# IMPACT OF MIGRANT LABOR ON WAGES OF LOW EDUCATED NATIVES IN SWEDEN, 1993-2003*

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The questions addressed in this paper are (i) What impact does immigration have on the wage level of the low-educated Swedish-born?, and (ii) what are the other possible factors determining the wages of the low-educated natives in Sweden? Using full population data from 1993 to 2003 with two-year intervals for Swedish data, a fixed effects model is estimated. Factors associated with increasing wage among low-educated natives are found to be the share of foreign migrants (both from OECD and non-OECD countries) in the labor market, employment level in the economy, share of low educated natives in the labor market, age, and having relatively higher education. Factors associated with lower wages among low-educated natives, on the other hand, appear to be internal mobility from a labor market to another and total days unemployed.

## INTRODUCTION

The world has turned into a global arena where individuals can move rapidly. At the end of the 20th century, about 140 million lived in a country where they were not born (Borjas, 1999). The reasons for emigration are various: Some people are forced to leave their home countries because of political enforcements or natural disasters, whereas some move for better life conditions while others reside in a new country for family reasons (Zink, 2001). Besides the reasons of migration, the receiving country of immigrants has a role in determining outcomes of migration, too. The outcomes have been assessed mainly in two categories: the immigrants' adaptation (or integration) to the host country's economy and the immigrants' impact on the receiving country's economy (Borjas, 1989). Regarding the latter issue, for both US and Europe, the evidence on the impact of immigration on the wages in the receiving country is generally modest: studies reveal elasticities that hover around zero, i.e., neither positive or negative (Friedberg and Hunt, 1995; Borjas, 1994; Ekberg and Andersson, 1995; Korpi and Abbasoglu Ozgoren, 2010). The impact of immigration on income inequality has also been analyzed by Korpi (2006) in his study for Sweden. According to the findings of this study, the population at the upper parts of the income distribution seems to gain more, whereas there is no conclusive evidence indicating whether the bottom part is gaining or losing from immigration. Whether the native population at the lower parts of income distribution gains or loses from immigration is the main question of this paper.

In this paper, we aim to test for two hypotheses: (i) What impact does immigration have on the wage level of the low educated Swedish population?, and (ii) what are the other possible factors determining the wages of the low educated Swedish born? As mentioned before, the theory recommends a differentiation in approaching economic changes as a consequence of migration: between from the perspective of those already established in the labor market and from the perspective of the new comers. Regarding the first approach, standard economic theory envisages that the already-settled-in-labor-market immigrants should face a downward pressure on their levels of income because of the increased supply of labor, leading to a convergence of incomes –at least in those segments of the destination labor market. However, according to non-neoclassical

* This paper is a summarized version of MSc. thesis supervised by Prof. Dr. Örjan Sjöberg and with assistance from Dr. Martin Korpi on data use, submitted to Stockholm School of Economics defended on 21st of February, 2008.

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approaches, the expected outcome is not that straightforward. According to the new economic geography literature, migration also has a role in driving investment and economies of scale in growth regions and hence increases local wage formation (World Bank, 2009). Within these approaches, migration has also seen as a part of "cumulative causation processes" and "positive feedback loops" *(ibid).*

When it comes to the impact of immigration on income inequality, the effects are not straightforward once again. It is known that immigrant groups are often concentrated in specific segments of the labor market and are typically occupied in low-paying types of work with worse working conditions, also implying inferior societal status and low secure income security, which may in turn increase income inequality overall. It is also conceivable that immigration by foreigners may contribute to a widening gap due to higher productivity and hence higher incomes amongst natives. For instance Korpi (2006) finds that wage inequality increases with local population size where the inequality stems from higher increases in top wages. In addition, an increase in the share of foreign born migrants increases wage inequality. In another study of Korpi (2008), it is found that population in the 5th and 10th percentiles in the wage distribution are losing a little bit as a result of immigration. The results are not totally consistent and seem to need further analysis, which have been the main question of this paper.

Longitudinal data are employed in this study differently from the traditional cross-sectional analyses. Explanatory variables involve the share of foreign born at the specific labor market (differentiating between OECD and non-OECD countries), supply of labor in the labor market, general employment level, age, education, days unemployed and internal movements where the individual switches from one labor market to another.

## REVIEW OF LITERATURE

The analysis of the impact of immigration on income distribution involves further questions regarding the dynamics of migration. First, skill levels of the immigrants implied by self-selection models have determining power on the outcomes of immigration since the skill levels of the immigrants imply whether they are complements or substitutes for the native labor force. Moreover the human capital of immigrants also has impact on the aggregate income. Based on these dynamics, immigration is expected to have negative or positive effects on natives' wages of either/both low or/and high wage percentiles, which are highly dependent on the educational level of the natives as well as immigrants. In this section, we first explain the self selection model and what it implies; second we present empirical literature on the interrelationship between immigration and income inequality. Finally we mention few studies based on the impact of immigration on wages of native populations, who can be considered as the complements or substitutes of immigrants in the labor market.

According to Roy's self selection model, skills level of migrants can be explained by the relative wage differentials between sending and host countries and transferability of skills across the two countries (Roy, 1951). Depending on the values of the parameters, positive or negative selection may occur. Positive selection is likely to occur if wage dispersion is higher in the source country[1]. However empirical results are ambivalent: Borjas proposed that if income inequality is higher in the source country, negative self-selection is likely to occur (Borjas, 1987). Chiswick's study, on the other hand, argues that "a larger wage inequality in the country of origin does not necessarily imply negative self selection, but rather only a less favorable (positive) self selection" (Liebig and Sousa-Poza, 2004; Chiswick, 1999). Another study by Chiswick and Carliner found that "immigrants were positively selected in the sense that they were more able and highly

motivated" (Hammarstedt and Shukur, 2006). Within the same line, Liebig and Sousa-Poza (2004) found that positive selection is generally expected in international migration even in the presence of high income inequality in the country of origin. Within the context of self selection model's theoretical debates, Stark (2006) found that migration woud be negatively selected as a consequence of the prevalence of relative deprivation at origin. The paper moves ahead the view that the negative selectivity arises from the inequality of the income distribution at origin per se, and not from the differentiation between the levels of inequality of the income distribution at origin and at destination.

Literature on migration affecting income inequality and income has been as follows: Migration can have an impact on income inequality and vice versa. Davies and Wooton (1992) analyzed the impact of international factor movements on the personal distribution of income. Their findings suggested that unskilled emigration reduces inequality in source countries and increases it in the hosts. On the other hand brain drain (skilled emigration) raises inequality in the source country and lowers it in the host. They conclude with the statement that other outcomes may also occur.

Korpi (2006) included migration affecting income inequality as a sub question in his study, which analyzed the impact of local population size on income inequality in Sweden. By applying a cross-sectional analysis of Swedish local labor markets using full population data, he found that size of local population has significant positive effects on wage inequality because although all wages increase with population size, top wages increase the most. This result is in line with the recent empirical literature[2]. Other explanatory variables, namely, labor market diversification, human capital, migration, age structure and employment are also shown to be significantly associated with inequality. As of our subject of interest, migration of Swedish and foreign born population is included in Korpi (2006)'s model to control for possible worker supply-side effects. He found migration of the Swedish born to be positively associated with inequality as measured by the Gini coefficient and that wage inequality increases with local population size where the inequality stems from higher increases in top wages, and an increase in the share of foreign born migrants increases wage inequality[3]. One interesting finding of this study is that 50/10 percentile ratio as a measure of wage inequality in lower median wages decreases as population size increases. This is an unexpected result and needs further analysis, which has been the main research question of this paper.

In his following study, Korpi (2008) analyzed the impact of migration on wage inequality, and his results are interesting: For the period 1993-2003, a change in the size of local population due to migration had a large and significant impact on wage inequality. The share of foreign born was found not to be significantly related to the increases in all inequality measures of wage income inequality. Although share of foreign born did not have any effect on total population estimates of inequality, the bottom percentiles (5th and 10th) were found to be losing out a little with increasing total migration.

The main theoretical approach about the impact of migration on wages has been of a neoclassical economic framework as mentioned previously. An increase in the number of low-skilled immigrants will lower the wages of comparable native workers, ceteris paribus, at least in the short run, because they now face more competition in the labor market (Borjas, 2006a). The skill composition of immigrants influences how earnings of different groups of natives will be affected: An increase in the number of low-skilled immigrants is expected to lower the wages of comparable (low-skilled and low earning) native workers, whereas high-skilled workers may gain from the inflow of foreign labor by paying less for services these migrants provide and by

specializing in production of goods and services in which their skills are better suited (Borjas, 2006b; Blessing, 2006). If the flow of migrants predominantly consists of higher educated however, all else equal, top wages are expected to be suppressed since supply of highly educated labor increases. Briefly, immigration shocks are expected to put a downward pressure on the wages of those who are potential substitutes for immigrants in the labor market. However as noted by the World Bank (World Bank, 2009), with the increase in market size, gains from dividing labor and agglomeration economies can be exploited. What impact of migration will have depends on the pull factors of migration. Pull factors should be in play for the migration to result in agglomeration economies rather than congestion costs.

Overall, the empirical literature suggests that the negative effect of immigration on wages of natives is rather small, often negligible and sometimes even of the opposite sign (Card, 2001; Dustmann et al., 2005; Frank, 2007; Carrasco et al., 2008; Partridge et al., 2008; Korpi and Abbasoglu Ozgoren, 2010). A study carried out by Korpi and Abbasoglu Ozgoren (2010) needs further emphasizing: This study analyzes the impact of immigration on low income and low educated workers in Sweden for periods of 1993-1999 and 1997-2003, separately and its findings imply a weak positive relationship between the share of foreign born, and real wage income of compulsory educated natives and of upper secondary educated natives ranging from 0 to 1.3 percent. It should be noted that the paper at hand differs from the study of Korpi and Abbasoglu Ozgoren (2010) due to time period used in the analyses and their methodologies.

When the low level of income inequality in Sweden is considered, negative selection of immigrants can be assumed roughly. Considering the fact that 39 percent of foreign-born persons in Sweden are from Non-European countries (Hammerstedt and Shukur, 2006), it can be speculated that foreign born population in Sweden can be perceived as substitutes for low educated natives in Sweden. However when the different theories and findings stated above, are considered, what impact immigration has on low-educated natives in Sweden is not straightforward to presume without empirical assessments.

## HISTORICAL REVIEW

The history of migration in Sweden, and income inequality measures for Sweden are summarized in this section.

### Background

Swedish labor market is characteristic with its high levels of unionization, high relative minimum wages, a low variance in the earnings distribution, and a big role for the public sector as employer and female participation rates close to men. Moreover tax/GNP ratios are highest in the OECD area (Blume et al, 2007). Sweden has an outstandingly egalitarian distribution of income and low rate of poverty. The living standards of the poor are closer to those of median citizens than in other advanced countries. Despite the depression in 1990s, the country maintained a low rate of poverty and avoided the growth of an underclass and homelessness that appeared in the US and UK (Björklund and Freeman, 1995). Sweden's distribution of earnings and income show a high degree of equality (Domeij and Klein, 1998). In Sweden, income inequality decreased between the mid-1970s and mid-1980s and increased later cancelling out previous changes (OECD, 2000: 48). At the lower end of the table, immigrants are observed when it comes to poverty analyses (Blume et al, 2007)[4]. Table 1 shows numerically the Gini coefficient and income quintile share ratio for the whole population of Sweden for years between 1995 and 2008. Although the income distribution was more even during the second half of 90s, 2000s witnessed low income inequality as well. In

fact, Sweden ha beens among the countries with the most even distribution of income in the world in the last decade (OECD, 2008).

**Table 1. Income Inequality Measures for Sweden**

| Year | G | s80_s20 |
|---|---|---|
| 1995 | .. | .. |
| 1996 | .. | .. |
| 1997 | 21 | 3.0 |
| 1998 | .. | .. |
| 1999 | 22 | 3.1 |
| 2000 | .. | .. |
| 2001 | 24 | 3.4 |
| 2002 | 23 | 3.3 |
| 2003 | .. | .. |
| 2004 | 23 | 3.3 |
| 2005 | 23 | 3.3 |
| 2006 | 24 | 3.5 |
| 2007 | 23 | 3.4 |
| 2008 | 24 | 3.5 |

**Source:** Eurostat

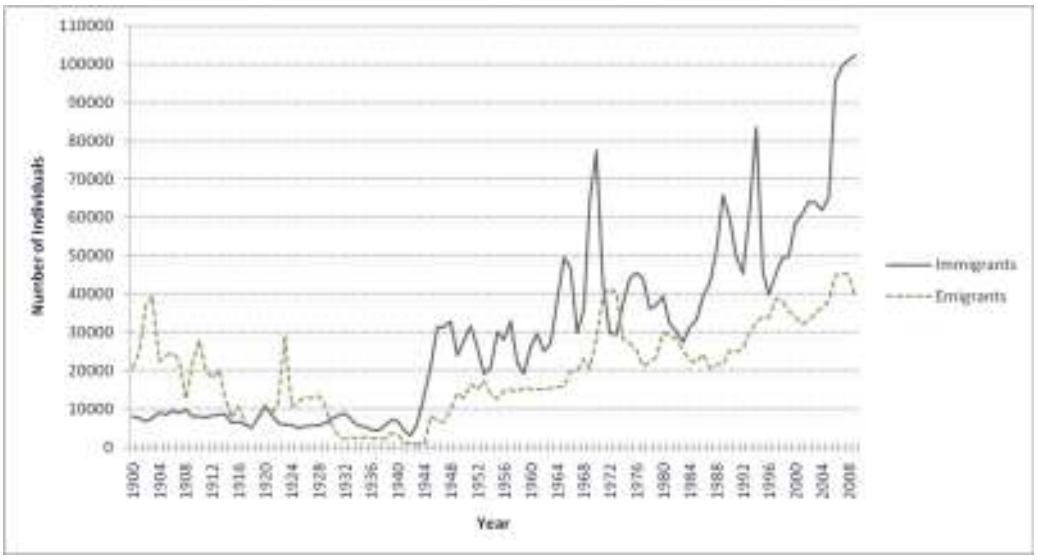
G: Gini Index measures the extent to which the distribution of income among individuals or households within an economy deviates from a perfectly equal distribution. It measures the area between the Lorenz curve and the hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. A Gini index of zero represents perfect equality and 100, perfect inequality.

s80_s20: Income quintile share ration is another measure of inequality of income distribution. It is calculated as the ratio of total income received by the 20 percent of the population with the highest income (the top quintile) to that received by the 20 percent of the population with the lowest income (the bottom quintile).

Sweden was a country of emigration in the late nineteenth and beginning of twentieth century. In the 1930s, Sweden underwent a transition from emigration country to an immigration country (Karlsson, 2002). Immigration and emigration figures are given in Figure 1.

The reason for this transformation was mainly the period of reconstruction of Europe after the Second World War, which led European countries to export cheap labor from developing nations. However labor migration reflected only one part of migration to Sweden. Other relevant theories explaining immigration in Sweden have been asylum and social networks theories. Sweden has been a destination for asylum seekers and refugees throughout 1950s. In 1950, the number of foreign-born persons in Sweden was less than 200,000 (less than 3% of the total population). In 2000, the portion of foreign-born persons had grown to 11.4% of the entire population of almost 9 million (Karlsson, 2002).

**Figure 1. Immigration and emigration from Sweden 1900-2010**




**Source:** Statistics Sweden

### Immigrants in Sweden

The share of foreign-born living in Sweden increased rapidly throughout the post-war years. In 1940, about only 1 percent of the population living in Sweden was born abroad, whereas this share rose to about 7 percent in 1970. In 2006, this figure reached about 12.9 percent accounting for over one million individuals (1,175,200). In the same period, the character of immigration changed as well (Hammerstedt and Shukur, 2006).

During the 1950s and 1960s the immigration was a kind of refugee immigration from countries in Eastern Europe. These migrants were in general well educated and performed well in the Swedish labor market. From 1950s until the mid-1970s immigration to Sweden was mainly labor-force migration as a result of the industrial and economic expansion. Labor recruitment started with labor from the Nordic countries, Germany and Italy. By the 1960s labor recruitment was extended to include Turkey, Yugoslavia and Greece (The Center for Migration Studies of New York, 1964). In 1965 The Labor Market Commission in Sweden argued in favor of extensive labor force immigration. The labor-force migration consisted mostly of low educated individuals from Finland and countries in Southern Europe. The great majority of the labor force migrants from Southern Europe came from former Yugoslavia. There was labor force migration from Italy and Greece as well. During 1950s and 1960s labor-force migrants also came from Nordic countries other than Finland, and from countries in Western Europe such as West Germany. These migrants were more educated than those who came from Finland or Southern Europe. The economic migrants did well in the Swedish labor market and, during the 1950s as well as the 1960s; the unemployment concentration was lower among immigrants than among native Swedes (Hammerstedt and Shukur, 2007).

In the mid-1960s, Swedish trade unions observed immigrants holding down the wage level for low-paid workers. Therefore a more restrictive immigration policy was adopted. As the labor-force migration of European immigrants was narrowed, the number of refugees from non-European countries started to increase *(ibid).*

**Table 2. Foreign-born persons according to region of birth in percent of all foreign-born persons 1960-2003**

| Region of birth | 1960 | 1970 | 1980 | 1990 | 2000 | 2003 |
|---|---|---|---|---|---|---|
| Nordic countries | 58.1 | 59.7 | 54.4 | 40.3 | 27.9 | 25.9 |
| Other European countries | 37.0 | 34.9 | 33.8 | 32.1 | 32.9 | 32.5 |
| Non-European countries | 4.9 | 5.4 | 11.8 | 27.6 | 39.2 | 41.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

**Source:** Hammerstedt and Shukur (2006)

Family tied migration has been another common form of immigration to Sweden. Regarding migration policies of Sweden, close family member of an immigrant is defined to be "a person who is granted a residence permit because he/she has close relatives living in Sweden. Spouses, partners and unmarried children under the age of 18 are regularly granted residence permits in Sweden. The term, family ties is often used." (Karlsson, 2002) and this policy made family reunifications easier to achieve resulted from social networks.

## HYPOTHESES, VARIABLES AND MODELS

Immigration's potential effect on lower parts of the income distribution appears to be an interesting issue to study according to the up-to-the-present-literature. The determinants of the wage pattern of the low educated Swedes (which is a good proxy for the population in lower parts of income distribution) are to be analyzed using panel data in this study. The hypotheses and model specifications generated below are based on this research question.

### Hypotheses

The four hypotheses to be tested are explained below:

**H1**: A high share of foreign born (with a differentiation between OECD and non-OECD immigrants) at the specific labor market is associated with a low wage level of the low educated Swedish born population.

**H2**: Moving from one labor market to another (internal migration) is associated with an increase in wages for the low educated Swedes.

**H3**: Macro variables such as the supply of labor in the labor market and employment level in the economy (as a proxy for business cycles) affect the wage level of low educated Swedish population.

**H4**: Human capital variables such as years of education, age and days unemployed are associated with the wage of the low educated Swedish population.

To test the four hypotheses, the dependent variable is chosen to be yearly wage before tax and no other income sources. Logarithm of the wage income was chosen as the dependent variable, while a number of migration-related variables (taking into account OECD membership status of the home countries of the immigrants), as well as variables indicating the level and composition of

labor supply in the specific labor market of interest, among others, were used as the independent variables.

Explanatory variables are to be divided in four groups, where the first group stands for immigration with the definition of the share of foreign born in the specific labor market. The second group represents only one independent variable, which represent the internal movements between labor markets (which may also be called internal migration). Third are the macro variables, namely employment level, and supply of labor in the labor market which is calculated as the share of low educated Sweden born in the labor market. Finally the last group corresponds to individual level human capital and socio-economic variables such as age, years of education and days unemployed. Two-year intervals are used as one-year intervals might have showed too little change from year to year.

The variables used in the models are presented in Table 3:

**Table 3. Variables and their definitions in the model**

| Variable | Definition |
|---|---|
| logwage | Log of yearly wage before tax |
| shareOECD | Share of foreign born from an OECD country in the specific labor market |
| shareNONOECD | Share of foreign born from a non-OECD country in the specific labour market |
| OECD_NONOECD | Interaction variable for the variables shareOECD and shareNONOECD |
| MGRNT | Dummy variable which takes the value 1 for a movement from a labor market to another |
| sizeLowEduc | Share of low educated Swedes in the specific labor market |
| employment | Employment level |
| educdummy | Dummy variable which takes value 1 for relatively higher education |
| age | Age of the individual |
| ALosDag | Days unemployed |

The variable in question according to the first hypothesis is the share of foreign born in the labor market where the individual belongs to. As pointed out in literature review section, the conclusions regarding the impact of immigration on wages of the population in lower parts of income distribution in Sweden are contradictory. Therefore both positive and negative associations between the shares of OECD countries and/or non-OECD countries and wage of low educated Swedes may be expected. An interaction variable between share of OECD born and share of non-OECD born might capture the total effect of migration. Therefore this variable is also to be included in the regression.

Moving from one labor market to another is assumed to be motivated for higher income opportunities and better jobs. Therefore internal labor market switches are expected to be positively correlated to the wages of the individuals, i.e. a positive coefficient for the variable is expected.

One of the two aggregated independent variables is the share of low educated Swedes in the labor market as a proxy for the supply of labor in the specific labor market. According to the neoclassical theory, an increase in the supply of labor should decrease wages. Therefore a negative sign for the coefficient of sizeLowEduc is expected. The next macro variable, employment level in the Swedish economy, may be used as a proxy for business cycles as cyclical unemployment arises from recession and decreases in the recovery phases of recessions. In the boom periods, unemployment can decrease and even excess of jobs may occur (and employment increases). The relationship between wage and unemployment is straightforward according to the classical economics. The wage curve represents the negative relationship between wage level and unemployment[5]. Therefore we can assume a positive relationship between wage level and employment theoretically.

According to the human capital approach, returns to education and experience should lead to higher wages. Therefore relatively more education should be reflected in higher wages. Age is also expected to increase wages as it is usually linked with experience. Another variable, total days unemployed in a year, is to be included in the model as for the ones working part time, it would reflect the time having stayed unemployed as a determinant of the yearly wage. And days unemployed is expected to be negatively associated with the total wage income of the low educated Swedish population.

**Model Specifications**

The models used in this study are three advanced panel models, namely fixed effects, between effects and random effects models. By applying a formal test, the superior model is to be selected finally between fixed effects and random effects models.

The basic model from which the advanced ones will be derived is the unobserved effects model where one can control for some types of omitted variables that differ between cases but are constant over time (constant term is assumed to be a time-invariant but varying across individuals):

$$lnw_{it} = \alpha_i + f'_{it} \cdot \beta + x_{1it} \cdot \gamma + x'_{2it} \cdot \theta + x'_{3it} \cdot \varphi + v_{it}$$

where $v_{it} \sim IID\ (0, \sigma_v^2)$ and;

$lnw_{it}$ = Log of yearly wage

$f_{it}$ = Vector for foreign born in the labor market, including share of OECD born immigrants, non-OECD born immigrants and the interaction between the two.

$x_{1it}$ = Dummy variable which takes value of 1 for moving from a labor market to another, 0 otherwise.

$x_{2it}$ = Vector for aggregated variables, namely share of low educated Swedes in the labor market and the employment level in the economy.

$x_{3it}$ = Vector for human capital and socio-economic variables, namely age, dummy for relatively higher education and days unemployed.

$i$ = Individual, 1,…., 3,690,626 (it changes according to years since an unbalanced panel is used in the analysis).

$t$ = Year, (t = 1993, 1995, 1997, 1999, 2001, 2003)

$\alpha_i$ = Unobserved effect

$v_{it}$ = Error term,

The first model to be estimated is the "between effects model":

$$ln\bar{w}_{i\bullet} = \alpha_i + \bar{f}'_{i\bullet} \cdot \beta + \bar{x}_{1i\bullet} \cdot \gamma + \bar{x}'_{2i\bullet} \cdot \theta + \bar{x}'_{3i\bullet} \cdot \varphi + \bar{v}_{i\bullet} \quad \textbf{(2)}$$

where;

$$ln\bar{w}_{i\bullet} = \frac{1}{T}\sum_{t=1}^{T} w_{it}$$

$$\bar{f}_{i\bullet} = \frac{1}{T}\sum_{t=1}^{T} f_{it}$$

$$\bar{x}_{1i\bullet} = \frac{1}{T}\sum_{t=1}^{T} x_{1it}$$

$$\bar{x}_{2i\bullet} = \frac{1}{T}\sum_{t=1}^{T} x_{2it}$$

$$\bar{x}_{3i\bullet} = \frac{1}{T}\sum_{t=1}^{T} x_{3it}$$

$$\bar{v}_{i\bullet} = \frac{1}{T}\sum_{t=1}^{T} v_{it}$$

And the within transformation ((1)-(2)) or "the fixed effects transformation" is:

$$lnw_{it} - ln\bar{w}_{i\bullet} = \left(f'_{it} - \bar{f}'_{i\bullet}\right) \cdot \beta + (x_{1it} - \bar{x}_{1i\bullet}) \cdot \gamma + (x'_{2it} - \bar{x}'_{2i\bullet}) \cdot \theta + (x'_{3it} - \bar{x}'_{3i\bullet}) \cdot \varphi + v_{it} - \bar{v}_{i\bullet} \quad \textbf{(3)}$$

The random effects model assumes that the unobserved effect ($\mu_i$) is uncorrelated with each explanatory variable in the following model:

$$lnw_{it} = \alpha + f'_{it} \cdot \beta + x_{1it} \cdot \gamma + x'_{2it} \cdot \theta + x'_{3it} \cdot \varphi + (\mu_i + u_{it}) \quad \textbf{(4)}$$

where $u_{it} \sim IID\ (0, \sigma_u^2)$

If we define the composite error term *as* $v_{it} = \mu_i + u_{it}$, (4) can be written as:

$$lnw_{it} = \alpha + f'_{it} \cdot \beta + x_{1it} \cdot \gamma + x'_{2it} \cdot \theta + x'_{3it} \cdot \varphi + v_{it} \quad \textbf{(5)}$$

Since $\mu_i$ is in the composite error in each time period, the $v_{it}$ are serially correlated across time. Under the random effects assumptions;

$Corr\,(v_{it}, v_{is}) = \sigma_\mu^2/(\sigma_\mu^2 + \sigma_u^2)$ , $t \neq s$ ,

where $\sigma_\mu^2 = Var(\mu_i)$ and $\sigma_u^2 = Var(u_{it})$ .

GLS transformation is needed to eliminate the serial correlation in the error term where the transformed model becomes ("the random effects model" to be estimated is):

$$lnw_{it} - \lambda ln\bar{w}_{i\bullet} = \delta(1-\lambda) + \left(f'_{it} - \lambda \bar{f}'_{i\bullet}\right) \cdot \beta + (x_{1it} - \lambda \bar{x}_{1i\bullet}) \cdot \gamma + (x'_{2it} - \lambda \bar{x}'_{2i\bullet}) \cdot \theta + (x'_{3it} - \lambda \bar{x}'_{3i\bullet}) \cdot \varphi + (v_{it} - \lambda \bar{v}_{i\bullet}) \quad \textbf{(6)}$$

where, $\lambda = 1 - \left[\sigma_u^2/(\sigma_u^2 + T\sigma_\mu^2)\right]^{1/2}$

Finally, Hausman Specification Test to choose between (3) and (6) is applied to see which model is superior for this study.

## DATA

Using panel data brings several advantages: Panel data can control for the factors that (i) vary across entities but do not vary over time, (ii) could cause omitted variable bias if they are omitted and (iii) are unobserved or unmeasured.

The study utilizes a database consisting of longitudinal full population data covering all individuals living in Sweden sometime between the years 1993-2003. The database has been compiled in cooperation between Statistics Sweden (SCB) and the Department of Social and Economic Geography at Uppsala University. The database provides a series of individual level data, including place of residence and work, occupational status, education, level of income, country of birth and gender.

For this study, concentrating on the impact of immigration on wages of the low educated Swedish born; data for six years (1993, 1995, 1997, 1999, 2001 and 2003) are used. Individuals younger than 21 and older than 64 years old are excluded from the study as the elder years are defined as economically inactive years and under the age of 21, many individuals are not yet fully established on the labor market in Sweden, either because of unemployment or because they are still in education.

As the next step, the individual data are linked to municipalities and municipalities to local labor markets. The definition of the local markets have changed over time as the changes in the size and age structure of local and regional population, and improvements in infrastructure and communication over time. In this study the 1998 definition of local Swedish labor markets by Statistics Sweden is employed as Korpi (2008) used, as well. From this definition, Sweden can be divided into 100 local labor markets, made up of some 289 municipalities. The separation is carried out with the logic that if more than 20 percent commute from municipality a to municipality b, municipality a is registered as belonging to the local labor market of municipality b, and so on. As a later stage, shares of foreign born, shares of low educated Swedes for each labor market that each individual belongs to are calculated.

As the population of interest is the low educated Swedish individuals, individuals born in a country other than Sweden and high educated people are excluded. For defining "low educated", two education groups were created: education up to 9 years and education up to 12-13 years implying a gymnasium (equivalent to college) education. The high education group with 13 and more than 13 years implying a university level education was excluded from the dataset. What are left are all men and women between the ages 21 and 65; a population of around 3.5 million people for each year.

Employment data came from Statistics Sweden as an external source and merged with our dataset. From this data, an unbalanced panel data set was constructed and a variable to count for moving from one labor market to another was created.

The final data set to be used for regressions included about 15.4 million observations.

## RESULTS

As mentioned in the section of "model specifications", two main models, namely *fixed effects* and *random effects* models are estimated. Another model named *between effects* model is carried out additionally to show the intermediate stage for obtaining the fixed effects model. All the regressions are run by using the software STATA.

Prior to analyzing the coefficients, the superior model is to be chosen. Fixed effects model provides consistent results but not the most efficient ones, whereas random effects model gives better p values. By testing the null hypothesis that "coefficients estimated by the efficient random effects estimator are the same as the ones estimated by consistent fixed effects estimator" with the Hausman specification test, one can choose between the two models. According to the test, fixed effects model should be chosen as Prob>chi2 is smaller than 0.05 (with the value of 0.00). Therefore in this paper, fixed effects model will be analyzed onwards. The results of the fixed effects regression are summarized in Table 4:

**Table 4. Variables, their coefficients and level of significance in the fixed effects model**

| Variable | Coefficient | Significance |
|---|---|---|
| Constant | 5.256 | 0.000 |
| Share of migrants born in an OECD country in the labor market | 0.479 | 0.000 |
| Share of migrants born in a non-OECD country in the labor market | 1.408 | 0.000 |
| Interaction variable for share of OECD and non-OECD born migrants | 18.040 | 0.000 |
| Dummy for moving from one labor market to another | -0.021 | 0.000 |
| Share of low educated Swedes in the labor market | 0.163 | 0.000 |
| Employment | 1.251 | 0.000 |
| Dummy for having relatively higher education in the low educated Swedish population | 0.262 | 0.000 |
| Age | 0.018 | 0.000 |
| Days unemployed | -0.005 | 0.000 |
| R-squared overall | 0.1203 | |

To find out the effects of migration on the wages of low educated Swedes, a fixed effects regression was run. More than 15 million observations with around 3.7 million individuals were used[6].

Two important results concerning migration follow from this regression. On the one hand, the regression outcome indicates a striking contradiction to the popular belief regarding the question at hand. In fact, the outcome does not comply with the popular belief that migration from outside of the host country affects the incomes of the low educated locals in a negative way. Therefore Hypothesis 1 is not supported for the case of Sweden. Actually, the effect in question has been found to be significantly positive. Indeed, wage incomes of low educated Swedes are found to be rising as the share of foreign-born individuals in the specific labor market rises. This applies in the case of immigrants from both OECD and non-OECD countries. Surprisingly, this statistically significant effect is even greater in the case of immigrants that originate from non-OECD countries. A 0.1 increase in the share of migrants born in an OECD country in the labor market is predicted to increase the wage level by 4.8 percent and if the share of migrants born in a non-OECD country in the labor market increases by 0.1, the wage of a low educated native increases by 14.1 percent. Likewise, the coefficient of the variable that represents the interaction between two above-mentioned variables is positive and significant with a very high value of 18.

An increase in the movements within the labor markets on the other hand, significantly reduces the wage incomes of low educated Swedes as indicated by the negative coefficient of the dummy variable, which takes on values according to the mobility of the individual within the labor market. Therefore internal migration has been shown to be negatively related to the wage incomes of low educated Swedes. Moving from one labor market to another is associated with a 2.1 percent decline in the wage of the individual. This result is interesting and even confusing as theory predicts that inter-labor market movements to result in higher wages for the individual. However our finding indicates that low-educated natives do not migrate or change labor market due to better opportunities.

Meanwhile, a change in the variable representing the share of low educated Swedes in the specific labor market, which is intended to represent change in the level of labor supply in that market, tends to affect their wages in the same direction. Thus, according to the outcome of the regression; among all the laborers in the market, as the share of low educated Swedes increase, their wage incomes also tend to increase. 0.1 unit increase in the share of low educated Swedes in the labor market results in 1.63 percent increase in the wage level. This contradicts with the neoclassical settings and may be an indication of positive externalities in effect. Besides, as one might expect, a rise in the employment level of the economy would trigger a rise in the level of wage incomes of low educated Swedes, as indicated by the significantly positive coefficient of the variable that represents the employment level. 0.1 unit increase in the employment level is found to be associated with 12.5 percent increase in the wage level of the low educated Swedes. Third hypothesis, where macro variables are expected to affect the wage levels of low educated Swedish population is therefore not to be rejected. However, the sign of the coefficient of the supply of labor has turned out to be positive.

Another highly expected outcome of the regression is the fact that individuals in the relatively highly educated group among the low educated Swedes tend to get higher wages, which is clear from the statistically significant coefficient of the dummy variable that takes on values according to the detailed education level of the low educated individual. The coefficient implies that a relatively higher educated Swede's wage is, on average, 26.2 percent above a comparable low educated Swede's wage. Likewise, wages of low educated Swedes tend to rise as their age

increases (when age increases by one year, wage level increases by 1.8 percent) and as the number of unemployed days fall (when days unemployed decreases by 1, wage level of the low educated Swede increases by 0.5 percent). Hypothesis 4 is not to be rejected according to these results.

All coefficients mentioned so far have large enough t-values to allow one to reject the null hypothesis that the particular coefficients are zero. The F statistic of the model proves that the model is statistically significant overall[7]. We also carried out further analysis regarding the sensitivity of the model and found that the model is a good one overall[8].

## CONCLUSION

This study has put the research one step forward to analyze how migration affects the wages of the population in the bottom parts of the income distribution for Sweden. Previous studies have indicated mixed results: A recent study by Korpi (2006) found that total affect of migration decreased 50/10 percentile ratio improving the inequality measure. However in a more recent study Korpi (2008) indicated slight decreases in the $5^{th}$ and $10^{th}$ percentiles in the wage distribution as result of migration. However, Korpi and Abbasoglu Ozgoren (2010) found that these groups of natives gained, albeit little, from immigration. This study was critical in understanding the links between migration and wage levels of the population in the bottom parts of the income distribution in Sweden.

Low educated Swedes represent the natives with relatively lower wages well, and the population used in this study at hand was therefore low-educated group of natives. As the data covered the whole population between 1993 and 2003, the results should be taken as representative of the whole population and the regressions do not suffer from sampling errors.

Two findings of the study are contradicting with the two hypotheses that (i) a high share of foreign born (with a differentiation between OECD and non-OECD immigrants) at the specific labor market is associated with a low wage level of the low educated Swedish population and; (ii) moving from one labor market to another (internal migration) is associated with an increase in wages for the low educated Swedes. Both these statements are falsified according to our fixed effects regression results. The hypotheses have their grounds in the theory; however this study could not find evidence for them, at least for the case of Sweden. The low educated natives seem to gain more as the share of foreign born increases in the labor market. This finding has been once more verified by Korpi and Abbasoglu Ozgoren (2010) using segmented time periods and different methodologies. The reason for this could be that immigrants, especially the ones from non-OECD countries are just assigned to a labor market on their arrival and are mostly composed of refugees or asylum seekers. Therefore they do not compete with low educated Swedes in the labor market. Regarding the theoretical approaches, the findings presented in this paper support the nonneoclassical approach rather than the neoclassical one. Hence negative supply side effects for Sweden for the time period 1993-2003 for low educated natives are ruled out. The general economic situation in Sweden during the period of analysis should also be considered when interpreting the results although we controlled for macroeconomic variables such as employment and days unemployed in the model. Sweden experienced a severe economic depression in 1990s and the period of 1993-2003 presents a recovery time with employment picking up until 2001, and returning to normalcy onwards. The lack of a negative effect of share of foreign workers on wages of low-educated natives as envisaged by the neoclassical theory in the analyses could be due to simply unemployment of immigrants, who are left out of the labor market and could not compete with their native counterparts. Another possibility is that the grouping of “low-educated” may be too narrow for the analyses to capture the possible wage competition. Sub-grouping natives and

immigrants along lines of occupation could help solve this problem. Labor market segmentation can be another reason of this finding, where immigrants and natives are concentrated in different segments of the labor market; hence these two groups have little or no cross-over capability.

On the other hand, natives are found to lose as a result of internal migration from one labor market to another. The reason for this could be that low educated Swedes' migration from a labor market to another are due to some other reasons than higher wages. This result needs further analysis, where determinants of labor market switches for individuals can be investigated.

Other findings suggest that macro variables, like supply of labor and employment level, affect the wages of the low educated natives. However a positive relationship between supply of labor and wages is suggested according to the results where supply of labor is proxied by the share of low educated natives in the labor market, contradicting the neoclassical theory. The theory of the labor market segmentation could be an explanation for this finding. If the segment of the labor market where natives are employed has a rigid wage system and provide relatively higher wages than wages in other segments where immigrants are employed; increase in the share of natives in the labor market may have an upward pressure on wages of these workers.

On the other hand human capital variables such as years of education, age and days unemployed are found to be associated with the wages of the low educated natives with their expected signs; positive, positive and negative, respectively.

The interesting results for the variables of international and internal migration need further analysis. The positive relationship between supply of labor and wages could be an outcome of the data problems, where an unbalanced panel is used. Moreover the proxy variable to measure supply of labor can be changed from a share variable to a total size variable, which may contribute to this work further. The analysis of a possible labor market segmentation regarding migrants and natives in the Swedish labor market would provide rewarding explanations to our findings, as well.

**Notes:**

[1] Presentation named "Immigration Economics" by Libertad González, Universitat Pompeu Fabra, October 26, 2006, available at http://www.inside.org.es/docs/activities/26octubre.ppt , retrieved in 2007.

[2] Earlier empirical and theoretical works supported the conclusion that inequality decreased with city size and size of local population. Later on, this belief was replaced by the opposite view; the larger the city the higher the level of inequality. This latter conclusion has also been strengthened by some empirical work of the past few years using state level data (Korpi, 2006: 7).

[3] The significance of the impact changes according to the definition of the income inequality measure. The effect is significant when the ratio of 99/50 percentile is used as the measure.

[4] Immigrants are defined to be members of migration that is the process of redistribution of the population in space depending on the changes in the society. However for a place change to be defined as migration, it should take place in significant distance and continuity which are able to create an effect (Erder, 2006).

[5] From http://www.leftbusinessobserver.com/Race_curve.html referring to Blanchflower and Oswald (1995), The Wage Curve, New York: the MIT Press.

[6] The interpretation of the coefficients follow the ceteris paribus statement onwards.

[7] One might claim that low R-squared should be the main decisive factor to test whether the model is a good one. However in panel studies overall R-squared is not a criterion as in the social sciences, low R-squared in regression equations are not uncommon especially for cross-sectional analyses (Wooldridge, 2006: 44). When using longitudinal data for a large time span, R-squared might be found to be much lower.

[8] Regarding the fixed effects model, the model may suffer from multicollinearity as the variable, share of low educated Swedes in the specific labor market used as a proxy for the supply of labor in the market may be correlated highly with the explanatory variables; share of OECD and non-OECD country born individuals in a specific labor market. Therefore an auxiliary regression was also run, which is not provided in this paper, but available upon request. The high overall significance of the regression suggests that there may be multicollinearity in the model. However

when the explanatory variable, share of low educated Swedes in the labor market is excluded from the regression, the results do not differ much. Therefore although one can argue that the model suffers from multicollinearity, we believe that it would not cause a considerable problem regarding the estimations and the model. As panel models control for time invariant variables, gender was not included in the model as an independent variable. Therefore fixed effects regressions were also run for males and females, separately. The results are not provided in here, but available upon request. We found that the statement "as share of Sweden born supply of labor increases wages go down" is satisfied within the female population. However the coefficient is significant at 0.05 level, instead of 0.01 for this case. The signs of the rest of the coefficients and their significance, on the other hand, do not differ between the two regressions for males and females.

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## ÖZET

## İSVEÇ'TE GÖÇMEN İŞGÜCÜNÜN DÜŞÜK EĞİTİMLİ İSVEÇLİLERİN ÜCRETLERİNE ETKİSİ, 1993-2003

Bu çalışmanın cevap aradığı sorular şunlardır: (i) İsveç'e gelen göçün düşük eğitimli İsveçlilerin ücret düzeylerine etkisi nedir? ve (ii) Düşük eğitimli İsveçlilerin ücretlerini belirleyen diğer olası etmenler nelerdir? İsveç verisi olarak 1993-2003 dönemini kapsayan tüm nüfus verisi iki yıl aralıklı kullanılarak bir sabit etki modeli tahmin edilmiştir. Düşük eğitimli İsveçlilerin artan ücretleriyle ilişkili etmenler; işgücü piyasasındaki (Hem OECD hem OECD olmayan ülkelerden) göçmenlerin oranı, ekonomideki istihdam seviyesi, işgücü piyasasındaki düşük eğitimli İsveçlilerin payı, yaş ve göreceli yüksek eğitim sahibi olmak olarak bulunmuştur. Buna karşılık İsveçlilerin düşük ücretleriyle ilişkili faktörler; bir işgücü piyasasından diğerine gerçekleşen iç hareketlilik ve işsiz geçirilen toplam gün sayısı olarak görünmektedir.