

Modernized Beveridge Curve

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Abstract - The article aims to analyze the economic success of Estonia as a small an economic model of the labour market in general, his persons employed, unemployment and vacant jobs, and compare it to Estonia's main partner countries of the EU. The problem is the large number of vacancies even in a situation of high unemployment and young people move abroad, which could result in the continuation of a qualified workforce. The scientific novelty is job vacancies and unemployment relationship (modernized Beveridge curve) of Estonia and other EU countries and its the mathematical models and suggestions for improvement in the labour market.

Keywords - European Union, Estonia, labour market, vacancy, Beveridge curve.

1. Introduction

During the crisis, and especially after the economic crisis, the current labour market problems being nearly all developed economies, especially in the new European EU countries.

This article analyzes the labour market dynamics and problems of the Estonian-based. Estonia's economy can be seen as a small business model, under which generalizations can be made in Eastern Europe, especially in new EU countries.

Estonia is one of the least-populous members of the EU, Euro zone, NATO, IMF and OECD. The United Nations lists Estonia as a developed country with a Human Development Index of "Very High" (Rank - 34th, 2011). An important element in Estonia's post-independence reorientation has been closer ties with Germany and the Nordic countries, especially Finland and Sweden. Estonia has the lowest ratio of government debt to GDP among EU countries as 6.0% at the end of 2011. A balanced budget, almost non-existent public debt, flat-rate income tax, free trade regime, competitive commercial banking sector, innovative e-Services and even mobile-based services are all hallmarks of Estonia's market economy.

Before the economic crisis, the economic growths of Estonia, Latvia and Lithuania were one of the highest in the European Union. Hence these countries were called Baltic Tigers. The crisis, however, took the three countries to a completely different edge – the fall of their GDPs was one of the biggest in the EU. After the crisis, the economic growth factors of

Estonia have again been one of the biggest in the union. In 2011, the real GDP growth in Estonia was 7.6%. [1] Weak spots are, however, the labour market. However, the employment rate and wages in Estonia are one of the lowest in the EU.

A thorough analysis of the development of a small economy such as Estonia will also help make more general conclusions, at least on the European level.

The main goal for the labour market of the EU is to reach the employment rate of 75%. This would significantly increase the future economic growth in Europe [2].

The problem is that in Estonia and other new EU countries is one of relatively high unemployment and low employment rates, and on the other hand not enough skilled labour force and unemployment is not reduced by increasing the rate of job vacancies, on the contrary - is growing. Why?

The problem is that relatively many work abroad. Due to the free movement of people within the EU, the problem in Eastern European countries, including Estonia, is the migration of younger labour force abroad, where the wages are higher. In Sweden and Finland, for example, net salary is 4 times higher than in Estonia, while labour productivity is only 2 times lower.

In order to make recommendations to policy makers and business leaders need to carefully analyze the social situation and to know the theoretical basis of its performance. Should analyze all of the social determinants of changes in laws and their interconnections. The labour market situation, and there be a change depend in particular on the economy (GDP) of the situation, political decisions and yet much more.

Would also need to know the relationship of these changes and the theoretical foundations. The analysis shows that some of the commonly accepted laws relating to labour markets are too vague and require clarification. They are also quite different from region to region.

U.S. and EU rule, the same factors affecting economic development, but also have specific characteristics. Significantly different from the old and new EU Member States' economic development.

Euro zone crisis, however, conditionally speaking Northern and Southern European monetary policy, which can directly affect the labour market situation.

After a thorough analysis of the economic crisis showed that, as has the current economic laws, or must be specified. Contemporary mathematical explain and predict the labour market situation in the future. May be mentioned as to why an increase in unemployment will be a vacancy in the unemployment level to rise.

The article is a modernized or improved Beveridge curve. If the classic Beveridge curve decreases linearly with an increase of the unemployment rate of vacant jobs, then our numerous empirical generalization of a certain extent this is true of unemployment, but the unemployment rate will further increase the number of vacant seats. Germany, which is one of the best labour market, unemployment begins to increase after a slight increase in the unemployment rate while also increasing the number of job vacancies.

Article based on the theoretical foundations recognized of the United States and Europe countries and international organizations labour market analysis, and author of the recently published position.

This knowledge can make better decisions about the labour market and thus improve the situation.

The methodologies used: an investigation of the ILO and Eurostat methodology and definitions of the labour market; comparative analysis of indicators and regression analysis.

2. Analysis of the labour market in Estonia

In a stable period, analysis are conducted annually, but in times of economic crisis, the changes in employment are extremely rapid, therefore data should be analyzed in shorter time periods – quarterly or possibly even monthly. In the years 2000 – 2008, the development of the economy in Estonia [3 - 4] and the EU was stable, in 2009 there was a rapid recession and the in subsequent years showed growth again. 2011th Estonia's GDP growth was 7.6%, which was the largest of the EU [1].

All this is reflected in changes in employment in Estonia and the EU: the economic growth resulting in increased employment. However, detailed analysis by quarter shows that the situation was more complex.

Labour force	2001	2008	2009	2010	2011
Total, thousands	660.8	694.9	690.9	686.8	695.9
Employed, thousands	577.7	656.5	595.8	570.9	609.1
Unemployed, thousands	83.1	38.4	95.1	115.9	86.8
Inactive, thousands	386.4	347.9	348.0	348.0	333.8
Employment rate, %	55.2	63.0	57.4	55.2	59.1
Unemployment rate, %	12.6	5.5	13.8	16.9	12.5

Table 1. Estonia. Labour status of population aged 15-74, 2001 -2011, *Source:* [5].

methods allow for more precise data manipulations. This in turn provides the opportunity to further

The employment rate rose till 2008 and then started to decline slowly – by 2010, the number of employed persons had fallen by 8.1 thousand compared to 2008 year. In the years 2007 – 2010, the number of active participants in labour market decreased by 84.7 thousand and the number of unemployed rose by 83.9 thousand. In the period 2008 – 2010, the respective numbers were -85.6 thousand and +77.5 thousand, the gap being 8.1 thousand; and in the years 2009 – 2010 the gap being only 4.1 thousand.

The highest number of non-active people in the last decade was registered in 2002 – 394.4 thousand; in the years 2008 – 2011, this number was smaller. The highest number of discouraged workers was registered in between 2002 – 2004: 17.7 thousand to 18.1 thousand; and the lowest in 2008 – 5.5 thousand. The largest number of old age pensioners, 148.8 to 152.8 thousand, was also recorded within this period. 2011th the situation improved somewhat, but not yet reached pre-crisis levels.

The current analysis of the Estonian labour market proceeds with looking at the employment data. In Estonia, the fall in employment rate and the growth of unemployment rate was not balanced during crisis. The gap between those figures was considerable. The reason for this is that a number of people had been working without a formal contract, and a number of people who were left unemployed abroad, started to register as unemployed in Estonia; those people, however, had not been counted amongst the employed people in Estonia and had not been the taxpayers of Estonia. Therefore we should first try to focus on the people who were left unemployed, not primarily on those who had been working unofficially. Of course, exceptions also apply here. In 2009, the number of employed persons fell by 60.7 thousand, but the number of the unemployed rose by 56.7 thousand (?), the total number of unemployed persons reaching 95.1 thousand. Employment in 2010 compared to that of 2008 had fallen by 85.6 thousand. The trend shows that in the primary and secondary sector, employment has been decreasing; in the tertiary sector, it had been rising till 2006; ratios it has been rising gradually, reaching 65.3 % in 2010 [6].

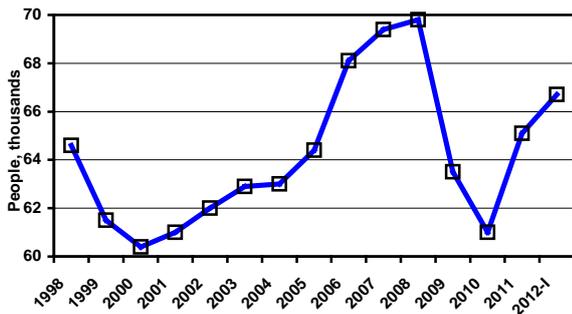


Figure 1. Estonian employment rate, 1998-2012-I, *Source:* [7].

The biggest number of employed persons was registered in QIII; 2007 – 662.1 thousand; and the lowest in Q1-2010 – 553.6 thousand. In the beginning of 1990s, the employment rate was even higher and it was followed by a significant migration to the East. The years 1999, 2009 and 2010 were the ones when employment rate dropped the most rapidly. But already in 2011. and 2012. occupancy was increased, QII-2012 there were 624 thousand. Figure 1 illustrates well the economic crisis of the second half of the nineties, especially the crisis of 1999, the economic growth followed by it and the results of the last economic crisis.

	1998	2001	2007	2008	2009	2010	2011
EU 27	61.2	62.6	65.4	65.8	64.5	64.1	64.3
Germany	63.9	65.8	69.4	70.1	70.3	71.1	72.5
Estonia	64.6	61.0	69.4	69.8	63.5	61.0	65.1
Latvia	59.9	58.6	68.3	68.6	60.9	59.3	61.8
Lithuania	62.3	57.5	64.9	64.3	60.1	57.8	60.7
Finland	64.6	68.1	70.3	71.1	68.7	68.1	69.0
Sweden	70.3	74.0	74.2	74.3	72.2	72.7	74.1

Table 2. Employment rate, age group 15 – 64, %, 1998 – 2011, *Source:* [7]

The smallest employment rates in the 1990s were in Southern-European countries Spain, Greece, but also in Ireland. The countries with the highest employment rate were Denmark, Sweden, Switzerland and the USA. In 1999, the employment rate in the EU-15 was 62.5%; in the USA, the employment rate was 73.9%. In order to be competitive in the global market, the EU has set a goal to reach employment rate of 75%. Here lies a deceptive contradiction: despite quite a high unemployment rate, employment should be increased. In the next decade, a similar trend continued. The highest employment rate was in Sweden in 2007 – 74.2 %; a year before, the highest employment rate had been in Finland – 72.0 %. The employment rate in Estonia has always stayed below 70%. As a general rule, the employment rate of male population has always been remarkably higher than the employment rate of female population, but data

shows that the trend of female employment is growing. In Southern European countries, female employment rate is lower than in the Nordic countries. In 2010, the average employment rate of men in EU-27 was 70.1 % and of women, 58.2%. In Estonia, the respective figures were 61.5% and 60.6%. The highest employment rate of women was in Sweden in 2001 – 72.3%; in Estonia, the highest employment rate of female population was in 2008 – 66.3%.

	2010		2011		2012	
	M01	M07	M01	M06	M01	M06
EU 27	9.5	9.6	9.5	10.0	10.1	10.4
Germany	7.3	6.8	6.4	6.1	5.6	5.4
Estonia	19.0	15.9	13.6	12.8	10.9	10.2
Latvia	20.0	18.3	16.3	16.2	15.3	:
Lithuania	17.2	18.3	16.5	15.6	13.7	13.7
Finland	8.7	8.4	8.0	7.8	7.5	7.5
Sweden	8.9	8.5	7.8	7.4	7.6	7.5

Table 3. Harmonised unemployment rates, %, 2010 – 2012, *Source:* [8]

The table shows the change in the unemployment rate after the economic crisis, EU countries, compared to the EU's most important partner country is the U.S. unemployment rate.

Unemployment in the EU decreased in 2000 and in the next 1.5 years, grew again to 9%, stayed stable for three years, and the next three years brought a significant fall to 7%, until the recession. In the two crisis years, since QII 2008, unemployment reached its peak, the reasons of which have already been analysed within this article. The beginning of 2011, however, showed slight fall in unemployment.

In June 2012 were in the EU27 unemployed 25 million men and women, unemployment rate at 10.4% and euro area at 11.2%. Among the Member States, the lowest unemployment rates were recorded in Austria (4.5%), the Netherlands (5.1%), Germany and Luxembourg (both 5.4%), and the highest in Spain (24.8%) and Greece (22.5% in April 2012). Compared with a year ago, the unemployment rate fell in seven Member States, increased in nineteen and remained stable in Sweden. The largest falls were observed in Estonia (13.6% to 10.9%), Latvia (17.1% to 15.3%) and Lithuania (15.4% to 13.7%). The highest increases were registered in Greece (16.2% to 22.5% between April 2011 and April 2012), Spain (21.2% to 24.8%) and Cyprus (7.6% to 10.5%). In June 2012, the unemployment rate was in the USA 8.2%. [9]

3. Job vacancies

In a situation when unemployment rate is high and there is a wish to increase employment, it is proper to

look at the vacancies and the changes within vacancy rates.

	Rate of job vacancies, %			
	Q I	Q II	Q III	Q IV
2005	2.3	2.4	2.6	2.4
2006	2.8	2.9	3.4	3.1
2007	3.3	3.4	3.7	3.0
2008	2.8	2.6	2.7	1.8
2009	1.0	0.8	0.9	0.8
2010	0.9	1.1	1.2	1.0
2011	1.2	1.2	1.5	1.3

Table 4. Estonia. Number of job vacancies and rate of job vacancies, %, Quarter, 2005 – 2011, [10].

Table 4 shows the number of job vacancies by quarters both in absolute and relative numbers. Before the economic crisis, the number of vacancies even reached 3.7% (QIII-2007), but dropped to a mere 0.8% or 3890 vacancies during recession.

In 4th quarter of 2011 the rate of job vacancies was the highest in public administration, defence and compulsory social security (2.6%), and the lowest in mining and quarrying (0.1%). The rate of job vacancies increased the fastest in accommodation and food service activities. The increase in the number of job vacancies was the biggest in transportation and storage and in accommodation and food service activities, where there were over two times more vacancies, compared to the 4th quarter of 2010. A third of the job vacancies were in the public sector and two thirds in the private sector. The rate of job vacancies was 1.4% in the public sector and 1.2% in the private sector. [11]

Table 13 enables to assess the number of vacancies before crisis, during the crisis and after it according to major groups of occupations. Although there has (always) been quite a large number of vacancies in all the economic sectors, the rates of job vacancies in different occupations are quite different. Before the economic crisis, the overall number of vacancies was 17.5 thousand, but even in the peak period of unemployment, the number of vacancies was almost 5 000 and over a 100 in major groups of occupation. Therefore, problems may lie in notifying the unemployed about job vacancies or in the fact that the unemployed people do not qualify for the vacancies.

Different job vacancies were also available in almost all Estonian regions during the peak of unemployment (QI2010).

In QIV, the number of vacancies among professionals, senior officials and managers was slightly smaller than in QI. We face a situation where not everyone wants to work as an unskilled worker; at the same time, employers do not see their abilities to be suitable for working on a job requiring high

qualification, for example, on a job of senior official or manager.

When the vacancy rate before the crisis (QI-2010) was high (2.8%), then in 2009, it had dropped to 0.8% in II and IV quarter. The rate of vacancies has been increasing slowly (2011=1.2%), but it is still lower than it was before the crisis. However, the vacancy rate today is higher than in 2010.

In Estonia, there have always been a certain number of job vacancies. Depending on the economic cycle, their numbers change continuously. At first glance, it seems that when unemployment increases, then the number of vacancies decreases and vice versa. Still, this regularities is more complex and varies from country to country. What shows the importance of this issue is the fact that even now, in Estonia and in the whole EU, there is the lack of qualified labour and at the same time, the workers are not willing to work with less suitable conditions.

The following analysis focuses on the relation of vacancies and unemployment and the rules of their distribution laws.

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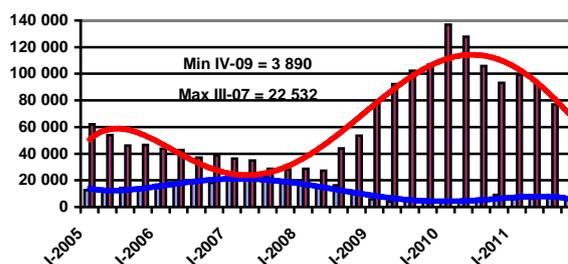


Figure 2. The division of unemployment and vacancies in Estonian, 2005-2011

Source: Author's illustration

Unemployed:

$$y = 0,2487x^5 - 20,969x^4 + 596,88x^3 - 6504,3x^2 + 22854x + 33800; R^2 = 0,9006$$

Vacancies:

$$y = -0,0964x^5 + 7,092x^4 - 180,24x^3 + 1790x^2 - 5700,8x + 17981; R^2 = 0,9391$$

Two trend lines were approaching each other up until the end of 2007, then their gap was minimal (QIII-07=6168; QIV-07=9824). Then, unemployment was decreasing and at the same time, the number of vacancies was growing. It was getting more and more difficult for employers to find labour force, especially qualified labour. This kind of developments in the labour market started to suppress the development of the enterprises. The employees, on the contrary, had quite good opportunities for choosing jobs, which enabled them

to ponder carefully about the nature of the job, the pay and the working conditions, etc. In the first half of 2008, the number of the unemployed was still decreasing, but the demand for workers started to rise slowly. The employers had to agree with higher demands of employees and this led to the fall in vacancy numbers. In the end of 2008, the effects of economic crisis started to be felt in the labour market. The unemployment rate started to increase quickly and the number of vacancies started to fall. 2010th the beginning of the unemployment rate reached a record size and the number of vacancies fell to a minimum. The gap between the two trend lines was the largest. Next, the two lines started to approach each other again – unemployment rate started to fall and the number of vacancies started to rise. Both trend lines match quite well with the curves of actual value, which shows that unemployment and vacancies in Estonia follow certain rules, because $R^2 \approx 1.0$.

The rate of vacancies in the EU, rose even up to 2.4% in 2007, but 2.5 years later, the economic crisis took it to 1.4%. In 2010, vacancy rate rose to 1.7 %. This trend in the EU is quite similar to the job vacancy trends observed in Estonia. In the III quarter of 2010, the rate of vacancies in the EU countries fluctuated between 3.0% - 0.3%. The highest vacancy rates were in Malta (3.0%), Norway (2.6%) and Germany (2.5%), the lowest in Latvia (0.3%). Despite the Estonian vacancy rate rising in the II and III quarter of 2010, it is still lower (1.2%) than the European average (1.5%).

When the number of unemployed persons in Estonia was 25 – 50 thousand, the number of vacant jobs was in between 23 -13 thousand. Since the number of unemployed reached 80 thousand, the number of vacancies has been stable, around 5 000. When the number of unemployed persons reached 60 thousand, the number of vacancies decreased almost twofold. However, the unemployment rate has risen much more quickly than the number of job vacancies has decreased. When the number of unemployed persons reached 80 thousand, the number of vacancies stayed stable despite of the rapid growth in unemployment.

Estonia as well as the entire EU labour market is a short conclusion brief but shrewd German Dr. Martina Rangers 2011th summary of labour.

„According to results of the labour force survey, some 7.4 million people aged 15 to 74 years wanted to have a job or to work more hours in 2011. Apart from 2.5 million unemployed, the unused labour supply comprised 2 million underemployed part-time workers, 1.7 million underemployed full-time workers and 1.2 million people in the hidden (or potential) labour force in 2011.“ [12]

If we leave out those who do not work for objective reasons, the potential labour continues in Estonia as well as in Europe. Would need to be able to work on and make better use of their potential abilities. Off hand, it might just bring a certain amount of professionals in your area who is continuing in Europe. Of course, there are also other exceptions.

4. The modernized Beveridge Curves

The following figures show the linkage between job vacancies and unemployment [13, 14]. Beveridge curve the input data is job vacancy and the unemployment rate (age 15-74) investigation of correlations. We will take a look at the modernized or improved Beveridge curves describing Estonia and other countries.

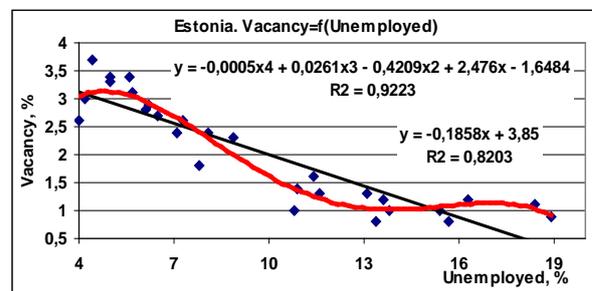


Figure 3. Estonia. Vacancy=f(Unemployed), 2005Q1-2012Q1, Source: Author's illustration

Modernized Beveridge curves (Estonia):
 $y = -0,0005x^4 + 0,0261x^3 - 0,4209x^2 + 2,476x - 1,6484$;
 $R^2 = 0,9223$

Classical Beveridge Curve (Estonia):
 $y = -0,1858x + 3,85$; $R^2 = 0,8203$

The changes in vacant jobs (Figure 3) are in strong correlation with the rate of unemployment, which is illustrated by the high value of R^2 . In the period since QI-2005, the value of 4 order polynomial $R^2=0.9223$. Figure 3, where we can see rates by quarters, shows that when unemployment rate exceeds 11%, the number of job vacancies stays stable, fluctuating within 1 percentage point; in case of very high unemployment rates, however, it may even rise, and in the end, fall a little again.

The right-hand part of the curve in figure 3 can be interpreted as part of high unemployment rate, some people are working unofficially, or have temporary or part-time jobs. They have lost hope to find an official job and prefer working unofficially instead of having a low-paid job or a job with unsatisfactory working conditions or microclimate. At the same time, some of them might be registered as unemployed, but are actually working abroad, in Finland, for example. What the employers see in this

situation is this: there is not enough qualified and disciplined labour force, but not everyone can be hired or is able to work even after having received proper training. The abilities of people and their motivation for working vary a lot [3]. Therefore, even in the peak of unemployment, there are those who do not accept all kind of jobs or working conditions. On the other hand, the employers also do not wish to give the job to „anyone“.

The vacancy rate decreases until the level of unemployment reaches 16%, and then starts to rise slowly. A linear correlation leads to an even simpler answer: when the number of unemployed persons rises, the number of vacancies decreases. Therefore, the more complex mathematical model enables a more exact explanation of the interrelated changes and gives a stronger correlative dependence.

When compared to the classical Beveridge curve described in the theoretical part of the current article, the model created by the authors of this article is more complex, offering a more specific explanation of the correlation between the rates of vacancy and unemployment in a real economic situation. Although the 2nd-order polynomial or simple parabola practically coincides with the classical Beveridge curve, the latter does not present the calculations of the strength of correlation. It may be, of course, claimed that correlation is strong enough without calculating R^2 . In most cases, the classical Beveridge curve is referred to, which does not present concrete calculations.

The curve developed by the authors of the current article is considerably more detailed, therefore more suitable labour force analysis, explanations and forecasts. What is especially important is the analysis of pre-crisis, crisis and after-crisis data by quarters, not years, as changes in the labour market have occurred in a very fast pace. Up to now, conclusions in this article have been done on the example of Estonia only. The question is, how do these complex correlations apply to other countries?

In order to make generalisations, Estonian data has been compared with data collected from Lithuania and Latvia, the countries that had an equally strong economic growth, but even a harsher economic downfall. Comparisons have also been made with Estonian partner countries: the EU countries Sweden, Finland and Germany, in order to find out whether the complex correlation discovered by the authors of this article applies there also. As it is known, Estonia came out of the economic crisis considerably more successfully than Latvia, Lithuania, Poland and other.

Suggested by the authors of the curve is much more thorough, which allows a better analysis of labour, explanations and predictions. What is particularly important to analyze the pre-crisis, crisis

after crisis, and quarterly data, not years, changes in the labour market in a very fast pace. So far, the findings in this article, it is only in Estonia, for example. The question is how these complex relationships to other countries?

In order to make generalizations, the data are compared with data collected in Estonia and Latvia, Lithuania, a country that was equally strong economic growth, but even more severe economic collapse. Comparisons are also made to the Estonian partner countries: EU countries Sweden, Finland, Germany and United Kingdom similar to the curves.

Let's see more of Poland (the largest economy in the new EU member States), Slovenia (the highest GDP per capita in the new EU Member), but also Austria and the Netherlands (have a lower unemployment in EU countries) and Spain and Greece have the highest unemployment in the EU countries). It is also true that we provide the modernized Beveridge curves?

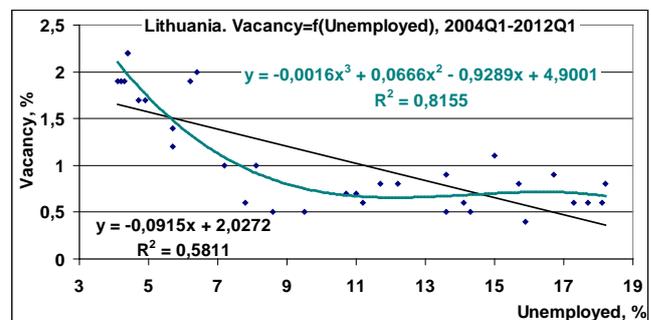


Figure 4. Lithuania. Vacancy=f(Unemployed), 2004Q1-2012Q1

Source: Author's illustration

Modernized Beveridge curves (Lithuania):

$$y = -0,0016x^3 + 0,0666x^2 - 0,9289x + 4,9001; R^2 = 0,8155$$

Classical Beveridge curve (Lithuania):

$$y = -0,0915x + 2,0272; R^2 = 0,5811$$

Lithuania's economic development before the crisis, the EU one of the fastest as well as the other Baltic states. Economic decline was also great. GDP per capita still lags in Estonia than in Latvia and Lithuania.

Until unemployment rate reaches 8%, the vacancy rate drops rapidly up to the level of 1.0%. When unemployment rate reaches 16%, the number of vacancies starts growing again. Although different polynomial curves differ from each other, a general trend can be observed: in case of very high unemployment rate, the number of vacancies starts growing again.

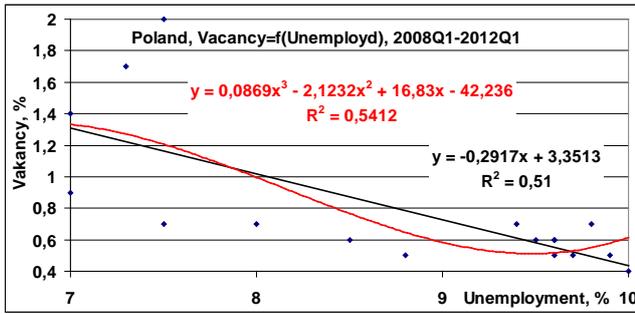


Figure 5. Poland. Vacancy=f (Unemployed), 2008Q1-2012Q1, Source: Author's illustration

Modernized Beveridge curves (Poland):

$$y = 0,0869x^3 - 2,1232x^2 + 16,83x - 42,236;$$

$$R^2 = 0,5412$$

Classical Beveridge curve (Poland): $-0,2917x + 3,3513$; $R^2 = 0,51$

Poland was the only EU country where there was a global economic crisis, economic decline and a loss, though, that the 2009th the real GDP grew by only 1.6% [1].

Poland Beveridge curve is similar in shape curve Beveridge Latvia, with Poland the unemployment rate is half that of Latvia, but weaker than R^2 . Curve of Poland 7-8% as well as a modernized classic Beveridge curves practically coincide, will further modernized Beveridge curve vacancy unemployment grows faster decline than the classical curve at Beveridge. Unemployment rate of 9% after the vacancy is no longer declining, and from 9.5% despite a rise in unemployment will increase rather slowly.

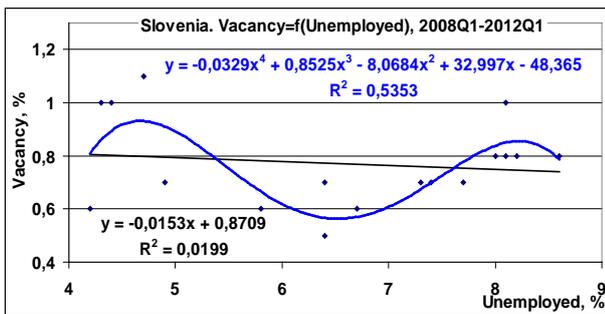


Figure 6. Slovenia. Vacancy=f (Unemployed), 2008Q1-2012Q1, Source: Author's illustration

Modernized Beveridge curves (Slovenia):

$$y = -0,0329x^4 + 0,8525x^3 - 8,0684x^2 + 32,997x - 48,365;$$

$$R^2 = 0,5353$$

Classical Beveridge curve (Slovenia):

$$y = -0,0153x + 0,8709; R^2 = 0,0199$$

Slovenia GDP per capita in PPS is among the largest of the new EU Member States, in 2011 was 94 (EU-27=100) [15].

Slovenia Beveridge curve is cyclic. The unemployment rate increased to 4.5% of the vacancy,

until vacancy decreased to 6.5% as the classical Beveridge curve. However, further increases in unemployment increases the vacancy, which stabilizes unemployment rates of over 8%. Here the classic Beveridge not work, because R^2 is close to zero.

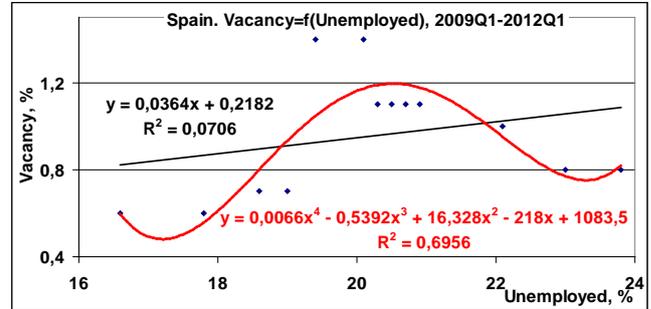


Figure 7. Spain. Vacancy=f (Unemployed), 2009Q1-2012Q1

Modernized Beveridge curves (Spain)

$$y = 0,0066x^4 - 0,5392x^3 + 16,328x^2 - 218x + 1083,5;$$

$$R^2 = 0,6956$$

Classical Beveridge curve (Spain): $y = 0,0364x + 0,2182$; $R^2 = 0,0706$

Spain has the highest unemployment rate in the EU countries, in June 2012 was 24.8%.

Spain Beveridge curve is also cyclic. The unemployment rate to 17% decreased the vacancy as the classical Beveridge curve, to 21% increased also vacancy and about 24% decreased again the vacancy, which then stabilizes. Here the classic Beveridge not works, because R^2 is close to zero.

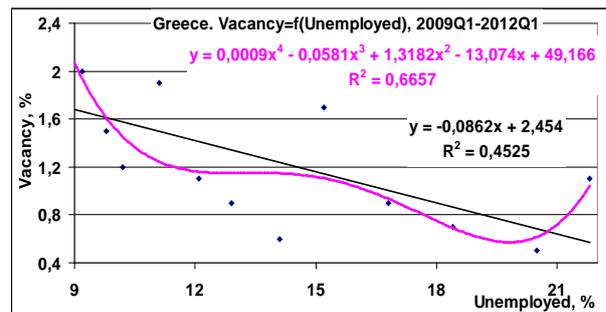


Figure 8. Greece. Vacancy=f (Unemployed), 2009Q1-2012Q1, Source: Author's illustration

Modernized Beveridge curves (Greece):

$$y = 0,0009x^4 - 0,0581x^3 + 1,3182x^2 - 13,074x + 49,166;$$

$$R^2 = 0,6657$$

Classical Beveridge curve (Greece):

$$y = -0,0862x + 2,454; R^2 = 0,4525$$

Greece has one of the highest unemployment rate in the EU countries, in June 2012 was 22.5%.

Greece's economy is the main cause of the euro crisis.

Here is a classic Beveridge curve quite well, because the R^2 is high. Modern curve, where R^2 is substantially higher, only a relatively small states, and subject to the existence of a situation of high unemployment.

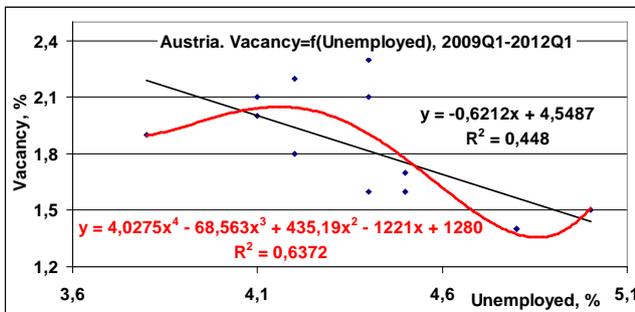


Figure 9. Austria. Vacancy=f (Unemployed), 2009Q1-2012Q1

Source: Author's illustration

Modernized Beveridge curves (Austria):

$$y = 4,0275x^4 - 68,563x^3 + 435,19x^2 - 1221x + 1280; R^2 = 0,6372$$

Classical Beveridge curve (Austria): $y = -0,6212x + 4,5487; R^2 = 0,448$

Austria GDP per capita in PPS is one of the among the largest of the EU Member States, in 2011 was 129 (EU-27=100) [15]. Austria has lower unemployment in EU countries.

Here is also a classic Beveridge curve quite well, because the R^2 is high. Modern curve, where R^2 is substantially higher, gives a more accurate picture. Modern curve, where R^2 is substantially higher, gives a more accurate picture. Unemployment rate increases to 4.2%, the increase in vacancy; vacancy decreases further to 4.8% as the classical Beveridge curve, below the quantity of vacancies stabilizes.

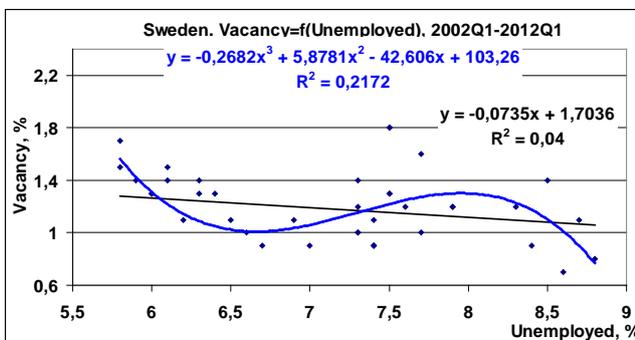


Figure 10. Sweden. Vacancy=f (Unemployed), 2002Q1-2012Q1

Source: Author's illustration

Modernized Beveridge curves (Sweden):

$$y = -0,2682x^3 + 5,8781x^2 - 42,606x + 103,26;$$

$$R^2 = 0,2172$$

Classical Beveridge curve (Sweden):

$$y = -0,0735x + 1,7036; R^2 = 0,04$$

Sweden is the country with a stable economy and high ethical standards. Despite this, Sweden was not left untouched by the economic crisis and the rise of unemployment rate. Compared to Eastern Europe, including the Baltic countries, the corruption and unofficial working in Sweden is minimal. The economic growth (GDP) of Sweden has been the highest in Europe during post-crisis years. When analysing the countries of considerable social guarantees, it must be taken into account that peoples savings there are remarkably higher than in the Baltic countries, therefore, people may not need to get back to work immediately after losing their job, nor are they forced to accept any job they are offered. In addition to that, the social benefits of Sweden are one of the highest in the world.

In Sweden is the relationship between vacancies and unemployment the cyclical and too weak (Figure 10). Vacancy rate starts to increase from a certain level of unemployment, in this case, 6.6%; but from the unemployment rate of nearly 8%, it starts to decrease again.

The linear dependence, as in other countries, is very weak. In Sweden, too, the dependence in a shorter period is stronger than in a longer period. Compared to the Baltic countries is significantly weaker correlation dependence.

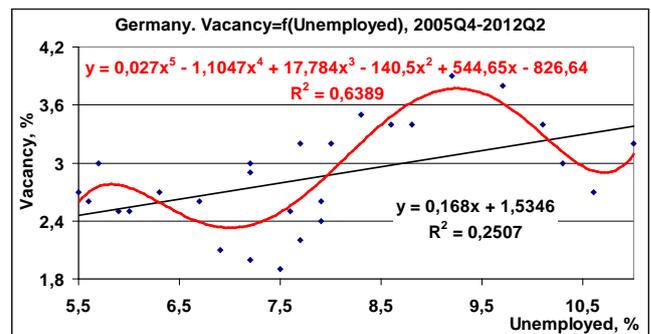


Figure 11. Germany. Vacancy=f(Unemployed), 2005Q4-2012Q2

Source: Author's illustration

Modernized Beveridge curves (Germany):

$$y = 0,027x^5 - 1,1047x^4 + 17,784x^3 - 140,5x^2 + 544,65x - 826,64; R^2 = 0,6389$$

Classical Beveridge curve (Germany):

$$y = 0,168x + 1,5346; R^2 = 0,2507$$

The dependence of vacancies and unemployment in Germany is considerably different from and more complex than the correlative relations of these indicators in the Nordic and Baltic countries.

Opposite trends can be observed in Germany. A certain peculiarity of Germany, as well as of Sweden and of the United Kingdom, is a large number of immigrant workers, especially on jobs of low qualification.

When we look at the linear correlations of shorter and longer periods, then in Germany we can observe an illogical and opposite trend compared to other countries – when there is a rise in unemployment, there is also a rise in vacancies. (!?) Even in a longer period, $R^2=0.2314$. Opposite trends can also be seen in correlation strengths of shorter and longer periods. The 4th order polynomial of shorter period had an $R^2=0.1771$ and 5th order polynomial had $R^2=0.2476$; figures from the longer period were $R^2=0.6794$ and $R^2=0.7136$ respectively. (Quite a big difference!)

Why is the situation like that? It may be concluded that in Germany, unemployment does not usually cause much problems. The unemployment benefits are high. When the employee does not like the offered job, he/she will not take it. At the same time, the low-paid and low-qualified immigrant workers must accept any jobs and conditions. The opening of German labour market to foreigners in May 1st makes the problem even more acute.

The trend lines show that in Germany, when unemployment rate is (around) 7%, the vacancy rate fluctuates in the range of 2.5%. The number of vacancies continues to rise up to the unemployment level of 9%; after that, vacancy rate starts to decline, even though in comparison with Nordic countries, it is still very high (2.7% - 3.9%) – higher than in the starting period of the analysis. Classical Beverage curve Germany would be the opposite, as unemployment increases, the vacancy.

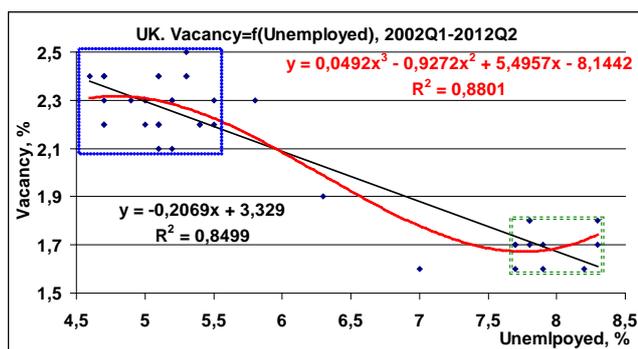


Figure 12. UK. $Vacancy=f(Unemployed)$, 2002Q1-2012Q2

Source: Author's illustration

Modernized Beveridge curves (United Kingdom):

$$y = 0,0492x^3 - 0,9272x^2 + 5,4957x - 8,1442;$$

$$R^2 = 0,8801$$

Classical Beverage curve (United Kingdom):

$$y = -0,2069x + 3,329; R^2 = 0,8499$$

According to data from 32 quarters, the dependency of vacancies and unemployment in the *United Kingdom* (Figure 12) is relatively straightforward and the correlation is very strong. Both the linear correlation ($R^2=0.721$) and the correlative relations of 2nd and 3rd order polynomials ($R^2=0.861$ and $R^2=0.9$) are strong in the shorter period. Therefore, it can be concluded that since the rise of unemployment rate in 2008Q2, there has been a fall in the number of vacancies. This is shown by a direct correlation! But we also have to consider that the unemployment rate in the UK is relatively low (8%), and therefore the rate of vacancies is also small (under 2.5%). The conditional gathering of data into two boxes describes the rapid growth of unemployment in the UK.

At the same time, the UK also gives data on unemployment and vacancy indicators by quarters during a longer period. It is important to note that next to Germany, the labour market of the UK is one of the biggest in the EU; therefore the analysis of the data from UK contributes to the making of more reliable generalisations. The correlative relations of vacancy and unemployment based on data from 32 quarters are very strong, including the linear correlation ($R^2=0.7901$). When we compare more complex relations, then the R^2 s of 3rd, 4th and 5th order polynomials are respectively 0.8306; 0.8439 and 0.8667 – they do not differ much from each other. Therefore, we can choose a simpler, 3rd level polynomial, where $R^2=0.8306$, to describe the relations.

The peculiarity of the UK is that the dots showing relations have gathered mainly into two groups: in the top left hand corner and in the bottom right hand corner. In case of unemployment rate of up to 5.5%, vacancies fall into the range of 2.1% to 2.5%. From 18 points on the chart, only one presents an exception, therefore the probability of the conclusions is over 0.95. The second group describes unemployment rate of 7.7 – 7.8 and includes five points representing small vacancy, in between 1.6% – 1.9%. This group is not common to the UK; its existence can only be observed in extreme situations such as the economic crisis, where the unemployment rate is over 5.5%. Only three points (9.4%) are left outside these two areas. Here, too, the trend lines show that when unemployment reaches 7% to 7.5%, the number of vacancies starts to rise.

When compared to the classical Beverage curve (linear trend line), the model created by the authors of this article is more complex, offering a more specific explanation of the correlation between the rates of vacancy and unemployment in a real economic situation. The curve developed by the authors of the current article is considerably more detailed, therefore more suitable labour force

analysis, explanations and forecasts. Up to now, conclusions in this article have been done on the example of Estonia only. The question is, how do these complex correlations apply to other countries?

In order to make generalisations, Estonian data has been compared with data collected from Lithuania, Latvia, Hungary, Slovenia, Slovakia, Sweden, Finland, Luxembourg, Belgium, Netherland and another countries, in order to find out whether the complex correlation discovered by the authors of this article applies there also.

Beveridge curve vertices are cyclic. Decreases at a certain level of unemployment in the job vacancy (classic Beveridge curve), but the unemployment rate is increasing with the vacancy. Depending on the country's economic prosperity and population levels (rich countries), the cycle is repeated: again, a certain level of unemployment at the vacancy decreases, but the unemployment rate grows, the rate of vacant seats. The first cycle ends in different countries with different unemployment rates, depending on the standard of living of the people there.

5. Conclusion

Labour market analysis must take into account the cyclical nature of the economy, as well as the intensive periods of economic growth have to be taken into account. During the economic crisis, almost all economic indicators fell in most countries, including Estonia. In the first half of 2010, there had been a considerable progress in the EU, but unemployment rates were still lower than during better times.

All this applies to the labour market as well. Especially during crisis periods, it is beneficial to analyse the labour market by shorter periods than a year – by quarters or even months.

According to „Europe 2020 Strategy“, one of the most important goals is achieving the rapid fall of unemployment and the implementation of efficient labour market reforms, in order to help create more and better jobs. It would be necessary to increase the participation rate of some groups in the labour market, and improve the efficiency of the labour market. Due to the economic crisis, unemployment increased significantly, and the demographic changes ahead threaten to decrease the amount of labour force even more. For sustainable development, achieving lower unemployment rates will not be enough; most member countries of the EU, including Estonia, have to take up measures to increase employment rate up to 75%. The low participation rate in the labour market is one of the long-term structural weaknesses of Europe. Before the economic crisis, the employment rate in Europe was many percentage points lower than in Japan or in the USA. What would help to solve these problems are minimizing

the number of vacancies, more efficient use of part-time employees, increasing the employment rate of younger and older people and those of low qualifications; decreasing job changes in the labour market.

Eastern European countries would need to increase workers' attitudes towards work and work culture, their qualifications, work motivation to increase the salaries and other benefits, increased productivity in addition to more efficient use machines, greatly improve the organization of work and the necessary executive level of education and experience of the labour laws to change even more flexible, improve information about vacancies the availability of jobs and the like.

Why do young people moving to live and work in the rich countries of Western Europe? In addition to the local standard of living far higher (wages), also called greater self-realization, the search for new challenges and development (career) options, and want to consult with the wider world search for happiness, adventurer, and the like.

In the labour market analysis, all its components should be looked at according to their relations to each other. In a simpler analysis, only the most important factors will be concentrated on. However, analysing one or two factors does not allow developing the most efficient means to improve the situation in the labour market. This is also shown by the European practice where despite economic growth, the situation of the labour market is improving slowly, and the implemented means are less effective than expected. Due to the free movement of people in the EU, the analysis of labour markets should focus on the changes in employment rates, not unemployment rates. When analysing the reasons of employees' mobility, the fact that wages differ in the old and new member states should also be taken into account. This has a direct effect on the mobility of employees. When analysing unemployment, one also has to consider that the data may not reflect the actual reality, as in the Eastern European countries, including Estonia, people may be register as unemployed, but may actually be working (part-time) abroad, for example in Finland, Sweden, the UK, or they may be working without a contract in their home country.

The winners of the 2010 Nobel Memorial Prize on Economics cited in this article have also noticed that for those who do not wish to take the normal job they are offered, some kind of measures should be implemented. For doing that, we do not need to analyse the situation in the USA, it is enough if we assess the situation in Estonia more thoroughly. A formal retraining (of the unemployed) does not fix the situation. According to employers, a number of unemployed people should not be hired at all, as the

damage they cause directly or indirectly to the employer and to the society at large considerably exceeds the costs on unemployment benefits. As for Estonia, when we do not count among the unemployed the people working unofficially, the ones who do not pay taxes to the country and the ones who have no desire to work at all, the actual unemployment rate is much lower. At the same time, the transfer unemployment connected to mobility is still inexorably there, along with the higher than normal unemployment rate, which may even be beneficial, because it helps to guarantee the necessary quality of the work and services and gives the employer a better chance to require the fulfilment of the working discipline. The new Labour Act of Estonia [38], which simplified the firing and lay-off procedure of the employees, has also had a positive effect on the labour market. The primitive equalizing of all employees and the wish to see an ideal employee in everyone lowers the quality of the labour market. The abilities and motivation of people vary greatly; therefore contradictions and competition are the basis for development of the labour market. Denying this would lead to economic stagnation.

After the economic crisis, the GDP of Estonia started growing again, but the fall of unemployment rate has been very slow. What are the reasons for this? In order to come out of crisis, enterprises try to minimize labour costs. First, the companies try to get rid of workers who are unqualified, not needed or have conflict personalities. At the same time, we are facing a new problem: there are not enough qualified employees to be found. Estonia is not the only one facing this problem.

After the crisis, economy does not develop extensively any more, instead, it develops along an intensive path. This means that manufacturing will grow mainly due to the use of more efficient machines and devices and more efficient organization of the work process. This lessens the amount of low qualified workers and raises the demand for employees with high qualifications. This does not only concern the unskilled workers, but also those having higher education – engineers, economists and other specialists. Hence we face also the problem of the quality of higher education. The demand for knowledge capital (knowhow) has grown noticeably - this is the greatest value in the information society.

It may be claimed that the classic Beveridge curve suits well for making less complicated conclusions, but for analysing real economic situations, the improved Beveridge curve is much more suitable. In general, the improved curve shows quite similar results in all the countries with certain accuracy, at the same time, it also enables to bring out differences

describing the peculiarities of every country and its labour market. When unemployment rises, however, we face a situation when job vacancies also start growing. These relations vary from country to country. For conducting a more thorough analysis, it must be found out why does the number of vacancies in the right side of the curve grow in the situation of high unemployment? What can be done here, considering that the employment rates have to start growing in Europe and other developed countries? One of the solutions would be improving communication in all levels. It is necessary to continue improving the quality of employees, continue with in-service trainings, the wages should be in correlation with labour productivity; working conditions, motivation etc. should be improved, and those not being involved in the labour market should be pressurised to work. Another important factor is to cultivate high ethical norms among employees and employers. All these measures would help to raise employment rate to such a level that there is no need to import immigrant workers from outside the EU.

Developing countries such as China, India etc., are facing other kind of problems. However, analysing those questions and presenting a more complex analysis of the labour market would not fit into the scope of this article. Therefore, this article is able to give a brief analysis of only some components of the labour market.

As a new contribution to research, the current article presents a (thorough) analysis of the Estonian labour market (Estonia being one of the Tiger countries of the EU). As a new contribution to theory, the authors of the article have developed the improved Beveridge curve, which helps to explain the dynamics of vacancies in the situation of high unemployment rates, and based on this, develop measures for finding solutions to these problems.

The improved Beveridge curve is novel not only for Estonia, but for the analysis of the EU labour market as a whole. For global analysis, a more detailed research on the economies of the USA, Japan and other developed countries must be conducted.

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