

# UNEMPLOYMENT AND LABOUR MOBILITY IN ESTONIA: ANALYSIS USING DURATION MODELS

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The current paper analyses unemployment and labour movements between labour market statuses in the period of January 1997 to July 2000 using data from the Estonian Labour Force Surveys. The paper is motivated by the hypothesis that in the beginning of transition in Estonia high labour mobility and low unemployment rate seemed to be related.

The analysis reveals that in the end of the 1990s labour mobility has decreased substantially in Estonia compared to 1994. The results from the paper indicate that unemployment rate and labour mobility measure have inverse relationship, both in aggregate and disaggregate level. The most mobile groups in Estonian labour market are Estonians, people living in the area of capital Tallinn and people with higher education. Young people also tend to move a lot from job to job. High mobility in case of young workers is accompanied by high number of unemployment incidents, which is captured by the aggregate unemployment rate time series.

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**The views expressed are those of the author and do not necessarily represent the official views of Eesti Pank.**

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## Introduction

Estonia is considered to belong to the group of successful reformers in the Eastern and Western European economies, where reforms were carried out quickly, economy reached the growth phase already in 1994 and until 1999 the unemployment rate was lower than in most other transition countries. At the beginning of the transition period, unemployment increased sharply in transition countries with the exceptions of the Czech Republic and Estonia. Until 1993 the unemployment rate remained less than 5% in Estonia. It can be argued that the low unemployment resulted from the decrease of real wages and labour force attendance (the number of inactive persons increased by the young and persons qualified for pension). In the following economic growth period the unemployment rate increased gradually, which can be explained by the restructuring of production process, until 1995 when the unemployment rate stabilised at 10 per cent level. Due to foreign demand shocks, unemployment rose sharply reaching to 15 per cent in 2000. During the economic growth period employment should increase. However, unemployment has not decreased remarkably. Today there are about 90,000 unemployed workers in Estonia, the share of long-term unemployed is about 45% and unemployment rate is rather high compared to the successful transition economies.

Transition countries' labour markets are described by changes in production structure, which cause labour to move from state sector to private sector and from old subsidised enterprises to the new developing ones. Therefore the transition period is expected to be accompanied by increase in labour movements between different sectors of economy. In the beginning of transition period it was assumed that the described movements take place through the unemployment status (Aghion, Blanchard 1994). Therefore the increase in movements takes place not only between economic sectors but also between labour market statuses: unemployment and employment.

The current paper analyses the relationship between unemployment and labour mobility<sup>1</sup>. The motivation for the topic comes from empirical research on transition process, where it is argued that labour mobility in transition countries is lower than in developed economies (Boeri, Flinn 1999). This result does not support the expectations from the beginning of transition period. At first it is difficult to explain how structural changes can take place with low labour mobility. According to the estimations in the papers of Faggio, Konings (1999), Haltiwanger, Vodopivec (1999), Eamets (2001), in Estonia labour mobility is higher than in other transition countries (with the exception of the Czech Republic) especially in the beginning of the transition period. It is argued that higher labour mobility can be related to the low unemployment rate in Estonia in the beginning of transition period (Haltiwanger, Vodopivec 1999; Jurajda, Terrell 2000; Eamets 2001).

Despite the expectations in the beginning of transition period it is observed that flows in and out of unemployment are small in transition economies (Boeri 1994). This has caused both the unemployment rate and long-term unemployment rate to increase.

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<sup>1</sup> Labour mobility is analysed only in terms of movements between labour market statuses and sectors of economy. Labour mobility in the sense of regional movements is excluded from the analysis. Papers by Ott Toomet have dealt with the topic of regional labour mobility in Estonia (Toomet 2000, 2001).

Therefore, the reason behind the increase of unemployment level is not the number of unemployment incidents but the stagnant pool of unemployed and long length of unemployment spells. Small number of unemployment incidents and high long-term unemployment level is possible with a high labour reallocation rate only if labour movements take place not through the unemployment status. The stagnant pool of unemployed explains why labour mobility measured in movements between labour market statuses is low. As moving from one sector to another not through the unemployment status statistically counts for one movement. But in the opposite case when movement takes place through the unemployment status, then two movements are counted, which causes the aggregate mobility measure to be smaller.

According to the theory (Caballero, Hammour 1994) high labour mobility (in the period of structural changes) causes short-term unemployment to rise. As described earlier, mobility between statuses and mobility between jobs are different measures that might not move together. Empirical evidence from transition economies shows that labour mobility (measured in terms of movements between statuses and jobs) and the speed of structural changes might not be related. Therefore, the relationship between mobility and unemployment is not clear.

The aim of the current paper is to analyse unemployment and labour mobility using duration models in the period from the first quarter of 1997 to the second quarter of 2000. Motivated by the arguable relationship between low unemployment level and high labour mobility in Estonia in the beginning of the transition period, the paper analyses whether the increase in the unemployment rate in the end of 1990s has been accompanied by a fall in labour mobility.

The first part of the paper introduces the situation of Estonian labour market. The second part analyses labour market flows in Estonia comparing these to the results from other countries and from Estonia in the beginning of transition period. The third part of the paper discusses the duration models estimated for analysing movements out of unemployment and employment. In the end the results are analysed in comparison with the situation of labour markets in other transition economies and some policy implications are drawn.

## **1. Main Trends in Estonian Labour Market**

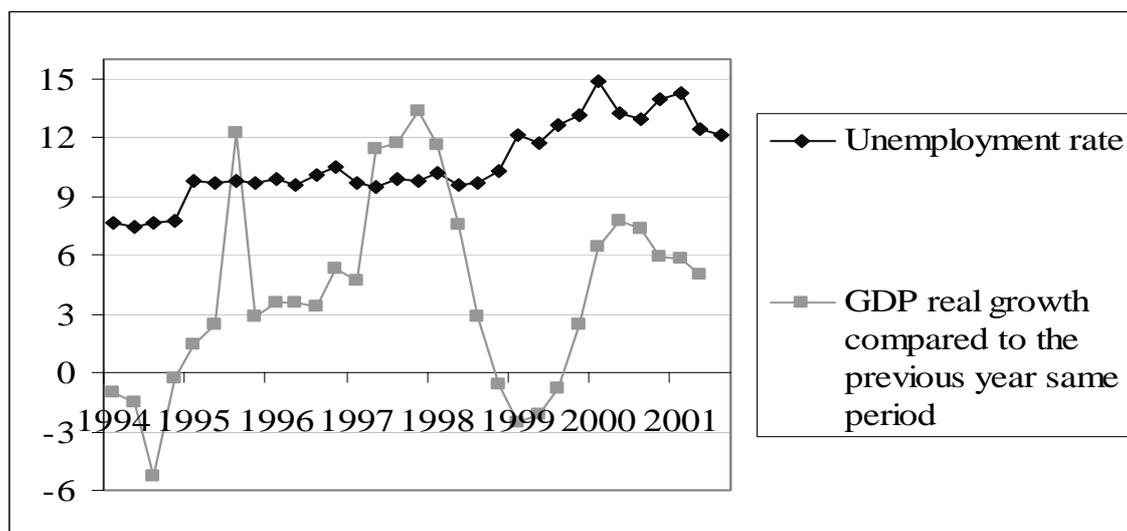
The keywords describing Estonian labour market during the transition period are fall in labour force as well as fall in labour force participation; rise in unemployment rate and labour reallocation due to the restructuring of economic activity.

In Estonia, as well as in other East European economies, labour force has been decreasing during the transition process (see Appendix 1 for the main trends in Estonian labour market). Labour force decreased by the rise of the number of non-active people and migration. As a result labour force decreased by about 130 thousand people during the past decade, while the number of non-active people has increased by only 70 thousand. The number of non-active persons increased mainly by the young and people

qualified for pensions. Despite the fall, in 2000 the labour force participation rate in Estonia was a little above the European Union average.

The usual large changes in the structure of production, which describe transition economies, took place in Estonia already in the first half of the 1990s. The increase of short-term unemployment due to the labour reallocation was lower than expected in Estonia. Instead the long-term unemployment rose, as well as the number of unemployed job searchers who quitted the search and moved to the inactive status (described in Appendix 2).

In Estonia like in other transition countries the fall of production was accompanied by the rise in unemployment (See Appendix 3 for the unemployment rate developments of Eastern and Central European countries). However, unlike other transition economies Estonian unemployment growth was slower in the beginning of the transition period (except when compared to the Czech Republic). In Estonia unemployment rate remained below 5% until the year 1993. The reason for low unemployment in Estonia has been the sharp fall in the labour force participation (Eamets 2001)<sup>2</sup>. An important factor was also the fall in real wage (Eamets 2001)<sup>3</sup>. In several papers it has been argued that unemployment rate was lowered by high labour mobility (Haltiwanger, Vodopivec 1999, Jurajda, Terrell 2000, Eamets 2001). Eamets has also argued that the low unemployment rate was caused by low unemployment benefits (Eamets 2001).



**Figure 1. Unemployment rate and GDP growth rate (%)**

Source: Labour Market; Gross Domestic Product

In the following economic growth period unemployment increased gradually which can be explained by the reconstruction of production process until 1995 when unemployment rate stabilised at 10% level. Due to foreign demand shocks unemployment increased sharply reaching 15% in 2000. At present, when economy is in the growth phase, there is a notable persistence in the unemployment rate.

<sup>2</sup> Labour force decreased in all the transition economies, but the fall in Estonia was especially deep.

<sup>3</sup> It has been found that in the former Soviet Union countries labour market changes happened through real wage, so that unemployment growth was moderate, while in other CEE countries real wage was rigid so that unemployment increased (Boeri, Terrell 2002)

Some of the stylised facts about Estonian unemployment (see also Appendix 4 for unemployment rates of separate labour force groups):

- unemployment rate is lower among Estonians compared to the whole group of other nationalities;
- from the year 1995 men have higher unemployment rate compared to women;
- by age groups the highest unemployment rate is among the young workers aged 15-24;
- by regions the highest unemployment rate is in the North-Eastern Estonia. Until 1997 Southern Estonia also had higher unemployment compared to other regions.

Labour market policy in Estonia is generally viewed as rather liberal. Minimum wage level is low<sup>4</sup> as well as unemployment benefits. Only the notification period in case of dismissal is rather long in Estonia – in most cases two months – compared to the European Union average of 12.3 days (OECD 1994). In terms of labour market policy, the share of active labour market measures is rather low<sup>5</sup>. Unemployment benefits as a percentage of average wages is lower compared to western economies and one of the lowest among transition countries<sup>6</sup>. In Estonia during the period under analysis unemployment benefits were lower than social assistance. An unemployed person is qualified to receive the unemployment benefits for 6 months, however, as it is lower than the official minimum, in reality the unemployed also receives social assistance<sup>7</sup>. So the unemployed person receives support after the end of unemployment benefits entitlement. Despite the fact that the level of both of these, the unemployment benefits and social assistance is very low, in some regions of Estonia the benefits are still considered to decrease the motivation to move from unemployment into employment.

## 2. Labour Flows in Estonia

Labour flows decompose net-employment changes. Labour market flows are analysed using a transition matrix. The matrix is built to connect two time periods and three possible statuses in the labour market: employed (E), unemployed (U) and inactive (I). The transition matrix describes nine possible transitions between labour market statuses:

$$\begin{pmatrix} EE & EU & EI \\ UE & UU & UI \\ IE & IU & II \end{pmatrix}$$

where EU, for example, describes the probability of individual moving from employment into unemployment during the period. The probability is calculated as the

<sup>4</sup> In 1998 the minimum wage was set to 1,100 EEK per month and the average wage level was 4,125 EEK per month, so the minimum wage was 27% of the average. In 1999 the share was 28% (minimum wage equal to 1,250 and average wage 4,400), in 2000 the share was 29% (minimum wage 1,400 and average wage 4,907 EEK per month). (*Sotsiaalministeeriumi haldusala arvudes 2000*)

<sup>5</sup> In 1999 the share of active labour market measures from GDP was 0.08%, which is 34% of all labour market measures. While in OECD countries the share of active measures from GDP was 0.8% and in EU 1.11% (Employment Outlook 2001).

<sup>6</sup> In 1997 unemployment benefits were 240 EEK per month, since March 1998 it is 300 EEK and since 1999 it is 400 EEK (*Sotsiaalministeeriumi haldusala arvudes 2000*).

<sup>7</sup> Social assistance from November 1997 has been 500 EEK per month, in the beginning of 1997 it was 460 EEK.

number of transitions from employment into unemployment divided by the number of people employed in the beginning of the period. The current paper follows the method used in the paper by Haltiwanger and Vodopivec (1999), where flows are calculated as changes between two time periods, for instance, January 1997 and January 1998 etc. The approach intentionally excludes short-term transitions.

Looking first at the aggregate flows in the labour market during the period from 1997 to 2000, the two periods should be distinguished. In 1997 the unemployment rate was stable, while in 1998–1999 the rate sharply increased. In Table 2.1 the increase in the flow from employment into unemployment is the first measure to describe the increase in the unemployment rate. It also indicates that the number of movements from the unemployment back to a job decreased substantially during the period, especially in 1999. Compared to the Czech Republic and the United States the measure of movements from employment into unemployment is much bigger in Estonia (Sorm, Terrell 2000; Boeri 1998). While the probability of transitions from unemployment into job is about two times lower in Estonia compared to the United States (Boeri 1998).

**Table 2.1. Labour market flows**

Period	EE	ee* <sup>8</sup>	ee	EU	UE	EI	IE	IU	UI
Jan 1997 – Jan 1998	93.0	6.7	10.7	3.2	33.2	3.8	6.9	2.5	6.9
Jan 1998 – Jan 1999	90.5	5.9	8.2	5.0	32.0	4.5	5.1	2.1	7.6
Jan 1999 – Jan 2000	90.4	5.1	8.2	5.4	27.9	4.2	5.2	2.7	6.9

Source: Estonian Labour Force Surveys 1998, 1999, 2000; author's calculations

During the period when unemployment was increasing the labour flows directly from job to job were decreasing. The result supports findings by Eamets (2001). In Table 2.1 there are two measures describing job to job transitions, the first measure counts movements across two-digit industries, describing the reallocation of labour related to the sectoral restructuring of production, and the other counts all the movements from job to job describing general mobility of labour force. The measure describing movements across sectors has decreased indicating the finishing up of reallocation process of production. Sharp fall in the general measure of movements across sectors happened in 1998. Compared to the other transition countries the probability of job to job movements is rather high throughout the whole period, reaching the level of Russia in 1997 (OECD Transition Report 2000)<sup>9</sup>.

In the paper by Haltiwanger and Vodopivec (1999) aggregate hiring and separation measures are used for analysing Estonian labour market developments. The hiring rate is defined as the sum of all movements into employment status as a share of previous period employment:

$$\text{hiring rate} = (ee_t + UE_t + IE_t) / E_{t-1}.$$

Separation rate is defined as the sum of all movements from the employment status as a share of previous period employment:

<sup>8</sup> ee\* - movements between two-digit industries.

<sup>9</sup> According to the OECD Transition Report 2000 the probability of job to job transitions is for Armenia 4.8% in 1999; for Hungary 5.4% in 1999; for Poland 4.8% in 1996 and 1998; and for Russia 10.2% in 1998. Sources are labour market surveys for Armenia, Hungary, Poland and Longitudinal Monitoring Survey for Russia.

$$\text{separation rate} = (ee_t + EI_t + EU_t) / E_{t-1}.$$

The defined aggregate measures describe general changes in employment well. In the following analysis these are useful for describing changes in labour demand.

Haltiwanger and Vodopivec showed that in 1989–1994 the separation rate increased before the hiring rate, however, by 1994 the hiring rate was slightly bigger compared to the separation rate. According to the calculations presented in Table 2.2, in 1997 the hiring rate was still higher than separation rate while both being at the lower level compared to the previous period (hiring and separation rates in 1997–1999 were lower compared to 1992–1994, being approximately the level of 1991)<sup>10</sup>. Throughout 1997–1999 the separation rate remained the same while the hiring rate decreased substantially causing the increase in the general and long-term unemployment rate. The main share of the decrease in hiring is due to the decrease in direct job to job movements. The results support the evidence from other countries, showing that in case of economic downturn it is not separation rate that increases considerably, but hiring that falls sharply (for example Ilmakunnas, Maliranta 2001).

**Table 2.2. Reallocation of labour**

Period	Hiring rate	Separation rate
Jan 1997 – Jan 1998	18.4	17.6
Jan 1998 – Jan 1999	14.8	17.7
Jan 1999 – Jan 2000	15.4	17.7

Source: Estonian Labour Force Surveys 1998, 1999, 2000; author's calculations

In the following part of the chapter movements from job to job and in and out of employment state are analysed. Labour force is differentiated by age, sector, region and educational level.

As in other countries, in Estonia younger people are most mobile in the labour market which is described by the fact that throughout the period 1997–1999 job to job movement rate as well as hiring and separation rates were the highest among the age group of 15–24. The oldest age group has the lowest rate of job to job movements as well as the hiring and separation rates. Throughout the whole period, hiring rate exceeded separation rate among young people, which is explained by the young entering the labour market for the first time.

<sup>10</sup> Note that separation and hiring rates presented in Table 2.2 are not the sum of transition probabilities presented in Table 2.1.

**Table 2.3. Labour market flows by age groups**

ee			
Period	15–24	25–49	50–69
Jan 1997 – Jan 1998	13.4	12.4	5.5
Jan 1998 – Jan 1999	12.9	8.5	5.7
Jan 1999 – Jan 2000	19.0	8.6	3.7
Hiring rate			
Period	15–24	25–49	50–69
Jan 1997 – Jan 1998	44.0	17.7	8.6
Jan 1998 – Jan 1999	35.1	13.7	8.7
Jan 1999 – Jan 2000	44.0	14.9	6.9
Separation rate			
Period	15–24	25–49	50–69
Jan 1997 – Jan 1998	25.5	18.4	12.8
Jan 1998 – Jan 1999	29.1	16.3	16.4
Jan 1999 – Jan 2000	38.2	15.4	16.2

Source: Estonian Labour Force Surveys 1998, 1999, 2000; author's calculations

In terms of geographical differentiation of labour force four separate regions are distinguished in the current analysis. In Appendix 4 it is shown that unemployment rate was the highest in Ida-Viru and Põlva Counties, in the following part these districts and the area around capital Tallinn as the centre of economic activity in Estonia are distinguished. According to the calculations the hiring rate was larger than separation in all the Counties except Ida-Viru and Põlva in 1997. In 1998–1999 separation exceeded hiring everywhere. Job to job movements were higher than average in Harju County, Ida-Viru and Põlva had lower than average job to job transition rates (except in 1998 in Põlva).

In the Haltiwanger and Vodopivec paper three regions are distinguished: Harju, Ida-Viru and the rest of the country. The results are similar to the ones from the end of 1990s. They find that in the beginning of transition, job to job flows as well as hiring and separation rates compared to the rest of Estonia were the highest in Harju County, the capital region, and lowest in Ida-Viru.

**Table 2.4. Labour market flows by regions**

ee				
Period	Harju	Ida-Viru	Põlva	The rest of the country
Jan 1997 – Jan 1998	13.6	7.2	7.2	9.2
Jan 1998 – Jan 1999	8.8	5.5	9.0	8.3
Jan 1999 – Jan 2000	10.2	4.8	4.2	7.4
Hiring rate				
Period				
Jan 1997 – Jan 1998	21.1	13.1	14.0	16.4
Jan 1998 – Jan 1999	15.4	12.4	11.8	14.0
Jan 1999 – Jan 2000	17.8	10.9	9.8	14.3
Separation rate				
Period				
Jan 1997 – Jan 1998	20.2	14.7	15.8	16.1
Jan 1998 – Jan 1999	18.4	16.8	20.4	16.7
Jan 1999 – Jan 2000	18.5	17.8	22.4	16.6

Source: Estonian Labour Force Surveys 1998, 1999, 2000; author's calculations

On the sectoral basis, hiring and firing rates are larger in industry and services. Separations exceeded hirings substantially in 1998 and 1999 in all the sectors, especially in the secondary and primary sector. In 1997 hiring rate was larger than separation rate only in the tertiary sector. Job to job movements in 1997–1998 were considerably higher in both the secondary and tertiary sector compared to the primary sector, while in 1999 job to job movements in the secondary sector exceeded the others. Haltiwanger and Vodopivec found that by 1994 job to job movements as well as hiring and separation rates were highest in trade; the lowest hiring rate was in agriculture.

**Table 2.5. Labour market flows by sector**

<b>ee</b>			
	Primary sector	Secondary sector	Tertiary sector
Jan 1997 – Jan 1998	9.1	11.0	10.8
Jan 1998 – Jan 1999	6.8	8.0	8.5
Jan 1999 – Jan 2000	7.3	9.1	7.7
<b>Hiring rate</b>			
	Primary sector	Secondary sector	Tertiary sector
Jan 1997 – Jan 1998	14.3	18.6	18.1
Jan 1998 – Jan 1999	12.2	13.4	15.2
Jan 1999 – Jan 2000	13.0	15.2	15.6
<b>Separation rate</b>			
	Primary sector	Secondary sector	Tertiary sector
Jan 1997 – Jan 1998	14.5	19.2	17.1
Jan 1998 – Jan 1999	14.9	19.8	16.6
Jan 1999 – Jan 2000	16.0	21.0	16.1

Source: Estonian Labour Force Surveys 1998, 1999, 2000; author's calculations

Differentiating labour force by educational level it is interesting to note that people with higher professional education and vocational secondary education based on secondary education have done well in the labour market in terms that hiring of the people has been larger than separations. These people had also high rate of movements from job to job. The schools belonging to the group are new or their programmes have been recently reformed and people having this type of education have acquired it rather recently.

The people doing not so well in the labour market are the ones having only basic education without any specific professional skills. From 1997–1999 the separation rate of this group exceeded the hiring rate. It is interesting to note that for this group the job to job movement rate is low.

People with higher education have larger than average job to job transition rate. During the whole period from 1997 to 1999 this group has not done so well in the labour market, only in 1999 the hiring rate exceeded separations.

**Table 2.6. Labour market flows by education \***

ee									
	1	2	3	4	5	6	7	8	9
Jan 1997 – Jan 1998	7.8	11.6	10.0	14.0		8.9	9.3	11.8	10.9
Jan 1998 – Jan 1999	7.0	7.6	12.7	8.6	8.5	7.3	7.0	9.3	8.7
Jan 1999 – Jan 2000	7.3	9.1	7.1	8.8	9.0	7.9	6.7	9.3	8.4
Hiring rate									
	1	2	3	4	5	6	7	8	9
Jan 1997 – Jan 1998	16.2	20.6	15.3	23.6		15.0	14.3	23.3	15.1
Jan 1998 – Jan 1999	15.5	14.8	18.9	16.1	14.9	12.2	12.2	21.4	12.2
Jan 1999 – Jan 2000	16.7	17.2	12.0	17.9	24.3	13.1	12.5	16.7	13.6
Separation rate									
	1	2	3	4	5	6	7	8	9
Jan 1997 – Jan 1998	18.6	19.0	21.3	19.9		14.7	14.7	13.6	16.2
Jan 1998 – Jan 1999	20.5	18.5	25.6	18.8	13.8	15.7	15.3	15.0	13.4
Jan 1999 – Jan 2000	25.8	19.5	17.6	18.8	18.5	15.3	15.7	15.2	12.7

Source: Estonian Labour Force Surveys 1998, 1999, 2000; author's calculations

\* The description of education levels:

- 1 – basic education,
- 2 – secondary education,
- 3 – vocational education with basic education,
- 4 – vocational education with secondary education,
- 5 – vocational secondary education based on secondary education,
- 6 – professional education based on basic education,
- 7 – professional education based on secondary education,
- 8 – higher professional education,
- 9 – bachelor or higher education.

It is hard to draw so clear conclusions from other education levels. In 1997 there seemed to be demand for labour of some specific education groups. 1997 hiring rate exceeded firing for people with only secondary education without specific skills, also people with vocational education acquired after secondary education as well as people with professional education acquired with secondary education. With the exception of professional education people who have the traditional secondary education and have or have not acquired any profession after that seemed to do well in the labour market. Those people had also high rate of movements from job to job.

Later in 1998–1999 the situation changed and people with secondary education were not successful any more. Their job to job transition rate was low and separations exceeded hiring. The ones still doing well were people with higher and higher professional education and vocational secondary education based on secondary education. It seems that for all the other educational groups the labour market conditions became unfavourable<sup>11</sup>.

<sup>11</sup> These results support by large the survey by Phare Regional Development Project and Ministry of Economics which revealed that enterprises find it most difficult to find skilled workers, but much easier to find specialists and no problem at all finding manual workers (*Regionaalse töajärgu olukorrad, 1999*).

To sum up:

- Mobility in the labour market has decreased compared to the first half of the nineties. Large share in the decrease of overall mobility is due to the fall in the flow from job to job. The rise in unemployment rate has taken place while the separation rate has not risen, but the hiring rate has decreased substantially.
- The rise in unemployment rate in the aggregate as well as disaggregate level has always been accompanied by a fall in direct job to job movements.
- As in other countries, more mobile group in the labour market is the young having the highest rates in job to job movements as well as transitions in and out of employment.
- Regionally labour force is more mobile in the capital region, being less mobile in Ida-Viru and Põlva, considering movements directly from job to job. Largest movements out of employment have taken place in Põlva and Ida-Viru, where the separation rate has substantially exceeded the hiring rate throughout the whole period.
- On the sectoral basis hiring and firing rates are larger in industry and services. In 1997–1998 job to job movements were higher in the secondary and tertiary sector, while in 1999 job to job movement rate in the secondary sector exceeded substantially the measure in the other sectors.
- People with higher, professional higher and vocational secondary education based on secondary education have the highest job to job transition rates. People with higher professional and vocational secondary education based on secondary education have also the hiring rates exceeding separation rates. In 1997 the other favourable groups in the labour market were people with the usual secondary education with or without any vocational education acquired later and people with professional education acquired with secondary education. These groups had later low level of job to job mobility and separations exceeding hiring, at the same time people with higher education became more successful in the labour market.

### 3. Modelling Labour Market Using Duration Models

#### 3.1. Specification of the Models

Cox proportional duration model is used in the paper to model labour market movements (see Lanchaster 1990). In duration models the hazard rate of leaving employment or unemployment status is modelled. Hazard rate describes the conditional probability of leaving employment/unemployment status in the following short time period on the condition that the individual is then still employed/unemployed. When the random variable  $T$  describing the duration of the period spent in the labour market status is described by distribution function  $F(t) = P(T < t)$  and density function  $f(t) = dF(t)/dt$ , then the survivor function  $S(t)$  is defined as:

$$S(t) = 1 - F(t) = P(T \geq t), \quad (3.1)$$

and hazard function can be written as:

$$h(t) = \frac{f(t)}{S(t)}. \quad (3.2)$$

In the paper the hazard for the  $i$ -th observation is assumed to be of the form:

$$h_i(t) = h_0(t) \cdot \exp(\beta' \underline{x}_i) , \quad (3.3)$$

where  $h_0$  – describes non-parametrically specified baseline hazard;  
 $\beta$  – is a vector of parameters;  
 $\underline{x}$  – is a vector of time invariant variables.

In the current paper three separate models are estimated, where the dependent variables are:

- 1) hazard of leaving the state of unemployment to employment;
- 2) hazard of leaving the state of employment to unemployment;
- 3) hazard of moving from one job to another.

Both censored and uncensored observations contribute to the likelihood function to be maximised. In case of modelling the hazard of leaving unemployment, the spell is considered censored when the person leaves the labour force. In case of the hazard of leaving employment to unemployment, spells are considered censored when a person moves to another job and vice versa (in case of the hazard of moving from job to job spells ending in unemployment are considered censored).

### 3.2. Data description and analysis

Data used in the analysis is from Estonian Labour Force Surveys. It covers the period from the 1st quarter of 1997 to the 2nd quarter of 2000. There are 3 different surveys and samples: ETU98, ETU99 and ETU00. All of the surveys were conducted in the second quarter of each year. The surveys had the backward looking part with questions covering the period of about 5 quarters from the beginning of previous year and questions covering the situation during the survey week. In the paper all the three described models are estimated for the three samples:

- 1) ETU98: period 1st quarter of 1997 to 2nd quarter of 1998,
- 2) ETU99: period 1st quarter of 1998 to 2nd quarter of 1999,
- 3) ETU00: period 1st quarter of 1999 to 2nd quarter of 2000.

Estonian Labour Force surveys are sample surveys. In the current paper the weighted sample is used for estimations. The weights are chosen by the State Statistical Office to adjust for age and geographical region.

In modelling the hazard of leaving unemployment all the spells, which began before the survey period, are excluded from the sample. For example in case of ETU98 the sample includes the spells, which start during the period from I quarter of 1997 until II quarter of 1998. This results in underestimation of unemployment duration. But in case all the unemployment spells are included, the duration would be overestimated.

In modelling the hazard, which describes leaving from employment status, all the spells are included in the sample. As stated, in this case we will overestimate the length of the average employment spell. The different sample design is based on the assumption that employment spells are on average described by longer duration but unemployment is generally short term.

Most of the unemployed only have one unemployment spell during the observed period, the maximum number of spells is three. Dominant number of employment incidence is also one, maximum is six.

The length of the average finished unemployment period<sup>12</sup> has increased in the end of 90s compared to Kulikov's (1999) results in the period 1989–1995. The standard deviation has also increased. The lengths and standard deviations of unemployment spells are presented in Appendix 5.

The description of explanatory variables and characteristics of samples are presented in Appendix 6 and 7. Spells are differentiated by demographic characteristics like nationality, sex, age and education. By age people are divided into three groups: aged between 15–24, 25–49 and 50–74. By education there are four groups: higher education, vocational/professional education, secondary education without specialisation and basic education without specialisation. Local labour market situation is described by geographical situation (individual's residence location). Two regions are separated: Harju County, which is the area around capital Tallinn, being a centre of economic activity and having especially high share of tertiary sector employment, and Ida-Viru County, which is the area in the eastern part of Estonia described by decreasing industries, big enterprises and pure labour demand conditions right now. Põlva County, which is also described by high unemployment rate, is not separated due to the small size (as Ida-Viru counts for more than one fifth of Estonia's unemployment, the share of Põlva is much smaller). By previous work experience people are divided into three groups: previous employment in primary, secondary or tertiary sector. Not all the unemployed persons have previous work experience; these form the fourth group.

In modelling the hazard of leaving unemployment status the base group is the unemployed who have not been employed (or have not been employed during the last 9 years), aged 25–49, non-Estonians, men, living outside Harju and Ida-Viru regions, with vocational/professional education. In modelling the hazard of leaving employment status the base group is the employed who work in the secondary sector, aged 25–49, non-Estonians, men, living outside Harju and Ida-Viru regions, with vocational/professional education.

### **3.3. Estimation Results**

#### **3.3.1. Model 1: Movement from Unemployment to Employment**

All the models are statistically significant while several explanatory variables included in the models are not. Estonian nationality has a strong positive influence on the hazard rate of leaving unemployment to job. The effect captures the influence of language abilities, sectoral and geographical factors. Large part of non-Estonians do not have good knowledge of Estonian language, which gives them disadvantage in the labour market, especially in the service and public sectors. The other effect which nationality might capture is that non-Estonians are employed mainly in decreasing sectors and have the education specific to these sectors. The third influence is the regional labour market differences. Large population of non-Estonians lives in Ida-Viru where the labour

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<sup>12</sup> Finished unemployment period ends with employment status.

demand is really low. The coefficient for Ida-Viru is not statistically significant. Therefore, the regional effect might have been captured by the Estonian nationality variable. The other explanatory variable describing the regional labour market situation is significant; Harju County – the area around capital Tallinn – has positive influence on the hazard of leaving unemployment status.

It is interesting to note that the importance of nationality and Ida-Viru region has decreased by the end of the period under analysis. In 1997–1998 non-Estonians including people living in Ida-Viru had substantially more difficulties in finding a job compared to Estonians and non-Estonians living in other areas of the country. The decrease in labour demand equalised the situation of these labour market groups.

The important result is that education seems to be a significant factor determining the hazard of leaving unemployment during the time period from the 1st quarter of 1998 to the 2nd quarter of 1999. There is a significant negative effect of having only basic or secondary education. The negative effect of basic education is larger in absolute value than the negative effect of secondary education. Thus, according to the estimations during the period of sharp rise in the aggregate unemployment rate people without any professional education had difficulties in finding jobs, especially if they had only basic education.

**Table 3.1. Estimation results: model 1**  
(Dependent variable: hazard of movement from unemployment to employment)

	ETU98	ETU99	ETU00
Estonian	0.372 (2.27)	0.512 (3.01)	0.288 (1.47)
Women	0.113 (0.88)	-0.206 (-1.58)	-0.379 (-2.20)
Harju	0.361 (2.49)	0.241 (1.61)	0.458 (2.40)
Ida-Viru	-0.112 (-0.49)	-0.102 (-0.50)	-0.063 (-0.24)
Aged 15–24	-0.154 (-0.82)	-0.094 (-0.57)	-0.358 (-1.44)
Aged 50–74	-0.080 (-0.39)	-0.011 (-0.06)	-0.111 (-0.48)
Primary_s	-0.662 (-2.93)	-0.756 (-2.74)	-1.169 (-2.90)
Secondary_s	-0.363 (-2.03)	-0.593 (-3.64)	-0.783 (-3.81)
Tertiary_s	-0.576 (-3.16)	-0.530 (-3.62)	-0.576 (-3.13)
Basic	-0.277 (-1.35)	-0.582 (-2.97)	-0.119 (-0.47)
Secondary	-0.143 (-0.82)	-0.247 (-1.72)	0.115 (0.58)
Higher	0.020 (0.09)	0.144 (0.63)	0.322 (1.06)
Log likelihood	-2159.109	-2189.826	1032.789
Prob > chi2	0.0004	0.0000	0.0000

z-statistics in parenthesis

According to the estimation results, previous employment has negative effect on the hazard of leaving unemployment to a job. The negative effect is always the greatest in absolute value in case of primary sector previous employment. However, during the first period, I quarter of 1997 until II quarter of 1998, in absolute value the negative effect was greater in case of tertiary sector, while in case of two last samples the negative effect was greater in case of secondary sectors indicating the changes taken place in labour demand.

In the model estimated using the last sample, which covers the time period from I quarter of 1999 to II quarter of 2000, there are two other effects statistically significant, which separately were not statistically significant in previous samples – women and persons aged between 15 and 24, who have negative effect on hazard describing leaving the unemployment status.

Looking at aggregate data it is observed that in the later period unemployment rate of young people increased. Still in aggregate numbers unemployment rate of young people in Estonia is not higher than in other European countries. It is common that the young need time to enter the labour market. The critical factor is the duration of unemployment among young people. If the duration becomes higher it shows that some groups of young people have severe difficulties in finding a job. It might describe the mismatch of education provided in schools and needed in the labour market.

For some factors the results are similar to the ones obtained for the period 1989–1995 in the paper by Kulikov (1999). As in the presented estimations, Kulikov observes the positive effect on hazard by education, Estonian nationality and living in the capital area, while negative effect by work experience in agriculture. He observes no statistically significant effect of sex, which is in line with the estimates obtained for the samples covering the 1st quarter of 1997 to the 2nd quarter of 1999. There are differences between Kulikov's results and the ones obtained in the current paper in terms of the impact of age on the hazard. Kulikov finds that when the whole period from 1989 to 1995 is considered, the hazard decreases with age, while in 1994–1995 both young and older people have lower hazard when comparing with the prime aged labour force. The results partly confront the estimates obtained in the current paper. In the estimations for I quarter 1997 to II quarter 1999, age had no significant effect. While for the period from I quarter of 1999 to II quarter of 2000, younger people had lower hazard rate. The differences in the impact of age can be explained by the progress in transition process. In the beginning of transition, when large restructuring of production took place, older people had the qualifications, which were not so much needed in the labour market any more. Therefore, they experienced more difficulties in finding a job when the unemployed and in many cases they left the labour force. The situation in the labour market has changed during the past decade in the sense that work experiences are more valued and now younger people find it difficult to enter the labour market.

### **3.3.2. Model 2: Movement from Employment to Unemployment**

The hazard of moving from employment to unemployment is influenced positively by age between 15 and 24 and basic level education, ie most vulnerable people in the

labour market considering the probability of becoming unemployed are the young and low-educated persons.

There are several characteristics, which have negative effect on the hazard of moving into unemployment. It is interesting to note that people with higher education came into more favourable situation in the latter periods when unemployment rate was rising rapidly.

An especially important factor determining the probability of becoming unemployed is higher education. It decreases the hazard of moving to unemployment indicating that even when there is no difference in the duration of unemployment for people having higher education from the ones with vocational/professional education, there is difference in becoming unemployed. The insignificance of secondary education variable in the latter period indicates that people with professional/vocational education do as well in the labour market as people with secondary education but without any specific qualifications.

**Table 3.2. Estimation results: model 2**  
(Dependent variable: hazard of movement from employment to unemployment)

	ETU98	ETU99	ETU00
Estonian	-0.267 (-1.90)	-0.207 (-1.85)	-0.343 (2.30)
Women	-0.323 (-2.87)	-0.398 (-4.32)	-0.367 (-3.14)
Harju	0.226 (1.77)	0.159 (1.51)	0.087 (0.64)
Ida-Viru	-0.148 (-0.90)	0.149 (1.11)	-0.062 (-0.31)
Aged 15–24	0.559 (3.46)	0.767 (6.30)	0.809 (4.71)
Aged 50–74	-1.065 (-5.90)	-0.782 (-6.10)	-0.685 (-4.26)
Primary_s	-0.268 (-1.67)	-0.348 (-2.10)	-0.356 (-1.67)
Tertiary_s	-0.324 (-2.60)	-0.273 (-2.78)	0.092 (0.73)
Basic	0.597 (3.66)	0.426 (3.33)	0.630 (3.68)
Secondary	0.303 (2.24)	0.104 (0.97)	0.011 (0.07)
Higher	-0.304 (-1.53)	-0.719 (-4.33)	-0.566 (-2.47)
Log likelihood	-4380.444	-5801.631	-2921.232
Prob > chi2	0.0000	0.0000	0.0000

z-statistics in parenthesis

The significant negative effect on the hazard describing movements into unemployment is by age 50–74 variable. The effect is probably caused by the fact that older people have longer employment periods and when losing a job they tend to leave the labour force.

According to the estimations Estonians and women have lower hazard rate when moving into unemployment. It indicates that Estonians and women have longer employment spells and also lower probability of becoming unemployed, resulting in lower aggregate unemployment rate.

### 3.3.3. Model 3: Movement from Job to Job

Regional labour market characteristics affect job to job mobility. In the region of capital Tallinn, described by high economic activity, employees are more likely to move from job to job. While in Ida-Viru County, where labour market is described by high unemployment rate and few big companies, people are less likely to move from job to job.

The other significant factor is age. According to estimations younger people have higher hazards in moving from job to job, while older people have significantly lower hazard. The reasons could describe younger people searching for better opportunities in the labour market while the older tend to stay at one job for a longer time.

**Table 3.3. Estimation results: model 3**  
(Dependent variable: hazard of movement from job to job)

	ETU98	ETU99	ETU00
Estonian	0.056 (0.46)	0.353 (3.07)	0.193 (1.10)
Women	-0.680 (-6.95)	-0.357 (-4.20)	-0.265 (-1.93)
Harju	0.304 (3.12)	0.314 (3.35)	0.422 (2.76)
Ida-Viru	-0.491 (-3.06)	-0.284 (-1.81)	-0.518 (-1.87)
Aged 15–24	0.866 (6.55)	0.867 (6.27)	1.428 (7.34)
Aged 50–74	-1.319 (-7.44)	-0.985 (-8.09)	-1.877 (-7.57)
Primary_s	-0.288 (-1.76)	-0.118 (-0.79)	-0.148 (-0.66)
Tertiary_s	0.027 (0.28)	-0.051 (-0.55)	-0.102 (-0.67)
Basic	-0.275 (-1.73)	-0.094 (-0.67)	0.185 (0.79)
Secondary	-0.015 (-0.12)	0.003 (0.03)	0.128 (0.79)
Higher	0.011 (0.09)	-0.080 (-0.68)	0.423 (2.34)
Log likelihood	-7638.812	-6679.384	-2649.482
Prob > chi2	0.0000	0.0000	0.0000

z-statistics in parenthesis

Employment in primary sector is a statistically significant factor decreasing the job to job movement hazard only from I quarter of 1997 to II quarter of 1998. According to the estimations it can be concluded that when general labour demand decreased then job to job mobility fell in all the sectors and the other factors determining the job to job movement rate became more important.

Women tend to have lower job to job movement hazard compared to men throughout the whole period. The evidence is supported by the estimations from the previous model where it was also shown that women have in general longer employment spells.

From educational factors in the period from I quarter of 1999 to II quarter of 2000 people with higher education had higher hazard in moving from job to job. While in the period from I quarter of 1997 to II quarter of 1998 people with basic education had lower hazard in moving from job to job. There is no significant effect of any education variable during the year 1998 and the two first quarters of 1999. When comparing the results with the ones from flows analysis it can be seen that differences in education are less important according to the duration model estimates.

### **3.4. Discussion of the Results**

To sum up the results from the estimated models it is possible to distinguish certain groups in Estonian labour market who do better or worse in terms of movements between labour market statuses. The more successful group includes Estonians, inhabitants of Harju County and people with higher education:

- Estonians move a lot directly from job to job, as well as when unemployed they have high hazard of moving out of unemployment and on top they have low hazard in moving into unemployment.
- People from the area of capital (Harju County) are also active in the labour market moving a lot from job to job and when becoming unemployed they have high hazard in moving out of unemployment.
- The third group doing well is people with higher education. They move more directly from job to job and have lower hazard in movements into unemployment. The importance of higher education was especially strong during the period when the aggregate unemployment rate was sharply rising. The problem with the people with higher education level is that they do not have higher hazard in moving out of unemployment. This might indicate that there is some structural mismatch or that in case of higher education unemployment periods are viewed as very negative signals in the labour market.

Less successful group includes people with only basic education. They are described by lower hazard rate in leaving unemployment status and higher hazard in moving into unemployment.

Young people have the same relative hazards but they also have high hazard in moving directly from job to job, which indicates that the young are in general more flexible in the labour market. The negative factor is the low hazard in moving out of unemployment in the period from I quarter of 1999 to II quarter of 2000. Due to the rising persistence in youth unemployment, the situation of the young in the labour market should be carefully monitored.

The results from the estimated models for Estonian labour market are not unusual and are in fact quite similar to other transition economies (See Appendix 8). Only two exceptions are to be discussed.

It is important to note that no persistence in youth unemployment is observed in other transition countries. Youth unemployment rate is high in all the transition economies, however, in general the unemployment is short-term. In duration model estimations it is generally found, similarly to Kulikov's results (1999) in Estonia for the period 1989–1995, that the hazard of leaving unemployment decreases with age<sup>13</sup>. It could be argued that the reasons for the persistence in the youth unemployment in Estonia are general economic conditions and mismatch of education given in vocational schools:

- Youth unemployment is an especially important problem during economic downturn. As during economic depression, hiring falls more than separations increase, therefore, young people find it especially difficult to enter the labour market.
- Estonian vocational education system is much criticised for being oriented to the old decreasing sectors of economy. The qualifications acquired in these schools are not demanded in the labour market, which results in the structural unemployment of young people.

The importance of education determining the individual's success in the labour market is common in all the transition countries. Considering the duration of unemployment, an interesting exception is Russia where during 1992–1994 education had no effect on unemployment duration<sup>14</sup>. This can be explained by special features of the former Soviet Union education system. The share of people with higher education is much larger in Russia, as well as in other former Soviet Union countries including Estonia, compared to other transition economies. During the restructuring process, higher education level was not the factor affecting individual's labour market performance.

The importance of higher education, as well as the share of people with higher education, should increase in the future when Estonia loses its low labour cost advantage. However, as mentioned earlier, Estonia needs a vocational education system reform, so that young people with professional skills entering the labour market would be qualified in the areas demanded in the labour market. Highly qualified labour should ensure the competitiveness of Estonian economy in the future.

In the European Union as well as in the United States it is widely researched topic whether an unemployment experience early in one's working life has some effect on the individual's latter labour market progress. Whether unemployment periods of the young effect their working habits, decrease their qualifications and make them less productive will be a question for the researchers in Estonia for a couple of decades.

The efficient labour allocation and high labour force participation rate are important for Estonia in general, as they influence the level of potential output and economic growth.

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<sup>13</sup> In several transition countries the decreasing effect of age on the hazard of leaving unemployment status has been found, for example Hunt (1999) in East Germany in 1990–1996; Wolff (1997) in Hungary in 1990–1994, Lubyova, van Ours (1999) in Slovakia in 1993–1998; Ham, Svejnar, Terrell (1998) for the Czech Republic and Slovakia in 1991–1993; Grogan, van den Berg (1999) in Russia in 1994–1996.

<sup>14</sup> Foley (1997) noted that education has no effect on the hazard describing leaving the unemployment status.

Efficient allocation of young work force is even more important considering the age distribution of Estonian population and expected demographic changes. The ageing of Estonian population creates a risk of lower output growth in the future. Efficient use of available labour will be a way to prevent it.

Labour market flexibility, with one of the components being labour mobility, is especially important for Estonia, as in the currency board system Estonia is unable to conduct its own monetary policy. The next step from labour mobility is the discussion of labour market institutions, when we consider rigidities. Estonia is in the middle of reforming its institutional system of labour market. Increasing labour market rigidities has especially strong effect on labour market groups described by low mobility. When labour force mobility is low, policy makers should be especially careful in terms of labour market institutions, which might decrease employment level.

## **Conclusion**

The paper analysed unemployment and labour transitions between labour market statuses from the 1st quarter of 1997 to the 2nd quarter of 2000. During the period unemployment rate increased in Estonia. The sharp rise in the unemployment rate started in the end of 1998 and peaked in the beginning of 2000. The average spell of unemployment period increased very moderately.

Labour mobility in Estonia has decreased substantially when comparing to the mid-1990s. The decrease of the measure of job to job movements indicates the end of restructuring process. From flow calculations and duration model estimates it can be concluded that most mobile groups in Estonian labour market during the period from I quarter of 1997 to II quarter of 2000 are Estonians, people living in the area of capital Tallinn and individuals with higher education. Group of young people is an exception. Generally the unemployment rate of the young is high, while mobility of young labour force is also high. At least until recently the group of young people is described by mainly short-term unemployment, but lately there is evidence of some persistence in the unemployment of the young.

The results from the paper indicate that unemployment rate and labour mobility measure have inverse relationship. In an aggregate level the results show that the unemployment rate increase was accompanied by a fall in labour mobility. In a disaggregate level the same phenomenon is observed: more mobile groups of labour have lower unemployment rates and vice versa.

It should be noted that the observed inversely related trends of labour mobility and unemployment might not indicate causal relationship between the two factors. The reasons for low labour mobility might be the lower number of jobs created not the workers' preferences. Available data used in the current paper did not allow analyse job creation and job destruction, which should be the topics for future research.

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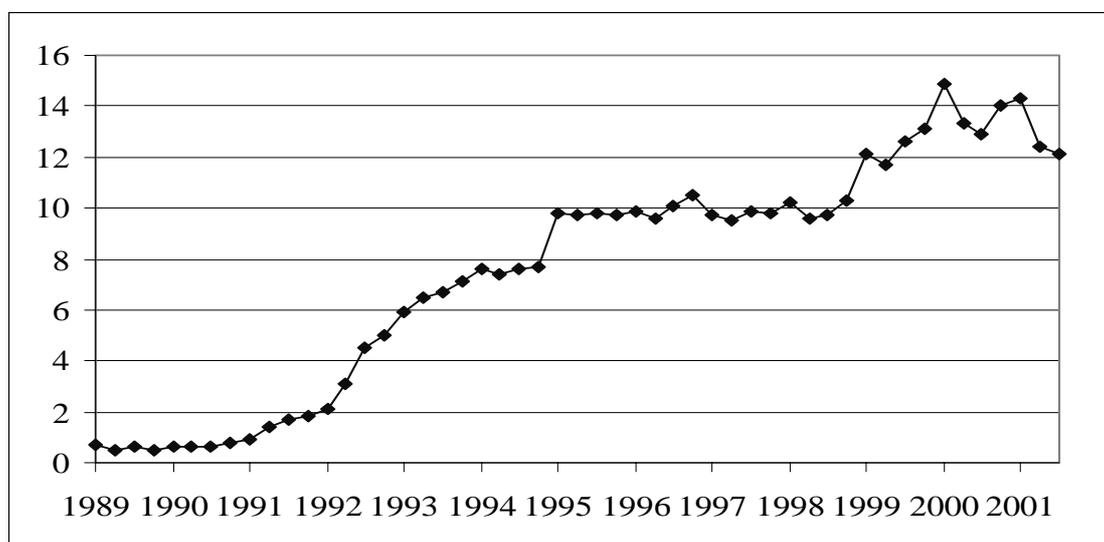
## Appendix 1. 15–69 year olds by economic activity

**Table 1. 15–69 year olds by economic activity**

	1990	1991	1992	1993	1994	1995
Total of aged 15–69	1102.3	1104	1101.2	1079.9	1069.4	1061.6
Labour force	831.7	819.8	794.8	757.8	749.4	726.9
Employed	826.4	807.8	765.7	708.1	692.6	656.1
Part-time job, %	3.4	3.6	4.1	5.0	5.9	7.8
Including underemployed, %	1.6	1.8	2.2	2.7	3.0	4.7
Unemployed	5.3	12	29.1	49.6	56.8	70.9
Inactive persons	270.5	284.2	306.4	322.1	320.1	334.6
Labour force participation rate, %	75.5	74.3	72.2	70.2	70.1	68.5
Unemployment rate, %	0.6	1.5	3.7	6.6	7.6	9.7
	1996	1997	1998	1999	2000	2 <sup>nd</sup> quarter 2001
Total of aged 15–69	1054.1	1047	1044.2	1042.5	1042.7	<b>1042.7</b>
Labour force	717.6	713.5	706.4	696.3	700.9	<b>695.9</b>
Employed	645.6	644.1	636.2	610	604.5	<b>609.3</b>
Part-time job, %	9.3	7.5	8.5	7.8	9.2	<b>7.4</b>
Including underemployed, %	5.3	4.8	4.5	4.5	2.8	<b>2.5</b>
Unemployed	71.9	69.4	70.2	86.2	96.5	<b>86.6</b>
Inactive persons	336.5	333.6	337.8	346.2	341.7	<b>346.8</b>
Labour force participation rate, %	68.1	68.1	67.6	66.8	67.2	<b>66.7</b>
Unemployment rate, %	10	9.7	9.9	12.4	13.8	<b>12.4</b>

Measurement unit: thousands, annual average

Source: Labour Market



Source: Labour Market

**Figure 1. Unemployment rate (%)**

## Appendix 2. Unemployed and inactive persons

**Table 1. Unemployed by the length of the unemployment period**

	1993	1994	1995	1996	1997	1998	1999	2000
Men								
Up to 6 months	10.5	11.3	15	10.8	12.8	14.1	16.4	21.7
7–12 months	7.8	5.9	11.1	5.3	8.6	7.7	9.8	6.9
More than 12 months	7.7	11.7	14.5	24.3	16.5	18.2	23.4	25.1
TOTAL	26	28.9	40.6	40.4	37.9	40	49.6	53.6
Women								
Up to 6 months	11.2	10.7	13.5	10.5	10	10.3	13.2	18.3
7–12 months	6.3	6.3	8.8	5.6	6.2	5.1	7.4	6.8
More than 12 months	6.2	10.8	8	15.5	15.3	14.8	16.1	17.7
TOTAL	23.7	27.8	30.3	31.6	31.5	30.2	36.7	42.8

Measurement unit: thousands

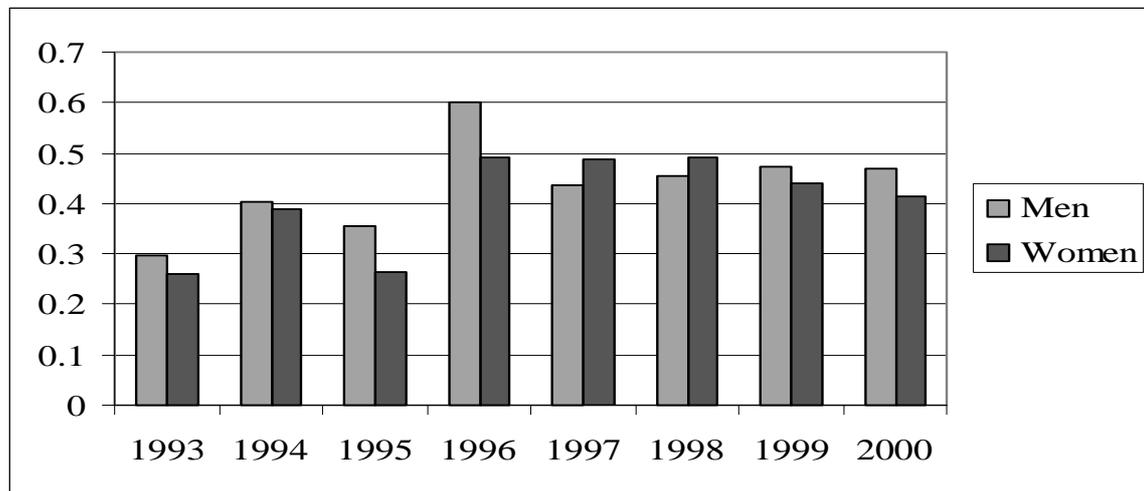
Source: Labour Market

**Table 2. Inactive, including the discouraged persons**

	1993	1994	1995	1996	1997	1998	1999	2000
Men								
Discouraged persons (lost hope of finding a job)	6.2	6.6	9.1	11.2	7.9	10.7	11.4	13
Total of inactive persons	112.6	112.2	121.5	125.1	123.1	127.7	132.6	130.9
Women								
Discouraged persons (lost hope of finding a job)	4.4	6.5	5.6	6.8	8.2	8.2	9.6	10.9
Total of inactive persons	209.5	207.8	213.2	211.4	210.4	210.1	213.6	210.8

Measurement unit: thousands

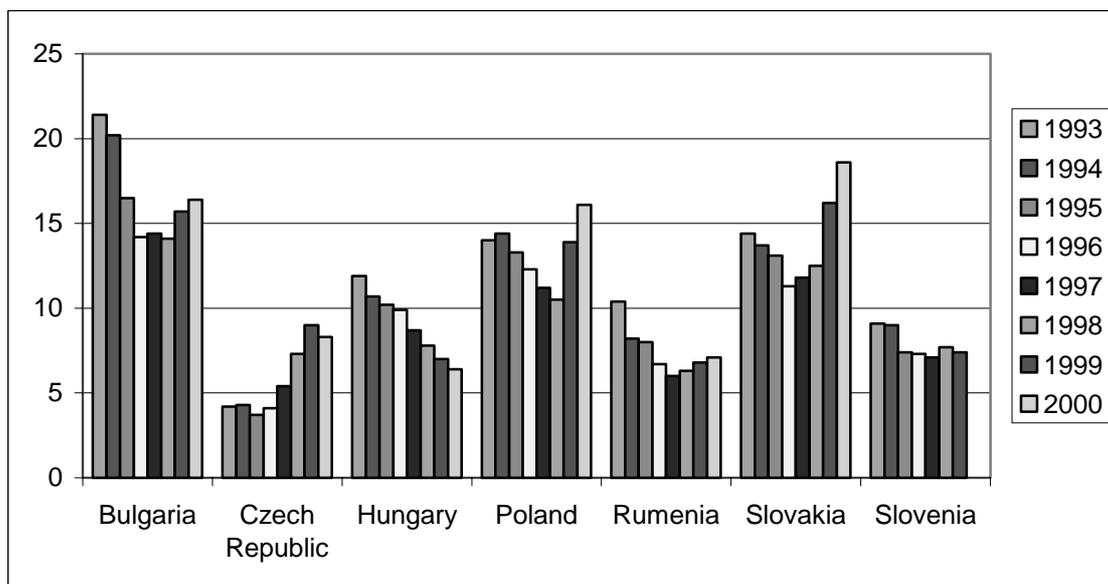
Source: Labour Market



Source: Labour Market

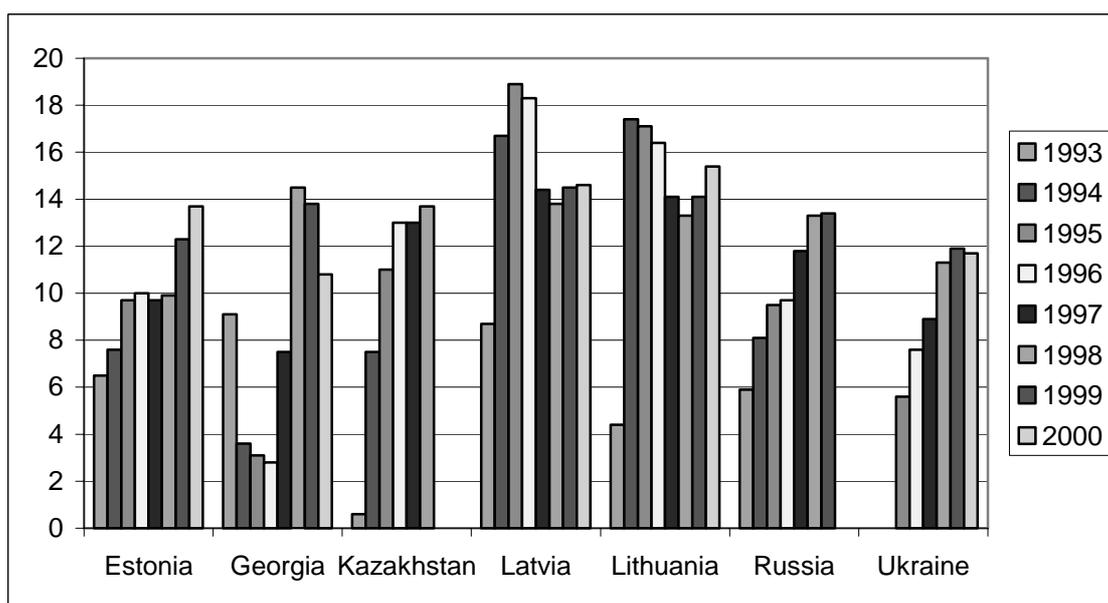
**Figure 1. The share of long-term unemployed (the unemployment period over 1 year) in the total pool of unemployed persons**

### Appendix 3. Unemployment rate in Central and Eastern European countries



Source: International Labour Organization

**Figure 1. Unemployment rate in the CEE countries**



Source: International Labour Organization

**Figure 2. Unemployment rate in the former USSR countries**

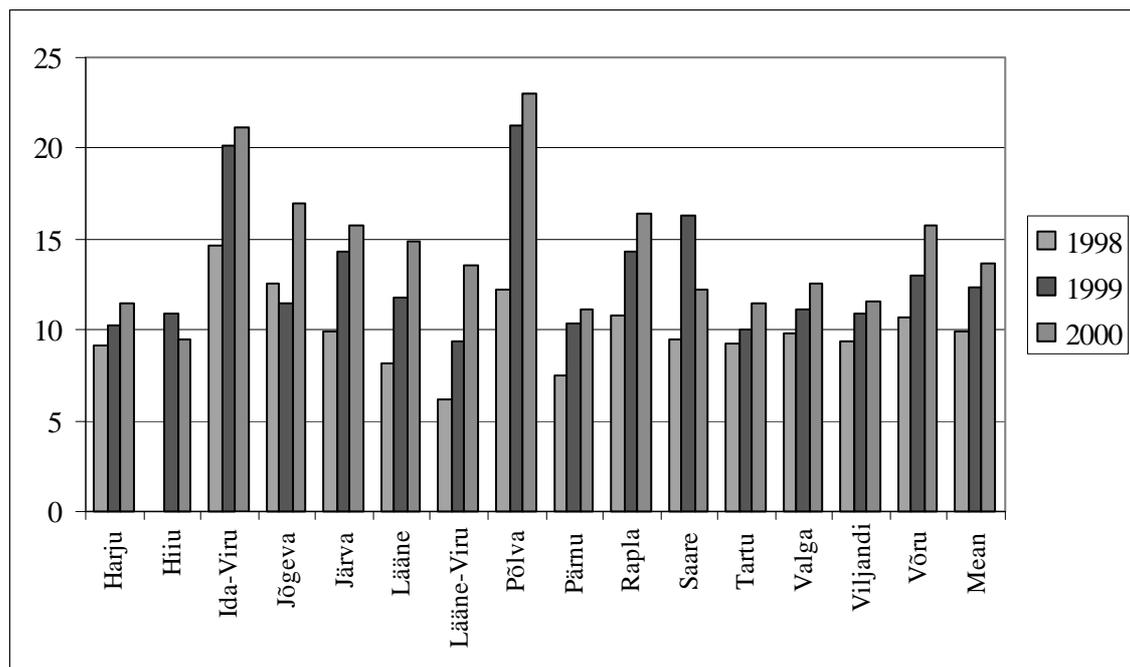
## Appendix 4. Unemployment rate by regional and personal characteristics

**Table 1. Unemployment rate**

	1993	1994	1995	1996	1997	1998	1999	2000
City	6.5	7.4	9.4	9.6	9.0	9.6	12.1	13.6
Countryside	6.6	8.0	10.6	11.1	11.3	10.5	12.9	13.8
Estonians	5.2	6.0	7.7	7.8	7.8	7.9	9.9	11.2
Non-Estonians	9.1	10.6	13.5	14.0	13.3	13.7	16.7	18.1
<b>Men</b>								
Aged 15–24	9.6	11.5	12.9	15.5	15.8	16.8	20.6	24
Aged 25–49	6.4	7	11	10.4	9.6	10.5	13.3	13.4
Aged 50–69	4.6	5	7.7	8.4	7.8	7.8	10.4	12.5
Aged 15–69	6.5	7.3	10.6	10.7	10.1	10.8	13.6	14.7
<b>Women</b>								
Aged 15–24	13	11.8	15.8	16.6	12.4	14.3	18.7	23.7
Aged 25–49	6.4	8.1	8.4	9	10.4	9.6	11.3	12.4
Aged 50–69	3.9	5.1	6.1	6	4.2	4.3	6.8	8.9
Aged 15–69	6.6	7.9	8.8	9.2	9.3	8.9	11	12.8

Annual average, %

Source: Labour Market



Annual average, %, population aged 15–74

Source: Regional Statistics: Labour market, Statistical Office of Estonia.

\* Data is not available when the sample size is less than 20 persons (for example Hiiu county in 1998)

**Figure 1. Unemployment rate by counties**

## Appendix 5. Length of average unemployment spell

Year	Average length in months	Number of periods	Standard deviation
1989 <sup>1</sup>	3.043	23	1.637
1990 <sup>1</sup>	3.904	59	2.637
1991 <sup>1</sup>	5.083	96	4.106
1992 <sup>1</sup>	6.569	211	5.880
1993 <sup>1</sup>	7.818	385	5.900
1994 <sup>1</sup>	9.904	481	8.848
1995 <sup>1</sup>	11.514	74	10.659
1997	17.783	387	17.031
1998	17.787	338	22.626
1999	16.741	197	18.231

Sources: <sup>1</sup> Kulikov (1999), Estonian Labour Force Surveys 1998, 1999, 2000 and authors calculations

\* Spells completed in employment

## Appendix 6. Description of variables

Variable	Description
Estonian	Nationality Estonian
Women	Women
Harju	Living in Harju county (region of capital Tallinn)
Ida-Viru	Living in Ida-Viru county (region of decreasing economic activity)
Aged 15–24	Aged between 15 and 24 years
Aged 25–49	Aged between 25 and 49 years
Aged 50–74	Aged between 50 and 74 years
Primary_s	(Previous) employment in primary sector
Secondary_s	(Previous) employment in secondary sector
Tertiary_s	(Previous) employment in tertiary sector
Higher	Higher education
Vocational/professional	Vocational education acquired with/after secondary education
Secondary	Secondary education without specific skills
Basic	Basic education without specific skills

## Appendix 7. Sample characteristics

**Table 1. Unemployment periods**

Statistic	ETU98 mean	ETU99 mean	ETU00 mean
Estonian	0.602	0.593	0.575
Women	0.444	0.432	0.469
Harju	0.450	0.423	0.415
Ida-Viru	0.138	0.162	0.154
Aged 15–24	0.265	0.251	0.227
Aged 25–49	0.595	0.604	0.601
Aged 50–74	0.140	0.146	0.172
Primary_s	0.077	0.066	0.054
Secondary_s	0.321	0.371	0.317
Tertiary_s	0.356	0.387	0.429
Basic	0.190	0.195	0.199
Secondary	0.297	0.265	0.243
Vocational/professional	0.409	0.447	0.454
Higher	0.104	0.092	0.103
Number of observations	895	1022	586

**Table 2. Employment periods**

Statistic	ETU98 mean	ETU99 mean	ETU00 mean
Estonian	0.675	0.671	0.655
Women	0.468	0.479	0.479
Harju	0.419	0.425	0.426
Ida-Viru	0.126	0.122	0.125
Aged 15–24	0.131	0.123	0.122
Aged 25–49	0.639	0.636	0.633
Aged 50–74	0.230	0.240	0.245
Primary_s	0.090	0.085	0.075
Secondary_s	0.340	0.331	0.338
Tertiary_s	0.570	0.584	0.588
Basic	0.123	0.123	0.118
Secondary	0.240	0.236	0.227
Vocational/professional	0.448	0.449	0.467
Higher	0.190	0.191	0.188
Number of observations	9012	8658	4760

## Appendix 8. Overview of duration models estimated on transition countries labour markets data

**Table 1. Duration models estimated on transition countries labour markets data**

Model	Country	Data	Period
<b>Hunt (1999)</b>	East Germany	Labour force survey	June 1990–1996
<b>Hunt (1997)</b>	East Germany	Labour force survey	1990–1994
<b>Wolff (1997)</b>	Hungary	Registered unemployment	Dec 1992 – Jan 1993
<b>Boeri, Flinn (1999)</b>	Poland	Labour force survey	III quarter 1994-1995
<b>Terrell and Sorm (1998)</b>	The Czech Republic	Registered unemployment	Oct 1992 – Sept 1994
<b>Van Ours (2000a)</b>	Slovakia	Registered unemployment	1993 – April 1998
<b>Van Ours (2000b)</b>	Slovakia	Registered unemployment	1993 – April 1998
<b>Lubyova, van Ours (1999)</b>	Slovakia	Registered unemployment	1993 – April 1998
<b>Lubyova, van Ours (1997)</b>	Slovakia	Labour force survey	1994 – 1995
<b>Lubyova, van Ours (1998)</b>	Slovakia	Labour force survey	1994–1996
<b>Ham, Svejnar, Terrell (1998)</b>	The Czech Republic, Slovakia	Registered unemployment	Oct 1991 – July 1993
<b>Foley (1997)</b>	Russia	Labour force survey	June 1992 – Febr 1994
<b>Grogan, van den Berg (1999)</b>	Russia	Labour force survey	1994–1996
<b>Kulikov (1999)</b>	Estonia	Labour force survey	1989–1995

**Table 2. Parameter estimates from the duration models estimated on transition countries labour markets data**

(Dependent variable: the hazard of leaving unemployment state)

Model	Explanatory factors													
	Women	Age	Education	Unemployment benefits	Earlier unemployment period	Duration dependence	Active labour market methods	Children	Wage	Capital region	Local unemployment rate	Sectors	Marriage	Voluntary leaving from the previous job
<b>Hunt (1999)</b>	-	-	+					X	+				X	
<b>Wolff (1997)</b>		-	+	-		-						1		
<b>Terrell and Sorm (1998)</b>	-	X	+	-	- <sup>2</sup>	<sup>3</sup>	+		+	X	-		4	
<b>van Ours (2000a)</b>		X	+			-	<sup>5</sup>			+			+	
<b>van Ours (2000b)</b>		X	+			- <sup>6</sup>	- <sup>7</sup>						+	
<b>Lubyova, van Ours (1999)</b>		- <sup>8</sup>	X			-	+						+	
<b>Lubyova, van Ours (1998)</b>	-	-	+			<sup>10</sup>		- <sup>11</sup>					+	
<b>Lubyova, van Ours (1997)</b>		X	+			- <sup>12</sup>		X			-		+	
From unemployment to inactivity		X <sup>13</sup>	X			-		X			-		+	
<b>Ham, Svejnar, Terrell (1998)</b>		-	+ <sup>14</sup>	-		P			+ <sup>15</sup>	+/ - <sup>16</sup>	-		+	
<b>Foley (1997)<sup>17</sup></b>	-	-	X	X		P <sup>18</sup>		X	X	X	-		+	-
From unemployment to inactivity	X	+	<sup>19</sup>	X		P		+ <sup>20</sup>	+	X	-		X	X
<b>Foley (1997)<sup>21</sup></b>	X	-	X	X				X	X	X	-		+ <sup>22</sup>	-
From unemployment to inactivity	X	- <sup>23</sup>	- <sup>24</sup>	X				+ <sup>25</sup>	+	X	-		X	X
<b>Grogan, van den Berg (1999)</b>	+	-	+			+ <sup>26</sup>				+ <sup>27</sup>			-	
<b>Kulikov (1999)</b>	X	-	+	-		-	+			+		<sup>28</sup>		

- negative effect; + positive effect; X – not statistically significant effect; P – polynom duration dependence

<sup>1</sup> Negative effect of industry or agriculture over 18%.

<sup>2</sup> Previous unemployment period effects negatively the hazard of men.

<sup>3</sup> The hazard of leaving unemployment increases until unemployment benefits are exhausted and then falls.

<sup>4</sup> Marriage effects negatively the hazard for women and positively for men.

<sup>5</sup> Training and short-term social jobs effect positively the hazard, while subsidizing long-term jobs in the private sector has negative impact.

<sup>6</sup> Until six months negative duration dependence the hazard is about constant.

<sup>7</sup> Short-term active labour policy measures effect positively, while long-term effect negatively.

<sup>8</sup> The effect is statistically significant only in case of men.

<sup>9</sup> The effect is statistically significant only in case of men.

<sup>10</sup> The analysis uses only data of school graduates and those who lost their job. There is negative duration dependence when unobserved heterogeneity is not considered.

<sup>11</sup> Statistically significant effect only in case of women.

<sup>12</sup> After III quarter the hazard falls.

<sup>13</sup> 30–45 year-old men have low hazard of movements into inactivity.

<sup>14</sup> Positive effect of higher education is in Slovakia not in the Czech Republic.

<sup>15</sup> Statistically significant effect only in Slovakia.

<sup>16</sup> Positive effect in the Czech Republic, negative in Slovakia.

<sup>17</sup> Polynom type duration dependence.

<sup>18</sup> Positive duration dependence until the 7th month and then hazard decreases until the 18th month.

<sup>19</sup> Positive effect of secondary education.

<sup>20</sup> Positive effect in case of women.

<sup>21</sup> Cox proportional hazard function.

<sup>22</sup> Negative effect in case of women.

<sup>23</sup> Negative effect of 30–39 year-olds.

<sup>24</sup> Negative effect of basic education and secondary education without specialisation.

<sup>25</sup> Positive effect in case of women.

<sup>26</sup> Positive duration dependence during the first 3 quarters.

<sup>27</sup> Negative effect of living in rural area (in less than 2500 persons in the place).

<sup>28</sup> Negative effect of previous employment in the agriculture, while positive effect of employment in the retail services (during 1994–1995, employment in industries has positive effect).