Analysis of Structure and Tendencies of Qualified Immigrant Workforce on the Swedish Labor Market
Abstract

The purpose of this paper is to make quantitative and qualitative analysis of foreign citizens who may participate on the Swedish labor market (in text refers to as ‘immigrants’). This research covers the period 1973-2005 and gives prediction figures of immigrant population, age and gender structure, and education attainment in 2010. To cope with data regarding immigrants from different countries, the population was divided into six groups. The main chapter is divided into two parts. The first part specifies division of immigrants into six groups by country of origin according to geographical, ethnical, economical and historical criteria. Brief characteristics and geographic position, dynamic and structure description were given for each group; historical review explain rapid changes in immigrant population. Statistical models for description and estimation future population were given. The second part specifies education and qualification level of the immigrants according to international and Swedish standards. Models for estimating age and gender structure, level of education and professional orientation of immigrants in different groups are given. Inferences were made regarding ethnic, gender and education structure of immigrants; the distribution of immigrants among Swedish counties is given. Discussion part presents the results of the research, gives perspectives for the future brief evaluation of the role of immigrants on the Swedish labor market.

Key words: Sweden, Immigration, Labor Force, Professional Education, Population Forecasting
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List of Abbreviations

Groups of Countries:

Group A.  West Europe, North America, Australia, Japan
Group B.  East Europe
Group C.  East and South Asia
Group D.  Sub-Saharan Africa
Group E.  Central Asia and Middle East
Group F.  Latin America

Levels of Education¹:

L1.  Primary education or first stage of basic education.
L2.  Lower secondary or second stage of basic education.
L5.  First stage of tertiary education.

Fields of Education²:

F0.  General education
F1.  Teaching methods and teacher education
F2.  Humanities and art
F3.  Social sciences, law, commerce, administration
F4.  Natural sciences, mathematics and computing
F5.  Engineering and manufacturing
F6.  Agriculture, forestry, animal health
F7.  Health care and nursing, social care
F8.  Services

¹ Corresponding to International Standard Classification of Education ISCED 1997, UNESCO
² Corresponding to The Swedish Educational Terminology SUN 2000
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Borlänge, October 2006
Introduction

In our days, qualified labor force becomes a valuable economic resource. Not only traditional immigrant countries like Australia, Canada or New Zealand but also such states as UK and Czech Republic provide active policy in involving professionals from abroad. As for today, Sweden does not have such policy; however we can consider Sweden to be an immigrant country.

It is estimated that today about one of ten people in Sweden are immigrant or has at least one immigrant parent and it is hard to overestimate importance of immigrants for the Swedish economy. The analysis and characteristics of the immigrant population, changes in the structure over the years and predictions for the nearest future was chosen as a topic for this Master Thesis.

The first aspect in describing immigrants is the number of immigrant population by gender and ethnic groups. The research of immigrant population covers period 1973-2005. During that period, the highest part of immigrants was from Europe and other high-developed countries. Since 1980s, the share of people from Middle East and other Asia countries becomes larger.

Evaluation of professional qualification of immigrants is another aim of the research. The core idea in inference regarding successful performing on a labor market is a relevant qualification level; the strong relation between ethnic origin and gender of a person and his or her educational level and professional orientation was proven in the Second Part; statistical models were built.

One more task of the work is to predict the possible distribution of immigrant labor force within Sweden. Each of the counties has its own level of economic development. Combining these results with expected demand for labor force in different regions we can estimate the level of employment in different regions. These results could be used both by government and by private sector in a long-term planning.

The main chapter of the thesis is divided into two parts. The first part gives division of immigrant labor force into groups accomplished with brief characteristics and model for population prediction. The second part explains changes in age and gender structure of immigrants for last 33 years and predicts the future structure, gives characteristics of educational level and professional orientation, estimates distribution of immigrants within the country.
Methodology

Data Sources

Our target group is foreign citizens who were granted residence permit to live in Sweden and are in the age range 16-65 years. This group includes those who came as refugee, family members with status of long-term resident, students, employee and self-employed people.

In describing characteristics of immigrants we extensively use statistical data from Statistics Sweden (SCB). “All population reports are based on the Total Population Register (TPR) maintained by Statistics Sweden. The migration statistics are based on notifications that the TPR receives daily from the Tax Authorities. In this report there are also figures concerning grounds for settlement in Sweden and about asylum-seekers from the Swedish Migration Board. To be registered as an immigrant a person must intend to stay in Sweden for at least one year.”

The following database tables were used in the work:


- **Population by county, marital status and sex (1968-2005)** was used in section in section 2.4 for building model to estimate the distribution of immigrants within Sweden in 2010.

- **Immigrants 16-74 years of age by sex, national background, level of educational attainment, field of education and country of emigration. (1987-2005)** and

- **Immigrants 16-74 years of age by sex, age, national background, type of migration, level of educational attainment and field of education. (1990-2005)** were used in section 2.2 and 2.3 for estimation education level and professional orientation of immigrants.

“Educational data on foreign born individuals in the Register of Education are collected from many sources. The most important is a special survey, 'Education completed abroad', which once a year is directed to newly immigrated individuals aged 20-59. The main reason that information about education is missing for many newly immigrated is that they have not participated in the survey. There is no certainty about how the missing data are distributed. But we believe that individuals with low education (and no education at all) are overrepresented among those who

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3 The statistical database is available online at [http://www.ssd.scb.se/databaser/makro/start.asp?lang=2](http://www.ssd.scb.se/databaser/makro/start.asp?lang=2)

4 Quoted from SCB (2001)
have no information about education. But of course, even many highly educated have unknown
education in the Register of Education.”

- Asylum-seekers in Sweden by country of citizenship and sex. (2001-2005) and
- Number of persons in Sweden who have acquired Swedish citizenship by country of
citizenship and sex. (2000-2005) were used in text as additional description of the groups.

**Statistical Methods**

The primary tool in building analytical models and making graphs was statistical programming
language *R*. The following list briefly summarizes methods and statistical models used in the
work. The statistical methods are explained more detail at the place they are first used.

**Descriptive statistics.** Ethnic and gender structure of immigrant population, data regarding
educational level and professional orientation, other information is presented in a form of tables
or graphs accompanied with relevant explanatory comments.

**Geographic Information System (GIS)** was extensively used in the First Part for representing
groups of countries and dynamics in immigrant flow. Such a representation gives clear picture
and is tool to make visual analysis of common tendencies of a given region.

**Autoregressive integrated moving average** was used in predicting the population growth.

\[ ARMA(p,q) \text{ process is defined as } X_t = \sum_{j=1}^{p} \phi_j X_{t-j} + \sum_{j=1}^{q} \theta_j \epsilon_{t-j} \text{, where } \epsilon_t \text{ denotes a series of} \]

uncorrelated random variables with mean zero; parameters \( \phi \) and \( \theta \) are found by a software.

\[ ARIMA(p,d,q) \text{ is a process whose } d\text{-th difference } \nabla^d X \text{ is an } ARMA(p,q) \text{ process.} \]

Among appropriate models the one with the smallest Akaike’s information criterion is chosen
\(\text{AIC} = \log \hat{\sigma}^2 + 2 \frac{p+q+1}{T} \), where \( \hat{\sigma}^2 \) is the estimate variance of \( \epsilon_i \), \( T \) is number of observations).

**Maximum likelihood estimation.** Computer algorithm based on maximum likelihood estimation
is used to find suitable shape parameters for Beta distribution to fit data regarding age structure.

**Generalized linear model.** Categorical data regarding education level were analyzed using
GLM model with Poisson family and log link function.

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5 The explanation was kindly given by Peter Öberg, Statistics Sweden in his letter dated May 2, 2006
6 The software has General Public License and can be downloaded from http://www.r-project.org/
**Pearson’s test statistic.** Was used in testing hypothesis about equal distribution of observations.

**Gender segregation index.** A method proposed by UNESCO was used to state the level of difference in homogeneity of professional orientation depending on gender for different groups.

**Simple linear regression.** Ordinary least square estimation was used to model the distribution of immigrants within Sweden depending on previous immigrant population and logarithm of the number of county inhabitants.

---

**Precision of Population Forecasting**

Even a correct model may have some degree of uncertainty caused by a number of unpredictable factors. In our immigrant population forecasting, the two major aspects may have influence on the trend change: unexpected refugee inflow and business cycles.

The precision of presented models could be evaluated using proposed standard deviation or by some other methods. Here we will use the following strategy: using the proposed models we will estimate the data for 2001-2005 and then compare the results with the real data. The following table represents the estimated and real total population of immigrants. The predicted figures for Ex-SFRY are not estimated due to difficulties explained in chapter 1.2.2.

<table>
<thead>
<tr>
<th>Table 1. Estimated and Real Population of Immigrants (2001-2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>real value</td>
</tr>
<tr>
<td>estimated</td>
</tr>
<tr>
<td>residuals</td>
</tr>
<tr>
<td>difference, %</td>
</tr>
</tbody>
</table>

As we can see, for the period 2001-2005 the model underestimates the immigrant population. This could be explained primary by the increasing refugee inflow from Iraq (cf. 21607 in 2000 and 27625 in 2003) and from Somalia; also we can take into account rapid increasing of Thai women population (from 4648 in 2002 to 7754 in 2005).

As regards countries which did not demonstrate such rapid changes, the prediction results were much more precise. The total population of immigrants from Europe (excluding Ex-SFRY), other highly-developed countries and Latin America in 2005 was 234 477 while predicted value was 231 704; the difference was about 0.11% in 2003 and 1.18% in 2005. In other words, assuming that there will be no unexpected shocks in refugee inflow during the next five years, we can expect our model to be quite precise.
Principles of Immigrant Classification

Immigrants from different countries were classified into six groups. The idea behind this is that people from similar regions may demonstrate similar skills and results on the labor market. Although the there is variation in professional characteristics, it is reasonable to assume that people from similar regions could have on average similar educational level and qualification background.

In classification immigrants into groups the following factors were taking into account:

**Geopolitical position.** Geographic location of a country is one of its the primary characteristics. People from neighboring countries are more likely immigrate into Sweden then from distant regions; immigration and labor law is more favorable for Nordic countries and EU citizens.

Another important aspect is political situation. Although refugee could come to Sweden from countries where labor force on average could be considered as high educated (Yugoslavia, Chile) in most cases refugee could have lack of relevant education due to wars, economic disasters or other reason. Re-educational and other training programs are usually provided for such people.

**Level of economic development.** Economic development of a home country is another important factor. People from highly developed countries usually have better education, familiar with modern technologies of production and do not require high investment in reeducation.

In case of failure to find a relevant job in Sweden, people from highly developed countries can just return to their home country. In contrast, people from poor countries are more likely to stay in Sweden by any means as unemployment benefits or help for asylum seekers is much higher than the salary they could have at home.

**Ethnical and culture characteristics.** Ethnical and culture characteristics should also be taking into account. One of the vital requirements on the Swedish labor market is proficiency in Swedish. Although there is a niche for or unskilled workers without good language skills and high qualified English speaking specialists, Swedish is a typical prerequisite. People from Germanic language group countries usually have better aptitude to learn Swedish.

People from different countries usually have different professional education. Some countries provide free education for citizens while in other countries literacy rate is quite low; in some countries men and women have unequal access to education. As it will be proven in the Part Two, immigrants from different countries have also different professional preference.

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7 The term was proposed by Johan Rudolf Kjellén, a Swedish political scientist.
Part 1. Dynamics of Immigrant Labor Force

1.1. Group A: West Europe, North America, Australia, Japan

1.1.1. General Characteristics

Location: West Europe, North America, Australia, Japan and some other.

Economy: highly developed industrialized and post-industrial counties.

GDP per capita: high, e.g. Finland ($30 300), Norway ($42 400), Denmark ($33 500).

Unemployment rate: Finland (7.9%), Norway (4.2%), Denmark (5.7%).

Language: mostly Germanic or Romanic groups; in Finland Swedish is the 2nd official language.

Religion: mostly Protestant Christian, Roman Catholic.

Literacy rate: very high, about 100%. In some countries higher education is free.

Source: CIA, The World Factbook

The dynamics of immigrants in Group A is presented on the following picture

Figure 1.1 Trend of Group A. West Europe, 1975-2005
The primary characteristic of the countries in Group A is the level of economic development. Countries are well industrialized and are oriented on high-technology production. Educational and professional level of labor force is on average high. Quite often people speak English as the first or second language which improves their position on the Swedish labor market.

The detailed structure of Group A in 2005 is presented at Table 1.1.

Table 1.1 Population of Group A (2005)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>men</th>
<th>women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finland</td>
<td>26498</td>
<td>38012</td>
<td>64510</td>
</tr>
<tr>
<td>Norway</td>
<td>12582</td>
<td>13155</td>
<td>25737</td>
</tr>
<tr>
<td>Denmark</td>
<td>14621</td>
<td>9686</td>
<td>24307</td>
</tr>
<tr>
<td>Germany</td>
<td>8302</td>
<td>7188</td>
<td>15490</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>9080</td>
<td>3666</td>
<td>12746</td>
</tr>
<tr>
<td>United States of America</td>
<td>4549</td>
<td>3389</td>
<td>7938</td>
</tr>
<tr>
<td>France</td>
<td>2899</td>
<td>1744</td>
<td>4643</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>2370</td>
<td>1636</td>
<td>4006</td>
</tr>
<tr>
<td>Italy</td>
<td>2624</td>
<td>1176</td>
<td>3800</td>
</tr>
<tr>
<td>Greece</td>
<td>2435</td>
<td>1347</td>
<td>3782</td>
</tr>
<tr>
<td>Spain</td>
<td>1957</td>
<td>1454</td>
<td>3411</td>
</tr>
<tr>
<td>Iceland</td>
<td>1574</td>
<td>1489</td>
<td>3063</td>
</tr>
<tr>
<td>Austria</td>
<td>1441</td>
<td>825</td>
<td>2266</td>
</tr>
<tr>
<td>Japan</td>
<td>613</td>
<td>1207</td>
<td>1820</td>
</tr>
<tr>
<td>Australia</td>
<td>1038</td>
<td>601</td>
<td>1639</td>
</tr>
<tr>
<td>Canada</td>
<td>764</td>
<td>683</td>
<td>1447</td>
</tr>
<tr>
<td>Switzerland</td>
<td>762</td>
<td>606</td>
<td>1368</td>
</tr>
<tr>
<td>Ireland</td>
<td>934</td>
<td>430</td>
<td>1364</td>
</tr>
<tr>
<td>Portugal</td>
<td>631</td>
<td>517</td>
<td>1148</td>
</tr>
<tr>
<td>Belgium</td>
<td>337</td>
<td>303</td>
<td>640</td>
</tr>
<tr>
<td>New Zealand</td>
<td>382</td>
<td>143</td>
<td>525</td>
</tr>
<tr>
<td>Other</td>
<td>273</td>
<td>367</td>
<td>640</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>96666</td>
<td>89624</td>
<td>186290</td>
</tr>
</tbody>
</table>

Source: Statistics Sweden. Foreign citizens in Sweden by country of citizenship, age and sex

The largest population in the Group A is Nordic countries citizens. Citizens of Finland, Norway, Denmark and Iceland together comprise 63.1% of the Group A. Sweden has long historical and cultural connection with these countries; labor and immigration law is also more favorable.

For the long period of time, the Finland citizens were the highest community among immigrants in Sweden. In 1973, Finnish citizens were 56.0% in Group A and about 45.5% among all immigrant population; in 2005 these figures were 35.1% and 19.1% respectively.

Among non-Nordic country in Group A which has high population of immigrants in Sweden are Germany and UK. The population of citizens from non-European countries in Group A is increasing; however the share of these countries in Group A now is only about 7%.
According to the model, it is estimated that the population of Finnish citizens in 2010 will decrease with 2643 people comparative to 2005 while the population of other countries will increase with 2998. As a result, increasing in other countries will compensate decreasing in Finnish population and the total population will have slight growth. Still Group A will be higher the next following population (Group B) in 3.3 times and comprise 51.6% of the total immigrant population. To estimate population of immigrants in Sweden for the following five years we will use ARIMA time series model. Selection among ARIMA models usually done by Akaike’s information criterion (AIC); the model with the smallest AIC is chosen.
Finland. The changes in population of Finland is described by ARIMA(0,1,3) model:

\[
\begin{align*}
\text{ma1} & = 1.6065 \\
\text{ma2} & = 1.4253 \\
\text{ma3} & = 0.5197 \\
\text{s.e.} & = 0.1495 \\
\end{align*}
\]

Other. The population of other countries in the Group is described by ARIMA(1,1,1)

\[
\begin{align*}
\text{ar1} & = 0.5103 \\
\text{ma1} & = 0.4001 \\
\text{s.e.} & = 0.2039 \\
\end{align*}
\]

In chapter 2.1 the separate values of Finland and for other countries of the Group are used in predicted the total gender structure of immigrant population.

### 1.2. Group B: East Europe

#### 1.2.1. General Characteristics

| Location: | East Europe (including new EU countries and some ex-USSR republics). |
| Economy: | mostly transformed from central-planning economy to free market economy. |
| GDP per capita: | relatively high, e.g. Poland ($13 570), Russia ($12 224), Estonia ($16 400). |
| Unemployment rate: | Poland (18.3%), Russia (7.6%), Estonia (9.2%). |
| Language: | Most countries in Group B belong to Slavic language group. |
| Religion: | mostly Orthodox Christian, Roman and Greek Catholic. |
| Literacy rate: | very high, about 100%. In some countries of the Group higher education is free. |

Source: CIA, The World Factbook

Group B comprise countries in Central and East Europe: former Soviet Republics and other European post-Socialist states. Geographically some countries in the Group B are located near Sweden; with many of the countries Sweden has long historical relations. Countries vary in economic development level. Many countries have modern type economy and are EU members.

Labor force in the Group is comparatively well qualified. Unlike the other groups, our primary period of interest starts from 1992. Due to historical changes, new independent states appear on the map of Europe; social and economical transformations, military conflicts and civil wars, tremendous geopolitical changes characterizes this period.
The population of ex-USSR citizens has tendency to increase from 1992 up to present while the number of immigrants from other countries in Group is decreasing or stable. So these countries should be analyzed separately. Another important subgroup to be analyzed separately are countries of the former Socialist Federal Republic of Yugoslavia (SFRY) 8.

**Ex-USSR.** In 2005, the total number of people from Russia, Ukraine and Belarus was 7504; 71.3% of them women. Since collapse of Soviet Union at the end of 1991, the number of Russian citizens in Sweden increased quite stable, about 485 people each year: 140 men and 345 women.

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**Ex-SFRY.** In 1973, the Yugoslavian population was one of the largest immigrant groups in Sweden; most of them were guest labors that came to Sweden for temporary job. In period 1973-1991, the average population of Yugoslavians was about 27590.

In 1992-1995, Yugoslavian wars coursed a huge amount of refugee to Sweden and to other countries. Most of the refugee came to Sweden from Bosnia. In 1993, the Bosnian refugee in Sweden was 14277 and 1996 this number increased in 2.6 times (cf. Croatia 1245 to 3084 and Slovenia 38 to 960 respectively). After Yugoslavian wars, many refugees stayed in Sweden.

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8 Three separate political entities that existed during most of the 20th century were called Yugoslavia. SFRY consisted of Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia, and Slovenia.
Other. The second largest population in Group B and first among other countries is Poland. The tempo of Polish population increasing was quite stable until 1982. The first sharp increasing was connected with martial law (December 1981). In 1992-2005, the Polish population in Sweden was quite stable; joining European Union facilitated labor migration of Polish people. In 2005, 88.8% of Polish citizens who got residence permit were guest workers (the highest value both in related and in absolute values among all countries).

Table 1.2 Population of Group B (2005)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>men</th>
<th>women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poland</td>
<td>5270</td>
<td>8288</td>
<td>13558</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
<td>4766</td>
<td>4183</td>
<td>8949</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>1665</td>
<td>3868</td>
<td>5533</td>
</tr>
<tr>
<td>Serbia and Montenegro</td>
<td>2354</td>
<td>2357</td>
<td>4711</td>
</tr>
<tr>
<td>Croatia</td>
<td>1272</td>
<td>1094</td>
<td>2366</td>
</tr>
<tr>
<td>Estonia</td>
<td>536</td>
<td>1444</td>
<td>1980</td>
</tr>
<tr>
<td>Romania</td>
<td>682</td>
<td>1200</td>
<td>1882</td>
</tr>
<tr>
<td>Hungary</td>
<td>791</td>
<td>1083</td>
<td>1874</td>
</tr>
<tr>
<td>Lithuania</td>
<td>651</td>
<td>1045</td>
<td>1696</td>
</tr>
<tr>
<td>Ukraine</td>
<td>325</td>
<td>1106</td>
<td>1431</td>
</tr>
<tr>
<td>Macedonia</td>
<td>568</td>
<td>483</td>
<td>1051</td>
</tr>
<tr>
<td>Latvia</td>
<td>300</td>
<td>725</td>
<td>1025</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>286</td>
<td>409</td>
<td>695</td>
</tr>
<tr>
<td>Belarus</td>
<td>162</td>
<td>378</td>
<td>540</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>192</td>
<td>332</td>
<td>524</td>
</tr>
<tr>
<td>Other</td>
<td>660</td>
<td>895</td>
<td>1555</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>20480</td>
<td>28890</td>
<td>49370</td>
</tr>
</tbody>
</table>

*Source: Statistics Sweden. Foreign citizens in Sweden by country of citizenship, age and sex.*
1.2.2. Model for Trend

![Graph showing population trend](image)

**Figure 1.6 Population in Group B**

**Ex-USSR.** As we can see in Figure 1.4, countries of the former Soviet Union demonstrate similar tendency. Since 1992 the number of immigrants from these countries is constantly increasing. The increasing of in immigrant population from ex-USSR in Sweden could be described by $ARIMA(1,1,1)$ with the following coefficients:

\[
\begin{align*}
\text{ar1} & = 0.9902 \\
m1 & = -0.5965 \\
\text{s.e.} & = 0.0169 \\
m1 & = 0.2092
\end{align*}
\]

We expect that the temps of increasing in this subgroup will be the highest among East Europe. It is also expected that the population from post-Soviet citizens will be higher than from former Yugoslavia and after 2010 may even exceed all other immigrants in Sweden from East Europe.

**Ex-SFRY.** As we can see from Figure 1.6, in 1973-1991 the population of Yugoslavians in Sweden was quite stable. Until the row of wars and economic sanctions it consisted mostly from guest workers.

Active inflow of refugee from Bosnia and Herzegovina stopped in 1996; from Federal Republic of Yugoslavia in 2001 after the war 1999. In most cases, after spending required period in Sweden, refugee got Swedish citizenship and this fact explains rapid decreasing in population since 1997. On February 6, 2003 the Federal Republic of Yugoslavia was transformed into a
commonwealth Serbia and Montenegro\(^9\) and new coming immigrants are started recorded in the Swedish Total Population Register from zero; that explains another rapid change in 2003 and was presented in Figure 1.5.

We assume that the will be no war in Balkans in the nearest future and thus no rapid refugee inflow from former SFRY. Thus the tendencies in immigrant increasing from the former Yugoslavia could be similar to period before 1992.

The increasing of population in the following period is estimated to be about 78.6\% of the increasing in previous period with standard error .12. The coefficients of \(ARI(1,1)\) model are:

\[
\begin{align*}
ar1 & = 0.7856 \\
s.e. & = 0.1264
\end{align*}
\]

**Other.** The increasing in other countries in population of Group B is build based on tendencies 1973-2005 and described by \(ARI(1,1)\) model with autoregression coefficient

\[
\begin{align*}
ar1 & = 0.5601 \\
s.e. & = 0.1601
\end{align*}
\]

The estimated dynamics of subgroups in Group B is presented in Table 1.3. It is expected that the proportion of men and women during the next five years will remain approximately the same as in the previous period. As a result, the number of immigrants will exceed the level of 1992 and East Europeans will become the second largest immigrant group after Group A.

**Table 1.3 Estimated Population in Group B (2005-2010)**

<table>
<thead>
<tr>
<th>Gender</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ex-USSR</td>
<td>Total</td>
<td>12907</td>
<td>13932</td>
<td>14948</td>
<td>15953</td>
<td>16948</td>
</tr>
<tr>
<td>men</td>
<td>3950</td>
<td>4264</td>
<td>4575</td>
<td>4882</td>
<td>5187</td>
<td>5488</td>
</tr>
<tr>
<td>women</td>
<td>8957</td>
<td>9668</td>
<td>10373</td>
<td>11071</td>
<td>11761</td>
<td>12446</td>
</tr>
<tr>
<td>Ex-SFRY</td>
<td>Total</td>
<td>16405</td>
<td>15910</td>
<td>16120</td>
<td>16285</td>
<td>16212</td>
</tr>
<tr>
<td>men</td>
<td>8656</td>
<td>8395</td>
<td>8506</td>
<td>8593</td>
<td>8554</td>
<td>8715</td>
</tr>
<tr>
<td>women</td>
<td>7749</td>
<td>7515</td>
<td>7614</td>
<td>7692</td>
<td>7658</td>
<td>7801</td>
</tr>
<tr>
<td>Other</td>
<td>Total</td>
<td>20058</td>
<td>20225</td>
<td>20926</td>
<td>21319</td>
<td>21538</td>
</tr>
<tr>
<td>men</td>
<td>7874</td>
<td>7940</td>
<td>8215</td>
<td>8369</td>
<td>8455</td>
<td>8504</td>
</tr>
<tr>
<td>women</td>
<td>12184</td>
<td>12285</td>
<td>12711</td>
<td>12950</td>
<td>13083</td>
<td>13158</td>
</tr>
<tr>
<td>Group B</td>
<td>Total</td>
<td>49370</td>
<td>50067</td>
<td>51994</td>
<td>53557</td>
<td>54698</td>
</tr>
<tr>
<td>men</td>
<td>20480</td>
<td>20599</td>
<td>21296</td>
<td>21844</td>
<td>22196</td>
<td>22707</td>
</tr>
<tr>
<td>women</td>
<td>28890</td>
<td>29468</td>
<td>30698</td>
<td>31713</td>
<td>32502</td>
<td>33405</td>
</tr>
</tbody>
</table>

\(^9\) Serbia and Montenegro are two separate states since June 3, 2006
1.3. **Group C: South and East Asia**

1.3.1. General Characteristics

| Location | South and East Asia (China, India, Thailand etc.). |
| Economy | different level of development. |
| GDP per capita | relatively low, e.g. Thailand ($8300), China ($6300), India ($3400). |
| Unemployment rate | Thailand (1.4%), China (1.4% to 20%), India (9.9%). |
| Language | English is the official language in India, Philippines, Singapore and some other countries. |
| Religion | Buddhist, Daoist, Hindu and other. |
| Literacy rate | Thailand (92.6%), China (90.9%), India (59.5%). |

*Source: CIA, The World Factbook*

In 1973, the number of immigrants from China and Thailand in Sweden was quite small (143 and 66 respectively). Since that period these two populations increased from year to year. Both populations show similar cycles of population increasing. A high disproportion between Thai men and women population could be primary explained by marriage between Swedish men and Thai women. Among 2323 Thai immigrants who got Swedish residence permit in 2005, 2098 were obtained as close relatives.

As regards China, we do not observe high difference between men and women population. The number of Chinese men was a slightly higher until 1994. However, the number of Chinese women increased more rapidly since 1994.

**Table 1.4 Population of Group C (2005)**

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>men</th>
<th>women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thailand</td>
<td>1039</td>
<td>7754</td>
<td>8793</td>
</tr>
<tr>
<td>China</td>
<td>2599</td>
<td>3058</td>
<td>5657</td>
</tr>
<tr>
<td>India</td>
<td>2160</td>
<td>1018</td>
<td>3178</td>
</tr>
<tr>
<td>Philippines</td>
<td>301</td>
<td>1645</td>
<td>1946</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>687</td>
<td>949</td>
<td>1636</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>360</td>
<td>493</td>
<td>853</td>
</tr>
<tr>
<td>Malaysia</td>
<td>293</td>
<td>397</td>
<td>690</td>
</tr>
<tr>
<td>Indonesia</td>
<td>208</td>
<td>406</td>
<td>614</td>
</tr>
<tr>
<td>Other</td>
<td>427</td>
<td>590</td>
<td>1017</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>8074</td>
<td>16310</td>
<td>24384</td>
</tr>
</tbody>
</table>

*Source: Statistics Sweden. Foreign citizens in Sweden by country of citizenship, age and sex*
The population of Indian citizens is the third in Group C. Rapid grow among Indian citizens is observed among men since 2000 (from 619 in 2000 to 2160 in 2005). Among 879 Indian citizens who got residence permit in 2005, 597 were visiting students.

The war in Viet Nam coursed a large amount of refugee. In period from 1978 to 1983, the number of Vietnamese citizen in Sweden increased from 25 to 2379. After living 5 years in Sweden, these people started applying for Swedish citizenship and their number in our target population decreased. From 1987 to 1992 we can observe one more wave of increasing Vietnamese in Sweden (from 1178 to 2867). Than this number began to stabilize; the average number for the last 5 years was 1570.
1.3.2. Model for Trend

The tendency in increasing of immigrants from Group C is presented in Figure 1.8. Cyclical character of the immigrant inflow could be explained both by business cycles and other macroeconomic and political factors.

The dynamics in the Group is described by \textit{ARIMA}(3,1,2) model with the following parameters:

\begin{align*}
\text{ar1} & = 1.6194 \\
\text{ar2} & = -1.0654 \\
\text{ar3} & = 0.3141 \\
\text{ma1} & = -0.5954 \\
\text{ma2} & = 0.7771 \\
\text{s.e.} & = 0.3449 \\
\text{s.e.} & = 0.5629 \\
\text{s.e.} & = 0.2932 \\
\text{s.e.} & = 0.2750 \\
\text{s.e.} & = 0.1820
\end{align*}

The following table shows the estimated population of immigrants in the group:

\begin{table}[h]
\centering
\begin{tabular}{lrrrrrr}
\hline
\hline
Total & 24383 & 26655 & 28457 & 29743 & 30619 & 31232 \\
men & 8074 & 8826 & 9423 & 9849 & 10139 & 10342 \\
women & 16310 & 17830 & 19035 & 19895 & 20481 & 20891 \\
\hline
\end{tabular}
\caption{Estimated Population in Group C (2005-2010)}
\end{table}

The number of new immigrants, especially women, will be significant enough to exceed those who will obtain Swedish citizenship and leave our target group, so the population in 2010 is expected to be 28% higher than in 2005.
1.4. **Group D: Sub-Saharan Africa**

### 1.4.1. General Characteristics

| Location: | Sub-Saharan Africa. |
| Economy: | mostly less developing countries. |
| GDP per capita: | low or very low, e.g. Somalia ($600), Ethiopia ($800), Eritrea ($1000). |
| Unemployment rate: | official data mostly are not available. |
| Language: | Many countries have as one of the official languages English or French. |
| Religion: | mostly Christian or Muslim. |
| Literacy rate: | low, e.g. Somalia (37.7%), Ethiopia (42.7%), Eritrea (58.6%). |

*Source: CIA, The World Factbook*

Among people in Group D who got residence permit in 2005, about one third was refugee and 46.1% came as close relatives. The mass migration of African people to Sweden as refugee for political or humanitarian reasons started at mid-80s.

In 2005, there were no refugee from Ghana and only one from Nigeria; the number of visiting students was 62.4% and 64.2% respectively. However, there were no visiting students from Somalia; 52.0% Somalis got residence permit as refugee and 47.7% as close relatives of those who is already in Sweden.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>men</th>
<th>women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somalia</td>
<td>3311</td>
<td>3259</td>
<td>6570</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>869</td>
<td>721</td>
<td>1590</td>
</tr>
<tr>
<td>Eritrea</td>
<td>657</td>
<td>754</td>
<td>1411</td>
</tr>
<tr>
<td>Gambia</td>
<td>720</td>
<td>376</td>
<td>1096</td>
</tr>
<tr>
<td>Burundi</td>
<td>433</td>
<td>498</td>
<td>931</td>
</tr>
<tr>
<td>Nigeria</td>
<td>720</td>
<td>198</td>
<td>918</td>
</tr>
<tr>
<td>Ghana</td>
<td>417</td>
<td>203</td>
<td>620</td>
</tr>
<tr>
<td>Kenya</td>
<td>259</td>
<td>354</td>
<td>613</td>
</tr>
<tr>
<td>Congo, the Democratic Republic</td>
<td>290</td>
<td>237</td>
<td>527</td>
</tr>
<tr>
<td>Uganda</td>
<td>278</td>
<td>234</td>
<td>512</td>
</tr>
<tr>
<td>Cameroon</td>
<td>385</td>
<td>121</td>
<td>506</td>
</tr>
<tr>
<td>Other</td>
<td>1667</td>
<td>1419</td>
<td>3086</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>10006</td>
<td>8374</td>
<td>18380</td>
</tr>
</tbody>
</table>

*Source: Statistics Sweden. Foreign citizens in Sweden by country of citizenship, age and sex*
The Ethiopians are the second largest population in Group D and is the only that demonstrate decreasing of population in significant number. The highest wave of Ethiopian immigrants increasing was in 1986-1991 and was coursed by the mass scale of drought and famine that struck the country in the mid-1980s, in which up to seven million are estimated to have died.

Due to the high influence of Ethiopian population on the Group and untypical behavior, this country will be modeled separately. As regards Somalia, it has similar tendency as other countries in the Group. The model for predicting the dynamics is given the in following section.
1.4.2. Model for Trend

![Population in Group D](image)

**Ethiopia.** The model for Ethiopia is based on data 1989-2005 after the mass inflow of refuge was decreased (but still continued). The $ARI(3,1)$ has the following coefficients:

\[
\begin{array}{ccc}
\text{ar1} & \text{ar2} & \text{ar3} \\
0.9400 & 0.2856 & -0.5922 \\
\text{s.e.} & 0.1928 & 0.3597 & 0.2408
\end{array}
\]

**Other.** The population of Somalia citizens is estimated together with other countries. Somalia shows similar tendencies as the other countries and described by $ARI(1,1)$ with coefficients:

\[
\begin{array}{c}
\text{ar1} \\
0.8064 \\
\text{s.e.} & 0.1099
\end{array}
\]

The total population of Group D in 2010 is estimated to reach 23121 and increase in 26% compared to 2005.
1.5. **Group E: Central Asia and Middle East**

1.5.1. General Characteristics

<table>
<thead>
<tr>
<th><strong>Location:</strong></th>
<th>Middle East, Central Asia and some other Muslim countries.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economy:</strong></td>
<td>different level, mostly developing or oil-exporting economy.</td>
</tr>
<tr>
<td><strong>GDP per capita:</strong></td>
<td>different. Iraq ($3400), Iran ($8100), Turkey ($7900).</td>
</tr>
<tr>
<td><strong>Unemployment rate:</strong></td>
<td>Iraq (25% to 30%), Iran (11.2%), Turkey (10%).</td>
</tr>
<tr>
<td><strong>Language:</strong></td>
<td>variations of Arabic, Persian and other.</td>
</tr>
<tr>
<td><strong>Religion:</strong></td>
<td>mostly Muslim.</td>
</tr>
<tr>
<td><strong>Literacy rate:</strong></td>
<td>different, e.g. Iraq (40.4%), Iran (79.4%), Turkey (86.5%).</td>
</tr>
</tbody>
</table>

*Source: CIA, The World Factbook*

The population of the Group E is the second highest among all immigrant groups. The intensive growth started at mid-1980s when a lot of other immigrants came to Sweden as refugee. Figure 1.12 presents a rapid increasing in Iran (but not Iraq) population coursed by Iran – Iraq war (1980-1988). Wars and other conflicts coursed increasing of refugee from Afghanistan, Syria, Lebanon and some other countries.
Persian Gulf War (1991), long economic sanctions, US invasion (2003) and situation followed it coursed a huge number of refugee. Today, immigrants from Iraq are the highest foreign group in Sweden among all non-Nordic citizens.

Table 1.7 Population of Group E (2005)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>men</th>
<th>women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iraq</td>
<td>11749</td>
<td>10509</td>
<td>22258</td>
</tr>
<tr>
<td>Turkey</td>
<td>5068</td>
<td>3924</td>
<td>8992</td>
</tr>
<tr>
<td>Iran (Islamic Republic of)</td>
<td>4538</td>
<td>4359</td>
<td>8897</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>2359</td>
<td>2104</td>
<td>4463</td>
</tr>
<tr>
<td>Syrian Arab Republic</td>
<td>1484</td>
<td>1380</td>
<td>2864</td>
</tr>
<tr>
<td>Lebanon</td>
<td>1049</td>
<td>772</td>
<td>1821</td>
</tr>
<tr>
<td>Pakistan</td>
<td>1226</td>
<td>524</td>
<td>1750</td>
</tr>
<tr>
<td>Morocco</td>
<td>710</td>
<td>655</td>
<td>1365</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>839</td>
<td>522</td>
<td>1361</td>
</tr>
<tr>
<td>Tunisia</td>
<td>539</td>
<td>324</td>
<td>863</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>312</td>
<td>336</td>
<td>648</td>
</tr>
<tr>
<td>Jordan</td>
<td>334</td>
<td>257</td>
<td>591</td>
</tr>
<tr>
<td>Egypt</td>
<td>357</td>
<td>207</td>
<td>564</td>
</tr>
<tr>
<td>Algeria</td>
<td>325</td>
<td>182</td>
<td>507</td>
</tr>
<tr>
<td>Other</td>
<td>1481</td>
<td>1171</td>
<td>2652</td>
</tr>
<tr>
<td>Total</td>
<td>32370</td>
<td>27226</td>
<td>59596</td>
</tr>
</tbody>
</table>


In 2003, the number of immigrants from Iraq was 27625. In 2001-2005, the total number of people from Iraq who got Swedish citizenship was 29723; at the same period 18155 Iraq citizens asked for asylum. Obtaining Swedish citizenship by refugee who came in the previous five years explains the tendency of decreasing of the Group population which starts at the end of 2004. We expect that a large amount of refugee from Iraq and some other countries that came in 2000-2005 will also apply for Swedish citizenship during 2006-2010.
1.5.2. Model for Trend

**Figure 1.12 Population in Group E**

**Iran.** The population of Iran citizens in Sweden is significant in Group E and is modeled separately. Since the end of Iran-Iraq war the number of refugee inflow is decreasing. It is described by $ARI(2,1)$ with coefficients:

\[
\begin{array}{c|c|c}
 & ar1 & ar2 \\
 s.e. & 0.2676 & 0.2625 \\
\end{array}
\]

\[
\begin{array}{c|c}
 ar1 & 0.7916 \\
 s.e. & 0.2676 \\
\end{array}
\]

**Other.** All suitable ARIMA models demonstrate strong dependence of population on a given year on a previous year. The population of the other immigrants in the group, including Iraq, could be best described by $ARI(1,1)$ model with the following coefficients:

\[
\begin{array}{c|c}
 ar1 & 0.8121 \\
 s.e. & 0.1017 \\
\end{array}
\]

Like in case of Ethiopia in 1991, the sharp decreasing of population in 2005 was a starting point of a long-term tendency of decreasing in the group population. Change from increasing to decreasing trend has the following explanation. Active stage of war in Iraq as well as in Lebanon is finished, and as for today we do not expect war in Iran. It is estimated that in 2008 the population East Europe citizens in Sweden will exceed the population in Group E. In total, the population of Group E will decrease approximately about 1445 people a year, which mostly could be explained by acquiring Swedish citizenship by a large amount of recent refugees.
1.6. Group F: Latin America

1.6.1. General Characteristics

Location: Latin America (Central and South America, Caribbean Islands).

Economy: mostly developing level.

GDP per capita: Chile ($11300), Brazil ($8400), Peru ($6100).

Unemployment rate: Chile (8%), Brazil (9.9%), Peru (8.7%).

Language: Mostly Spanish or Portuguese.

Religion: mostly Roman Catholic, Protestant.

Literacy rate: Chile (96.2%), Brazil (86.4%), Peru (87.7%).

Source: CIA, The World Factbook

At the beginning of 1973, the population of Group F was relatively small. The mass inflow from Latin America started at the end of 1973 and was coursed by my military junta of Augusto Pinochet in Chile. By 1980, the total population of the group increased in 6.6 times comparative to 1973.

The other refugee inflows from Latin America were also coursed by severe military dictatorships such as Uruguay (1973-1984), El Salvador (1980-1992), Argentina (1976-1983) and some other.

The highest population of Chile citizens was in 1991 and reached 13961 (cf. in 1973 it was 163). After democratic elections (December 14, 1989), Chilean population in Sweden began to decline. Since 1995, the decreasing of Chile citizens in Sweden was stable (about 267 per year).

Table 1.8 Population of Group F (2005)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>men</th>
<th>women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>4501</td>
<td>3204</td>
<td>7705</td>
</tr>
<tr>
<td>Brazil</td>
<td>427</td>
<td>1133</td>
<td>1560</td>
</tr>
<tr>
<td>Peru</td>
<td>652</td>
<td>725</td>
<td>1377</td>
</tr>
<tr>
<td>Colombia</td>
<td>567</td>
<td>588</td>
<td>1155</td>
</tr>
<tr>
<td>Cuba</td>
<td>376</td>
<td>368</td>
<td>744</td>
</tr>
<tr>
<td>Mexico</td>
<td>388</td>
<td>356</td>
<td>744</td>
</tr>
<tr>
<td>Bolivia</td>
<td>311</td>
<td>237</td>
<td>548</td>
</tr>
<tr>
<td>Other</td>
<td>1353</td>
<td>1099</td>
<td>2452</td>
</tr>
<tr>
<td>Total</td>
<td>8575</td>
<td>7710</td>
<td>16285</td>
</tr>
</tbody>
</table>

1.6.2. Model for Trend
Chile. The population of Chile started to decline since 1990. It could be described by ARIMA(1,1,1) with the following coefficients:

\[
\begin{array}{cc}
\text{ar1} & \text{ma1} \\
0.8226 & 0.6979 \\
s.e. & 0.1246 0.1843
\end{array}
\]

Although the population of Chile will decline, this will be compensated in some degree by increasing population in such countries as Brazil, Mexico, and Peru. However, these immigrants come not for political but primary for economical reasons.

Other. The population of the other immigrants in the group is described by ARI(1,1):

\[
\begin{array}{c}
\text{ar1} \\
0.8170 \\
s.e. & 0.0964
\end{array}
\]

It is expected that the population of Chile citizens will decrease to 6227 (81% of level 2005) while population of other countries will increase to 9442, so the total population will decrease from 16285 in 2005 to 15669 in 2010.
Part 2. Structure of Immigrant Labor Force

The part describes age and gender structure of immigrants, their levels and fields of education. Standards ISCED-1997 and SUN-2000 are introduced. Proposed statistical models describe age structure, give ability to predict education characteristics based on immigrant's ethnic origin and gender. Differences in qualification background of immigrants are discussed.

2.1. Age and Gender Structure of Immigrants

The Age and Gender structure of immigrants in 2005 is presented in Figure 2.1. The scale of graphs for each group is proportional to the group population to make the shapes comparable.

We can observe that for most groups the highest share of immigrants are of the age range 25-35 years, i.e. of the most economically active period. Genders are not distributed in equal rates, e.g. in Group C the women population is two times large than men.
Age structure in Group A has untypical pattern comparative to other groups. The explanation of bimodality is the following. The gender-age structure of Group A could be split into two parts: population of Finnish citizens and other immigrants. The division is presented on the next Figure.

**Figure 2.2 Age and Gender Structure in Group A**

The new immigrants often come at the age of 25-29 years. The first peak of the Group A is in a range of people of age 35-39 which corresponds to those who came to Sweden in 1990s; the second peak (55-59) corresponds to Finns who came as labor immigrants at the beginning of 1970s and still lives in Sweden as Finnish citizens.

We can compare age and gender structure of Finnish population in 2005 and 1973. Like members of other groups, Finns arrived at age about 23-27 and since that time they had no choice but to getting older. The following picture shows the changes.

**Figure 2.3 Age and Gender Structure of Finnish Population in 1973 and 2005**
The age structure of immigrant labor force changed over the years. The age and gender structure is presented at Figure 2.4. While the majority of immigrants in 1973 were younger 35, in 2005 the average age of immigrants in age range 20-60 was 39 for men and 38 for women. The estimated age structure in 2010 is estimated based on method proposed in the following section.

Figure 2.4 Age and Gender Structure of Immigrants (1973-2010)

About two thirds of the immigrants are from Europe or other highly-developed countries whose population is getting older. However, some old people quit our target group: some will return home, other will acquire Swedish citizenship; young immigrants will come during 2006-2010.

The following picture represents distribution of immigrants of different age and education. The highest number of immigrants is concentrated at the age 25-35 years with education equivalent to bachelor or higher (L5). A lot of people have upper secondary education (L3). The share of people with post-graduate education (L6) is higher and more spread among men population.

Figure 2.5 Level of Education by Age and Gender (2005)
2.1.1. Model for Gender Structure

The age structure of each given group and gender could be described via fitted Beta distribution. To estimate the share of a certain age range in a total population of immigrants of a given group and gender we use the following function:

\[
\text{Share}(t_1, t_2) = \frac{\int_{(t_1-17)/48}^{(t_2-17)/48} y^{\alpha-1} (1-y)^{\beta-1} \, dy}{B(\alpha, \beta)}
\]

(2.1)

where \( t_1, t_2 \) – age range of interest, about 20-60 years\(^\text{10}\);

\( B(\alpha, \beta) \) – beta function defined as \( B(\alpha, \beta) = \int_0^1 y^{\alpha-1} (1-y)^{\beta-1} \, dy \);

\( \alpha, \beta \) – corresponding coefficients of beta functions which were found by method of maximum likelihood estimation for given data regarding age and gender structure of the groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \alpha )</td>
<td>( \beta )</td>
</tr>
<tr>
<td>Group A, Finland</td>
<td>1.5531</td>
<td>0.9811</td>
</tr>
<tr>
<td>Group A, Other</td>
<td>1.7304</td>
<td>1.5544</td>
</tr>
<tr>
<td>Group B</td>
<td>1.4772</td>
<td>1.9557</td>
</tr>
<tr>
<td>Group C</td>
<td>1.7506</td>
<td>3.2551</td>
</tr>
<tr>
<td>Group D</td>
<td>1.7413</td>
<td>2.9479</td>
</tr>
<tr>
<td>Group E</td>
<td>1.5805</td>
<td>2.5255</td>
</tr>
<tr>
<td>Group F</td>
<td>1.7492</td>
<td>2.1537</td>
</tr>
</tbody>
</table>

As it was stated in the previous section, there is bimodality in Group A; this makes some difficulties but we use this fact in our purposes. Although new young people are expected to come and some present immigrants could obtain Swedish citizenship, it is evident that in total the immigrants will become older.

To build the model for the gender structure in 2010, we assume that Finns become older in five years. Taking into account their share in the total population, this will approximately reflect the total tendency (these coefficients are represented in Table 2.1).

To build the total age structure for Group A, we use the share of Finns population in Group A (.274 for men and .424 for women) and of the other countries (.726 and .576 respectively) as the weight coefficients.

\(^{10}\) At the age of 17, the cumulative distribution function (cdf) of a model is equal to 0 and in 64 years equal to 1.
The usage of the model is presented the following examples

**Example 1.** Find expected average age for men in Group B.

**Solution.** The expected value for Beta function is \( E(X) = \frac{\alpha}{\alpha + \beta} = \frac{1.48}{1.48 + 1.96} = 0.43 \); expected age is 17+48(0.43) = 37.7; the variance is \( Var(X) = \frac{\alpha \beta}{(\alpha + \beta)^2(\alpha + \beta + 1)} = 0.05 \); variance of age is \( 48^2(0.05) = 115.2 \). The real values are 38.6 and 112.0 respectively.

**Example 2.** Find the share of immigrants in Group F who is in age range 28-37.

**Solution.** We are know that the total population of Group F is 16285; 52.7% of them are men and 47.3% are women. Our \( t_1 \) and \( t_2 \) are 28 and 37 respectively. We can apply numerical procedure to formula (2.1) or use difference of \( (37-17)/48 \) and \( (28-17)/48 \) quintiles of Beta function with parameters \( \alpha \) and \( \beta \) given in Table 2.1.

As a result, we found that the share of the people of age range 28-37 in Men population is 13.6% and in Women population is 13.2%. In total population the share is \( (.136)(.527)+(.132)(.473) = 13.4\%\) or \( 16285(0.134) = 2186 \) people.

The following picture shows fitted Beta distribution for Group F. Dashed lines represent age range 28 - 37 from the Example 2.

![Figure 2.6 Fitted Beta Distribution for Group F](image)

The presented model could be used to compare structure of different groups, testing statistical hypothesis and other purposes.
2.2. **Educational Level**

2.2.1. **Evaluation of Qualification Background**

Possibly the most important role in describing the place of an immigrant on the Swedish labor market, belongs to educational level and obtained qualification. The higher level of education a person has, the more likely this person will find suitable working place.

We classify the education level according to International Standard Classification of Education ISCED-1997 which was adopted by UNESCO's General Conference and is used in the international collection of education statistics. The standard is presented in Appendix B.

Based on a model from the following section we can estimate education structure in 2010. The predicted educational structure could be best described by the following picture.

![Diagram of educational structure by gender](image)

**Figure 2.7 Estimated Ethnic Structure and Educational Level by Gender (2010)**

The width of bars is proportional to the corresponding population of immigrant groups so by the sum of corresponding rectangle we can estimate the total population of a given educational level.

Most immigrants are expected to come from Group A and B. The major part of people from these groups is expected to have higher education level (L5); the share of adult people with primary and lower secondary education (L2), especially among men from East Europe, is small.

Immigrants from some countries are more likely to have higher education than the other. For instance the share of women from Thailand among women in Group C is 47.5%; Based on a large sample, we estimate that the share of Thai women with only primary or lower secondary education is expected to be 73.9%.
2.2.2. Model for Levels of Education

The purpose of this section is to build a model which will help us to predict the education structure of the total immigrant population based on the number of people in each group and gender structure of each given group.

We assume that on average educational level of a person depends on gender and the country of origin. As we expect that the ethnical structure of immigrant will be different in future we cannot just take current proportion of education levels. However, it is possible to estimate the degree of influence that has gender and origin on educational level. The model was build basing on a large sample regarding 17519 foreign citizens.

### Table 2.2 Level of Educational Attainment according to the Country Group

<table>
<thead>
<tr>
<th>Educational attainment</th>
<th>Gender</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 primary and lower secondary education</td>
<td>men</td>
<td>548</td>
<td>64</td>
<td>66</td>
<td>90</td>
<td>374</td>
<td>56</td>
<td>1198</td>
</tr>
<tr>
<td></td>
<td>women</td>
<td>347</td>
<td>140</td>
<td>539</td>
<td>101</td>
<td>456</td>
<td>43</td>
<td>1626</td>
</tr>
<tr>
<td>L3 upper secondary education</td>
<td>men</td>
<td>1030</td>
<td>420</td>
<td>94</td>
<td>128</td>
<td>385</td>
<td>96</td>
<td>2153</td>
</tr>
<tr>
<td></td>
<td>women</td>
<td>862</td>
<td>498</td>
<td>246</td>
<td>115</td>
<td>383</td>
<td>97</td>
<td>2201</td>
</tr>
<tr>
<td>L4 post-secondary education</td>
<td>men</td>
<td>624</td>
<td>155</td>
<td>67</td>
<td>95</td>
<td>297</td>
<td>54</td>
<td>1292</td>
</tr>
<tr>
<td>less than 3 years</td>
<td>women</td>
<td>656</td>
<td>316</td>
<td>205</td>
<td>72</td>
<td>246</td>
<td>93</td>
<td>1588</td>
</tr>
<tr>
<td>L5 post-secondary education</td>
<td>men</td>
<td>2011</td>
<td>394</td>
<td>370</td>
<td>254</td>
<td>496</td>
<td>112</td>
<td>3285</td>
</tr>
<tr>
<td>3 years or more</td>
<td>women</td>
<td>1854</td>
<td>849</td>
<td>534</td>
<td>86</td>
<td>348</td>
<td>153</td>
<td>3618</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>7932</td>
<td>2836</td>
<td>2121</td>
<td>941</td>
<td>2985</td>
<td>704</td>
<td>17519</td>
</tr>
</tbody>
</table>

*Source: Statistics Sweden. Immigrants and emigrants 16-74 years of age by sex, age, national background, level of educational attainment and field of education.*

Having data in contingency table presented in Table 2.2 we can build generalized linear model with Poisson family and log link function to describe our population.

Our response variable will be the number of people with given qualification level. These numbers will be used to build the proportion in which education levels will be distributed in a total population of immigrants.

Explanatory variables are country group, gender and the population of a given group and given gender. As weight coefficients we use the share of each given group of countries and gender in educational level of given gender (e.g. weight for men with upper secondary education in Group A is 1030/2153 = 0.4784).

After summing up all the significant coefficients for respecting parameters, we got the following tables (Table 2.3 and Table 2.4).
Table 2.3 Table of Coefficients (part a)

<table>
<thead>
<tr>
<th>Education level</th>
<th>Gender</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>primary and lower secondary education</td>
<td>men</td>
<td>-8.6090</td>
<td>0.5480</td>
<td>3.3310</td>
<td>3.1810</td>
<td>0.7890</td>
<td>2.3810</td>
</tr>
<tr>
<td></td>
<td>women</td>
<td>-7.9255</td>
<td>1.2315</td>
<td>4.0145</td>
<td>3.8645</td>
<td>1.4725</td>
<td>3.0645</td>
</tr>
<tr>
<td></td>
<td>women</td>
<td>3.9189</td>
<td>5.5019</td>
<td>4.9289</td>
<td>4.7689</td>
<td>4.9619</td>
<td>4.3289</td>
</tr>
<tr>
<td>post-secondary education, less than 3 years</td>
<td>men</td>
<td>1.2650</td>
<td>4.1120</td>
<td>4.1460</td>
<td>4.0580</td>
<td>3.7500</td>
<td>4.3690</td>
</tr>
<tr>
<td></td>
<td>women</td>
<td>1.6059</td>
<td>4.4529</td>
<td>4.4869</td>
<td>4.3989</td>
<td>4.0909</td>
<td>4.0399</td>
</tr>
<tr>
<td>post-secondary and post-graduate 3 years or more</td>
<td>men</td>
<td>2.7410</td>
<td>5.2640</td>
<td>5.3950</td>
<td>4.9800</td>
<td>4.3620</td>
<td>4.3700</td>
</tr>
<tr>
<td></td>
<td>women</td>
<td>2.9570</td>
<td>5.4800</td>
<td>5.6110</td>
<td>5.1960</td>
<td>4.5780</td>
<td>4.5860</td>
</tr>
</tbody>
</table>

Table 2.4 Table of Coefficients (part b)

<table>
<thead>
<tr>
<th>Level</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2</td>
<td>1.541E-04</td>
</tr>
<tr>
<td>L3</td>
<td>3.160E-05</td>
</tr>
<tr>
<td>L4</td>
<td>5.380E-05</td>
</tr>
<tr>
<td>L5</td>
<td>5.040E-05</td>
</tr>
</tbody>
</table>

The algorithm of making inference using coefficients above is shown through the examples.

**Example 1.** We have given that in 2004 there were 14799 women in Group C. We need to estimate how many of them have upper secondary education (L3).

**Solution:** From the Table 2.3 we take coefficient corresponding to women in Group C with education level L3 (equal to 4.9289) and from the Table 2.4 corresponding to level L3 (equal to 3.160E-05). The number of interest we find using the formula:

\[
\text{Pop(Group, Gender, EduLevel)} = \exp(a + b \times \text{Total})
\]

\[
= \exp(4.9289 + 3.160E-05 \times 14799) = 221
\]

The real number is 246 (see Table 2.2). After calculating L2, L4 and L5 for women in Group C, we can find the proportion of L3 level among these women.

**Example 2.** We have given that in 2004 there were 96498 men in Group A. We need to estimate how many of them have post-secondary education, less than 3 years (The real number is 624.)

**Solution:** From the Table 2.3 we take coefficient corresponding to men in Group A with education level L4 (equal to 1.265) and from the Table 2.4 corresponding to level L4 (equal to 5.380E-05). The number of interest is:

\[
\text{Pop(Group, Gender, EduLevel)} = \exp(1.265 + 5.380E-05 \times 96498) = 637
\]

Taking into account predicted number of immigrants in 2010 by groups and gender we will be able to build the proportion in which education levels will be distributed.
2.3. **Professional Orientation**

2.3.1. **Differences in Fields of Education**

The other factor in qualitative analysis of immigrant qualification background is the field of professional orientation. The fields of obtained education are given here according to Swedish Educational Terminology Standard SUN-2000. The standard corresponds to the ISCED-97; Appendices C gives some examples to give the common idea of the standard. In our work we use the first digit that indicates the educational program at the broadest level.

When describing fields of education, we use the following notation:

- **F0.** General education
- **F1.** Teaching methods and teacher education
- **F2.** Humanities and art
- **F3.** Social sciences, law, commerce, administration
- **F4.** Natural sciences, mathematics and computing
- **F5.** Engineering and manufacturing
- **F6.** Agriculture, forestry, animal health
- **F7.** Health care and nursing, social care
- **F8.** Services

Educational programs are cross-classified by levels and fields of education, each variable being independent. Thus, every educational program can be classified into one and only one cell in the level-field matrix. Obviously, not every combination of level and field exists, or can exist.

<table>
<thead>
<tr>
<th>Level of Educational Attainment</th>
<th>Field of education</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F0</td>
<td>F1</td>
</tr>
<tr>
<td>L1</td>
<td>1756</td>
<td>0</td>
</tr>
<tr>
<td>L2</td>
<td>1222</td>
<td>0</td>
</tr>
<tr>
<td>L3c</td>
<td>906</td>
<td>12</td>
</tr>
<tr>
<td>L3</td>
<td>1059</td>
<td>58</td>
</tr>
<tr>
<td>L4</td>
<td>2</td>
<td>248</td>
</tr>
<tr>
<td>L5</td>
<td>0</td>
<td>663</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4945</td>
<td>981</td>
</tr>
</tbody>
</table>

*Source:* Statistics Sweden. Immigrants and emigrants 16-74 years of age by sex, age, national background, level of educational attainment and field of education.
Table 2.5 shows correspondence between fields and levels of qualification. To make picture more clear, level L3c is specified. According to ISCED-1997, L3 often gives basement for the further education, while Level 3C is designed to lead participants to acquire the practical skills, know-how and understanding necessary for employment in a particular occupation or trade.

Professional orientation requires at least upper secondary education. People in fields like Engineering or Nature sciences usually have higher or post-graduate education while in Service mostly have secondary or post-secondary education.

**2.3.2. Dependence between Country Group and Field of Education**

To check whether immigrants from some groups are more likely to concentrate at certain fields of education than people from other groups we use Pearson chi-squared statistic.

The data presented in Table 2.6 represents the structure of educational orientation. The numbers in parentheses represent expected values of each cell if the fields were distributed equally.

<table>
<thead>
<tr>
<th>Field of Education</th>
<th>Groups</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>General education, teaching, services</td>
<td>A 2330</td>
<td>6272</td>
</tr>
<tr>
<td></td>
<td>B 1075</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C 920</td>
<td></td>
</tr>
<tr>
<td></td>
<td>D 422</td>
<td></td>
</tr>
<tr>
<td></td>
<td>E 1329</td>
<td></td>
</tr>
<tr>
<td></td>
<td>F 196</td>
<td></td>
</tr>
<tr>
<td>Social sciences, law, commerce</td>
<td>1317</td>
<td>2590</td>
</tr>
<tr>
<td>Science, technology, manufacturing</td>
<td>1441</td>
<td>3265</td>
</tr>
<tr>
<td>Health care and nursing, social care</td>
<td>618</td>
<td>1040</td>
</tr>
</tbody>
</table>

Table 2.6 Fields of Education by Groups

Source: Statistics Sweden. Immigrants and emigrants 16-74 years of age by sex, age, national background, level of educational attainment and field of education.

The estimated expected values in cell $n_{ij}$ is calculated as 

$$E(\hat{n}_{ij}) = n \left( \frac{r_i}{n} \right) \left( \frac{c_j}{n} \right) = \frac{r_i c_j}{n}$$

where $r_i$, $c_j$ – amount in row $i$ and column $j$ respectively, $n$ – total number of observations.

To analyze data in our contingency table we use the following Pearson’s test statistic:

$$X^2 = \sum_{j=1}^{6} \sum_{i=1}^{4} \left[ n_{ij} - E(\hat{n}_{ij}) \right]^2 / E(\hat{n}_{ij}) \sim \chi^2_{df=15}$$

$$X^2 = 611.344584$$

Such a large value of Pearson chi-squared statistic gives us enough evidence to reject our hypothesis about proportional distribution of fields among the groups. So we can state that the field of education depends on the country of origin.
2.3.3. Gender Segregation by Fields of Study

In this section we will measure how men and women of different groups tend to concentrate in different fields. To make our conclusion we will use Index of gender segregation by fields of study (GSI) proposed by UNESCO.

The idea of the GSI index is the following. Each group consists of certain ration of men and women; if there is no gender segregation in distinct fields, the ratio of men and women in each field should be the same assuming that there is no change in the total enrolment. Comparing theoretical distribution with real figures we count how many people need to change their profession to make distribution equal and divide this number by the total population of the group.

It should be stressed that the calculation of the number of persons who would need to change field is based on the percentages of males and females in the total enrolment for all fields taken together.

To simplify our task we group fields of education into more broad categories:

1. General education, teaching, services
2. Social sciences, law, commerce
3. Science, technology, manufacturing
4. Health care and nursing, social care

The following example describes the using of GSI in our analysis.

Table 2.7 Fields of Education in Group A by Gender

<table>
<thead>
<tr>
<th>Field of Education (SUN 2000)</th>
<th>men</th>
<th>women</th>
<th>Total</th>
<th>men, %</th>
<th>women, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 General education, 1 Teaching, 2 Humanities, 8 services</td>
<td>1560</td>
<td>1559</td>
<td>3119</td>
<td>50.02</td>
<td>49.98</td>
</tr>
<tr>
<td>3 Social sciences, law, commerce, administration</td>
<td>749</td>
<td>883</td>
<td>1632</td>
<td>45.89</td>
<td>54.11</td>
</tr>
<tr>
<td>4 Science, technology, 5 Manufacturing, 6 Agriculture</td>
<td>1447</td>
<td>484</td>
<td>1931</td>
<td>74.94</td>
<td>25.06</td>
</tr>
<tr>
<td>7 Health care and nursing, social care</td>
<td>269</td>
<td>597</td>
<td>866</td>
<td>31.06</td>
<td>68.94</td>
</tr>
<tr>
<td>Total</td>
<td>4025</td>
<td>3523</td>
<td>7548</td>
<td>53.33</td>
<td>46.67</td>
</tr>
</tbody>
</table>

Source: Statistics Sweden. Immigrants and emigrants 16-74 years of age by sex, age, national background, level of educational attainment and field of education.

Table 2.6 represents the distribution of immigrants by fields in Group A by gender. As we can see, there is disparity in distribution of gender in different fields. For instance, in group of fields “Science, technology, manufacturing, and agriculture”, about 75% are men; in “Health care and nursing, and social care” 69% are women. If men and women of the Group were distributed equally among fields we would have the situation presented at the Table 2.8.

---

11 Based on Gender-Sensitive Education Statistics And Indicators. A practical guide, UNESCO
Table 2.8 Theoretical Distribution of Fields of Education in Group A

<table>
<thead>
<tr>
<th>Field of Education (SUN 2000)</th>
<th>men</th>
<th>women</th>
<th>Total</th>
<th>men, %</th>
<th>women, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 General education, 1 Teaching, 2 Humanities, 8 services</td>
<td>1663</td>
<td>1456</td>
<td>3119</td>
<td>53.32</td>
<td>46.68</td>
</tr>
<tr>
<td>3 Social sciences, law, commerce, administration</td>
<td>870</td>
<td>762</td>
<td>1632</td>
<td>53.31</td>
<td>46.69</td>
</tr>
<tr>
<td>4 Science, technology, 5 Manufacturing, 6 Agriculture</td>
<td>1030</td>
<td>901</td>
<td>1931</td>
<td>53.34</td>
<td>46.66</td>
</tr>
<tr>
<td>7 Health care and nursing, social care</td>
<td>462</td>
<td>404</td>
<td>866</td>
<td>53.35</td>
<td>46.65</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4025</strong></td>
<td><strong>3523</strong></td>
<td><strong>7548</strong></td>
<td><strong>53.33</strong></td>
<td><strong>46.67</strong></td>
</tr>
</tbody>
</table>

It follows that the index is not a measure of the overall gender disparity in access to, or participation in, a particular level of education but rather a measure of the concentration of men and women in specific fields, for a given overall gender distribution. On the other hand high gender segregation by field of study may be associated with a comparatively high female participation. The graphic presentation of the index is given in Figure 2.8.
2.4. **Distributions of Immigrants within Sweden**

It is important not only to predict the total immigrant population in Sweden but also to know how this labor force will distribute within the country. The distribution of immigrants will be considered on a level of a county (län). Each of the counties has its own level of economic development. It is important for the government and the local authority to predict the future situation in advance. A geographical mapping of the distribution is presented at Appendix F.

![Figure 2.9 Growth in Immigrants Population](image)

The changes of immigrant distribution within Sweden in 2005 comparing with 2000 are shown on a Figure 2.9. (Note the difference in the scale). The area of points is proportional to the total population in a given county in 2000. Although in 2005 the population of foreign citizens in Stockholm, Uppsala and Jönköping counties comparatively decreased, in many other we can observe increasing of immigrant population.

It is natural to assume that the population of immigrants in the future depends on the present population. New coming immigrants are likely to join their families, friends etc; immigrants could to find it more desirable to live or work together with people of the same ethnic group.

Another influential factor is the total population of inhabitants living in a given county. In a county with higher population, it is easy to find a job. Stockholm, Göteborg (Västra Götland county) and Malmö (Skåne county) also are traditional immigrant cities.

The population of immigrants in counties follows Normal distribution except three outliers – Stockholm, Västra Götaland and Skåne counties. The prediction regarding these tree counties will be done separately; for the other counties we will make some assumptions to build a simple linear regression model.
2.4.1. Stockholm, Västra Götaland and Skåne Counties

Stockholm, Västra Götaland and Skåne have a long history of immigrant settlement. Building model for these counties is a non-trivial task and could be a topic for separate research. Instead of building sophisticated model we will make our prediction based on a following principle.

We estimated total population of immigrants in Sweden to be 362028. The following section will state that the immigrant population in other counties estimated to be 117846, thus the other immigrants distributed among these three counties. Assuming that the population of immigrant distributed as in 2005, we get: Stockholm 125534, Skåne 55240, Västa Götland 63408.

2.4.2. Model for Other Counties

The model for the other counties will be built using assumptions mentioned above. The explanatory variables are the previous population and the total population of a given county. To avoid heteroscedastisity, we will use the logarithm of total population of inhabitants of a given county. The dependent value in our model is the immigrant population on a given county.

The relationship between the variables is present more detail on a Figure 2.10. The linear dependence of immigrant population in 2005 on population in 2000 as well as on log of the total population of a county is quite obvious.

![Figure 2.10 Dependence between Immigrants in 2005, 2000 and log(Population in 2000)](image-url)
Our model for predicting immigrant population in a given county with a given population and population of immigrants in year $t+5$ is

$$ImPop_{t+5} = -9927 + 0.8068 \times ImPop_t + 922.2 \times \log(TotalPop_t)$$

$$R^2 = 0.98$$

where $ImPop_t$ - population of immigrants in a given county,

$TotalPop_t$ - total population of inhabitants in a given county.

The graphical representation of the model is presented on a Figure 2.11; Stockholm, Västra Götaland and Skåne populations were estimated on the previous chapter and are not shown here.
The figure on the left represents immigrant population in 2005 comparing to 2000, on the right shows predicted population in 2010 vs. 2005. The first (left) and the second (right) bar correspond to the population of immigrants in the county in year $t$ and $t+5$ respectively. The color of the counties represents the total population of inhabitants in a given county (counties with higher population are darker).

From the picture we can observe not only the population of immigrants at a given county but also internal migration within Sweden and its influence on the estimated immigrant population in the next five years. For instance, the decreasing of the total population in Norrbotten will cause deceleration in immigrant increasing trend in the county.

The estimated population of immigrants by counties is presented on the following table.

<table>
<thead>
<tr>
<th>Region</th>
<th>Total Population</th>
<th>Immigrants</th>
<th>Total Population</th>
<th>Immigrants</th>
<th>Immigrants</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Stockholm county</td>
<td>1823210</td>
<td>126325</td>
<td>1889945</td>
<td>118677</td>
<td>125534</td>
</tr>
<tr>
<td>03 Uppsala county</td>
<td>294196</td>
<td>11902</td>
<td>304367</td>
<td>11200</td>
<td>11115</td>
</tr>
<tr>
<td>04 Södermanland county</td>
<td>250303</td>
<td>9488</td>
<td>261895</td>
<td>9321</td>
<td>9250</td>
</tr>
<tr>
<td>05 Östergötland county</td>
<td>411345</td>
<td>11250</td>
<td>416303</td>
<td>10898</td>
<td>10815</td>
</tr>
<tr>
<td>06 Jönköping county</td>
<td>327829</td>
<td>9228</td>
<td>330179</td>
<td>8609</td>
<td>8544</td>
</tr>
<tr>
<td>07 Kronoberg county</td>
<td>176639</td>
<td>4773</td>
<td>178443</td>
<td>5102</td>
<td>5063</td>
</tr>
<tr>
<td>08 Kalmar county</td>
<td>235391</td>
<td>4476</td>
<td>233944</td>
<td>4777</td>
<td>4741</td>
</tr>
<tr>
<td>09 Gotland county</td>
<td>57313</td>
<td>710</td>
<td>57488</td>
<td>727</td>
<td>721</td>
</tr>
<tr>
<td>10 Blekinge county</td>
<td>150392</td>
<td>3376</td>
<td>150696</td>
<td>3689</td>
<td>3661</td>
</tr>
<tr>
<td>12 Skåne county</td>
<td>1129424</td>
<td>46114</td>
<td>1169464</td>
<td>52223</td>
<td>55240</td>
</tr>
<tr>
<td>13 Halland county</td>
<td>275004</td>
<td>6400</td>
<td>285868</td>
<td>6531</td>
<td>6481</td>
</tr>
<tr>
<td>14 Västra Götaland county</td>
<td>1494641</td>
<td>60984</td>
<td>1528455</td>
<td>59945</td>
<td>63408</td>
</tr>
<tr>
<td>17 Värmland county</td>
<td>275003</td>
<td>7047</td>
<td>273288</td>
<td>8340</td>
<td>8277</td>
</tr>
<tr>
<td>18 Örebro county</td>
<td>273615</td>
<td>7622</td>
<td>274121</td>
<td>7382</td>
<td>7326</td>
</tr>
<tr>
<td>19 Västmanland county</td>
<td>256889</td>
<td>10014</td>
<td>263191</td>
<td>9781</td>
<td>9707</td>
</tr>
<tr>
<td>20 Dalarna county</td>
<td>278259</td>
<td>5212</td>
<td>275755</td>
<td>5681</td>
<td>5638</td>
</tr>
<tr>
<td>21 Gävleborg county</td>
<td>279262</td>
<td>5291</td>
<td>275994</td>
<td>5870</td>
<td>5825</td>
</tr>
<tr>
<td>22 Västernorrland county</td>
<td>246903</td>
<td>3752</td>
<td>243736</td>
<td>4638</td>
<td>4603</td>
</tr>
<tr>
<td>23 Jämtland county</td>
<td>129566</td>
<td>1938</td>
<td>127028</td>
<td>2323</td>
<td>2305</td>
</tr>
<tr>
<td>24 Västerbotten county</td>
<td>255640</td>
<td>5204</td>
<td>257652</td>
<td>5900</td>
<td>5855</td>
</tr>
<tr>
<td>25 Norrbotten county</td>
<td>256238</td>
<td>7323</td>
<td>251740</td>
<td>7980</td>
<td>7919</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8882792</strong></td>
<td><strong>348429</strong></td>
<td><strong>9047752</strong></td>
<td><strong>349594</strong></td>
<td><strong>362028</strong></td>
</tr>
</tbody>
</table>

The presented results could be used both by government and by private sector in a long-term planning. Combining these results with expected demand for labor force in different regions we can estimate the level of employment in different regions.
Discussion

Immigrants came to Sweden mostly for economical reasons or as refugee. The changes in immigrant inflow that came as guest workers could be explained primary by business cycles. If there is a tendency of recession in other countries while Swedish economy demonstrates growth, people have a tendency to come for a temporary or permanent job and vice versa. People who come as refugee or for humanitarian reason are more likely to stay in Sweden for any means.

A total of 56,108 persons were granted residence permits in Sweden in 2005. Residence permits were granted to 22,028 persons because of family ties, 8,076 to refugee, permits to visiting students to 6,837 persons and permits on grounds of adoption to 805 persons. Residence permits under the EU/EEA agreement were issued to 18,069 and the rest for some other reasons.12

It is estimated that today about one of ten people in Sweden are immigrant or has at least one immigrant parents. It is vital to have realistic estimation of the current situation and to provide quantitative and qualitative analysis of immigrant structure for the nearest future. The following table presents predicted immigrant population in Sweden in 2010 by region groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Group A</th>
<th>Group B</th>
<th>Group C</th>
<th>Group D</th>
<th>Group E</th>
<th>Group F</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>186,645</td>
<td>56,112</td>
<td>37,232</td>
<td>23,121</td>
<td>49,249</td>
<td>15,669</td>
<td>362,028</td>
</tr>
<tr>
<td>men</td>
<td>96,850</td>
<td>22,707</td>
<td>10,342</td>
<td>12,586</td>
<td>26,734</td>
<td>8,121</td>
<td>177,340</td>
</tr>
<tr>
<td>women</td>
<td>89,795</td>
<td>33,405</td>
<td>20,891</td>
<td>10,535</td>
<td>22,515</td>
<td>7,548</td>
<td>184,689</td>
</tr>
</tbody>
</table>

Today 52.5% of immigrants in Sweden come from West Europe or other highly developed countries (Group A) and about 14% from East Europe (Group B). It is estimated that in 2010 this proportion will be 51.5% and 15.5% respectively. Immigrants from these groups are expected to be qualified professionals. In 2010, East Europe is estimate to be second largest group among immigrants; most of them are expected to be citizens of Poland and Russia.

Group C (East and South Asia) is expected to have the highest temp of growth, 28%. The largest population of the group is Thailand. Among 2,323 Thai who got residence permit in 2005, 2,098 came as close relatives; 88.2% of Thai population in Sweden are women. Among people from the second largest country, China, about 46.8% were visiting students in 2005.

12 Source: Swedish Migration Board (2005)
The majority of immigrants from Sub-Saharan Africa (Group D) came to Sweden as refugees. However, there are some countries in which the dominant share of immigrants are visiting students. During 2001-2005, 12,283 immigrants from Group D asked for asylum; 59.3% of them are men. At the same period, 13,204 got Swedish citizenship (47.5% are men).

Group E mostly represents Islamic countries on Middle East and Central Asia. A large share of the immigrants comes to Sweden as refugees from Iran, Iraq, Afghanistan, and some other countries. There are also some countries (Pakistan, Bangladesh) from which most residences came as visiting students. The total number of foreign citizens in this group is going to decrease. During 2001-2005, 45,514 people (70% men) asked for asylum while 61,669 (50% men) acquired Swedish citizenship and quit our target group.

Since 1973, the major part in Group F was refugee from Chile and some other Latin America countries. However, today immigrants from this group come mostly for economical reasons.

As we can see from Appendix E, the immigrant inflow has cyclical pattern. People usually migrate at the age about 22-28 so despite the common tendency of immigrant population to getting older, the age structure can change over the years due to new young immigrants.

The education level of immigrant labor force is expected to be quite high. Almost a half of them are expected high education which is explained by a high share of people from Europe and other highly developed countries. However, professional qualification does not guarantee successful performance on a labor market.

In most cases, Swedish labor market demand not just for skilled workers but for Swedish-specific skills. Requirements are usually concern not only language skills but also a row of other factors. The Swedish Integration Board specifies some of the difficulties that immigrants face:

“Reasons for the generally weaker position of immigrants in the labour market are multiple and complex. They may be related to the personal situation of the individual or they may be more structural. Among these are the importance of knowledge of Swedish, education, lack of networks, the occurrence of discrimination and length of time the immigrant has lived in this country. The longer immigrants have lived in Sweden, the higher their rates of employment while unemployment levels decline markedly.”

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13 Swedish integration policy for 21st century. Swedish Integration Board
References

### Education Levels according to Standard ISCED 1997 (UNESCO)\(^4\)

<table>
<thead>
<tr>
<th>How to determine the level of a program</th>
<th>Name of the level</th>
<th>Code</th>
<th>Complementary dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Proxy criteria for contents</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Main criteria</strong></td>
<td><strong>Subsidiary criteria</strong></td>
<td><strong>Name of the level</strong></td>
<td><strong>Code</strong></td>
</tr>
<tr>
<td>Educational properties</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School or centre-based</td>
<td>Minimum age</td>
<td>Upper age limit</td>
<td>Staff qualification</td>
</tr>
<tr>
<td>Beginning of systematic apprenticeship of reading, writing and mathematics</td>
<td>Entry into the nationally designated primary institutions or programs</td>
<td>Start of compulsory education</td>
<td>Primary education</td>
</tr>
<tr>
<td>Subject presentation</td>
<td>Full implementation of basic skills and foundation for lifelong learning</td>
<td></td>
<td>Lower secondary education</td>
</tr>
<tr>
<td>Typical entrance qualification</td>
<td>Minimum entrance requirement</td>
<td></td>
<td>(Upper) secondary education</td>
</tr>
<tr>
<td>Entrance requirement, Content, Age, Duration</td>
<td></td>
<td></td>
<td>Post-secondary non tertiary education</td>
</tr>
<tr>
<td>Minimum entrance requirement, Type of certification obtained, Duration</td>
<td></td>
<td></td>
<td>First stage of tertiary education (not leading directly to an advanced research qualification)</td>
</tr>
<tr>
<td>Research oriented content, Submission of thesis or dissertation</td>
<td></td>
<td></td>
<td>Prepare graduates for faculty and research posts Second stage of tertiary education (leading to an advanced research qualification)</td>
</tr>
</tbody>
</table>

\(^4\) Source: International Standard Classification of Education ISCED 1997
Appendix C

Standard SUN 2000 (Example of Items)\

0. General education
   010c - Broad, general program, natural science orientation
   080z - Reading and writing skills for adults
1. Teaching methods and teacher education
   146b - Teacher education, commerce and administration
2. Humanities and art
   223x - Other program in Swedish and comparative literature
3. Social sciences, law, commerce, administration
   312b - Social anthropology and ethnology
   321x - Other program in journalism and media studies
   343z - Banking, insurance and finance
4. Natural sciences, mathematics and computing
5. Engineering and manufacturing
6. Agriculture, forestry, animal health
7. Health care and nursing, social care
   721i - Medical education, specialization in radiology
   761c - After-school care for children and adolescents
8. Services
   811b - Program for hotel services
9. Unknown

In SUN 2000, the first two digits in the orientations module indicate the principle orientation and correspond to fields of education. The third digit in the orientation code indicates the subject orientation and is identical to the classification into ‘Fields of Education and Training’ developed by UNESCO, EUROSTAT and the OECD as a supplement to ISCED 97. The fourth digit in the orientation code is used if there is a need for further specification.

Source: Swedish Educational Terminology Standard SUN-2000

15 Source: Swedish Educational Terminology Standard SUN-2000
Appendix F

Distribution of Immigrant Population within Sweden (2005)

Source: Statistics Sweden. Foreign citizens by county, marital status, age and sex.