Unemployment

The Impact of Immigration on the Swedish Labour Market

An empirical approach

Andrew Inyoin
Payman Bitarafhaghighi
Supervisor: Johan Lindén
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Division of Business and Social Sciences
Mälardalen University
SE-721 23 Västerås, Sweden
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Abstract

Immigration and its effect on the unemployment rate has always been an important political and economic topic across Europe. According to economic theory, positive net immigration should not have any long-term negative effects on average native labour market outcomes. The purpose of this thesis is to find out whether ‘immigration doesn’t increase unemployment’ by briefly presenting previous research on the topic followed by observing and scrutinizing, with the help of the OLS method in a linear regression model, historical data (1980-2015) on immigration and unemployment. And furthermore, using the same procedure as above, try to find out whether ‘Sweden’s Beveridge curve shifted due to immigration.’ After analysing the various results from the regressions, a conclusion that immigration does increase unemployment and that Sweden’s Beveridge curve shifted indirectly due to immigration is made.

Key words: Immigration, labour market, employment, labour market equilibrium, unemployment, wage, Beveridge curve.
Acknowledgement

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Authors: Andrew Inyoin and Payman Bitarafhaghighi

Examiner: Christos Papahristodoulou

Supervisor: Johan Lindén

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Introduction

The study of immigration and its effects is an important area for both economics and politics. The foreign-born population in Sweden has risen significantly since 1960 from about 4% to almost 16% of the total population. According to predictions from Statistic Sweden, the population is expected to reach about 12.9 million by 2060.

Figure 1: Population growth between 1900 and 2060.

One of the predicted trends in population change is that the foreign-born population will count for more people aged between 25 to 64. The figure will be expected to increase from only one fifth of the population in 2014 to one fourth in 2020 and one third in 2030. In fact immigration counts for a large proportion of population growth in Sweden.

Figure 2: Share of foreign-born and native population.
Apart from demographic changes, immigration has its own impact on Sweden’s economy and particularly on the labour market. But, does immigration really help or hinder the labour market? The answer to this question is one of the priority debate topics across Europe today. According to economic theory, positive net immigration should not have any long-term negative effects on average native labour market outcomes.

The purpose of this thesis is to try to find whether the immigration rate has an influence on the employment rate in Sweden. Starting with a short overview of the history of immigration in Sweden and then continue to the theoretical background of the effect of immigration on the labour market and finally a regression analysis of the available empirical data. Finally with the help of Beveridge curve, the effect of immigration on the unemployment rate will be scrutinized.

Overview of history of immigration and emigration in Sweden

Sweden faced great emigration between the mid-1800s up until 1930. Almost 1.3 million Swedes emigrated to countries like USA, Canada and Australia due to many reasons including: poverty, religious persecution and lack of political freedom. This period of great emigration negatively influenced the economic growth in Sweden. After World War II the number of immigrants started to rise significantly. Since 1930, with the exception of a few years in the 1970s, Sweden has had a larger number of annual immigration than emigration. Prognoses show the same trends in upcoming years.

Figure 3: Number of Immigrants and Emigrants.
Due to World War II the inflow of migrants to Sweden increased during the 50’s and 60’s. The migrants were mostly from Germany and the Nordic-Baltic countries. As a result of this, the Swedish Migration Board was formed in July 1969 to help regulate migration. In the mid-80s, the number of asylum seekers from countries like Iraq, Lebanon and Syria increased significantly in the whole of Europe, especially in Sweden. About 100,000 people moved to Sweden in the 90’s during the breakdown of Yugoslavia. Sweden joined the EU in 1995 and later in 2001 joined the Schengen cooperation. This gave the people within the European Union the right to freely move to Sweden.

Problem description

Trade, work, cooperation, war, among others, are some of the words that come to mind when one asks oneself why people leave their native countries for foreign ones. Movement of people from one community to another isn’t a new concept, in fact it can be traced as far back in time as the great civilisations of Ancient Egypt and Rome where people were either forcefully taken from their native communities as slaves or left by their own free will for financial and social gains, the latter being the most common in most of today’s communities.

Immigration according to the oxford dictionary is; ‘the action of coming to live in a foreign country/community permanently.’ When people make the decision to immigrate, it’s usually to areas with better standards of living. Immigrants are of many types, including: political immigrants, environmental immigrants and economic immigrants. The first two types of immigrants include refugees and asylum seekers who flee their countries because of political persecution or natural disasters and the third type move mainly to look for jobs in order to improve their economic well-being.

Resources in any organised community are planned for and distributed according to the size of the population i.e. an equilibrium between resources and native population is created, therefore it would be reasonable to conclude that an increase in population as a result of immigration would disturb this equilibrium unless the resources are increased with the population, which is most unlikely in a short period of time. It’s as a result of this reasoning that immigration has become a priority topic in parliaments across Europe.

Since the beginning of the Syrian civil war in 2011, Europe has seen an increase in refugees and asylum seekers, Sweden being one of the countries that has taken in a large number of these migrants. When the migrants are granted asylum, the Swedish government then has the responsibility of integrating them into the Swedish society.
and later into the labour market. The theme of this paper rotates around what happens to unemployment levels when there is an increase in labour supply.

**Aim**

The aim of this thesis is to find out whether ‘immigration doesn’t increase unemployment’ and whether ‘Sweden’s Beveridge curve shifted due to immigration’ mainly with the help of the OLS method in a linear regression model ranging from 1980 to 2015.

**Limitations**

Considering the magnitude of the problem, boundaries will be needed to facilitate testing the hypothesis because there are many variables and a lot of information which won’t all be used in the study.

The study and the empirical data to be used range from 1980 to 2015 and the data sources are mostly state institution data bases and economic journals. The time range is interesting mainly because it’s easier to see significant changes over a long period of time than it is to see over a short period and the fact that Sweden’s Beveridge curve (explained later) shifted in the early 90’s and late 00’s. It will be interesting to investigate what caused these shifts.

There is a tonne of data concerning Swedish immigration but only the relevant one will be used. The paper is both theoretical and empirical so, economic articles and text books will be the main source of data for the theoretical part and archived statistics for the empirical part.

The empirical data however may not completely be accurate or available in some cases because there’s an underground economy that might not have been taken into account when the data was collected or a time period when no surveys were made.

The assumption that unemployment doesn’t increases with immigration goes hand in hand with the theory which is based on earlier studies (Borjas and Pissarides), the only short coming is that most of these studies were made in North America so a few adjustments have to be made when making comparison to European empirical data.

**Literature review**

Although there are many studies that examine the effect of immigration on wages, unemployment and labour markets in USA, UK and Europe, there are few studies that focus only on Sweden. Probably because the Swedish labour market has a very
unique model as compared to the rest of the world and the fact that labour market discrimination has not been considered a relative subject so far.

Pieter Bevelander & Nahikari Irastorza (2014) published a report about the integration of new immigrant in Sweden and they concluded that the unemployment rate was often higher for low-educated refugees during their first years in Sweden compared to natives and labour migrants from EU countries in the same period. Joakim Ruist (2013) in a study about the labour market impact of refugee immigration in Sweden between 1999-2007 found that immigration flow of refugees had no significant impact on the total unemployment rate although it had a noticeable effect on the unemployment rate among earlier immigrants from low and middle income countries.

A report from the institute for evaluation of labour markets and education policy (IFAU) published in 2007 showed a different outcome of increase in labour supply. The report suggested that the possibility of entering into the labour market was significantly dependent on the business cycle. Lena Nebky (2003) in an empirical study on the employment of immigrants concluded that the unemployment rate was generally higher among the foreign-born than the natives but this difference reduced by the time the foreign-born stayed longer in Sweden. Although this difference will never disappear.

Lina Aldén & Mats Hammarstedt (2014) in a study at Linnaeus University Centre for Labour Market and Discrimination Studies found out that there was a significant difference between the employed native-born people and the foreign-born people and they also realized that there was a wide difference between groups in the foreign-born category. These differences were categorized by country of origin, gender and educational level.

Jan Ekberg in a research called ‘European versus Non-European Immigrants on the Swedish Labour Market During the Recession’ emphasized on the effect of the business cycle on the unemployment rate among EU and non EU immigrants and concluded that unemployment was generally higher during recessions. A study done by Pavlína Žáková (2013) statistically showed that the Swedish labour market was not functional for low-skilled and low-educated workers. Viktoria Chuikina and Sara Azmoudeh Fard (2012) at Mälardalen University compared the impact of immigration in Sweden and the UK but their research showed mixed results and they suggested further studies in this area.

Although there hasn’t been much research for the Swedish case, almost all of the earlier research suggests that in order to scrutinize the impacts of immigration on labour market one needs to consider many factors like skill level, establishment period and the effect of the business cycle in order to have a better picture of the impact of immigration on unemployment.
Theoretical background

Labour Market Equilibrium

Equilibrium is balance. A market is a platform that facilitates exchange of resources for money. In the case of a labour market, the resource exchanged for wages is a skill/labour. The working population acts on the supply side while the firms act on the demand side.

Labour is of the high and low/unskilled kind. Some sectors/firms like software production companies and law firms demand high skilled labour while others like cleaning companies demand low skilled labour. High skilled labour is scarce so firms are willing to pay a high wage for it. High skilled workers are fewer compared to unskilled workers because there are limited opportunities and funds for acquiring higher skills. Depending on the sector, the types of labour can either be perfect substitutes or complements for each other. They belong to the same labour market in the first instance so they compete with each other but different labour markets in the second instance.

An equilibrium on the labour market, one in particular, is achieved when supply of labour is in balance with the demand for labour, in other words, the number of workers available is equal to the number of workers needed by the firms, meaning that everyone has a job. This balance is achieved without any direct intervention from the parties involved but rather evens itself out with the help of the laws of demand and supply. The type of market being hinted on is the perfectly competitive one; a market where the parties involved are free to enter and leave. In this type of market, the equilibrium ‘balances out’ the conflicting desires of workers (high wage) and firms (low hiring cost) and determines the wage ($w^*$) and employment ($L^*$) observed in the labour market, J. Borjas (2016). $w^*$ and $L^*$ are known as the equilibrium or optimal wage and employment. As the wage rises, workers will supply more labour while firms will demand less of it.
Figure 4: Perfectly Competitive and Monopsony Labour Markets.

The green area in (b) represents a deadweight loss that society suffers.

Figure 4-a illustrates the outcome of trade between firms and workers. The area of the triangle between the equilibrium wage and demand curve is what the firms gain while the area of the triangle between the equilibrium wage and the supply curve is what the workers gain. The two areas together represent society’s welfare or gain for society as a whole, there aren’t any losses in this case.

There are however other types of markets that differ from the perfectly competitive one. One of these markets is a monopsony where there’s only one firm and many workers so it sets the wage ($w_m$) which is usually lower than that in a perfectly competitive market. This type of market, as in Figure 4-b, demonstrates one type of inefficiency/loss suffered in the labour market.

Since everyone has a job in a perfectly competitive labour market, there’s no unemployment. However, the equilibrium changes with time due to internal and external factors that cause fluctuation in wages and employment, consequently leading to losses to society like unemployment as shall be shown later. Some of the factors that cause change in the equilibrium include government policies like setting minimum wages which protect workers from being paid too little by firms and the other which is of interest in this case; immigration.

Impact of Immigration on the Labour Market

As mentioned earlier, the types of labour can either be perfect substitutes or complements for each other. In the first case, high skilled labour can be replaced with low skilled, may be due to the insufficiency of high skilled labour. In this case they belong to the same labour market and therefore compete against each other. The other case is where the low skilled workers take up the more physically demanding
tasks, leaving the high skilled labourers to put their skills to better use. In this case they belong to different labour markets therefore don’t compete against each other.

According to J. Borjas (2016), Immigration, in the short-run, reduces wages and employment of native-born workers. Immigrants comprise of both low/unskilled and high skilled labourers but the low skilled ones usually take up a big share in most instances.

If immigrants are perfect substitutes with natives in terms of labour, they compete on the same labour market, they therefore increase the supply of labour in that labour market hence shifting the supply curve to the right as shown in Figure 5-a. In the short-run when demand for labour is fixed because of fixed capital, the wages eventually go down from the equilibrium level. Natives leave their jobs, stop applying or emigrate to places with a higher wage. In the long run however, firms start entering the market because of the low cost of labour. The presence of many firms and increased capital in the market leads to an increase in demand for labour. This then shifts the demand curve to the right, just enough to cross the new supply curve at the old equilibrium wage (Figure 5-b). This shows that immigration does not have any long term effects on the labour market but it’s hard to determine how long ‘long’ is because there is no certainty of how fast firms can adapt to change i.e. increase capital.

**Figure 5: Impact of Immigration in the short and long-run. Perfect Substitutes.**

In Figure 5-a, \(N^*\) represents equilibrium employment i.e. the number of employed natives before immigration, \(L'\) is the increased employment or total employment after immigration (natives and immigrants), \(w^*\) is the equilibrium wage before immigration which decreases to \(w'\) after immigration.
The difference between \(N^*\) and \(N'\) is the number of natives who chose not to work because of the lower wage.

On the other hand, if immigrants and natives are labour complements, they belong to different labour markets so they don’t compete for the same jobs. In this case the wages of the natives rise because they are utilising their skills better, leaving the immigrants to take up the work that doesn’t require high skill. From utilising their skills better, their productivity increases which in turns leads to an increase in demand on the high skilled labour market (demand shifts to the right as shown in Figure 3) which further leads to an increase in wages. In Figure 6, \(N^*\) is the equilibrium level of skilled employment. After demand increases, skilled employment increases from \(N^*\) to \(N'\) while wages increase from \(w^*\) to \(w'\).

**Figure 6: Impact of Immigration on Native Workers in the Short-run. Complements.**

![Diagram showing impact of immigration on native workers in the short-run. Complements.](image)

**Mathematical Perspective (Perfect Substitutes)**

Demand for labour depends on total production in an economy, which is production of all firms summed up. A production function is needed to determine production levels. The Cobb-Douglas production function is the function of choice in this case. It shows production in terms of two production factors; capital and labour, as shown below:

\[
Q = AK^\alpha L^{1-\alpha}
\]

\(Q\) is production in the economy, \(A\) is a constant, \(K\) is the capital stock, \(L\) is the labour, and \(\alpha\) is a number between 0 and 1. This particular function shows an economy with constant returns to scale.
Assuming equilibrium, the price of labour (real wage, \( w \)) and capital (real rate of return, \( r \)) are given by the value of the marginal productivity of the two factors, as shown in the equations below:

\[
    r = \alpha A \left( \frac{K}{L} \right)^{a-1}
\]

\[
    w = (1 - \alpha) A \left( \frac{K}{L} \right)^a
\]

Therefore, immigration leads to an increase in Labour (L) which increases the real rate of return (r) and decreases the real wage (w) which further leads to workers leaving but as the rate of return increases in the long-run, firms invest in more capital until it gets to a point where it’s sufficient enough to bring \( r \) back down to the level (fixed \( r \)) it was at before, which in turn increases wages and incentive for people to work. But, as seen in the equation, the ratio between capital and labour also has to be fixed for this to happen. Therefore capital has to proportionately increase with labour in the long run in order to avoid a large decrease in wages.

**Unemployment**

A country’s population, in terms of labour, is made up of people who voluntarily don’t want to or can’t work plus those that want to and can work. The latter is the labour force which is made up those that have jobs (employed) and those that don’t have jobs (unemployed). Unemployment is a situation where a person is looking for a job but can’t find one. It’s one of the inefficiencies or failures that arise from a disturbance in the labour market equilibrium. A minimum wage set by the government is an example of such a disturbance as illustrated in the figure below:

**Figure 7: Labour market failure, Unemployment (Short-run).**
The minimum wage, as seen in Figure 7, is higher than the equilibrium wage which means that firms face a higher marginal cost of production. In order to cut costs, they hire less workers. As a result, the labour demanded ($Ld$) is less than the labour supplied ($Ls$) therefore leaving some people unemployed which is the difference between $Ls$ and $Ld$. The equilibrium can further be disturbed by immigration which, in the short-run, increases unemployment as shown in the figure below:

**Figure 8: Increase in Unemployment due to Immigration in the Short-run.**

![Figure 8](image)

Figure 8 illustrates the effects of the minimum wage and immigration on the labour market. Immigration shifts the supply curve to the right which in turn increases the labour supplied from $Ls$ to $Ls'$ therefore the difference between labour supplied and labour demanded (unemployment) increases.

The number of unemployed workers fluctuates with time due to a number of reason and the speed at which it fluctuates (unemployment rate, the part of the labour force that’s unemployed percent) is one of the indicators of the state of the economy.

The main cause of unemployment is the inequality in demand and supply of labour, there are however other reasons as to why workers are unemployed. Some workers lose their jobs because firms make layoffs as a result of decrease of aggregate demand, that is, when the economy is in a recession, this type of unemployment is known as cyclical unemployment. It’s mainly influenced by the business cycle. Other workers lose their jobs because their skills are not transferable between sectors, so as some sectors shrink while others grow, the skills from the shrinking sectors become obsolete. Another part lose their jobs because their labour’s only required during a given time, an example of such is berry pickers whose labour’s only needed during
the harvesting months, this is known as seasonal unemployment. Finally, there are some workers that move from one job to another, either because they’ve been laid off or left voluntarily, they are unemployed during the period they are trying to locate the right job. This type of unemployment is known as frictional unemployment.

The unemployment rate persists even when supply is equal to demand, that is, it doesn’t get to zero. This is known as the natural rate of unemployment or equilibrium unemployment. It doesn’t get to zero because of structural and frictional unemployment, there’s always someone that’s in between jobs or losing a job because of upgrades in a firm.

**The Beveridge curve**

The Beveridge curve which is named after the economist William Beveridge simply shows the relationship between job vacancies and unemployment. Figure 9 shows a simple model for the Beveridge curve. The labour force in this case comprises of natives and immigrants. Part of this labour force can find a job and enter the group of the employed while the others enter the group of the unemployed if they don’t find a job. The unemployed group has another input. Some employed people leave their jobs voluntarily to find new ones and as a result enter into the unemployed group. A part of the employed are forced to leave their jobs and become unemployed unwillingly. Vacancies increase when firms and government create jobs or when workers give up their positions. The Beveridge curve simply indicates the job matching process.

**Figure 9: A Simple Model of the Beveridge Curve.**
The Beveridge curve depicts the relationship between the unemployment and vacancy rate. Normally there is a negative correlation between the two. The Beveridge curve is a hyperbola and slopes downward as illustrated in figure 10. It has the unemployment rate on the horizontal axis and the vacancy rate on the vertical axis. The unemployment rate is measured as the number of unemployed divided by the labour force while the vacancy rate is measured as the number of vacancies divided by the labour force. The Beveridge curve shows a negative correlation between unemployment and job vacancies.

**Figure 10: The Beveridge Curve.**

As one moves upwards along the Beveridge curve, unemployment decreases while vacancies increase, this signifies an economic boom. On the other hand, as one moves downwards along the Beveridge curve unemployment increases while vacancies decrease, this signifies an economic recession. Moving along the Beveridge curve can be interpreted as business cycle changes.

Another important feature of the Beveridge curve is its location and distance from the origin. As showed in figure 10, the 45 degree line indicates all points where the vacancy rate is equal to the unemployment rate which means that if one keeps the job vacancy rate constant shifting the Beveridge curve from the origin implies more unemployment rates which is one of the most important fundamentals behind the analysis of Beveridge curve.

As one moves away from the origin, the inefficiency in the labour market increases. In short, continuous observation of the Beveridge curve indicates both the efficiency of the labour market and the state of the economy in the business cycle. But why does
the Beveridge curve shift sometimes? There is a multitude of reasons that could lead to this phenomenon.

1- *Growth in the labour force:* A sudden increase in the labour force can lead to a shift in the Beveridge curve due to the fact that job vacancies are fixed in the short-run therefore a growth in the labour force will increase the unemployment rate because there are more workers than jobs. This would shift the Beveridge curve to the left. It is worth mentioning that vacancies are adjustable to the labour market in the long-run.

2- *Inefficiency in demanded and supplied skills:* It happens when the skills required in the labour market don’t match with the skills provided by the labour force. For example when there is a shortage of skilled worker but there are many unskilled job seekers.

3- *Change in job matching efficiency:* Improvement of the job matching process will decrease the job finding time and make it easier for job seekers to find jobs that match their skills. This means a more efficient job market and it may lead to a shift in the Beveridge curve toward the origin.

4- *Long term and frictional unemployment:* Both of them will push the Beveridge curve to the centre.

5- *Economic and political uncertainty together with economic shocks:* They can lead to a sudden increase in unemployment and it takes more time for employers to hire their desired employee.
Swedish Beveridge curve

**Figure 11:** Unemployment rate in Sweden 1980-2015.

The graph shows that the unemployment rate was around 2% between 1980 and 1990. It increased significantly during the early 90’s to just above 8% and then gradually decreased to about 4.6% in 2000. Another significant increase happened between 2008 and 2010 when unemployment jumped from 6.2% to 8.6%.

Figure 12 shows the vacancy rate in the same period. It is clearly obvious that there is a negative correlation between the vacancy rate and unemployment.

**Figure 12:** Vacancy rate in Sweden 1980-2015.

In order to get a better perspective of the functionality of Sweden’s labour market, the Beveridge curve is presented in figure 13.
The data points on the graph represent the years from 1980-2015 and they increase sequentially along the curve by one year.

The Beveridge curve shifts to the left between 1991 and 1993. During this period the unemployment rate increased significantly while the vacancy rate decreased gradually. The Beveridge curve shifted again in 2009. The underlying reason can be found by examining the unemployment rate and vacancy rate between 2008 and 2010.

**Methodology**

The estimation method is ordinary least squares. Five different regression equations are examined in order to find the best possible model that explains the unemployment change over time. Following variables are used in regression equations:

- \( U_t \): Unemployment in period \( t \)
- \( U_{t-1} \): Unemployment in period \( t-1 \)
- \( V_t \): Vacancies in period \( t \)
- \( F_t \): Number of unskilled immigrants in period \( t \)
- \( S_t \): Number of skilled immigrants in period \( t \)
- \( M_t \): Total number of immigrants in period \( t \)
- \( G_t \): GDP growth at period \( t \)
The Beveridge curve will be estimated in 2 different time period. First, the period 1980-2015 using the regression analysis of the following equation:

\[ U_t = a_0 + a_1(U_{t-1}) + a_2(V_t) + a_3(M_t) + a_4(G_t) \] \hspace{1cm} (I)

This gives a general picture of the possible effect of immigration on the unemployment rate. In the first model a number of assumptions are considered. Firstly, the assumption that all immigrants entered directly to the labour force. In order to minimize the effect of business cycle the GDP growth is added into the regression equation and second assumption is that GDP growth is the only indicator of the business cycle.

In the second step the total number of immigrants is divided into two groups of Skilled and unskilled immigrants to find out the possible effects. The Beveridge curve will be estimated using the following equations for the period 2000-2015:

\[ U_t = a_0 + a_1(U_{t-1}) + a_2(V_t) + a_3(F_t) + a_4(S_t) + a_5(G_t) \] \hspace{1cm} (II)

The reason that regression analysis is done for two different time periods is the lack of data for the number of work permits granted by the Migration Board before 2000. A number of assumptions are considered in this model. Firstly, the assumption that the numbers of asylum seekers who are granted the resident permit are almost equal to the number of unskilled immigrants. In other words, almost all of the asylum seekers are unskilled immigrants. Another assumption is that all immigrants who are granted the work permit are skilled workers.

Change in the business cycle has a direct impact on unemployment rate so in order to minimize the business cycle effect, GDP growth (assumed to be the only indicator of the business cycle) is added to this model as well.

As it mentioned earlier there are two differences between the equation (I) and equation (II). Firstly the time period has changed from 1980-2015 to 2000-2015 and secondly the total number of immigrants has split into skilled and unskilled workers. In other words two things have changed at the same time which may affect the conclusions from the equation II. The Beveridge curve will be estimated therefore according the following regression equation:

\[ U_t = a_0 + a_1(U_{t-1}) + a_2(V_t) + a_3(M_t) + a_4(G_t) \] \hspace{1cm} (III)

In this regression analysis same variable as regression equation (I) has used but the time period is between 2000 and 2015.

The effect that estimated with \( U_{t-1} \) among the independence variables is a short run effect. In order to obtain the corresponding long run effect the regression (IV) is examined according to the following calculations:
Consider the equation (I)

\[ U_t = a_0 + a_1(U_{t-1}) + a_2(V_t) + a_3(M_t) + a_4(G_t) \]

In the long run equilibrium \( U_t = U_{t-1} = U \)

So if \( U \) is substituted for \( U_t \) and \( U_{t-1} \) we get

\[ U = a_0 + a_1(U) + a_2(V_t) + a_3(M_t) + a_4(G_t) \]

Then the result is solved for \( U \)

\[ U = \frac{1}{1-a_1}[a_0+a_2(V_t) + a_3(M_t) + a_4(G_t)] \]

... (IV)

It is worth mentioning that in Regressions (I), (II) and (III), the lagged dependent \( U_{t-1} \) is used on the right side of the regression equation and therefore there is a possible risk for autocorrelation and this is another underlying reason for running the equation (IV) which does not have the lagged dependent.

Finally the last regression analysis will be examined without considering the effect of GDP growth and immigration.

\[ \ln (U_t) = a_0 + a_1 \ln (U_{t-1}) + a_2 \ln (V_t) \] ...... (V)

**Regression analysis**

Regression results from equation (I)

1980-2015

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Co-efficient</th>
<th>Standard error</th>
<th>T-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>2.04967</td>
<td>0.3189</td>
<td>6.4272</td>
<td>0.0000</td>
</tr>
<tr>
<td>Unemployment rate (t-1)</td>
<td>0.80580</td>
<td>0.0663</td>
<td>12.1491</td>
<td>0.0000</td>
</tr>
<tr>
<td>Vacancy rate</td>
<td>-2.08909</td>
<td>0.4298</td>
<td>-4.8605</td>
<td>0.0000</td>
</tr>
<tr>
<td>Total number of immigrants</td>
<td>0.00002</td>
<td>0.0000</td>
<td>2.7361</td>
<td>0.0102</td>
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<tr>
<td>GDP growth</td>
<td>-0.18396</td>
<td>0.0489</td>
<td>-3.7586</td>
<td>0.0007</td>
</tr>
</tbody>
</table>
The regression analysis shows that the model explains 96% of unemployment changes over time. All the parameters in this case are significant. The co-efficient for the unemployment rate in period t-1 means that if the unemployment rate in period t-1 increased by 1% unit then the unemployment rate on period t increased by 0.806% unit. The co-efficient for the vacancy rate and GDP growth mean that if the vacancy rate and GDP growth increased by 1% unit, the unemployment rate would decrease by 2.09%unit and 0.18% unit respectively. The co-efficient for the total number of immigrants is 0.00002 meaning that immigration does have a considerable effect on the unemployment.

Regression results for equation (II)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Co-efficient</th>
<th>Standard error</th>
<th>T-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
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<td>Number of granted work permits</td>
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The result shows that only vacancy rate and unemployment rate (t-1) are statistically significant. The model explains 83% of the change in unemployment which is less accurate compared to the first regression.

The non-significance of the two immigration variables in regression II may be because the effect on unemployment from immigration cannot be significantly attributed to one or the other kind of immigration. This would be the case if the two
immigration variables are highly correlated. In order to check for multicollinearity, the variance inflation factor (VIF) is calculated.

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<th>Standard deviation</th>
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<td>Number of granted work permits</td>
<td>0.5490</td>
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Regression results from equation (III)

2000-2015

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<th>Parameter</th>
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<th>T-value</th>
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<td>2.42968</td>
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<td>Unemployment rate (t-1)</td>
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<td>0.21305</td>
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<td>Total number of immigrants</td>
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<td>0.16235</td>
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</table>

R²                                    | 0.81         |
F                                     | 12.04780     |
P-value for F                         | 0.00052      |

The results show that vacancy rate and unemployment rate in period t-1 are statistically significant and immigration is not statistically significant. This model explains 81% of variation in the unemployment rate over time, which is the worst estimation compared to the other three regressions.
Regression results from equation (IV)

1980-2015

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R² 0.79
F 39.3390
P-value for F 0.0000000001

Regression results from equation (V)

1980-2015

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</table>

R² 0.93
F 212.0161
P-value for F 0.0000

This model explains 93% of variation in unemployment rate over time. In this model, the GDP growth and immigration were not included. The model shows that both unemployment rate in period t-1 and vacancy rate are statistically significant.
Conclusion and Summary

According to the results, immigration is statistically significant in the first regression but not in the second one. The reason for this could be because of the difference in time periods or splitting the total number of immigrants into asylum seekers and number of granted work permits. In order to validate the underlying reason, third regression is examined with the same variable as in the first regression but with the same time period as in the second regression. The third regression showed that the difference in significance of immigration in the first and second regressions was due to the change in time period. In other words, immigration is significant in long run but insignificant in short run.

Calculating variance inflation factors (VIF) for the two immigration variables, namely: number of asylum seekers and number of work permits granted in the second regression shows that non-significance of the two immigration variables in the regression II is not due to multicollinearity because the results shows that the two variables are not highly correlated.

Equation (I) shows the estimated effect of $U_{t-1}$ on the independent variables in the short run but in order to obtain the corresponding long run effect, forth regression equation was derived. The result shows that the long run effects are even larger than the short run effects.

The theory, as stated earlier in the paper, states that immigration increases the unemployment rate in the short-run but it eventually comes back to the same level in the long-run. However, the results from the regressions suggest otherwise that immigration has a significant effect on the unemployment rate in the long-run but insignificant effect in the short-run.

The model shows that unemployment in the earlier period and vacancy rate are the most important factors affecting the shape of the Beveridge curve. It clearly explains why Sweden’s Beveridge curve shifted to the right in the beginning of the 90’s. During this period the unemployment jumped suddenly while the vacancy rate fell significantly. It is worth mentioning that during the same period Sweden experienced a negative GDP growth which can be connected to the sudden increase in the number of unemployment and decrease in the number of job vacancies. The Beveridge curve shifted to the right another time between 2008 and 2010. In this period unemployment increased suddenly from 6.2% to 8.6%. In other words, unemployment increased by about 39% in just 2 years. During the same period vacancy rate first decreased and then increased. It is a clear indication that the matching process was less efficient in this period and that the labour market failed to match the required skills with the available jobs. It is also worth mentioning that GDP growth was negative during this period with a significant figure (2009), it was
about -5.2% due to the financial crisis. So from all possible reasons that were considered earlier, inefficiency in demanded and supplied skills, change in job matching efficiency and economic-political uncertainty together with economic shocks could possibly explain why the Beveridge curve shifted in 2009.

According to the economic theory, immigration doesn’t increase the unemployment rate in the long-run and this model shows the opposite result for the Swedish case between 1980 and 2015. Examining Sweden’s Beveridge curve shows that inefficiency in the matching process and economic-political uncertainty and finally immigration indirectly were the most important factors for shifting its Beveridge curve.

This study shows that the number of immigrants affect the unemployment rate and one must consider the indirect effect of immigration on the labour market. For example the first quarter of 2015, 17% of the foreign-born population was unemployed compared to just about 6.2% of the native-born. The figure is even higher for the foreign-born population without high school education. It’s a reminder of the inefficiency in matching demanded and supplied skills. While the total number of job vacancies is historically high, the unemployment rate does not decrease significantly. It’s also a reminder to the results of earlier studies mentioned in the literature review section regarding the integration of immigrants to Sweden’s labour market and functionality of the establishment process.

Further studies should be done with new statistics specifying the different skill levels of immigrants in upcoming years in order to find a better result from the possible impact of immigration on the unemployment rate. It can also be a good idea to try and study the integration of immigrants over a longer period in a more sophisticated model.
References

Internet links

- Statistics for vacancies between 1996-2015
  
  http://www.arbetsformedlingen.se/Om-oss/Statistik-prognoser/Tidigare-statistik.html

- Information concerning Sweden’s capital stock
  

- Equilibrium Unemployment
  
  https://data.oecd.org/unemp/long-term-unemployment-rate.htm#indicator-chart

- The Beveridge Curve
  
  https://en.wikipedia.org/wiki/Beveridge_curve

Books


Articles


• J. Borjas ‘The Economics of Immigration’ Source: University of California San Diego, Journal of Economic Literature, Vol. 32 (December 1994)


### Appendix 1

<table>
<thead>
<tr>
<th>Year</th>
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### Appendix 2

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