditions for immigrants arriving at the same time. Thus, the main hypothesis is that individuals arriving during economic boom periods are more likely to have faster earnings assimilation than the ones who arrive during a slump. The paper argues that two

exogenous factors influence refugees: the governmental refugee settlement policy and the Swedish economic crisis of 1990s.

The paper of Åslund and Rooth (2007) concludes that early earnings assimilation is very dependent on a favourable national labor market. Hence, those who enter in poor local labor market conditions are likely to experience high local unemployment in subsequent years. High unemployment upon arrival has a clear impact on earnings and employment for at least ten years. Moreover, local conditions in the year of immigration impacts initial individual outcomes. Some cohorts arriving in the beginning of the recession did not manage to exceed 50% of the average earnings in Sweden.

To sum up, both time of arrival time and destination area matter in a long run and it is mirrored in earnings assimilation of immigrants. Thus, the immigrants could face with totally different labor market conditions and it could impact their perspective assimilation and integration.

Additionally, the obstacles of labor market assimilation could be rooted in discrimination issues. Being excluded from the labor market and separated from native employees, the immigrants can not integrate properly into the labor market. Moreover, immigrants are more vulnerable to economic downturns and crises. They are a risk group that can lose labor market attachment.

#### **1.4. Thesis outline**

The remainder of the paper is organized as follows: section 2 reviews theoretical background and previous research. Section 3 presents the data and the sample of the analysis. Section 4 describes statistical model and defines variables involved in the study. Section 5 presents descriptive statistics of the study. Section 6 outlines empirical framework and discuss statistical results. Section 7 concludes. Finally, section 8 gives suggestions for the further research.

### **2. Background and theoretical framework**

#### **2.1. Previous research and empirical findings**

##### **2.1.1. Previous research**

The current section contributes to previous studies regarding the income gaps between natives and immigrants and the reasons behind them.

Labor market assimilation is the main issue discussed by scholars and experts of migration (Aguilar and Gustavsson 1991, Borjas 1994, Chiswick 1979 Ekberg 1994). The majority of studies indicates that there exist the gaps in income between immigrants and natives. The returns on human capital vary between natives and foreign-born. The immigrants are often employed in overqualified positions. Thus, labor market integration for immigrants is a matter of country specific skills, education and country language.

Theoretically, the earning gaps, wage differentials can be explained by the lack of access to the labor market due to language problems, lack of adequate skills and necessary human capital, imperfect competition and discrimination. The evidence suggests that ethnic backgrounds, educational attainment, time and aim of immigration may contribute to explanation of income distribution. The studies regarding that matter are underlined below. In addition, of particular interest of that thesis is the impact of immigrants' educational level on employment and income distribution in the Swedish labor market sectors.

Hammarstedt and Palme (2005) compared the intergenerational earnings mobility of immigrants with natives in Sweden. They stated that the difference in earnings between immigrants and natives is explained also by the different ethnic origins. Immigrants have lower

intergenerational earnings mobility within groups with similar ethnic backgrounds. The wage gaps also depend on the generation of immigrants. According to Behrenz and al. (2007), second generation immigrants have disadvantage in job acquisition. In the second generation of immigrants the wage gaps are smaller than in the first generations. This could be explained by the investment into the human capital done by the parents of immigrants. They invest more in education acquisition in Sweden and Swedish language learning. Consequently, the access to the native society increases and assimilation has more probability to occur. But the return to education can be different among different immigrant groups. Moreover, Swedish employers consider education acquired out of Sweden weaker and sometimes lacking necessary skills and approaches. The immigrants born outside Sweden are overrepresented in the group of individuals who have achieved post-secondary and high education. Therefore, the refuse of those immigrants into the labor market could be connected either with the quality of their education or with the discrimination.

Rooth and Ekberg (2006) explored refugee immigrant groups and concluded that for many immigrants their first occupation in Sweden had a lower status than in their country of origin.

Additionally, Hansen and Lofstrom (2003) underline that none of the groups of immigrants reaches parity with natives. However, the amelioration of socio-economic status takes place in Sweden. It's possible for around one third of the immigrants. The deterioration of status is small. Unfortunately, the majority of immigrants after 14 years do not "catch-up" with their previous status in the home-country. This applies to immigrants who had the high socio-economic status at the country of origin. Upward occupational-status mobility is faster for people who obtained Swedish education and invested in Swedish language skills. Consequently it affects the increase of human capital transferability.

Hammarstedt (2001) investigated disposable income differences between natives and immigrants in Sweden. The study showed that early immigrants' cohorts had the same or even higher disposable income than the later arrived immigrants. Thus, there are differences in disposable income between natives and immigrants. Moreover, the differences are substantial between immigrants from different regions and different immigrant cohorts. The study also provides evidence that education has a positive impact on the disposable income.

Hammarstedt (2003) also looked at income from work among immigrants. The study provides evidence that among other characteristics, the educational level has the core influence on earnings. The study shows that the proportion of immigrants who have income from work is around 90 percent for immigrants with secondary school education. However, the immigrants at any educational level have the lower proportion of income from work as native Swedes. Hammarstedt (2003) also mentions the variable "hours worked". The income differences can occur due to the differences in hours worked. The variables involved into analysis are: wage, years of schooling, and years of experience. The study indicates a significant difference in income from work between immigrants and natives. Additionally, the evidence of the study is that the income increases as the length of stay also increases. The "quality" of European immigration inflows remains the same.

Nekby and al. (2007) underline that the differences between immigrants and natives are significant in terms of income and employment. Consequently, immigrants have lower wages and higher unemployment rates. The study of youth labor market status in 1995 led to the conclusion that there were differences in employment especially among non-European immigrants. However, the gap is narrowing with the education acquired in Sweden. For the Western European immigrants, no employment gap was found between natives in immigrants if they are highly educated (University educated).

Hansen and Wahlberg (2009) used LINDA database for their analysis. They analyzed poverty of immigrants comparing their incomes with native Swedes. The study indicates that immigrants, especially refugees are more vulnerable to poverty than natives.

Among the reasons of improved labor market positions Duvander (2001) examines the knowledge of Swedish language, education obtained in Sweden and cohabitation with a

Swedish partner. She assumes these characteristics as determinants of risk of unemployment. She founded that generally country-specific skills are an asset, but they do not completely determine better labor market positions. Her study shows that the groups of immigrants with the same level of skills may have different opportunities in the labor market (better labor market positions).

Behtoui and Neergaard (2010) stated that social capital is helpful to integrate into the labor market and that non-European immigrants are lacking the social capital. Access to social capital is easier with higher educational attainment and more work experience.

Le Grand and Szulkin (2000) also underline that labor market integration is unproblematic for Western countries immigrants. In contrast, the immigrants from other countries face different obstacles, mainly discrimination. Le Grand and Szulkin (2000) mention inequality into the labor market in terms of differences in human capital and immigrants' exclusion from rewards into the labor market. They concluded that the wage gap between natives and immigrants is a reason of different returns on their human capital, not because of differences in accumulated human capital. The earnings of immigrants increase with their duration of stay in Sweden. Taking an ethnic background into consideration, the study reveals a large degree of wage inequality.

### *2.1.2 Empirical findings*

The section presents previous empirical findings about income differentials in labor market sectors.

Previous research on earnings of immigrants has a lot of pathways and directions. Thereby, the performance of immigrants into the receiving country is easy to explain through the access to the labor market and employment opportunities. The present paper also aims to analyze the earning gaps, but extend the analysis to different labor market sectors. Unfortunately, the issue of industrial distribution of immigrants in Sweden has received little attention. However, some studies have appropriate connection with the research question of present paper. Several studies of industrial distribution of immigrants could be mentioned.

Generally in EU 15<sup>2</sup>, the immigrants from North America, Australia, New Zealand and Western EU dominate in highly skilled non-manual positions; immigrants from other countries are underrepresented in medium-skilled non-manual positions and over-represented in non-skilled manual positions. Thus, manufacturing, construction, hotels and restaurants, real estate, renting and research tend to involve more immigrants than the other sectors. In contrast, the public sector (public administration and defence) are mostly occupied by natives (Münz 2008).

According to International Migration Outlook (OECD, 2007), immigrants in Sweden are overrepresented in construction, manufacturing, hospitality, health care.

Aslund and Skans (2010) studied ethnic workplace segregation in Sweden taking industry, geography and human capital into consideration. The paper revealed that immigrants from Nordic countries and Eastern Europe dominate in the manufacturing industry while the others are employed in staffing and cleaning services. The groups of Turks, Finns and Yugoslavs are overrepresented in manufacturing sector (Leinio 1988).

Parasnus (2006) looked at assimilation of immigrants into Australian labor market. The main finding of the paper is that the industrial distribution of immigrant's employment tends to concentrate in several industries. Those "immigrant - intensive" industries are: retail trade, manufacturing, health services, agriculture, business and repair services (Parasnus 2006, p.330). The distribution remains almost unchanged in Australia during 1994-2000. The segregation in the industrial sectors emerges due to illegal immigrants who appear to be "employed" in restaurant industry and fruit picking. However, in Australia there is no strong segregation within the industry of immigrants.

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<sup>2</sup> Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

Becker and al. (2008) focused on the case of Switzerland. Their analysis concluded that immigrants are focused on “knowledge - based” and “knowledge - intensive” service sectors. The changes in Swiss migration policy of 1991 were oriented to encouragement of tertiary educated individuals. In addition, Swiss immigration policy has impacted the concentration of the immigrants into the seasonal industrial sectors. Hotel and restaurant sector is one with the largest share of foreign - born. However, by year 2000 the share slightly decreased suggesting the shift towards other sectors. Also the ratio of foreign born in construction has shifted being 24 percent in 1990 and below 7 percent in 2000. The IT and business services experienced an increase of migrants inflow from 4 to 13 percent in 1990 and 2000 respectively. After 2000 banking and finance, chemical sectors have experienced increase of immigrants. The shift of immigrants percentage in the labor market sectors is explained by the growth of value added in the sector as well as by the change in migration policy.

The analysis of the industrial distribution of immigrants in the US reveals that immigrants are employed in construction, restaurant service, and agricultural production. Whether the immigrants are low skilled they are more likely to be “cooks (5.8 %), janitors and cleaners (4.3 %), truck drivers (4.3 %) machine operators (4.1 %) and farm workers (4 %). Low educated natives are most likely to be truck drivers (6 %), followed by sales supervisors (3.1 %), production supervisors (2.9 %) and machine operators (2.8 %)” (Hall and Farkas 2008, p. 627). The occupational concentration is determined by lower education, lower language proficiency and even by the lack of legal status. Obviously, illegal immigrants do not create necessary networks and therefore they face industrial barriers.

Helgertz (2010) examined the labor market outcomes of natives and immigrants in Sweden. The effect of industry is of particular interest for the present study. The analysis of the dissertation states that immigrants have disadvantageous positions compared to natives. Females experience bigger disadvantages within the sector than the males. Moreover, labor market sector-specific opportunities vary across individuals’ linguistic distance, gender and educational attainment. Thus, manufacture is male - dominant sector while service sector accounts for female - dominance. The study of Helgertz (2010) indicates that career opportunities vary between the industrial sectors. More specifically, manufacturing sector deprives career opportunities for the immigrants. Service sector demands high standards of personal and educational attainment and immigrants are rejected as they do not meet the requirements. Agricultural sector was excluded from the study. The analysis also states problems of human capital transferability within different sectors. Hence, the absence of country-specific skills is seen as an obstacle of labor market assimilation. The disadvantage of female in manufacturing sector also excludes them from career opportunities as they do not fulfil industry-specific requirements.

Historical evidence could be helpful in explaining occupational distribution of immigrants. Hence, after 1960s a bulk of immigrants worked in restaurant branch. After the oil crises in the 1970s the service sector had a “drastic reduction of demand for foreign labor” (Lundh and Ohlsson 1994, p.97). The decrease of the growth rate resulted in giving priority to the natives. The transaction costs of immigrant skills and attainments were not beneficial.

Income differentials within the labor market sectors are evidently connected with the industrial expansion and capital inflows in the industry. As stated by Lundh and Ohlsson (1994) the industrial growth in the middle of the 1970s has lead to export - oriented production. Therefore, the industrial expansion impacted the labor import in Sweden. Automotive and engineering industries required workforce including foreign labor force. The period of “oil crisis” 1973 - 1974 also resulted in structural crisis, namely high wage costs and marketing expenditures. Therefore, the transformations of industries appeared in high investments in “knowledge-based and high-technology production”. As a result, the service sector demanded foreign human capital in order to substitute the lack of personnel. As the investments in manufacturing and service sectors increased, these labor market sectors are expected to have higher wages both for natives and immigrants. Orientation towards innovation, new technology

and efficiency was main drivers of growth in manufacturing sector, particularly shipbuilding, engineering. The need for skilled employees contributed to concentration of highly educated immigrants in this sector. After 1958 investments into manufacturing and service sectors allowed Sweden to acquire larger part of international market. The growing participation into the international economic arena required employment of foreign nationals who could maintain and enlarge the share of the market (Lundh and Ohlsson 1994).

Along with demand for highly educated, engineering industry was in need of unskilled labor. Therefore, while the labor market was not saturated with the foreign labor force, immigrants could find the job according to their preferences. In addition, immigrants were employed in low - skilled production processes as the large - scale automotive production and other changes in technology contributed to the additional need for unskilled rather than highly educated immigrants. The further renewal of Swedish economy, research and development investments had a negative effect on immigrants' employment. Moreover, Sweden has created demand for country- and culture- specific skills, which has thrown back immigrants from employment in this sector. The position of immigrants has deteriorated after industrial reforms of the middle 1970s (Lundh and Ohlsson 1994).

## ***2.2. Hypotheses formulation***

Taking into account the previous researches the paper hypothesizes that immigrants will have higher wages in service sectors, more specifically, immigrants from Europe and North America will probably have higher wages than other immigrants as they have similar country-specific skills and are more likely to obtain them easily. Manufacturing sector is probably less favourable for immigrants. The impact of labor market sector on the remaining regions of origin is probably have similar pattern in terms of wages and have similar wage gaps compare to native population. Additionally, assuming the pattern of positive income - education relationship, the education is expected to have positive impact on income; origin is supposed to have positive impact on income when it comes to native and European immigrants as they have similar educational and professional skills. The study also assumes age and years since migration to have positive impact on wages.

## **3. Data and sample of the study**

### ***3.1. Source material***

The source material for the study was selected from a register - based longitudinal database for Sweden, Longitudinal Individual Data (LINDA). The database consists of official statistics of individuals and their household members. The major data sources of LINDA are Income Registers (*Inkomst- och Förmögenhetsstatistiken*) and Population Censuses (*Folk- och Bostadsräkningen*). The data set disposes both information about native population and immigrants. The individual is considered to be an immigrant if he or she is born out of Sweden. The samples of immigrants are not overlapping. The data is for the research purposes and it is representative for the type of the study accomplished in this paper.

### ***3.2. Sample description***

The sample used for this study consists of 1 991 827 individuals both natives and immigrants. The characteristics of individuals are sex, civil status, years since migration, age, labor market sector (industry) where he or she is employed, year of immigration, educational

attainment, income from work (including unemployment benefits, sickness leave compensation), country of birth. The time span of the analysis is: 1993-1999. The analysis concerns individuals of the age 16-64. Appendix 1 gives a detailed description of variables involved in the study.

### ***3.3. Limitations of the study***

Some limitations apply to the study. Firstly, the status of immigrant is of particular interest. The status of immigrant could have influence the distribution of immigrants in labor market sectors. It would be interesting to distinguish labor market characteristics of labor migrants or refugee. However, the status of immigrant is omitted in LINDA database. Secondly, language proficiency variable would have added to overall understanding whether the country - specific skills differ between labor market sectors. Finally, cohabitation with the native partner would also be an additional determinant of labor market assimilation of immigrants.

### ***3.4. Variable design***

In order to be consistent with background and to accomplish detailed analysis of income from work and its impacting factors, the variables are to be categorized and clearly expressed. The section deals with detailed variable description. The detailed description of the involved variables is also given in Appendix 1.

The industrial sectors in LINDA database are presented according to Swedish Standard Industrial Classification based on EU recommendation (SNI codes). SNI codes change from “Agriculture” to “Other extra-territorial organizations and bodies activities” (codes from 1100 to 99000 respectively). The codes are five - level digit codes. SNI codes are also structured in main categories and sub - categories that are separated alphabetically. The main categories and sub-categories included in labor market sectors for the study are presented in Table 1.

Three sectors are distinguished from the sample: agriculture, manufacturing, service sectors. The sectors from 1100 to 14500 (Agriculture to Other mining and quarrying) were allocated to “Agriculture”; the sectors from 1500 to 36630 (Manufacturing to Other manufacturing) – to “Manufacturing”; the sectors from 37000 to 93050 (Recycling to Other service activities) to “Service” respectively. The categories alphabetically marked P “Activities of households” and Q “Extra-territorial organizations and bodies” are excluded from the analysis as the sample does not have any observations for these categories. Hereby, the variable “industry” has three categories.

The educational categories were created based on the Swedish Educational Terminology (SUN codes). SUN codes are used to classify educational programs and they represent both level and orientation of the educational program. The modules of level and orientation are helpful in describing the specific focus of individual’s educational program. An indication of the educational attainment is primary, secondary and tertiary education. For better understanding of descriptive statistics the categories of the variables are stated as “primary” (referring to preprimary and primary education), “secondary” (referring to lower, upper and post secondary education), “tertiary” (referring to tertiary and postgraduate education). The variable “education” also has three categories.

The country of birth is treated as the origin of immigrant. The original sample contains 162 countries of origin. The variable that accounts for immigrant’s country of birth called “origin”. In order to keep the origin of the immigrant structured, the core regions of origin are defined geographically. Hence, five regions of origin are created (Native, Africa, Europe, Asia, and America). The region “Native” is self explanatory. The region “Africa” refers to the countries situated on African continent and islands. The region “Europe” includes European countries, United States, Canada, Australia and New Zealand. The reason of such a structure is based on linguistic closeness, similarity of living standards and therefore reduced time for adaptation and assimilation. The region “Asia” accounts for Asian countries. Whether the

country of origin was marked as Soviet Union, the individuals were assigned to “Asia” origin category. Additionally, Russia and Turkey were also allocated to “Asian” region. Region “America” stands for South America and Mexico.

Table 1. Main categories and sub - categories selected for the labor market sectors.

<b>Agriculture</b>	A Agriculture, hunting and forestry B Fishing C Mining and quarrying CA Mining and quarrying of energy producing materials CB Mining and quarrying except energy producing materials
<b>Manufacturing</b>	D Manufacturing DA Manufacture of food products; beverages and tobacco DB Manufacture of textiles and textile products DC Manufacture of leather and leather products DD Manufacture of wood and wood products DE Manufacture of pulp, paper and paper products; publishing and printing DF Manufacture of coke, refined petroleum products and nuclear fuel DG Manufacture of chemicals, chemical products and man-made fibres DH Manufacture of rubber and plastic products DI Manufacture of other non-metallic mineral products DJ Manufacture of basic metals and fabricated metal products DK Manufacture of machinery and equipment DL Manufacture of electrical and optical equipment DM Manufacture of transport equipment DN Other manufacturing
<b>Service</b>	E Electricity, gas and water supply F Construction G Wholesale and retail trade: repair of motor vehicles, motorcycles and personal and household goods H Hotels and restaurants I Transport, storage and communication J Financial intermediation K Real estate, renting and business activities L Public administration and defence; compulsory social security M Education N Health and social work O Other community, social and personal service activities

Source: Statistics Sweden, LINDA database

Civil status characteristics vary from unmarried person to civil partnership. The variable was categorized in two categories “married” (including civil partnership with man, civil partnership with woman, married man, married woman not living with the husband, married woman living with the husband) and “unmarried” (unmarried person, divorced, widowed).

The effect of age is assumed to have non-linear effect on income and therefore, the model additionally uses the variable of age squared. The same pattern refers to variable years since migration.

The variable “sex” is self-explanatory and has two dummy variables.

The dependent variable “income” refers to income from work. In order to adjust income to inflation, Consumer Price Index (CPI) for Sweden was obtained from Statistics Sweden. The

reference year is 1999. The CPI from 1993 to 1999 are equal 4.7, 2.6, 2.5, 0.4, 0.6, -0.1 and 0.2 respectively. Deleting the CPI of 1999 by CPI of years 1993 to 1998 and multiplying it by the income for these years gives inflation adjusted income. More precisely, the “income from work” variable is taken in logarithmic value. Logarithm of income allows a percentage change explanation.

The dummy variables for two-level interactions are created within the variables industry and origin, industry and education. Three-level interactions comprise industry, origin, education.

Thus, the study involves quite a lot of explanatory variables aiming to define income differentials.

## 4. Method

### 4.1. Statistical models

In order to view the different effects of explanatory variables, three models are estimated. In every model the dependent variable is logarithm of income from work adjusted by inflation. The dependent variable is continuous. Therefore, the method for multiple regression models is Ordinary Least Squares (OLS) method. All three models use logarithm of income rather than the original values of it. The transformation leads to the move from unit - based interpretation to percentage - based interpretation. Using log transforms helps to construct a wide range of meaningful and useful relationships between variables. The explanatory variables differ depending on the Model.

Hence, Model 1 includes basic characteristics that can influence the change of individual income. Thus, those variables are: size of household, age, age squared years since migration and years since migration squared. The reason of taking squared values for age and years since migration is the expectation of non-linear effect between these variables and log of income. Additionally, the explanatory variables included in Model 1 are: three dummy variables for the education and industry (primary, secondary, tertiary; agriculture, manufacturing, service sectors respectively), two dummies for sex and civil status (male, female; married, unmarried respectively) and five dummies for the origin (Native, Asia, Africa, America, and Europe).

Model 2 is extended to the analysis of interactions between industry and origin of the immigrant. More specifically, the dummies included into the Model 2 are fifteen two-level interaction variables, which combine each of three industries with every five regions of origin.

Model 3 accounts for three-level interactions between industry, origin and education. The three-level analysis helps to deepen the knowledge within the sectors and helps to reveal what combination of variables gives the strongest effect on income of the individual. The interactions agriculture\*Africa\*tertiary and agriculture\*America\*tertiary are excluded from the Model 3 as the studied sample does not have any observations for these interactions.

### 4.2. Reference categories

Reference categories are always an important part of the analysis. They help to compare the effects of other categories on a selected one. Therefore, choosing a reference category requires thorough estimation and analysis. The reference categories were chosen basing on the facilitation of comparisons and explanation of variables’ effect on dependent variable (log of income from work). The assumption here is more simplicity in comparing and explaining the unit change of one category compared to another.

In the Model 1 the reference category for education is primary education, for industry – agriculture, for sex – male, for origin - native, for civil status – unmarried. These categories make the results easier to interpret and to compare.

For two- and three - way interactions in Model 2 and Model 3 agriculture \* native and agriculture \* native \* primary are reference categories. Agriculture is chosen as a labor market sector with the lowest income (see Figure 7). Primary education is also expected to bring lowest

wages compare to higher levels. Natives would be more successful in the labor market than immigrants and therefore it is logical to refer to Swedish nationals.

## 5. Descriptive statistics

After data adjustments, 1 991 827 observations from 162 countries of origin remain. The Table 2 presents variable means. Summary statistics is presented in the Appendix 2.

The bulk of the individuals employed in labor market sectors are native Swedes. The majority of the individuals in the sample have obtained secondary education. The majority of individuals with tertiary education are concentrated in the service sector. Males are overrepresented in agricultural and manufacturing sectors, while females represent the majority in the service sector. The gender distribution within the sectors underlines that the service sector is female - dominated. The trend is quite logical and easy to interpret as the specific skills of the sector favor women rather than men. Additionally, the bulk of men employed in manufacturing is also explained by the demand for male - specific skills in this area. The mean of years since migration emphasizes that manufacturing sector attracts more immigrants with probability of more experience and country specific skills as they have spent some time in Sweden.

Table 2. Variable means

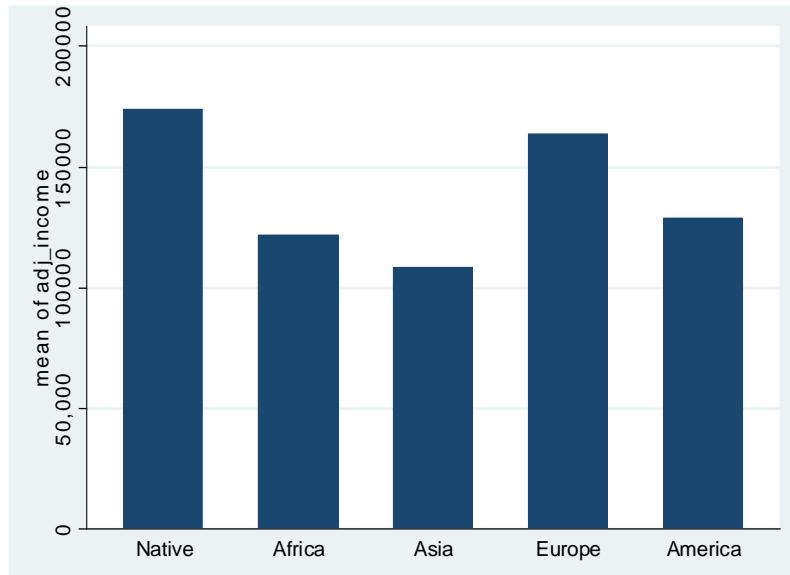
	Agriculture	Manufacture	Service
<b>Origin</b>			
Native (%)	93.70	88.41	91.17
Africa (%)	0.08	0.34	0.50
Asia (%)	1.85	2.30	1.92
Europe (%)	4.11	8.33	5.80
America (%)	0.26	0.62	0.63
<b>Education</b>			
Primary (%)	12.42	13.51	7.09
Secondary (%)	75.33	69.17	60.41
Tertiary (%)	12.25	17.32	32.50
<b>Civil status</b>			
Married (%)	56.66	60.16	62.45
Unmarried (%)	43.34	39.84	37.55
<b>Sex</b>			
Male (%)	64.98	72.17	42.96
Female (%)	35.02	27.83	57.04
Year	1996.15	1996.171	1996.14
Size of household	3	2.91	2.97
Age	38.14	40.15	40.42
Age squared	1601.79	1736.36	1756.02
Years since migration	0.79	2.33	1.68
Income	114 190	195 581.3	166 053.6
Log income	10.69	11.44	11.16
N of observations	15 459	377 007	1 599 361

The graphical review of mean income within different categories allows more detailed visual analysis of its distribution.

As seen from Figure 3, the income differs between natives and immigrants. Moreover, European immigrants (which also include North America, Australia and New Zealand) are approaching natives in terms of income. This similarity could be explained by the fact, that European, Canadian, Australian and US immigrants possess similar education, job skills and

language proximity. Immigrants from Asian region have the lowest income from work. Africa and Asia have similar values. The lag of these regions from natives accounts for educational and labor market differences, absence of networks, inadequate human capital assessment and even discrimination.

Figure 3. Mean income within different origins.



The ocular analysis of income distribution between natives and immigrants within agricultural, manufacturing and service sectors (Figure 4 – Figure 6 respectively) reveals that manufacturing sector has a steady distribution of income within the immigrants of different regions of origin. The differences of mean income are not crucial there. Agricultural sector is the one that has more differences in income than the other sectors. African and Asian immigrants have less income from work than the others, while European and American immigrants have similar level of income in every sector. As expected, the Swedish population has the highest income within all the industrial sectors.

Figure 4. Mean income in agricultural sector within different origins.

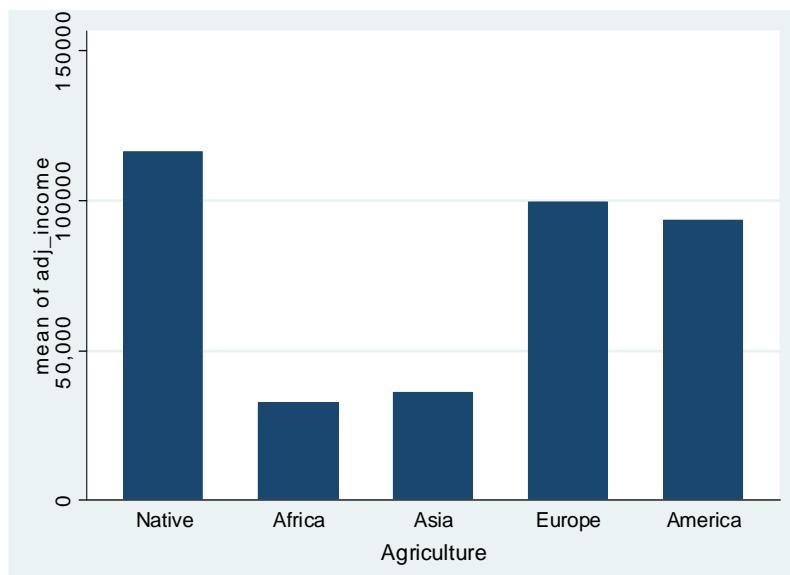


Figure 5. Mean income in manufacture sector within different origins.

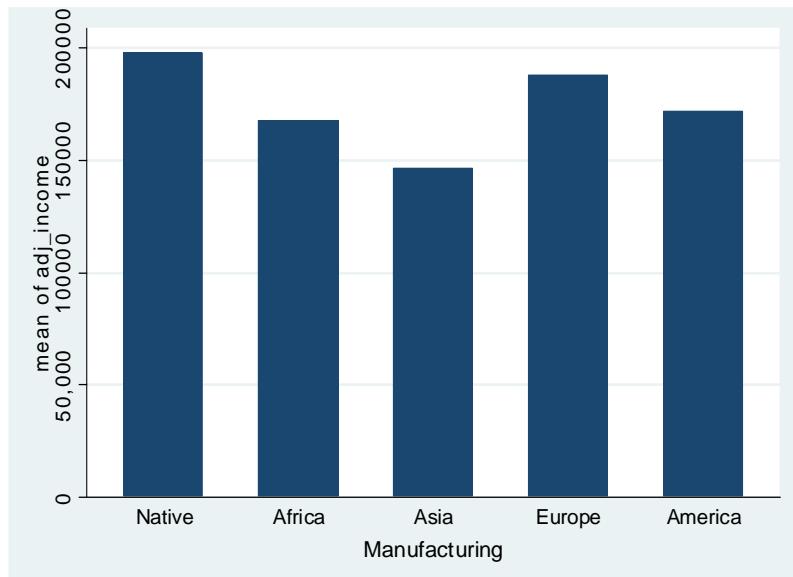


Figure 6. Mean income in service sector within different origins.

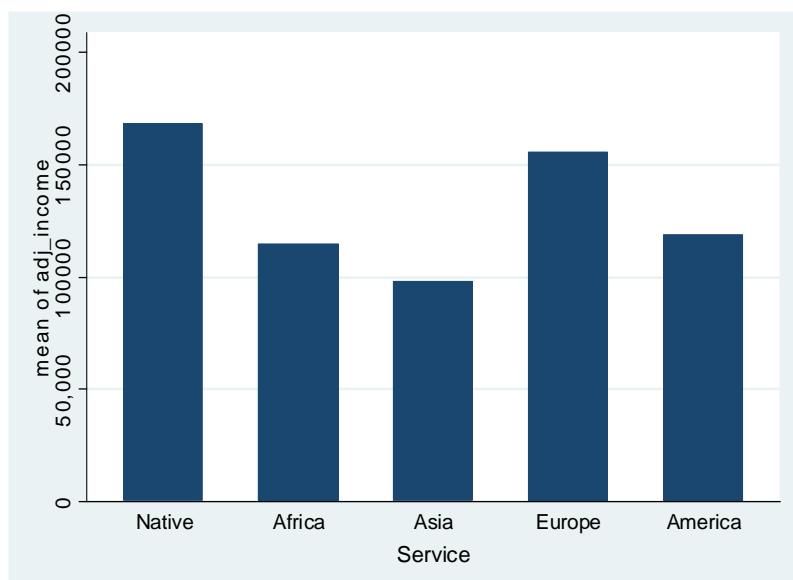
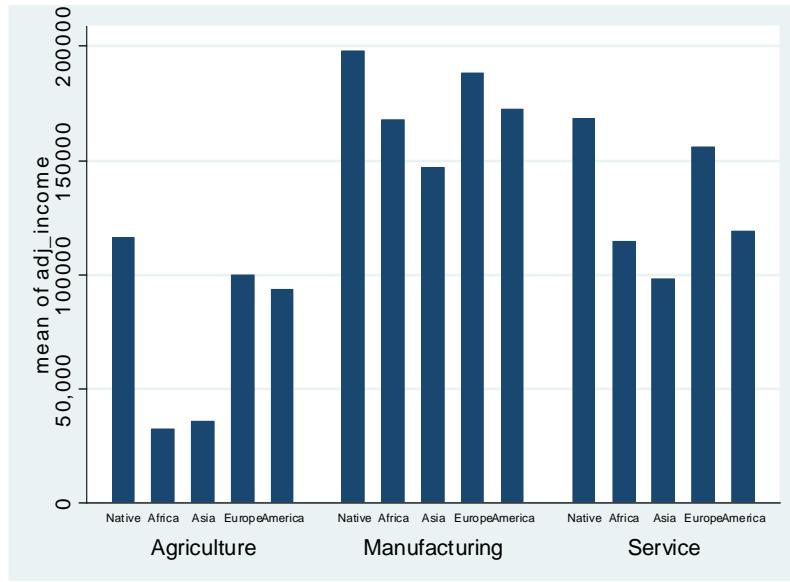


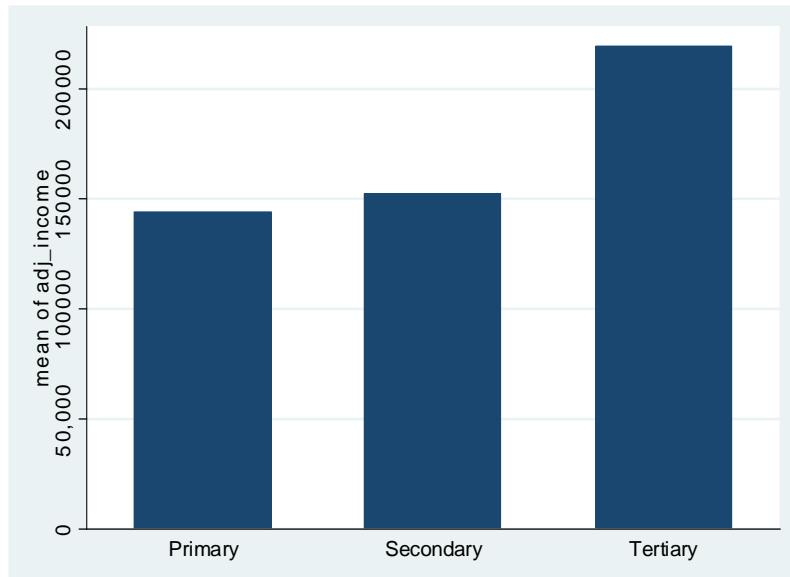
Figure 7 illustrates the combination if three previous figures.

Figure 7. Mean income in three industrial sectors within different origins.



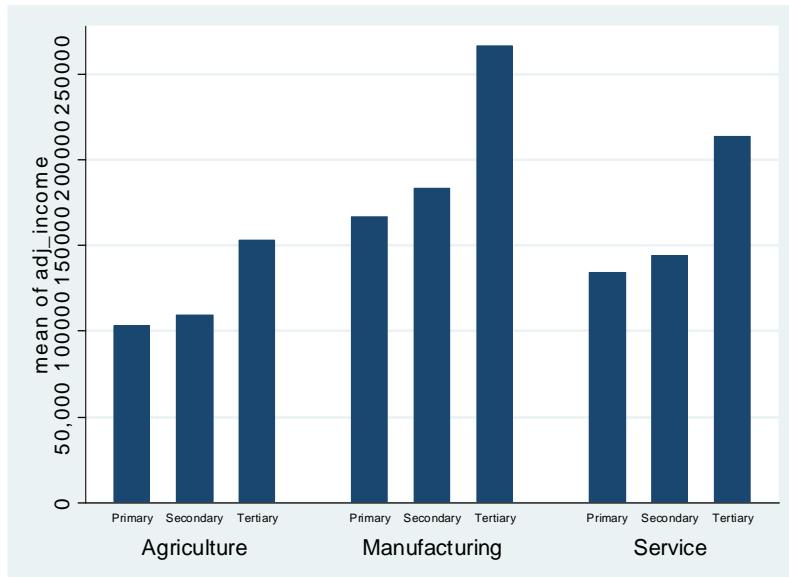
The educational impact on income for the studied sample is illustrated in Figure 8. As expected, the increase in educational level positively impact the income of the individual. The human capital theory also stresses that the returns on education augment with every unit increase. (Schultz 1961, Stiglitz 1964). Moreover, tertiary education gives a substantial increase in income for the studied sample.

Figure 8. Mean income within educational levels.



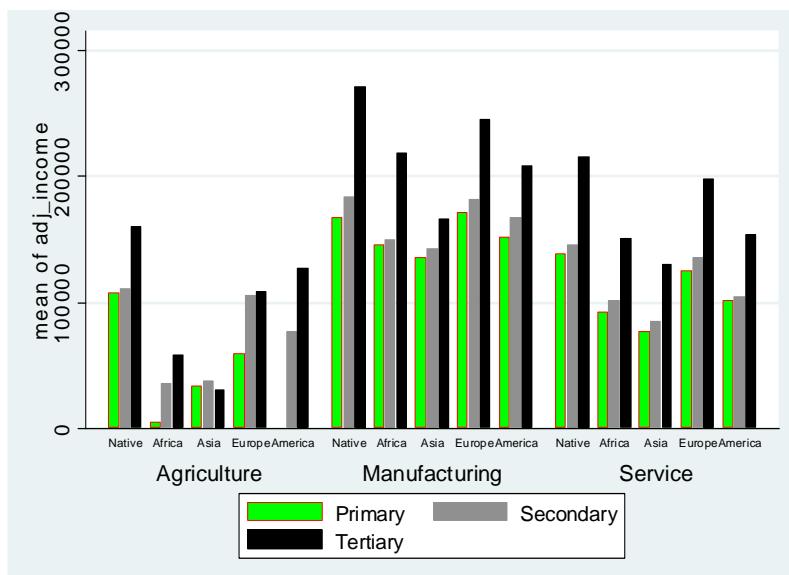
When looking at the distribution of income within the industries between different educational levels, the previously discussed trend is also applicable and the Figure 9 also suggests the highest returns on the tertiary education.

Figure 9. Mean income within between educational levels within the industries.



The additional analysis of income distribution between natives and immigrants within the labor market sectors (Figure 10) shows that the agricultural sector has the lowest income for immigrants from Africa, Asia and America. The individuals with tertiary education from Africa and America are not represented in the agricultural sector. Individuals with primary and secondary education from Europe and native Swedes have similar income, while the difference is significant among those individuals with tertiary education. The manufacturing sectors does not have crucial differences in income distribution for all groups of origin with primary and secondary education. However, tertiary education affects substantial income differentials. The American immigrants (South American) are exception from the trend. Thus, individuals with secondary education employed in manufacturing have higher income rather than tertiary educated in agricultural sector. The service sector shows the dominant role of tertiary education in income possession. Tertiary educated individuals have comparative advantage in work remuneration.

Figure 10. Mean income within the sectors controlling for origin and education.



Thus, the descriptive statistics shows that labor market sector has an impact on income distribution and its size. The highest income within the sectors is observed in manufacture sector, the lowest - in the agricultural sector. Educational attainment plays an important role in income differentials for both natives and immigrants. Origin of immigrants either approaches immigrants' ("Europe") wages to the natives' level or moves them away from this standard ("Asia", "America").

## 6. Empirical analysis

### 6.1. Statistical results

The section presents the output obtained after running three OLS regressions with log of income as a dependent variable. The results suggest statistical significance for the majority of the variables (Table 3).

Table 3. Statistical results for Model 1, Model 2, and Model 3

<b>Variable</b>	<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>
Size of people in the household	0.025 ***	0.025 ***	0.029***
Age	0.202 ***	0.202 ***	0.207***
Age squared	-0.002 ***	-0.002 ***	-0.002***
Years since migration	0.033 ***		
Years since migration squared	-0.0004 ***		
<b>Education:</b>			
Primary	Reference	Reference	Reference
Secondary	0.435 ***	0.440 ***	
Tertiary	0.741***	0.743 ***	
<b>Industry:</b>			
Agriculture	Reference	Reference	Reference
Manufacturing	0.613 ***		
Service	0.340 ***		
<b>Sex:</b>			
Male	Reference	Reference	Reference
Female	-0.354 ***	-0.353 ***	-0.351***
<b>Civil status:</b>			
Unmarried	Reference	Reference	Reference
Married	-0.080 ***	-0.089 ***	-0.100***
<b>Origin:</b>			
Native	Reference	Reference	Reference
Africa	-0.746 ***		
Asia	-0.780 ***		
Europe	-0.689 ***		
America	-0.749 ***		

<b>Two-level interactions:</b>			
Agriculture * Native		Reference	
Agriculture * Africa		-1.937 ***	
Agriculture * Asia		-1.857 ***	
Agriculture * Europe		-0.647 ***	
Agriculture * America		-0.463	
Manufacturing * Native		0.562 ***	
Manufacturing * Africa		0.265 ***	
Manufacturing * Asia		0.389 ***	
Manufacturing * Europe		0.454 ***	
Manufacturing * America		0.392 ***	
Service * Native		0.306 ***	
Service * Africa		-0.123 ***	
Service * Asia		-0.223 ***	
Service * Europe		0.100 ***	
Service * America		-0.119 ***	
<b>Three-level interactions:</b>			
Agriculture * Primary * Native		Reference	
Agriculture * Primary * Africa		-1.886	
Agriculture * Primary * Asia		-1.465 ***	
Agriculture * Primary * Europe		-0.532 ***	
Agriculture * Primary * America		-0.892	
Agriculture * Secondary * Native		0.411 ***	
Agriculture * Secondary * Africa		-1.640 **	
Agriculture * Secondary * Asia		-1.667 ***	
Agriculture * Secondary * Europe		-0.299 **	
Agriculture * Secondary * America		0.045	
Agriculture * Tertiary * Native		1.291 ***	
Agriculture * Tertiary * Asia		-2.079	
Agriculture * Tertiary * Europe		0.590	
Manufacturing * Primary * Native		0.596 ***	
Manufacturing * Primary * Africa		0.406 ***	
Manufacturing * Primary * Asia		0.507 ***	
Manufacturing * Primary * Europe		0.547 ***	
Manufacturing * Primary * America		0.594 ***	
Manufacturing * Secondary * Native		0.976 ***	
Manufacturing * Secondary * Africa		0.632 ***	
Manufacturing * Secondary * Asia		0.751 ***	
Manufacturing * Secondary * Europe		0.795 ***	
Manufacturing * Secondary * America		0.749 ***	
Manufacturing * Tertiary * Native		1.527 ***	
Manufacturing * Tertiary * Africa		1.116 ***	
Manufacturing * Tertiary * Asia		0.810 ***	
Manufacturing * Tertiary * Europe		1.453 ***	
Manufacturing * Tertiary * America		0.171	
Service * Primary * Native		0.313 ***	
Service * Primary * Africa		-0.011	
Service * Primary * Asia		-0.142 ***	
Service * Primary * Europe		0.146 ***	

Service * Primary * America			0.016
Service * Secondary * Native			0.753 ***
Service * Secondary * Africa			0.261 ***
Service * Secondary * Asia			0.199 ***
Service * Secondary * Europe			0.534 ***
Service * Secondary * America			0.308 ***
Service * Tertiary * Native			1.354 ***
Service * Tertiary * Africa			0.841 ***
Service * Tertiary * Asia			0.547 ***
Service * Tertiary * Europe			1.155 ***
Service * Tertiary * America			0.705 ***
Constant	6.084 ***	6.115 ***	6.157 ***
R-squared	0.077	0.076	0.077
N of observations	1 991 827	1 991 827	1 991 827

\* p<0.05; \*\* p<0.01; \*\*\* p<0.001

## 6.2. Discussion

### 6.2.1. Model 1

Model 1, which includes basic characteristics of individual income, suggests the positive impact of size of household, age, years since migration, educational level and industry. The effect of age squared and years since migration squared is negative. These coefficients suggest a slight deviation of parabola from originally assumed. The same effect is applicable to years since migration squared. Taking primary education as a reference category enables to compare the change of income over the increase in educational level. Thus, secondary education gives 43.5 percent increase in income while tertiary education increases income almost two times (74.1%). Manufacturing sector gives more than a half increase of income compared to agriculture (61.3%). Service sector has a positive impact of 34 percent on income. Thus, being employed in manufacturing sector gives the biggest income change than in agricultural and service sectors. Gender gap in terms of income accounts for 35.4 percent less income for female compared to male. Civil status “married” has a slight negative effect (8 %) on income when referring to “unmarried” individuals. Region of origin gives negative change of income compared to natives for all dummy variables. Thus, the highest negative impact is observed in a group of Asian immigrants (78%) following by American and African immigrants. The impact of region of origin for American and African immigrants on income is very similar, decreasing it by 74,9 and 74,6 percent respectively. Thus, the previously discussed three groups of origin have substantially lower income from work compared to native Swedish population. European immigrants have slightly higher income than the groups with other regions of origins (68,9% less than natives). However, this value is rather high and does not suggest a high gap of income between immigrants of different origins.

The majority of coefficients of independent variables involved in Model 1 are expected and they correspond to overall expectations and logical understanding. Thus, the higher educated individual earns more than primary educated; immigrants possess lower income, than natives; increase of household members also adds to slight income increase (2.5 %); increase in age and years since migration also have positive impact on income. However, some results are out of expectation. Service sector are more likely to accumulate more capital and have higher wages. The sample obtained for the study suggests quite the contrary and shows manufacturing sector as “capital – saturated”. The dominance of manufacturing sector in wage distribution could be explained by substantial capital investments in this sector after the middle of the 1970s.

Even if the investments were directed in means of production, the sector can still benefit from excess of capital. Another possible explanation of income-dominance of manufacturing sector is inclusion of “service - oriented” activities in the Manufacturing sector. For example, manufacturing activities according to SNI codes such as manufacturing of textiles, food products, leather, machinery require not only production but further marketing support, promotion and maintenance. Therefore, “service-oriented” activities may be “hidden” in manufacturing sector. One more explanation of higher wages in manufacturing sectors is rooted in wage bonuses in the sector. The higher management positions in manufacture are subject to bonuses and wage benefits based on production effectiveness.

Another finding is surprisingly high and similar negative values of coefficients for regions of origin suggesting the absolute dominance of native population in income generation. The expected value for European immigrants was much lower than for other groups of origin, basing on the assumption of their language and skills closeness.

### 6.2.2. Model 2

The second model includes two-way interactions of industry and origin. It gives an overview of labor market sector effect in combination of immigrant's origin. The results are compared to category “agriculture\*native”. The reference category of native Swedish people employed in agriculture is chosen based on the evidence that the employment in the agricultural sector gives the lowest income.

The effect of age, age squared, years since migration, years since migration squared, education, civil status and gender are somewhat identical with the Model 1.

The first two coefficients for “agriculture\*Africa” and “agriculture\*Asia” suggest very high negative impact on income of almost 200%. Hereby, being an African or American immigrant employed in agricultural sector enormously diminishes immigrants' income compared to natives employed in agriculture. European immigrants in agriculture have a negative impact on income (64,7 %) while American immigrants are less vulnerable to smaller income from this sector (46,3 %). The obtained output underlines more favorable income conditions for American immigrants employed in agriculture.

It is worth stressing that all the values for “manufacturing” sector interactions have pronounced positive impact. Hence, the highest positive effect definitely belongs to natives in manufacture (increase of income by 56,2 % compared to the same group of population in the agricultural sector). The following interaction is “manufacturing \* Europe” that increases income by 45,4 %. The lowest increase in income is observed for African immigrants employed in manufacturing sector (26,5 %). Thus, manufacturing sector favors income growth for both natives and immigrants referring to natives employed in agriculture. The finding is in line with Figure 5 in “Descriptive statistics” section.

The service sector favors income increase for natives and European immigrants (30,6 % and 10 % respectively) compared to natives employed in agriculture. The effect underlines proximity of labor market conditions and experience for European and North American immigrants. They can easier acquire and apply Sweden-specific skills and business environment knowledge in the sector. Moreover, Finns and other Nordic immigrants do not experience tough language problems and therefore are more preferable by the employers in the sector. The less favorable position in the sector is represented by Asian immigrants (negative effect on income is 22,3 %). The service sector is less perspective for this group of immigrants as historical, geographical and living standards disparities lead to gaps of North European business environment knowledge and market perceptions.

### *6.2.3. Model 3*

The third model is composed of three-way interactions between “industry”, “education” and “origin”. The reference category is primary-educated natives in agriculture. The majority of variables are statistically significant and almost all the values have positive values.

Agricultural sector has a high percentage of negative income change for primary- and secondary - educated Asians (146 % and 166 % respectively), secondary educated Africans (164 %). The lower negative effect is observed for primary- and secondary - educated Europeans (53,2 % and 29,9 % respectively) that again underlines higher level of labor market assimilation for this group of immigrants. Tertiary education has a pronounced positive effect on income growth for natives and accounts for 129 %. As a reminder to descriptive statistics section, it is worth stressing that the interactions “agriculture \* tertiary \* Africa” and “agriculture \* tertiary \* America” are disregarded since the absence of observations.

Thus, agricultural sector gives more possibilities of wage increase for secondary - and tertiary – educated natives and tertiary – educated European immigrants compared to primary – educated natives in the sector.

Manufacturing sector has the highest positive coefficients, which underlines the upward growth of income for every region of origin and for increase of educational attainment. Primary - educated individuals of all origins earn less than higher educated ones. However, the percentage change of income is similar for primary – educated Natives (59,6 %) and primary – educated Americans (59,4 %). Primary – educated Europeans earn less (54,7 %) than Americans and Natives with the same characteristics. The possible explanation behind this tendency is that the low educational attainment in the sector determines specific work structure and labor division, which does not require specific knowledge and therefore treats all the employees equally.

Secondary – educated individuals in the manufacturing have the highest income change if they are Natives (97,6 %), following by Europeans (79,5 %) , Americans and Asians (around 75 % for both groups). Tertiary –educated immigrants in this sector have very high effect of origin and education. Thus, tertiary educated natives give 152% increase of income. European immigrants have similar value of 145 %, African immigrants account for 111 %. Consequently, the manufacturing sector gives more opportunities of income growth for immigrants especially with tertiary education. The values of coefficients vary around 100 percent and suggest significant role of manufacturing sector in income generation with additional educational level.

Summing up, manufacturing sector is attractive both for immigrants and natives. It encourages acquisition of higher education and gives incentives for higher wages.

Service sector positively impacts primary – educated individuals from Europe (around 15 % of increase in income), for Asians with the same education the effect is opposite and is almost 15 % of income decline. Secondary education in the sector contributes to income growth, especially for Natives and Europeans (75,3 % and 53,4 % respectively). The other immigrant groups could also experience a wage growth compared to Natives with elementary education in agriculture. Tertiary education has the same effect on Natives and Europeans (135 % and 115 % respectively). For other regions of origin the effect is also positive and larger than 50 %.

Overall, for every further category of educational attainment natives experience income growth. Moreover, the tertiary education within every sector gives around two times increase in income compared to primary-educated natives in agriculture. Therefore, the human capital theory could be mentioned as the explanation of the pattern (Schultz 1961, Becker 1964). The income growth in manufacturing and service sector is also more obvious for European immigrants. The most similar effect of three-way interactions is observed for natives and European immigrants. The trend is logical and expected. The worst situation of income growth is in interactions involving “Asia” and “Africa” as a region of origin. The possible reasoning is lack of specific skills and experience required for career opportunities and wage growth.

## 7. Conclusion

The present study aimed to assess the earning gaps between immigrants and natives taking into consideration labor market sectors. The relation between labor market sectors and earnings is insufficiently explored. The previous findings, however, suggest income gaps between immigrants as a consequence of differences in country – specific skills, necessary educational attainment, networks, etc. The analysis of income gaps within industrial sectors in Sweden underlines the dominance of immigrants in low – skilled manufacturing sector, restaurant sectors, cleaning and stuffing.

The study used Longitudinal Individual Database (LINDA) for the analysis. Three models were estimated. The first model includes basic characteristics that can influence the change of individual income. The second model is extended to the analysis of two – level interactions of origin and labor market sector. The last model accounts for three – level interactions between labor market sector, origin and education. The reference categories agriculture \* native and agriculture \* native \* primary were selected for two- and three - level interactions. The bulk of the individuals in the sample are native Swedes. The majority of the individuals have secondary education. The highest number of observations (1 599 361) refers to service sector.

The statistical results for Model 1 suggests the positive impact of size of household, age, years since migration, educational level and industry on income. Secondary and tertiary education has positive impact on income growth. Employment in manufacturing sector gives more than a half increase of income compared to agriculture. Service sector also has a positive impact on income. Another finding is surprisingly high and similar negative values of coefficients for regions of origin suggesting the absolute dominance of native population in income generation. However, the value for European immigrants was lower than for other groups of origin, underlining the assumption of their language and skills closeness.

Model 2 reveals the highest positive effect of natives employed in manufacture. The following interaction is “manufacturing \* Europe” that increases income almost two times. The lowest increase in income is observed for African immigrants employed in manufacturing sector. Thus, manufacturing sector favors income growth for both natives and immigrants referring to natives employed in agriculture. The service sector favors income increase for natives and European immigrants compared to natives employed in agriculture. The effect underlines proximity of labor market conditions and experience for European and North American immigrants. They can easier acquire and apply Sweden-specific skills and business environment knowledge in the sector. Moreover, Finns and other Nordic immigrants do not experience tough language problems and therefore are more preferable by the employers in the sector. The less favorable position in the sector is represented by Asian immigrants. The service sector is less perspective for this group of immigrants as historical, geographical and living standards disparities lead to gaps of North European business environment knowledge and market perceptions.

Model 3 underlines that agricultural sector has a high percentage of negative income change for primary- and secondary - educated Asians and secondary educated Africans. The lower negative effect is observed for primary- and secondary - educated Europeans that again underlines higher level of labor market assimilation for this group of immigrants. Tertiary education has a pronounced positive effect on income growth for each group of immigrants. Manufacturing sector contributes to upward growth of income for every region of origin and for increase in educational attainment. Manufacturing sector gives more opportunities of income growth for immigrants especially with tertiary education. Service sector positively impacts primary – educated Europeans. Secondary education in the sector contributes to income growth, especially for Natives and Europeans. The other immigrant groups could also experience a wage growth compared to Natives with elementary education in agriculture.

The statistical results have revealed that employment within the manufacturing sector has more possibilities of income generation for immigrants and probably leads to diminishing

income gaps among natives and immigrants. The result contradicts with previous findings that showed that manufacturing sector deprives career opportunities for the immigrants (Helgertz 2010).

Summing up, manufacturing sector is attractive both for immigrants and natives. It encourages acquisition of higher education and gives incentives for higher wages. Overall, for every further category of educational attainment natives experience income growth. Moreover, the tertiary education within every sector gives around two times increase in income compared to primary-educated natives in agriculture. Therefore, the human capital theory could be mentioned as the explanation of the pattern (Schultz 1961, Stiglitz 1964).

The income growth in manufacturing and service sector is also more obvious for European immigrants. The most similar effect of three-way interactions is observed for natives and European immigrants. The analysis also reveals that immigrants from Africa and Asia substantially lag behind natives in terms of income from work.

To conclude, the study generated both expected and unexpected values providing the facts of labor market effect on income gaps among natives and immigrants. Manufacturing sector is the one with the highest possible wages. Both manufacturing and service sectors favor natives and European immigrants. Educational attainment has a pronounced positive impact for every group of individuals. Thus, the study suggests that industry matters in individual income generation. Therefore, the labor market sector should be taken into account when conducting a detailed analysis of income gaps.

## **8. Suggestions for further research**

Whereas the present paper is primarily deals with effect of education, origin and industry on income from work, the study could be extended to the analysis of income differentials within the same characteristics but from gender perspective. The extension of the present research could shed light on male - female income distribution and gender dominance within immigrants. Thus, it will allow looking at the studied topic in a slightly different way. Additionally, the determinants of income could be extended to generation of immigrants, place of habitation (city/town), cohabitation with a Swedish partner as well as Swedish language proficiency.

The next recommendation is rooted in one of the possible reasons of wage gaps. The analysis has to be conducted in context of historical layoffs, stresses and downturns of the labor market. Looking at employment rates of natives and immigrants allows identification of vulnerable groups during the crisis.

Finally, the analysis of labor market sectors could be extended to the occupational distribution of immigrants as well as more detailed educational characteristics and its impact on income. SNI and SUN codes employed in LINDA database allow the analysis of both occupation and education.

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## Appendix 1

### Variable labels

<b>Variable name</b>	<b>Variable label</b>
bidnr	ID
bant	size of household
bkon	sex
bkon_dum 1	male
bkon_dum 2	female
civilstat	civil status
civilstat_dum 1	married person
civilstat_dum 1	unmarried man
binvar	year of immigration
bsun	educational level (SUN codes)
income	income from work
log_income	log of income
year	year
bfoland	country of birth
bald	age
age2	age squared
ysm	years since migration
ysm2	years since migration squared
origin	region of origin category
origin_dum1	Native
origin_dum2	Africa
origin_dum3	Asia (including Russia, Turkey and Soviet Union)
origin_dum4	Europe, North America, Australia, New Zealand
origin_dum5	America
education	educational level category
education_dum1	Primary and lower secondary
education_dum2	Upper and post secondary
education_dum3	Postgraduate (tertiary)
industry	industry category
industry_dum1	Agriculture
industry_dum2	Manufacturing
industry_dum3	Service

## Appendix 2

### Summary statistics

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>Std, Dev,</b>	<b>Min</b>	<b>Max</b>
Bidnr	1991827	44700000	3476228	40000000	99000000
Bant	1991827	2,96	1,45	1	14
Bkon	1991827	1,51	0,50	1	2
Bciv	1991827	3,40	2,54	1	17
Binvar	185948	1976,95	11,86	1934	1999
Bsun	1991827	35275,10	25258,81	1100	97999
Year	1991827	1996,15	2,03	1993	1999
Bald	1991827	40,35	11,08	16	64
Bkungr	1991827	63186,46	23429,41	1111	99000
Education	1991827	1,21	0,57	0	2
education_dum 1	1991827	0,83	0,27	0	1
education_dum 2	1991827	0,62	0,49	0	1
education_dum 3	1991827	0,29	0,46	0	1
Industry	1991827	1,80	0,42	0	2
industry_dum 1	1991827	0,01	0,09	0	1
industry_dum 2	1991827	0,19	0,39	0	1
industry_dum 3	1991827	0,80	0,40	0	1
bkon_dum 1	1991827	0,49	0,50	0	1
bkon_dum 2	1991827	0,51	0,50	0	1
Civilstat	1991827	0,38	0,49	0	1
civilstat_dum 1	1991827	0,62	0,49	0	1
civilstat_dum 2	1991827	0,38	0,49	0	1
Origin	1991827	0,26	0,83	0	4
origin_dum 1	1991827	0,91	0,29	0	1
origin_dum 2	1991827	0,00	0,07	0	1
origin_dum 3	1991827	0,02	0,14	0	1
origin_dum 4	1991827	0,06	0,24	0	1
origin_dum 5	1991827	0,01	0,08	0	1
age2	1991827	1751,10	909,30	256	4096
Ysm	1991827	1,8	6,65	0	60
Income	1991827	171240	157403	0,50	13900000
log_income	1991827	11,21	1,92	-0,69	16,44