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Jaanika Meriküll*

Abstract

The paper investigates the dynamics of worker flows and the duration of different labour market states during the recent boom and bust of 2001–2010 in Estonia. We find that labour market adjustment has mostly taken place through massive worker reallocation, resulting in a high unemployment rate. Despite high worker flows from employment to unemployment, labour market mobility has fallen in many ways during the recession: job tenure and unemployment spells have increased, while job-to-job transitions and mobility across industries and occupations have fallen. The unemployed with the lowest level of education and non-Estonians have the lowest mobility to enter employment and run the highest risk of long-term unemployment. There is evidence of softer ways of adjustments to the crisis, where more workers are engaged in remote work, part-time work or jobs that do not match their skills. Internal migration has small potential to alleviate the high unemployment. The current crisis has hit the country more evenly across its regions than the Russian crisis did. Unemployment has increased similarly in all regions and unemployment inequality has dropped. Even so, there are some signs of marginalisation. The situation is worst in the north-eastern part of the country with unemployment hitting 25%.

JEL Code: J60, E32, J61, J62, J64

Keywords: worker reallocation, unemployment and employment duration, business cycle

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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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Non-technical summary

The economic crisis of 2008–2010 has raised unemployment to a historically high level in many countries and the high rates have been worryingly persistent. The Baltic countries had witnessed rapid economic growth for almost for a decade and have been hit especially hard by the crisis. Fiscal adjustment, maintaining the fixed exchange rate and stabilisation of the financial system have led them to regain competitiveness, while the recovery in the labour market has been slow. This paper seeks to reveal the factors behind this sluggish labour market adjustment by investigating labour mobility during the last decade in Estonia. Labour market mobility is studied by worker flow analysis and duration analysis of unemployment, employment and job-to-job spells. We also aim to illuminate the possible implications of the new Employment Contracts Act.

We find that hiring rates behave pro-cyclically and separation rates counter-cyclically, which is consistent with empirical evidence from other countries. During the economic boom in 2003–2007 hiring in the labour market exceeded separations, and this resulted in positive employment growth. The economic crisis hit the labour market harder in 2009 when the separation rate increased from 14% in the previous years to 21% and the hiring rate dropped from 15% to 12%. Empirical findings from other countries indicate that during a recession firms seek to adjust for lower labour demand first through cuts in hiring and do not necessarily increase separation. However, this is true only when the drop in demand is gradual. The demand drop for Estonian firms was so sharp that lay-offs were used widely to adjust for the crisis, which explains why the increase was steeper in separations than in hiring.

The large worker flows after 2008 also had implications for the duration of employment and unemployment. During the crisis, the average duration of right-censored unemployment was pushed down by new entrants by one year, from 24 months to 12 months. The opposite development took place in employment duration, which increased, again by almost a year from 6.8 years in 2007 to 7.6 years in 2010. The increase in average employment duration indicates less mobility in the labour market. Nevertheless, a large part of the increase in employment duration is probably the result of more common separation of workers with short tenure and the small number of new job-openings, as the more rigid employment environment has also led to less job-to-job movement. Whereas almost 9% of workers moved yearly between jobs during the boom, this share dropped to 6% during the crisis. In addition to the lower mobility between jobs, there is also less job-to-job mobility between industries and occupations. The economic crisis has reduced occupational

mobility and job mobility between industries, and so the role of the pull and push factors behind it deserves further research attention.

The average duration of right-censored unemployment dropped due to new entrants, and including a control for those exiting from unemployment to employment reveals that unemployment spells increased significantly during the crisis. Around 60% of the unemployed found a job within a year during the years of rapid growth, whereas since 2008 only 40% of unemployed have found a job within a year. A comparison of the years 2007 and 2010 would provide even more extreme variation. During the crisis, higher education and ethnicity have increased in importance for exiting from unemployment to employment. The importance of marriage has also increased and females have exited unemployment more quickly. The chances of moving out from employment to unemployment provide more or less a mirror image of those of moving from unemployment to employment. The main difference is age, because while age is not significant in explaining exit from unemployment, the young and the old have exited employment to unemployment more frequently. In job-to-job mobility, the groups who had less difficulty in exiting unemployment during the crisis – those with higher education and those of Estonian ethnicity – have also moved less between jobs in a given period of time. In consequence the picture of labour mobility seen through individual characteristics is quite complex, as there seem to be some groups of individuals that have managed to exit unemployment better, but at the same time have been less flexible in moving between jobs.

The negative consequences of the recent crisis on the labour market show more similarity across regions than did the previous recession during the Russian crisis. The inequality in regional unemployment (NUTS3 level 5 regions) fell to its lowest of the whole post-communist period in 2009. However, the inequalities in regional unemployment have started to increase again in 2010, mainly due to the continuing rise in unemployment in the Ida-Viru region. Except for in that region, the potential for reducing unemployment through internal migration is low, as unemployment rates are similarly high in all regions. The most popular destination for internal migration is still the capital region; however its unemployment rate is the second highest after the Ida-Viru region. There is also evidence of softer ways of adjusting to high unemployment as more workers are engaged in part-time work, in remote work and – it is hoped temporarily – in work that does not match their level of education.

Contents

1. Introduction

The global financial crisis that started in 2008 has led to similar turbulence in the Estonian labour market to that experienced during the economic transition period in the 1990s. When Estonian real GDP fell by 14% in 2009, the currency exchange rate was unchanged and most of the adjustment to the crisis took place through the labour market. Nominal wages fell by around 3% from the first half of 2008 to the first half of 2010, but more importantly the unemployment rate increased from 4% to 18% in the same period. Purfield and Rosenberg (2010) state in the IMF Policy Discussion Paper that this change in the aggregate nominal wage level and the fiscal adjustment in all the Baltic countries are internationally unprecedented. They claim that in terms of improvements in competitiveness, external balance and inflation this crisis adjustment strategy has been successful, while high unemployment demands further attention and reforms in all three countries.

Following from this, there are already signs of adjustment to the crisis in regained competitiveness and recovery of GDP growth, which is expected to turn positive again in 2010, but the crisis has caused a massive increase in the net and gross worker flows in the labour market. The regained competitiveness has presumably been achieved through intensive cost cutting by companies and cleansing through firms demographics. The Eurosystem's Wage Dynamics Network survey indicates that around 40% of Estonian companies have combated the crisis by reducing price, margins, output and costs, while the most important adjustment channel, cost reduction, has been relevant or very relevant for 95% of companies (Dabušinskas and Rõõm, 2009). Simultaneously the death and birth rates for companies have gone up from their previous 10-year average of 10% to 15% in 2008 and 2009 (Masso, Meriküll and Vahter, 2010). Both of these factors, the cost cutting through lay-offs and the high death rate of companies, have contributed to the increase in unemployment, while the impact of the company birth rate rise on job creation has remained only modest. Unemployment remains high and probably represents the largest cost of the generally well-absorbed crisis. This suggests that a closer look at the labour market implications of the latest crisis and an investigation of the incidence of unemployment are needed.

The purpose of this paper is to investigate labour market mobility during the recent economic boom and recession in Estonia. We contribute to the literature by investigating labour market mobility during an extreme boom-and-bust cycle. The implications of fast growth and fast economic contraction on labour mobility may be asymmetric and non-linear compared to conventional economic fluctuations. To our knowledge there is no such evidence on international empirical literature. This paper studies labour market mobility by worker flow analysis; the duration of labour market states is studied by

a survival analysis of unemployment, employment and job-to-job movement. We also aim to illuminate the possible implications of the new Employment Contracts Act. The Employment Contracts Act was passed right at the bottom of the crisis on 1 July 2009 and its main implications were to reduce the cost and increase the speed of firings and to increase job-to-job mobility. We make use of the Estonian labour force survey micro data from 2001 to 2010 third quarter and use the Cox proportional hazard duration model for the survival analysis. The paper is organised as follows: the next section reviews the literature background; Section 3 presents the results of the worker flow analysis in terms of industries, occupations and geographical regions; Section 4 presents the results of the survival analysis of labour market states and the last section summarises.

2. Related literature

Labour market mobility is an ambiguous term. It can capture wage mobility; mobility between labour market states or jobs; direct geographical mobility of labour; or the duration of a labour market state. The current paper focuses on the latter indicators: the movement of labour between labour market states, internal migration and labour market mobility across regions, and a duration analysis of the states. Wage mobility usually reflects workers' movement across wage distribution and is related to worker mobility through wage gain or loss after a job change. We do not cover wage mobility in this paper. The mobility between labour market states can be measured by either the labour market flows or the duration of a particular state. In this paper we give an overview of both, with the labour market flows presented in the following section, and the duration analysis after that. The empirical analysis uses individual level data for both of the exercises.

The economic crisis of 2008–2010 has raised unemployment to a historically high level in many countries and the high rates have remained worryingly persistent. This is particularly so in the Baltic countries that enjoyed high growth rates and low unemployment for almost a decade before the sharp break in the end of 2008. Leaving aside the size of the adjustment in the labour market, this dynamic in the labour market is something that has been discussed before in the literature on the international business cycle. Gross worker flows have been found to be tightly related to economic cycles, and many studies have shown that job creation decreases and job destruction increases during a recession (Davis and Haltiwanger, 1999; Gautier and Broersma, 2001; Davis, Faberman and Haltiwanger, 2006). During an economic crisis the worker flows out of employment increase and flows into employment decrease, resulting in high rates of unemployment.

The most recent studies on Estonian labour market mobility were conducted at the turn of the century ten years ago. Large labour reallocation flows in Estonia during the transition process caught the research attention of many scholars[1] and prompted papers on the pros and cons of gradualist or rapid reform schemes[2]. Haltiwanger and Vodopivec (2002) found that introducing market reforms led to a burst of job destruction and a jump in worker separation rates, while increases in job creation and worker hiring rates followed after a few years. This demonstrates the inefficiency of labour reallocation as the unsynchronised nature of the destruction and creation rates caused an increase in the length of unemployment spells. The transition to the market reforms increased the hiring and separation rates by about 2–3 times in the mid-1990s, while the labour market flows fell to the standard level of Western countries at the end of the 1990s, with annual job creation and destruction rates of around 10%. Lehmann et al. (2005) find similar job flow dynamics in the 1990s. They contribute to the debate by showing that the displaced workers typically have less skills and that the cost of displacement is mostly related to the lost wage income due to unemployment and not to a lower wage at the new job.

The same inverted U-shape for job flow dynamics is also confirmed by Rõõm (2002), who found that labour mobility fell substantially at the end of 1990s compared to the turbulent times in the mid-1990s. Her estimations for the period of the last downturn of the economic cycle in 1998–2000 showed that the unemployment rate and labour mobility were inversely related. During the recession mobility decreased while those labour market groups with the highest mobility maintained the lowest unemployment rate. Rõõm (2002) finds that the most mobile groups in the Estonian labour market were Estonians, people living in the capital region, and those with higher education.

While the high rates of job creation and destruction fell to the level of high-income countries at the end of the 1990s, the job reallocation rate remained high. Masso, Eamets and Philips (2004) estimate that excessive job reallocation rates, where job reallocation exceeds the net employment change, remained twice as high as in high-income European countries and somewhat higher than in the USA even in 2000. They find that a large part of job reallocation is explained by shifts between industries, which indicates that mobile labour facilitated sectoral restructuring in the later phase of transition.

[1] See e.g. Haltiwanger and Vodopivec (2002); Lehmann, Philips and Wadsworth (2005); Masso, Eamets and Philips (2004).

[2] See Jurajda and Terrell (2008, 2003) comparing Estonia and the Czech Republic, Haltiwanger and Vodopivec (2002) comparing Estonia and Slovenia.

3. Analysis of worker flows

3.1. Methodology

Labour market flows may be calculated using worker flows or job flows. These two notions – *job* and *worker flows* – do not overlap. Job flows are smaller, because new jobs created or old ones destroyed form only a sub-fraction of all worker movements. Workers may change jobs or leave the labour force for other reasons as well. See Davis and Haltiwanger (1999) for a more thorough discussion of this discrepancy. They define worker flows as the number of people changing their job or employment status. Job flows indicate change in the employment positions filled by workers. Their overview of the empirical literature shows that job flows account for 30–50% of all worker flows.

Another pair of notions that should be clarified are *worker turnover* and *worker reallocation*. The former comprises all labour market transitions within a certain period, counting exits and entries and considering multiple transitions per person, while the latter covers only the number of individual people involved in the reallocation (Davis and Haltiwanger, 1999). We use the worker reallocation indicator rather than the turnover indicator in this paper.

Our main tool for the labour market transitions analysis is the worker flows derived from the Estonian Labour Force Survey (LFS) data[3]. For a robustness check of the worker flows dynamics we also calculate the job creation and destruction rates using the same data source. The transitions between labour market states are calculated annually, so that the shift between the labour market status a year ago and at the current year is investigated. The annual flows do not take into account short-term transitions within a year and this means that the seasonality of flows with a higher temporal frequency can be avoided. Caroleo and Pastore (2010) argue that as short-term spells are often related to various institutional factors such as the unemployment benefit system, the annual flows are preferable for international comparison. They also claim that only permanent moves affect permanent employment, hence annual flows are more suitable for a structural analysis. We have chosen a calculation methodology for worker flows that also enables us to compare the flows with earlier studies on Estonia that have used the same methodology, Haltiwanger and Vodopivec (2002) and Rõõm (2002).

Haltiwanger and Vodopivec (2002) proposed worker flow calculations to accommodate the Labour Force Survey data as follows:

[3] The methodology of the data collection of Estonian Labour Force Survey is discussed in the section 4.1, methodology and data of the survival analysis.

Hiring rate = $(UE_t + IE_t + EE_t)/E_{t-1}$
Separation rate = $(EU_t + EI_t + EE_t)/E_{t-1}$
Worker reallocation rate = $(EE_t + EU_t + EI_t + UE_t + IE_t)/E_{t-1}$
UE_t – worker transited from unemployment in period t-1 to employment in period t
IE_t – worker transited from inactivity in period t-1 to employment in period t
EE_t – worker remaining employed between period t-1 and t, but with a different employer
E_{t-1} – employment one year ago
EU_t – worker transited from employment in period t-1 to unemployment in period t
EI_t – worker transited from employment in period t-1 to inactivity in period t

They also propose a methodology for calculating job flows based on the Labour Force Survey (LFS) (Haltiwanger and Vodopivec, 2002):
Job destruction rate = individuals involuntarily separated from their main job divided by total employment from the previous year.
Involuntary separation is defined as a separation from the main job for the first six reasons listed below:

1. *Closure / bankruptcy of establishment*
2. *Reorganisation / privatisation of establishment*
3. *Dismissal initiated by employer*
4. *Personnel reduction*
5. *Expiration of employment contract or trial period*
6. *Termination of entrepreneurial activity or farming*
7. Military service
8. Sickness
9. Studying
10. Retirement
11. Early retirement
12. Parental leave
13. Need to care for children or adults
14. Other personal or family related reasons
15. Other work related reasons (working conditions, head-hunting, conflicts, shift to self-employment)
16. Other

The job creation rate is calculated as residual from net employment growth, so:
Job creation rate = net employment growth + job destruction rate

Like the annual worker flows, the annual job flows also underestimate short-term transitions between jobs. There is another shortcoming that arises from self-estimation of the separation as resignation or dismissal. As also discussed by Haltiwanger and Vodopivec (2002), it is sometimes difficult to

choose the correct category for the reasons behind the separation from a job. They give the example of "How would a worker who lost his job because of downsizing, but voluntarily retired from the labour force answer the question: Why did you leave your job?" The great advantage of the worker and job flow calculation is that the difference between the hiring and separation rate and the job creation and destruction rate is easily interpretable and equal to net employment growth[4].

3.2. Worker flows and the business cycle

It is an empirically well-established finding that hiring rates behave pro-cyclically and separation rates counter-cyclically (see e.g. Gautier and Broersma, 2001 on the Netherlands; Davis et al., 2006 on the USA). Estonian hiring and separation rates along with economic growth are depicted in Figure 1. The magnitude of the worker and job flows is found to be higher in the USA than in Estonia. Quarterly worker flows fall between 10 and 25% in the USA (Davis et al., 2006), while after 2000 and before 2008 the annual worker flows were around 15% in Estonia. These pre-crisis worker flows remain to the lower end of the worker flows of OECD countries; while separation rate increased above OECD average level during the crisis (see OECD, 2010 and Figure 1 below).

During the major restructuring and economic downturn in the first half of the 1990s, separation rates went up first and were followed by the hiring rate some time later. This period was characterised by an increase in structural unemployment and inactivity rates. During the Russian crisis in 1998–1999 the hiring rate dropped first and quickly, but the separation rate remained unchanged. During the rapid economic growth from 2003 to 2007 the hiring rate became higher than the separation rate. The separation rate started to exceed hiring in 2008, while a sharp increase in the separation rate accompanied by a less sharp drop in hiring was witnessed in 2009.

The modest change in separations and drop in hiring during the Russian crisis and the sharper increase in separations and drop in hiring during the latest economic crisis fit with two empirical findings on the data of developed economies (Davis and Haltiwanger, 1999). First, businesses adjust to gradual shrinking by cutting hiring and not necessarily by increasing separations. Second, job destruction and creation are concentrated in sharply growing or shrinking businesses. Davis and Haltiwanger (1999) establish in their

[4] However, there may be some discrepancies between the net employment growth found in this study and that published by Statistics Estonia. The main reason for this is the retrospective nature of the labour market status information for the previous year in the labour force survey. See note 2 in Appendix 1 for more details.

literature survey that gradually shrinking businesses, those shrinking by less than 15% per year, usually adjust by lowering the entry levels of new workers and not by increasing lay-offs of workers. This means that with gradual shrinking the hiring rate falls more and the separation rate rises less to adjust for the changes in employment. To establish the concentration of separation and hiring, job destruction and creation should also be observed. As will be shown later, the empirical standard is that around 30–50% of separations are cases of job destruction. Davis and Haltiwanger (1999) find that usually more than two-thirds of job destruction originates from businesses that are shrinking by more than 25%. Similarly, Davis et al. (2006) find that in the USA the tendency towards concentration in job destruction or creation is manifest in 60% of businesses that grow or shrink by more than 10% and that this tendency holds in every part of the economic cycle. The same authors find that worker flows are much less concentrated in sharply growing or shrinking businesses, and that around 50% of hirings and separations take place in businesses that change their employment by less than 5%.

The gradual shrinking of worker flow dynamics no longer holds for the latest crisis. The simultaneous increase in separations and drop in hiring are related to a less gradual employment adjustment and a large drop in employment in sharply shrinking businesses or the disappearance of sharply growing businesses. The business performance survey of 2009 supports this explanation, Dabušinskas and Rõõm (2009) reveal that 58% of businesses experienced a drop in demand of more than 20% during the crisis. From this, the rough explanation for the labour market reallocation in the latest crisis is that many businesses faced dramatic shrinking that could not be adjusted by cutting hiring alone, but that also needed large-scale separation.

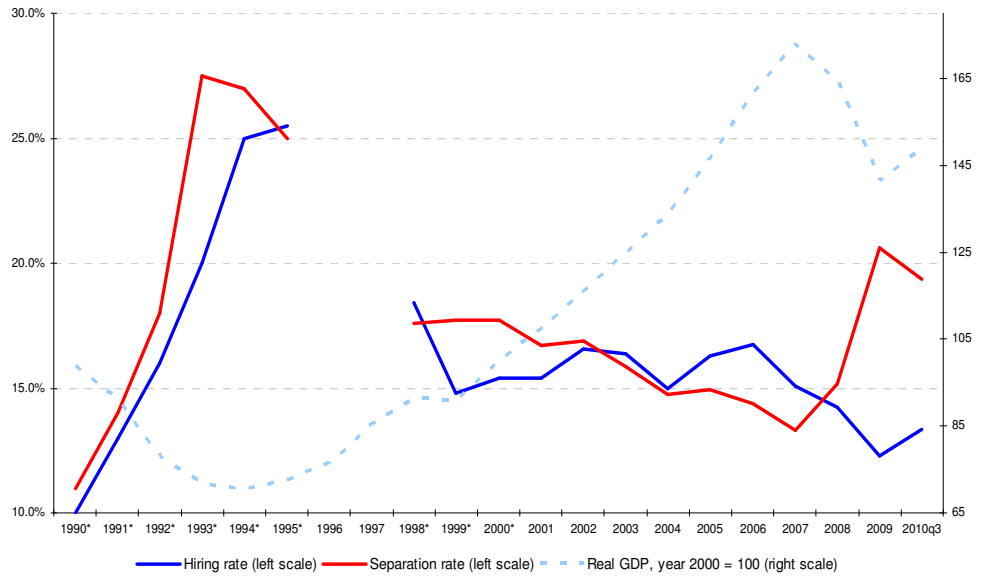

Figure 1: Worker flows and real GDP (values are presented in Appendix 1)

Note: Worker flows up to 2010q3, real GDP up to 2010q3.

Source: Hiring and separation rates: 1990-1995 are based on the graph of Haltiwanger and Vodopivec (2002); 1998-2000* Rõõm (2002); 2001-2010 author's own calculations from labour force surveys. Real GDP: Statistics Estonia.*

The shifts in the institutional framework during the last ten years must also be considered. After the Russian crisis in 1998 the adjustment in the labour market took place mainly through wages and productivity and the adjustment through employment was insignificant (see Babetskii 2006), while the recent crisis witnessed more adjustment through employment. One of the explanations could be the unemployment insurance system brought in in 2002, with the first payments made in 2003, which made the average unemployment income almost seven times higher in 2003 than in 2002. As discussed by OECD (2009) and empirically estimated by Lauringson (2010a, 2010b) this higher unemployment income has contributed to longer duration of unemployment. The risk of an unemployment trap has increased during the latest crisis since the gap between wages and unemployment income has fallen significantly due to the unemployment benefit reform and due to the latest crisis. The average ratio of unemployment income to net wages jumped from 6% in 2003 to 38% in 2004[5] and increased to 42% in the bottom of the

[5] OECD (2010) estimated that a 10%-point increase in the replacement rate leads to a 0.4–0.5%-point increase in separation and 0.2–0.4%-point increase in hiring. This regularity does not stick out in the worker flows after the introduction of Estonian unemployment insurance in 2003; however this effect may be cancelled out and materialise only in the

crisis in 2009 (author's own calculations based on LFS micro data and average net wages). However, Lauringson (2010b) estimates that the effect of unemployment insurance benefits as a disincentive to move from unemployment to employment has been milder during the crisis.

Comparing the income of an unemployed person at the bottom of the Russian crisis in 1999 with that of an unemployed person in the latest crisis in 2009 reveals that this institutional change is also reflected in the sentiments of the unemployed. In 1999, 9% of the unemployed stated that they could cope financially without any particular difficulties, while the share increased to 15% in 2009 (author's own calculations based on LFS micro data). The financial stability of the unemployed is a positive result of the introduction of unemployment insurance, but like any increase in unemployment benefit, it has led to longer unemployment spells and probably also to higher worker flows and lower wage flexibility. As the unemployment insurance benefits will be paid out for up to 270 days[6] and the peak in unemployment was in the first quarter of 2010, the labour market adjustment resulting from the crisis will probably continue after the individual people making up the peak unemployment flow have entered the labour market in 2011.

We can go further with the comparison of worker and job flows. Davis et al. (2006) show from US data that a high share of worker flows originate from job flows, meaning that job flows account for between one-third and one-half of worker flows. The similarity in this proportion is confirmed from European data (see literature survey by Davis and Haltiwanger (1999) and from Dutch data by Gautier and Broersma (2001)). Haltiwanger and Vodopivec (2002) find that the same proportion held in Estonia during the beginning of 1990s. International comparison from employer data shows that Estonian job flows were still somewhat higher in 2000 than they were in other European countries and were at a similar level to those of the USA (Masso et al., 2004). They found Estonian job flows to be around 10% per year. The employee-side measure in the LFS gives much lower rates of job flows (for more details, see the discussion of job flow measurement by the LFS in Haltiwanger and Vodopivec (2002)). The data on Estonian worker and job flows in 2001–2010q3 are presented in Figure 2[7].

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economic downturn in 2009. The institutional issues need further attention in the analysis of Estonian labour market mobility.

[6] The maximum length of unemployment insurance benefit is 360 days, but this will apply only after 2011, see Lauringson (2010a, section 2) for discussion of the details.

[7] It must be remembered that a direct comparison of the worker and job flows across studies is not usually possible, as different temporal frequencies or sources of data (employer-side or employee-side) may affect the results significantly.

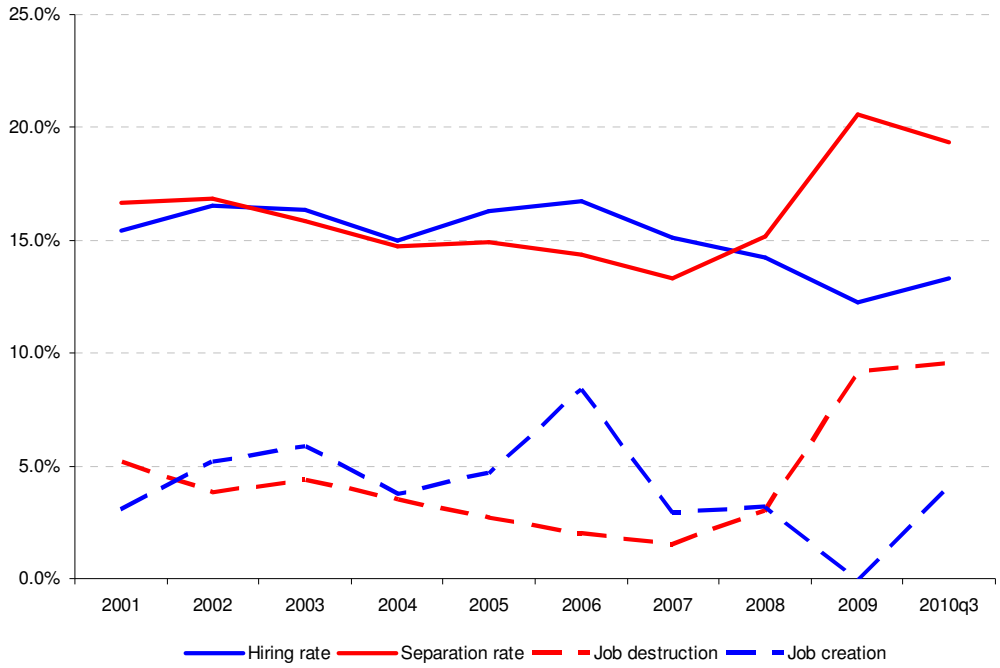

Figure 2: Worker and job flows, 2001–2010q3 (values are presented in Appendix 1)

Source: author's own calculations based on Estonian labour force surveys.

The dynamics in the Estonian separation and destruction rates and the hiring and job creation rates are similar. Since the job creation rate is calculated as a residual from employment growth and job destruction, it shows much more volatility over the sample. The job destruction rate was more stable, while the contribution of job destruction to worker separation rates has increased significantly during the recession. The average contribution of job flows to worker flows has fallen in the last 10 years compared to the 1990s, and on average job flows accounted for somewhat less than 30% of worker flows in 2001–2010. In the period of rapid economic growth, job destruction accounted for only 11–18% of worker separations, while in the sharp economic downturn the job destruction as a component of the separation rate increased to 50% (see Appendix 1 for worker and job flows). That the share of job destruction in worker separation was below 20% during the economic boom indicates that during this time most of the labour market shifts materialised as job-to-job movements or normal attrition to inactivity and job destruction had only a minor role, while the steep increase in the worker separation rate in 2009–2010 originates mostly from lay-offs and not from resignations or increased shifts to inactivity. This is in line with the evidence

from other countries that job destruction increases and job creation decreases during a recession

3.3. Unemployment and employment duration and the business cycle

A sharp increase in the separation rate also has implications for the duration of unemployment. Davis and Haltiwanger (1999) looked at how separations lead to further separations as new employment matches may not be successful. The fraction of the separations that arise from the massive job destruction have longer term implications. In consequence the average duration of unemployment could shorten due to higher matching activity in the labour market and lengthen due to structural features. The average duration of unemployment and employment varies widely across OECD countries (Hobijn and Şahin, 2009). For example, it is usual that in Europe more than 40% of job tenure is longer than 10 years, while the same ratio in the USA is 26%. Within Europe, Southern Europe is marked by long job tenures and transitional Hungary and Czech Republic by short tenures. The dissimilarities in unemployment duration across OECD countries are even larger. In continental Europe up to 50% and even more of the unemployed are long-term unemployed who spend more than a year in unemployment, while in the USA the same ratio is 7%. (Hobijn and Şahin, 2009) The main explanation for these discrepancies has been in labour market institutions. For example it has been found that unemployment insurance systems in Europe have increased unemployment duration, but due to better quality matching they have also improved employment duration (Tatsiramos, 2009).

Figure 3 shows Estonian employment and unemployment duration since 2000. The calculations are based on the duration of the last unemployment or employment spell of the unemployed or employed respondent in the survey reference week (right-censored spells). This means that no spells have ended yet. The unemployment duration dropped sharply in 2008, which is because of the new entrants resulting from the rise in separations. The average unemployment duration starts increasing in 2010, which probably captures the low demand for labour rather than structural features of unemployment or the impact of unemployment insurance benefits. Appendix 2 also shows the dynamics of the fraction of the unemployed who were in long-term unemployment. The fraction has been around 50% in the last 10 years, except for the years 2008 and 2009 when it dropped to 30% due to new entrants. This means that in terms of long-term unemployment Estonia resembles, for example, Germany from Western Europe and Slovakia and Hungary from Central and Eastern Europe.

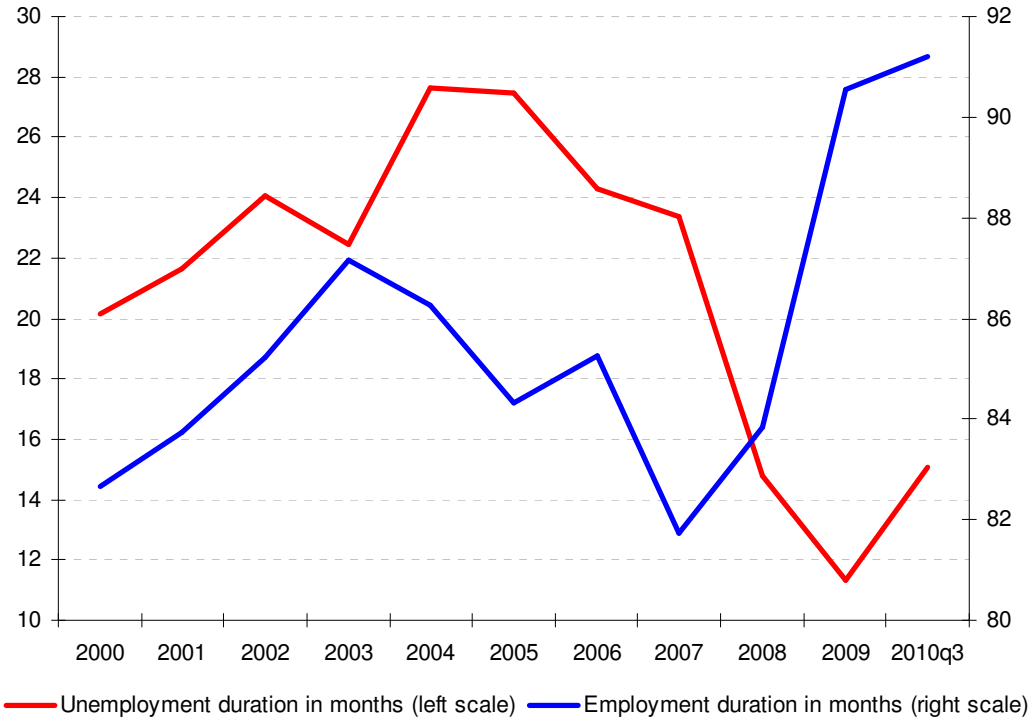

Figure 3: Duration of the last unemployment or employment spell in months (right-censored)

Source: author's own calculations based on Estonian labour force surveys.

Simultaneous with the drop in unemployment duration, employment duration jumped up by one year during the crisis. The main reason for this is probably the rigid hiring environment. It should also be considered that as the costs of firing an employee increase with tenure, employers prefer to lay off workers with shorter tenure first. The job tenure pattern in Estonia resembles that of the USA more than that of Europe, and the average job tenure is quite low, so that before the crisis only 23% of workers had tenure of longer than 10 years. During the crisis the share of workers with job tenure of over 10 years increased to 27%, but it is still comparable to the 26% in the USA and lower than in the Czech Republic and Hungary (OECD statistics by Hobijn and Şahin, 2009; author's own calculations for Estonia from LFS micro data).

3.4. Worker flows between industries and occupations

This section investigates worker mobility across industries and occupations. A relatively large share of Estonian workers are still employed in the primary and secondary sectors while the share of employment in services remains below the EU15 average. The period of rapid growth between 2003 and 2007 significantly increased employment in construction, distorting this structural dissimilarity even more (OECD, 2009). As was shown earlier, the massive worker turnover was one of the highest among transition economies in the 1990s, then it cooled down around the turn of the century and dropped to internationally low levels during the economic boom. The OECD Economic survey on Estonia (OECD, 2009) identifies that a production shift towards exporting industries is necessary for the recovery and that rapid employment shifts to these sectors will indicate whether the previously low worker flows were due to opportunities for prosperous employment or institutional change. Earlier empirical evidence on Estonia found that the contribution of between-industry reallocation was much higher than in developed countries, which presumably helped to facilitate the long-lasting structural change (Masso et al., 2006).

Table 1 presents job-to-job worker flows and the composition of these movements within and between industries. There was more job-to-job movement during the period of rapid economic growth but it has slowed down during the downturn since 2008. Historically half of the movements between jobs are to other industries and half are within the same industry. There is a certain tendency for mobility between industries to have decreased during the recession after 2008. Both of these results are in line with previous empirical findings: mobility within and mobility between industries each account for around half of job-to-job movements; mobility within industries is counter-cyclical and mobility between industries is pro-cyclical (Shin and Shin, 2008 on US data). The existing empirical literature suggests that between-industry shifts carry higher costs than within-industry shifts. These higher inter-industry movement costs stem from the lower wages in the job in the new industry and longer spells of unemployment when moving between industries (Shin and Shin, 2008). Shin and Shin (2008) find that the longer unemployment spells of inter-industry shifts explain some of the increase in aggregate unemployment during the recession. Lehmann et al. (2005) found from data from the 1990s that most of the costs related to employment displacement are related to the cost of unemployment while there is no wage penalty from the new job. However, this regularity may not hold any more over the last 10 years and during the recession.

Table 1: Worker reallocation within and between industries, in %, 2001–2010q3

	job-to-job flow to employment, %	1-digit NACE industries		3 sectors: primary, secondary, tertiary	
		within	between	within	between
2001	7.9	58.0	42.0	77.9	22.1
2002	9.2	51.6	48.4	76.0	24.0
2003	8.6	54.0	46.0	72.2	27.8
2004	7.8	51.0	49.0	69.7	30.3
2005	8.8	48.9	51.1	70.1	29.9
2006	9.0	46.8	53.2	73.5	26.5
2007	8.8	45.9	54.1	73.2	26.8
2008	8.6	48.2	51.8	77.2	22.8
2009	6.9	55.0	45.0	77.9	22.1
2010q3	5.6	53.8	46.2	81.5	18.5

Source: author's calculations from Labour Force Surveys.

Worker allocation across occupations is presented in Table 2. Worker mobility across occupations also behaves pro-cyclically and there has been less movement across occupations during the recession. Around 40% of job-to-job movers changed their occupation in 2010, while the rate was 48% in 2006. Estonian employment growth was at its highest during the last 20 years at 6.4% in 2006, reflecting the peak of tightening of the labour market. During this time, occupational and industrial mobility were also at their the highest in the last 10 years. Campos and Dabušinskas (2009) estimated Estonian occupational mobility during the period of steep transition in the first half of the 1990s and found that around 10% of workers changed their occupation each year during this time. This fraction of workers has decreased to around 4% in the last decade and dropped below 3% during the latest crisis. Aside from the economic transitional period, worker mobility has also been found to be pro-cyclical in other empirical studies (see, for example, Moscarini and Thomsson, 2007).

Table 2: Worker reallocation within and between occupations, in %, 2001–2010q3

	Job-to-job flow to employment, %	1-digit ISCO classification	
		Within occupation, %	Between occupations, %
2001	7.9	59.5	40.5
2002	9.2	55.6	44.4
2003	8.6	56.9	43.1
2004	7.8	54.3	45.7
2005	8.8	59.0	41.0
2006	9.0	52.0	48.0
2007	8.8	52.9	47.1
2008	8.6	54.6	45.4
2009	6.9	57.7	42.3
2010q3	5.6	61.7	38.3

Source: author's calculations from Labour Force Surveys.

3.5. Worker flows by region and geographical mobility of the labour force

The disparities across regional unemployment or job flows may be mitigated by internal migration across countries. In this section, we investigate worker reallocation across geographical regions. We present regional statistics on the NUTS3 level. The Nomenclature of Territorial Units for Statistics, NUTS, is the European Union system of division of regional units (see European Commission, 2007, for more details), in which the NUTS3 level indicates small regions in European terms. There are five NUTS3 regions in Estonia.

Paci, Tiongson, Walewski and Liwiński (2010) generalise from the literature that internal migration is much lower in Central and Eastern European (CEE) countries than in OECD countries and Western Europe. Internal migration rates are high in the USA, France, the Netherlands and the UK, but the levels are similar to those of the CEE in Mediterranean Europe and Austria. They claim that while there are large regional disparities in labour market indicators in the CEE, there is not enough internal mobility to adjust for these differences. Their analysis on the LFS data of the CEE countries in 2004 indicates that internal migration is concentrated among young, better-educated and single individuals, which is likely to increase the regional inequality even more. Jurajda and Terrell (2009) complement this result with a sample of four post-communist countries by finding that most of the regional unemployment differences are explained by differences in human capital and also that FDI flows to more high-skilled regions have amplified the differences in regional unemployment. They claim that the internal migration

of high-skilled and not low-skilled workers is probably a consequence of the higher opportunity costs of reallocation for the latter.

Appendix 3 shows that the unemployment dynamics have been relatively similar across Estonian regions and that the differences in regional unemployment were amplified during the economic boom and decreased during the recession. This is in line with the regional growth argument in the literature that the relationship between economic growth and regional inequality is bell-shaped. Economic growth may lead to an increase in regional inequality, especially during the catching-up process, as seen in for example Barrios and Strobl (2009) on the empirical analysis of the EU27 countries. In general, Estonian regional differences in unemployment are at a similar level to those in countries that have the same post-communist background. The coefficient of variation for regional unemployment is in a similar range, between 25–37%, to that which was observed by Jurajda and Terrell (2009) in 2001 for the Czech Republic, Hungary, Bulgaria and Ukraine.

Figure 4 plots the worker hiring and separation rates over the five Estonian NUTS3 regions. Haltiwanger and Vodopivec (2002) and Rõõm (2002) found that during the transitional phase in the 1990s hiring and separation rates were highest in the capital region and lowest in the Ida-Viru region. The previous recession during the Russian crisis in 1998–2000 hit least in the capital region, where the gross worker flows were high but unemployment remained the lowest among the regions (see Appendix 3). The negative consequences of the latest crisis on the labour market show more similarity across regions. Regions' hiring and separation rates are well correlated; most of the regions witnessed higher hiring and lower separation during 2004–2007 and a deep drop in hiring and an increase in separation after 2008. There are some differences between regions, the main exception being the heavy-industrial Ida-Viru region, which has had higher unemployment in the past and has suffered the most during the recession. However, for the rest of the regions that have witnessed the same negative net worker flows and unemployment dynamics (see Appendix 3), there is not much potential from internal migration as hiring rates are low everywhere. This holds of course only under the assumption that there are no skill mismatches across regions.

Figure 4: Worker flows by regions, 2001–2010q3

Source: author's calculations from Labour Force Surveys.

The LFS data also contain information on the dynamics of individuals' places of residence, but do not collect information on the reasons behind their migration. Table 3 presents data on the Estonian labour force yearly geographical reallocation, which is measured by the change in the place of residence in terms of village, borough or town. The reason behind the change of place of residence is measured indirectly by the simultaneous change in the labour market state, which shows that around half or even up to 80% of geographical reallocations coincide with changes in the person's labour market state or in job-to-job movement. For comparison, only 20–25% of the geographically immobile individuals shift between labour market states or jobs.

Geographical mobility has increased somewhat during the recession, and almost 2% of the labour force changed its place of residence within the first half of 2010. Although regional hiring and separation rates and unemployment rates did not show any significant differences during the recession, with the exception of the Ida-Viru region, most of the labour force movements take place towards the capital region Harju, 70% of them in 2010 I–III quarter. There has also been an increase in the tendency for people to move to work abroad since the recession started in 2008. Here it is important to bear in mind the small sample size behind these numbers, as yearly LFSs cover only around 100–200 geographically mobile individuals.

Table 3: Geographical mobility of the labour force*, 2001–2010q3

	Changed place of residence within the year (village, borough or town), %	...of whom changed job or labour market status, %	Did not change place of residence and changed job or labour market status, %	Moved to:					
				Harju	Central	Ida-Viru	West	South	Abroad
2001	1.69	70.9	25.0	56.2	7.2	9.6	5.4	20.2	1.5
2002	1.64	74.1	24.5	54.1	6.4	6.2	12.5	16.5	4.3
2003	1.24	75.2	23.6	47.3	9.4	4.2	16.7	17.8	4.5
2004	1.46	67.0	22.2	51.4	9.6	0.9	12.9	24.3	0.9
2005	1.60	81.8	21.9	61.4	9.2	0.8	9.8	16.3	2.6
2006	1.72	68.6	21.9	54.8	12.5	2.3	11.9	16.8	1.8
2007	1.80	43.4	19.3	42.5	18.6	2.5	9.3	22.3	4.9
2008	1.17	70.8	20.7	49.0	6.5	4.6	10.2	22.8	6.9
2009	1.67	62.4	25.4	36.3	17.7	7.3	13.8	16.8	8.1
2010q3	1.71	48.4	25.6	69.6	8.9	4.2	9.9	12.3	9.1

*Notes: * Calculations include only individuals who lived in Estonia a year earlier.*
Grey area: Sample size is smaller than 20 observations, which indicates that this value is not representative of the whole population.

Source: author's calculations from Labour Force Surveys.

Tables 4 and 5 provide statistics on the factors that hamper the move from unemployment to employment, and remote work and educational mismatch by region. Table 4 presents the factors that prevented people taking a job offered by the Labour Office. The sample size is small and for some regions the estimates are not representative, but there is evidence of some reluctance towards internal migration. Around one-fifth of the individuals have turned down a job offered by the Labour Office because it is geographically too far from home. This lack of mobility is stronger in the regions outside the capital area Harju, which may indicate either that most of the job openings come from the capital area or that residents of the periphery are more reluctant to change their place of residence. Paci et al. (2010) find that while internal migration is not strongly related to labour market indicators, commuting is more sensitive to these disparities in the CEE countries. They claim that housing market failures and a lack of financial resources for migration may explain this trade-off between internal migration and commuting. Emotional and lifestyle factors that impede geographical mobility should also be considered.

There may still be some structural unemployment due to skills mismatches across regions, and Table 5 seeks to investigate this point. It also provides statistics on remote work across regions. Remote work has the potential to mitigate unemployment problems where there is a reluctance to migrate and offers a successful combination of work and family life. The self-assessed educational mismatch is highest in the Ida-Viru region, which has the highest unemployment. Surprisingly, the capital region Harju, which is the richest in jobs, has almost the same share of over- or undereducated workers. The educational mismatch has increased during the recession in both of these regions. The self-assessed educational mismatch is lower in the more rural regions. According to Statistics Estonia the share of tertiary educated workers is ten percentage points higher in the capital region than it is in rest of the country, indicating that the capital region is attracting the high-skilled workers, but that they are more likely to do work that does not match their level of education. Remote work has increased in most of the regions during the recession, which has probably lessened the structural unemployment problem. Remote work is usually defined as work done away from the employer, with the employee contacting the employer using telecommunication or IT systems. Remote work has the highest potential for lowering unemployment in the Ida-Viru region, although there may be some skill- and infrastructure-based limitations there. The whole population frequency of remote work has significantly increased during the recession, from 5.1% in 2007 to 7.8% in 2010 (author's own calculations from the LFS microdata).

Table 4: Factors that prevented people taking a job offered by the Labour Office in %*, 2001–2010q3

	Whole country	Harju		Central		Ida-Viru		West		South	
	(1)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
2001	28	28	7	33	0	23	18	46	13	30	13
2002	17	8	5	40	17	15	6	11	29	26	7
2003	9	2	2	41	28	2	3	3	30	26	17
2004	29	35	13	20	24	2	15	5	47	55	47
2005	18	11	6	10	31	13	17	0	0	42	42
2006	22	52	0	24	57	12	17	79	28	17	15
2007	41	37	34	72	65	44	16	52	48	30	40
2008	26	23	5	11	27	27	6	21	26	32	34
2009	28	13	7	26	18	39	32	18	18	42	28
2010q3	25.3	12.7	8.5	31.0	31.1	11.5	25.9	55.2	4.5	53.7	27.1

*Notes: * Share of individuals that found this factor to be a reason to decline the job.*
Grey area: Sample size is smaller than 20 observation, meaning this value is not representative of the whole population.
(1) Job offered was too far from place of residence.
(2) Transport facilities made it impossible to attend the job offered.

Source: author's calculations from Labour Force Surveys.

Table 5: Remote work and educational mismatch, % in employment, 2001–2010q3

	Remote workers, % in employment					Work not matching level of education, % in employment				
	Harju	Central	Ida-Viru	West	South	Harju	Central	Ida-Viru	West	South
2001*	5.3	6.3	2.3	7.5	7.4	20.5	11.3	21.2	7.8	9.4
2002*	5.0	5.4	2.1	9.5	7.0	19.8	9.7	20.8	7.0	7.5
2003	5.2	3.0	4.2	4.4	6.8	19.5	8.5	20.6	7.7	8.2
2004	6.0	3.5	3.9	3.6	5.0	19.1	8.7	18.0	10.3	10.6
2005	6.8	3.7	3.5	2.9	5.7	13.7	6.2	21.8	10.4	11.6
2006	6.3	3.5	3.9	5.4	3.7	14.1	9.3	17.5	9.4	10.8
2007	5.7	5.1	3.0	8.2	3.6	14.7	9.4	17.4	9.8	9.9
2008	6.5	4.5	3.8	6.4	3.1	15.2	8.2	18.3	10.5	8.9
2009	10.6	4.8	5.5	5.6	2.0	18.1	8.9	19.3	11.8	9.7
2010q3	12.3	8.3	3.4	5.4	2.5	18.5	9.2	20.9	10.3	8.5

*Note: * The share of the employed who worked at home frequently; from 2003 onwards the share of the employed who used remote work by working part of the time away from the employer and contacting the employer through ICT.*

Source: author's calculations from Labour Force Surveys.

In summary, internal migration is usually quite low in the Central and Eastern European countries, while there is some evidence of an increase in geographical mobility in Estonia during the latest recession. There is also evidence of softer ways of adjusting to high unemployment, with more workers engaged by remote work and doing, it is hoped temporarily, work that does not match their level of education. However, unemployment is at a similarly high level in all the regions except Ida-Viru, which indicates that the potential for reducing aggregate unemployment by regional reallocation of labour is in general small

4. Analysis of the duration of labour market states

4.1. Methodology

This section employs survival analysis to investigate how far unemployment and employment spells depend on personal characteristics. We assess the duration of three different spells: duration of transition from unemployment to employment, duration of transition from employment to unemployment and duration of transition from job to job. We make use of the non-parametric Kaplan-Meier analysis and the semi-parametric Cox proportional hazard model.

There are three important functions in the survival analysis[8]. First, the *distribution function* of a spell. The spells are denoted by T and capture the time to the failure. The spell is taken as the random variable T with a density function of $f(t)$, where t is a realisation of T. Hence, the distribution function captures the probability that a spell is smaller than T:

$$P(T < t) = F(t) = \int_0^t f(s)ds$$

Second, the probability that the spell is larger than or equal to t is captured by the *survival function*:

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

The survival function depicts the probability of survival being longer than time t. The Kaplan-Meier method plots the statistical estimation of the survival function with the duration of the spell in the first axis and the probability of a survival in the second axis. For example for the unemployment spell the probability of a person still being unemployed within the time up to period t is calculated as the number of cases that are still unemployed in period t divided by all the cases that have experienced unemployment. We

[8] The overview of the duration analysis is based on Cleves, Gould and Gutierrez (2004).

use this simple plotting to investigate in a descriptive way how the survival rates of unemployment and employment durations have changed over time. We could expect significant differences after 2008 in accordance with Figures 1–3.

Third, the *hazard function* captures the probability that the spell will end in period t if the spell has lasted until that period:

$$f(t|T \geq t) \equiv h(t) = f(t) / S(t)$$

The hazard function is also called the conditional failure rate. While the survival function is non-increasing, the hazard function can be increasing or decreasing, and can fluctuate or involve constant values. For example, unemployment hazard rates are usually found to be decreasing in time, meaning the probability of exit decreases with elapsed duration. The main reasoning behind this dynamic is the depreciation of human capital in longer periods of unemployment. Lauringson (2010a) has found from Estonian data that the unemployment exit hazards increase up to the expiration of unemployment insurance benefit and start decreasing afterwards.

We go further in the regression analysis of the hazard rates. We make use of the Cox proportional hazard model to estimate the impact of explanatory variables on the hazard of leaving a particular state at period t. The hazard rate of each subject j in period t is expressed as:

$$h(t|x_j) = h_0(t)e^{x_i\beta_x}$$

where $h_0(t)$ captures the baseline hazard, β is a vector of parameters and x is a vector of the explanatory variables that are invariant over the duration of the spell. The Cox proportional hazard model does not specify the function of a baseline hazard over time, but it assumes that the hazard is same for everyone in the sample.

We estimate the Cox proportional hazard model with a wide range of explanatory variables consisting of personal characteristics (age, sex, education, ethnicity etc.) and geographical location.

4.2. Data

This paper uses Estonian Labour Force Survey (LFS) data to calculate labour market state spells. The LFS data is collected by Statistics Estonia and covers approximately 1.5% of the population aged between 15–74 every year. This data set has limitations for duration analysis because of its censoring, but advantages because of its representation of unemployed individu-

als who are not reflected in registered unemployment and who are excluded from the register-based analysis. The individuals surveyed are asked to report their movements between labour market states only for the last year before the time of the survey. Since Estonian LFS data is collected as a rotating panel, it makes it possible to extend the observation period for individuals who enter the sample multiple times. The regularity of Estonian LFS sampling means that an individual enters the sample for two consecutive quarters, stays out of the sample for the following two quarters and enters the sample again for two consecutive quarters. This means that after merging the surveys by individual identifier we can observe the same individuals for up to 2½ years. The total number of individuals in the sample of 2001–2010q3 was 56 576 and 42% of these are present in all four waves, so they are observable for the whole 2½ years.

Following the method of Rõõm (2002) the spells from unemployment to employment that started before the survey period are excluded from the sample and spells from employment to unemployment that started before the survey period are not excluded, see Figure 5 for the scheme of censoring. This is because employment spells are significantly longer than unemployment spells (see Figure 3) and consequently we underestimate the average unemployment spell and overestimate the average employment spell. Given that the methodology for calculating spells is the same over time, for comparative purposes the mistake resulting from the censoring is presumably minimal. We also exclude spells shorter than a month as these spells result in zero duration for our monthly-based dataset. Additionally, as inactivity is not the focus of this paper, all unemployment or employment spells exiting to inactivity are excluded from the analysis (see also Figure 5).

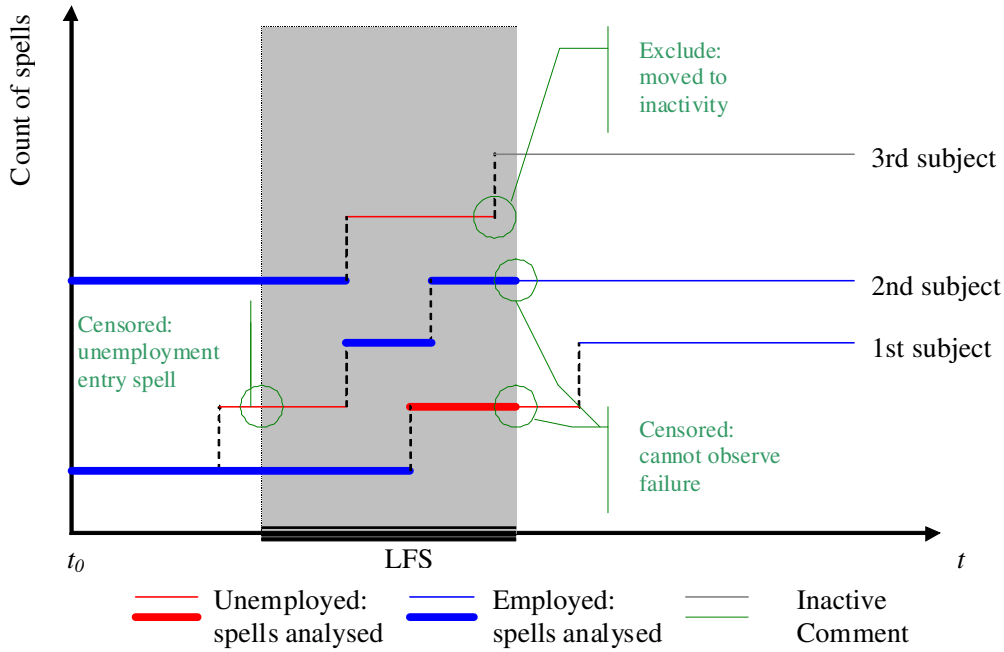

Figure 5: The censoring scheme of labour market state spells on the LFS data.

Source: author's illustration.

4.3. Results

4.3.1. Unemployment duration

We start with simple Kaplan-Meier survival estimates of unemployment. Figure 6 shows the unemployment survival function over the periods of the economic cycle. We can take the years 2001–2003 as good years in the labour market, 2004–2007 as boom years (the financial crisis was already clearly present in 2007, but the employment and unemployment levels remained relatively unaffected until 2008) and 2008–2010q3 as recession years. We can observe that there are already statistically different dynamics in unemployment survival between the good years and boom years, but the different behaviour during the hard recession years is extensive. While 45% and 38% of the unemployed were still unemployed 12 months after entering unemployment during the good and boom years, the same indicator in the recession years was 59%. It is noticeable that while the unemployment rate was at almost the same level in 2000 and 2009, 13.6% and 13.8% respectively, the pattern of unemployment duration had changed significantly. The new unemployment insurance system may also have played a role there. Unfortunately we cannot investigate the impact of various unemployment benefits on

unemployment duration using the LFS, since it only collects data on unemployment benefits from individuals who have not exited unemployment, meaning the benefit information is available exclusively for those who fail to exit.

The average, right-censored, unemployment duration fell due to new entrants in 2009–2010, see also Figure 3 and Appendix 2. If we consider the exiting as shown in Figure 6, the increased unemployment spells indicate that many of the currently unemployed are at more risk of becoming long-term unemployed after the crisis. We investigate further the characteristics of the individuals who have the highest chances of entering longer unemployment spells by estimating Cox proportional hazard models. The results are presented in Table 6.

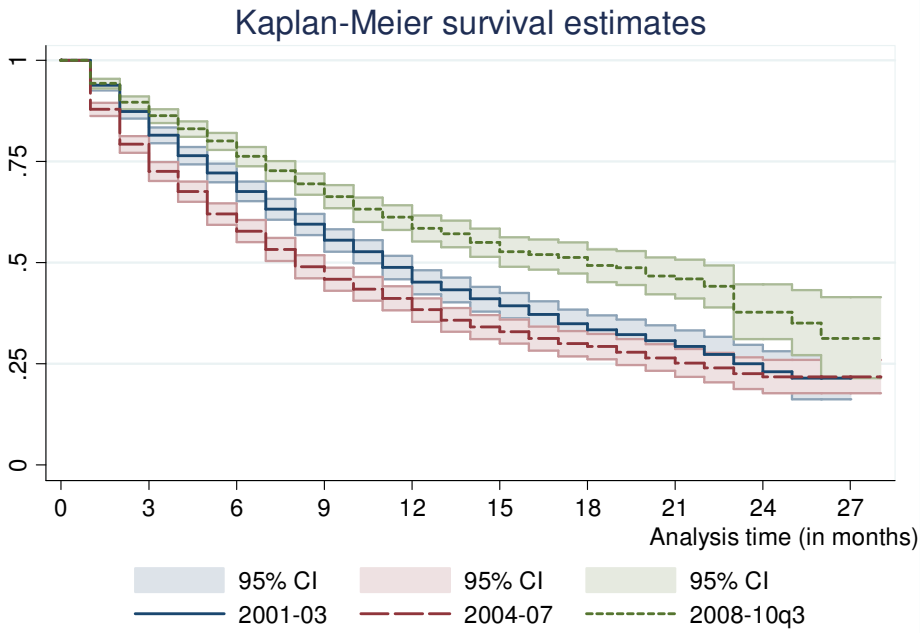

Figure 6: Survival functions of spells from unemployment to employment, 2001–2010q3.

Note: Year reflects the beginning time of a spell.
Source: author's calculations on LFS.

Since the number of observations is low due to the quite strict censoring and elimination of duplicates over rotating individuals, we estimate the Cox proportional hazard models using similar business cycle periods as in Figure 6. The importance of nationality and education for the chances of exiting unemployment has increased during the recession, Estonians and individuals

with tertiary education having the highest probability of exiting. Table 6 reports exponentiated coefficients, so we have to take the exponential of the coefficient before interpreting its impact on the chance of exiting from unemployment. For example, the unemployed with tertiary education had in the pre-crisis period a 50% (exp(0.4)) higher chance of exiting unemployment than did those with only primary education. During the crisis the importance of higher education in exiting unemployment increased, so that those with tertiary education have a 67% higher chance than those with only primary education. Similarly, Estonians had a 50% higher chance of exiting unemployment than did non-Estonians before the crisis and the chances increased to 78% during the crisis. The importance of Estonian language skills has also increased, but it must be remembered that this is correlated with ethnicity and does not reflect a pure language skill effect.

Interestingly, gender had no impact on exiting to employment during the boom years, but during the recession women have higher hazard rates for exiting to employment. Among traditionally significant personal characteristics, age is insignificant, while married individuals have a higher probability of exiting unemployment to employment and this effect has also been amplified during the crisis. Men had an 18%-lower and married persons a 33%-higher probability of exiting unemployment during the crisis.

Regarding the human capital indicators, we also test the impact of occupation, field of employment and field of education on the exit to employment. The first two of these indicators reflect the employment position at the last job before unemployment. Surprisingly there is no statistically significant impact from these human capital indicators. One explanation for this could be again the even smaller sample-size after the inclusion of these human capital variables. Another robustness test we undertake is a different experiment with left-censoring. We include also those individuals to the sample whose unemployment started two years before entering to the survey. This way we include some very long-term unemployed to the sample, but with the cost of under-representing short-term transitions. This exercise gave surprisingly similar results to the ones reported in Table 6, education and ethnicity stand again as the most important characteristics explaining exit from unemployment. There is also evidence that while education helps to exit unemployment even during the crisis, its' effect is weaker when we include also these very long-term unemployed. Similarly, the importance of cohabiting decreases and the role of regional residence increases somewhat during the crisis. However, these estimations are not comparative: to ensure a comparative sample size across different time-spans estimated, 2001–2003 vs. 2004–2007 vs. 2008–2010q3, we distribute spells by the end time of a spell (Table 6 origins from the beginning of the spell). Results of these additional estimations are available from the author upon a request.

Table 6: Hazard of moving out from unemployment to employment, 2001–2010q3

	2001–2003	2004–2007	2008–2010q3	2001–2003	2004–2007	2008–2010q3	2001–2010q3
Sex (1=male)	0.291***	0.087	–0.196**	0.254***	0.107	–0.180*	0.091**
	(0.075)	(0.072)	(0.093)	(0.079)	(0.077)	(0.096)	(0.046)
Age	–0.010	–0.036**	–0.017	–0.015	–0.043**	–0.008	–0.021*
	(0.022)	(0.018)	(0.028)	(0.022)	(0.019)	(0.029)	(0.013)
(Age^2) / 100	0.002	0.029	–0.005	0.008	0.036	–0.019	0.010
	(0.027)	(0.024)	(0.036)	(0.028)	(0.025)	(0.037)	(0.016)
Married (1=married or cohabiting)	0.119	0.184**	0.291**	0.114	0.233***	0.306***	0.165***
	(0.083)	(0.083)	(0.114)	(0.088)	(0.089)	(0.116)	(0.053)
Estonian (1=Estonian, 0=other)	0.164	0.406***	0.574***				0.373***
	(0.101)	(0.106)	(0.130)				(0.064)
Secondary education	0.222**	0.319***	0.204*	0.223**	0.314***	0.180	0.230***
	(0.090)	(0.083)	(0.113)	(0.093)	(0.088)	(0.116)	(0.054)
Tertiary education	0.406***	0.404***	0.510***	0.410***	0.495***	0.449***	0.417***
	(0.140)	(0.123)	(0.169)	(0.148)	(0.128)	(0.172)	(0.083)
Harju region (base South)	0.315***	0.334***	0.297**	0.290**	0.298***	0.249*	0.305***
	(0.109)	(0.108)	(0.137)	(0.113)	(0.112)	(0.133)	(0.068)
Central region (base South)	0.054	0.422***	0.578***	0.029	0.401***	0.559***	0.324***
	(0.106)	(0.100)	(0.133)	(0.107)	(0.101)	(0.133)	(0.065)
Ida-Viru region (base South)	–0.519***	0.143	0.060	–0.177	0.330*	–0.020	–0.120
	(0.161)	(0.153)	(0.214)	(0.179)	(0.181)	(0.280)	(0.099)
Western region (base South)	0.056	0.183	0.528***	0.063	0.162	0.518***	0.215***
	(0.116)	(0.115)	(0.149)	(0.117)	(0.118)	(0.149)	(0.072)
Estonian-language skills (Home=4, Write and read=3, Speak=2, Understand=1)				0.078	0.175***	0.203***	
				(0.049)	(0.053)	(0.069)	
New Employment Contract Act (0 before 2009m7, 1 onwards)							–0.033
							(0.139)
Year dummies	1827	1596	1797	1565	1406	1590	5220
# of observations	–5123.3	–5270.0	–3241.2	–4420.2	–4590.5	–2993.7	–15882.9
Log likelihood	0.291***	0.087	–0.196**	0.254***	0.107	–0.180*	0.091**

Notes: Cox proportional hazard model, reporting coefficients and not hazard ratios. Years in the first row reflect the beginning time of a spell. Robust standard errors clustered by ID in parentheses. $^{***, **, *}$ *denote statistical significance at the 1, 5 and 10% levels respectively.*

Source: author's calculations from the LFS data.

Regarding the human capital indicators, we also test the impact of occupation, field of employment and field of education on the exit to employment. The first two of these indicators reflect the employment position at the last job before unemployment. Surprisingly there is no statistically significant impact from these human capital indicators. One explanation for this could be again the even smaller sample-size after the inclusion of these human capital variables. Another robustness test we undertake is a different experiment with left-censoring. We include also those individuals to the sample whose unemployment started two years before entering to the survey. This way we include some very long-term unemployed to the sample, but with the cost of under-representing short-term transitions. This exercise gave surprisingly similar results to the ones reported in Table 6, education and ethnicity stand again as the most important characteristics explaining exit from unemployment. There is also evidence that while education helps to exit unemployment even during the crisis, its' effect is weaker when we include also these very long-term unemployed. Similarly, the importance of cohabiting decreases and the role of regional residence increases somewhat during the crisis. However, these estimations are not comparative: to ensure a comparative sample size across different time-spans estimated, 2001–2003 vs. 2004–2007 vs. 2008–2010q3, we distribute spells by the end time of a spell (Table 6 origins from the beginning of the spell). Results of these additional estimations are available from the author upon a request.

Lastly, we report the estimation results for the impact of the new Employment Contract Act on unemployment. As we have no difference-in-difference estimator here, the impact is not identified and we can observe only the unexplained difference before and after the enforcement of the new Employment Contract Act in July 2009. Employing this analysis methodology shows no statistically significant effect from this dummy variable.

4.3.2. Employment duration

This section investigates the impact of personal characteristics on exiting from employment to unemployment and job-to-job movements. We estimate the impact of the same set of personal characteristics on employment spells as in the previous section. The results are presented in Tables 7 and 8. The chances of moving out from employment to unemployment are a mirror image of those of moving from unemployment to employment. Again, the risk of moving to unemployment has increased for men and decreased for those with tertiary education and with Estonian ethnicity during the recession. The role of language skills reduces the risk of moving to unemployment, but here it is relatively less important and has not been amplified during the recession. As with unemployment spells, we find no statistically

significant effect from the new Employment Contract Act on the duration of employment spells.

Table 7: Hazard of moving out from employment to unemployment, 2001–2010q3

	2001–2003	2004–2007	2008–2010q3	2001–2003	2004–2007	2008–2010q3	2001–2010q3
Sex (1=male)	0.154**	0.125	0.241***	0.081	0.129	0.247***	0.176***
	(0.070)	(0.085)	(0.066)	(0.075)	(0.091)	(0.072)	(0.042)
Age	0.006	–0.031	–0.102***	–0.004	–0.045*	–0.115***	–0.042***
	(0.019)	(0.023)	(0.016)	(0.021)	(0.024)	(0.017)	(0.011)
(Age^2) / 100	–0.055**	–0.021	0.064***	–0.045*	–0.003	0.078***	–0.002
	(0.022)	(0.026)	(0.018)	(0.024)	(0.027)	(0.019)	(0.013)
Married (1=married or cohabiting)	–0.418***	–0.344***	–0.169**	–0.317***	–0.336***	–0.176**	–0.321***
	(0.073)	(0.086)	(0.075)	(0.079)	(0.093)	(0.081)	(0.045)
Estonian (1=Estonian, 0=else)	–0.433***	–0.507***	–0.711***				–0.527***
	(0.084)	(0.098)	(0.080)				(0.050)
Secondary education	–0.428***	–0.514***	–0.421***	–0.483***	–0.618***	–0.372***	–0.429***
	(0.080)	(0.095)	(0.079)	(0.086)	(0.102)	(0.085)	(0.048)
Tertiary education	–1.191***	–1.189***	–1.316***	–1.325***	–1.281***	–1.239***	–1.213***
	(0.136)	(0.148)	(0.123)	(0.150)	(0.158)	(0.130)	(0.078)
Harju region (base South)	0.292***	–0.039	–0.184**	0.214**	–0.088	–0.226**	0.026
	(0.094)	(0.107)	(0.090)	(0.101)	(0.113)	(0.093)	(0.057)
Central region (base South)	0.249**	0.093	0.328***	0.217**	0.110	0.321***	0.218***
	(0.103)	(0.123)	(0.098)	(0.104)	(0.126)	(0.100)	(0.062)
Ida-Viru region (base South)	–0.039	–0.040	–0.139	–0.070	–0.229	–0.325*	–0.111
	(0.121)	(0.149)	(0.127)	(0.158)	(0.200)	(0.175)	(0.076)
Western region (base South)	0.126	0.011	–0.165	0.113	0.002	–0.166	–0.034
	(0.103)	(0.125)	(0.109)	(0.104)	(0.127)	(0.110)	(0.065)
Estonian-language skills (Home=4, Write and read =3, Speak=2, Understand=1)				–0.206***	–0.318***	–0.314***	
				(0.042)	(0.049)	(0.040)	
New Employ-ment Contract Act (0 before 2009m7, 1 onwards)							–0.130
							(0.084)
Year dummies	10936	12080	11745	9667	10845	10845	34761
# of observations	–9153.6	–6054.5	–9329.6	–7494.9	–5091.5	–7984.8	–27390.8
Log likelihood	0.154**	0.125	0.241***	0.081	0.129	0.247***	0.176***

Notes: Cox proportional hazard model, reporting coefficients and not hazard ratios. Year reflects the end time of a spell. Robust standard errors clustered by ID in parentheses. ***, **, * *denote the statistical significance at the 1, 5 and 10% levels respectively.*

Source: author's calculations from LFS.

Table 8: Hazard of moving from job to job, 2001–2010q3

	2001–2003	2004–2007	2008–2010q3	2001–2003	2004–2007	2008–2010q3	2001–2010q3
Sex (1=male)	0.316***	0.119**	0.251***	0.329***	0.126**	0.211***	0.213***
	(0.060)	(0.051)	(0.071)	(0.063)	(0.053)	(0.073)	(0.034)
Age	–0.092***	–0.148***	–0.096***	–0.093***	–0.149***	–0.107***	–0.115***
	(0.017)	(0.014)	(0.022)	(0.018)	(0.014)	(0.022)	(0.010)
(Age^2) / 100	0.038*	0.098***	0.037	0.039*	0.098***	0.050*	0.062***
	(0.020)	(0.016)	(0.025)	(0.021)	(0.017)	(0.026)	(0.011)
Married (1=married or cohabiting)	–0.013	0.032	0.073	0.012	0.037	0.067	0.025
	(0.066)	(0.056)	(0.086)	(0.068)	(0.058)	(0.089)	(0.038)
Estonian (1=Estonian, 0=else)	0.255***	–0.100	–0.210**				–0.010
	(0.082)	(0.067)	(0.099)				(0.046)
Secondary education	–0.078	–0.143**	–0.134	–0.050	–0.185***	–0.128	–0.113**
	(0.077)	(0.065)	(0.097)	(0.080)	(0.068)	(0.100)	(0.044)
Tertiary education	–0.235**	–0.420***	–0.562***	–0.263**	–0.462***	–0.552***	–0.371***
	(0.100)	(0.085)	(0.122)	(0.105)	(0.088)	(0.126)	(0.057)
Harju region (base South)	0.399***	0.139**	0.129	0.387***	0.133*	0.164*	0.192***
	(0.079)	(0.067)	(0.097)	(0.081)	(0.069)	(0.095)	(0.045)
Central region (base South)	0.362***	0.238***	0.209*	0.378***	0.240***	0.188*	0.269***
	(0.086)	(0.074)	(0.112)	(0.086)	(0.076)	(0.114)	(0.050)
Ida-Viru region (base South)	–0.427***	–0.431***	–0.410**	–0.455**	–0.283*	–0.324	–0.479***
	(0.135)	(0.122)	(0.178)	(0.178)	(0.151)	(0.216)	(0.081)
Western region (base South)	0.215**	0.053	0.122	0.221**	0.065	0.123	0.119**
	(0.087)	(0.079)	(0.110)	(0.088)	(0.080)	(0.111)	(0.052)
Estonian-language skills (Home=4, Write and read=3, Speak=2, Understand=1)				0.077	–0.037	–0.088*	
				(0.047)	(0.038)	(0.049)	
New Employment Contract Act (0 before 2009m7, 1 onwards)							–0.167
							(0.125)
Year dummies	10554	12000	11111	9450	10851	10358	33665
# of observations	–10031.0	–13604.8	–7188.3	–9123.3	–12268.8	–6685.7	–34505.6
Log likelihood	0.316***	0.119**	0.251***	0.329***	0.126**	0.211***	0.213***

Notes: Cox proportional hazard model, reporting coefficients and not hazard ratios. Year reflects the end time of a spell. Robust standard errors clustered by ID in parentheses. ***, **, * *denote the statistical significance at the 1, 5 and 10% levels respectively.*

Source: author's calculations from LFS.

Table 8 presents the results for job-to-job movements. The results are similar to spells from employment to unemployment, but there are some exceptions. Again, Estonians or individuals with Estonian skills and individuals

with tertiary education move between jobs less frequently. As with spells to unemployment, job-to-job mobility is higher for males. While age is persistently statistically significant, young and old individuals change jobs more frequently, and cohabiting status is not significant for job-to-job mobility. The somewhat rigid nature of the North-Eastern region labour market is reflected in the job-to-job analysis: the Ida-Viru, region is statistically significant with a negative sign, indicating that workers in this area are less likely to move between jobs. Language skills somewhat reduce the impact of the Ida-Viru region on job-to-job mobility.

5. Summary

The latest recession has caused massive adjustments in the Estonian labour market. The purpose of this paper was to investigate Estonian labour mobility during the boom and bust of the last 10 years. Results indicate that from one perspective labour market mobility has been high, absorbing the crisis mostly through movement from employment to unemployment. There is also evidence of increased geographical mobility during the crisis, although the crisis has hit all regions except the Ida-Viru region to quite a similar extent. From another perspective there is evidence of less mobility during the crisis as there has been less movement between jobs, industries and occupations. We find strong evidence of the pro-cyclicality of hiring rates and counter-cyclicality of separation rates, which has been evidenced in previous business cycle literature, but the speed and extent of the adjustment, especially via separations, in the Estonian labour market is unique.

The duration analysis indicates that the impact of human capital on labour mobility has become more important during the crisis. Individuals with higher education and with good Estonian language skills have exited unemployment more quickly during the crisis. At the same time individuals with the same characteristics tend to move less frequently from employment to unemployment and have lower mobility from job to job. Finally, our simple specification finds no statistically significant impact from the new Employment Contract Act on unemployment or employment duration. The impact of this institutional reform and also that of unemployment insurance on labour market mobility demands further analysis. Lauringson (2010a) shows that the unemployment insurance system has contributed to longer unemployment spells, which have presumably also contributed to the massive adjustment through employment, and to lower wage flexibility, in the latest crisis.

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Appendix 1: Workers flows between labour market states and job flows, 2001–2010q3

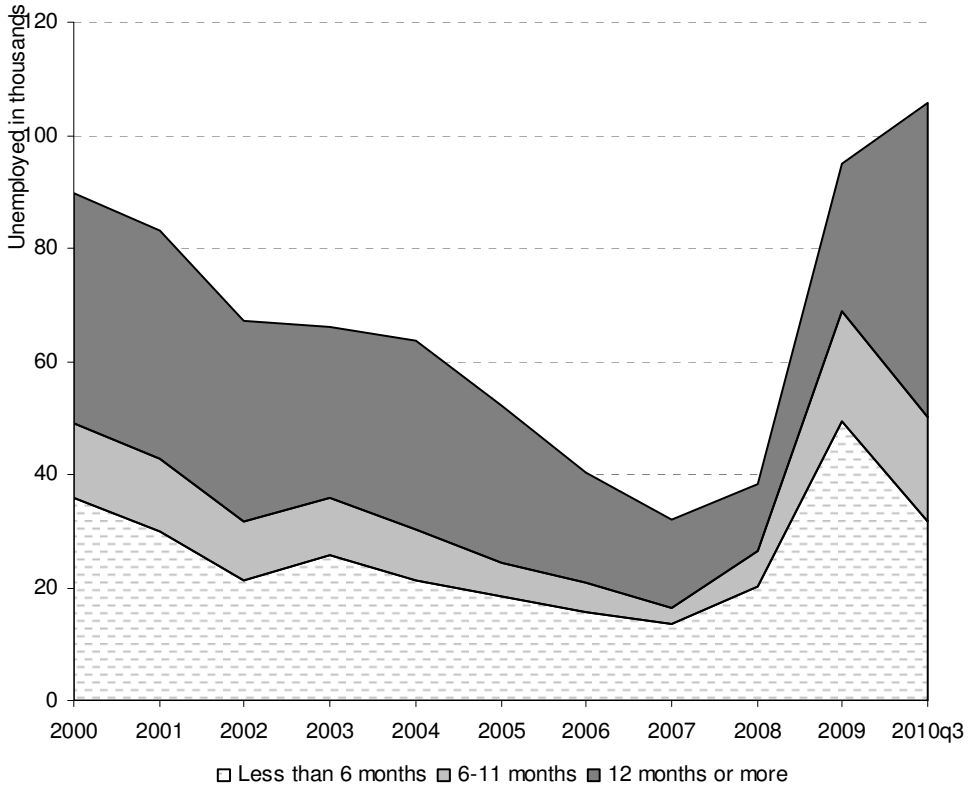
	EE*	EU	EI	UE	UU	UI	IE	IU	II	EE	Hiring rate	Separation rate	Job creation rate	Job destruction rate
2001	91.2	4.4	4.4	4.2	7.5	1.9	3.3	2.3	59.7	7.9	15.4	16.7	3.0	5.1
2002	92.3	3.4	4.3	3.8	5.9	2.1	3.6	2.1	60.8	9.2	16.6	16.9	5.2	3.8
2003	92.7	3.5	3.8	4.0	5.8	1.5	3.8	1.9	60.3	8.6	16.4	15.8	5.8	4.3
2004	93.1	2.7	4.2	3.7	6.0	1.2	3.4	2.1	60.0	7.8	15.0	14.7	3.7	3.5
2005	93.9	2.2	3.9	3.5	5.0	1.1	4.0	1.6	59.8	8.8	16.3	14.9	4.7	2.7
2006	94.6	1.7	3.7	3.0	3.2	0.7	4.8	1.5	53.1	9.0	16.7	14.4	8.4	2.0
2007	95.5	1.4	3.1	2.3	2.7	0.4	4.0	0.9	52.2	8.8	15.1	13.3	2.9	1.5
2008	93.4	2.7	3.9	1.8	2.0	0.3	3.8	1.1	48.3	8.6	14.2	15.2	3.2	3.0
2009	86.4	8.4	5.3	2.2	4.6	0.4	3.1	1.7	47.9	6.9	12.3	20.6	0.0	9.2
2010q3	86.6	8.5	4.8	4.0	9.7	0.8	3.3	2.3	52.4	6.0	13.3	19.4	4.1	9.5

Note 1: see section 3.1 for the flow notations and definitions; EE - individuals who were employed a year ago and are still employed divided by the total amount of employment a year ago; EE - individuals who were employed a year ago and are still employed but with a different employer divided by the total amount of employment year ago.*

Note 2: The difference between hiring and separation rates should result in net employment growth. This regularity between gross and net flows does not always result in exactly the same net employment growth under the methodology used in this paper. The discrepancy comes from the different base employment value of official statistics on employment growth and our gross flow calculations – we work with respondents' retrospective estimation of their employment status a year ago, official statistics uses the estimations of a current year.

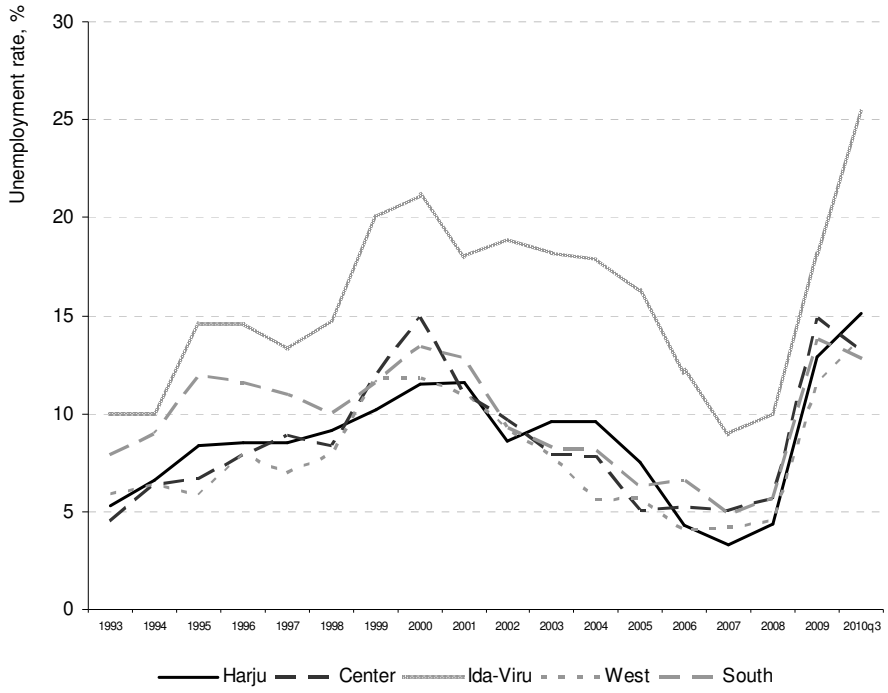
Source: author's calculations on LFS microdata.

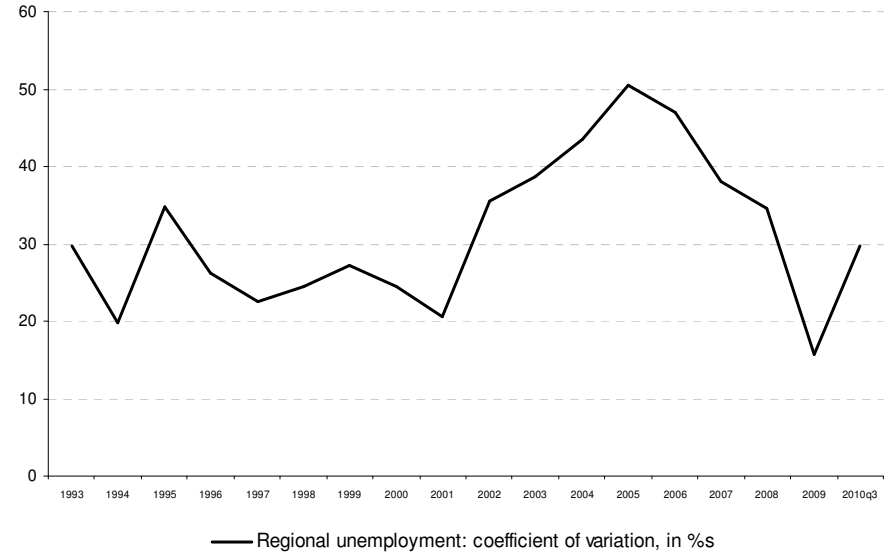
Appendix 2: Unemployed by duration of unemployment, 2000–2010q3 in thousands



Source: Statistics Estonia, 2010.

Appendix 3: Unemployment dynamics by NUTS3 region and the coefficient of variation, 1993–2010q3





Note: Coefficient of variation is calculated by dividing standard deviation by mean and multiplying by 100.

Source: Statistics Estonia 2010, author's calculations.

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