

# Relaxation of Employment Protection and its Effects on Labour Reallocation

Liina Malk

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# Relaxation of Employment Protection and its Effects on Labour Reallocation

Liina Malk<sup>\*</sup>

## Abstract

Flexibility of employment protection is considered to be essential for rapid adjustments in the workforce to changing economic conditions and for the reallocation of labour towards more productive activities. This was one of the main arguments for the new Employment Contracts Act in Estonia, which eased employment protection by reducing the costs of terminating employment relationships. Since such substantial changes in employment protection legislation (EPL) are quite rare, this reform provides a good chance to examine the outcomes of the relaxation of employment protection. This paper evaluates the effects of this institutional change on labour reallocation. Exploiting the microdata of the Labour Force Surveys for the years 2007–2011, we analyse worker flows and employ the difference in differences approach to identify the effects of the EPL reform, using Lithuanians as a control group for Estonians. Subsequent to the reform, labour flows out of and into employment increased in Estonia relative to Lithuania. However, from the regression analysis, a statistically significant impact of the EPL reform was identified only on the former of these two types of flows. Both the assessment of aggregate flows and the estimation of difference in differences effects for transition probabilities indicate that the reform of employment protection resulted in lower job-to-job flows while the overall effect on labour reallocation was positive.

JEL Code: J60, K31

Keywords: employment protection legislation, labour reallocation, policy evaluation, difference in differences estimation.

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

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## **Non-technical summary**

The aim of this paper is to evaluate the effects of employment protection legislation (EPL) by examining the employment law reform in Estonia, where the new Employment Contracts Act came into force in mid-2009. One of the principal goals of this reform was to improve the flexibility of the labour market and the key change was a reduction in the costs of terminating employment relationships. This was accomplished by reducing the notice period and the amount paid in severance payments. According to economic theory, lowering the costs of terminating employment contracts should increase labour mobility. The purpose of this paper is to evaluate the impact of reducing the strictness of EPL on labour reallocation to test whether this is the case.

In this paper, two close and similar countries are studied in order to identify the effects of the EPL. The evaluation is based on a difference in differences method comparing labour mobility in Estonia and Lithuania (the control group) before and after the employment law reform in Estonia. The analysis uses data from the Labour Force Surveys for the years 2007–2011 to examine labour flows into and out of employment as well as job-to-job flows. The probabilities of yearly transitions in the labour market are estimated with probit models and the regression formulation of the difference in differences approach is used to identify the effects of the reform.

Labour reallocation consists of three types of flow: job-to-job switches, movements out of employment and movements into employment. The estimation gives evidence of the EPL reform having a positive influence on the total reallocation of labour as the probability of reallocation in the labour market has increased. However, looking at the different types of flow separately we can see that the reallocation rate has increased because the movement out of employment has increased. In other words, we find that the reduction in the strictness of EPL seems to have increased the probability of transitions out of employment. This result is consistent with theories of EPL and in accordance with previous findings in the empirical literature.

Theory suggests that a relaxation of employment protection should also increase the hiring rate. The fast recovery of the Estonian labour market from the crisis and the increased flows into employment mean that there has been a rise in hirings. However, with our specification of the hiring probability no significant impact of the EPL reform on the inflows to employment could be identified. Our results suggest that this positive effect on hirings has rather come from the faster growth of the Estonian economy relative to the Lithuanian during the post-reform period of our study.

In terms of reallocation in the form of job-to-job flows, the results of our evaluation are not in accordance with orthodox economic theory. We identify significant negative effects from the EPL reform on the probability of job-to-job transitions. As the theory states that more flexible EPL should create more job opportunities by increasing worker flows, this finding of reduced job-to-job flows resulting from the relaxation of EPL is somewhat contradictory. Intuitively, one reason for this result may be that workers perceive a higher risk of becoming unemployed and losing income because of the more flexible EPL and therefore they are less likely to search for new jobs. This outcome may also be caused by shorter notice periods, which reduce the chance of finding a new job before actual dismissal takes place and moving directly from one job to another without entering unemployment. In any case, since there are some institutional differences between the Estonian and Lithuanian unemployment insurance systems and labour taxation, these results could also be affected by interactions between EPL and other labour market institution.

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## 1. Introduction

Employment protection legislation (EPL) can be considered as a tax on work-force adjustments, since it imposes legal restrictions on dismissals and on the compensation to be paid to workers by their former employer in the event of the termination of an employment contract (Boeri (2011)). In downturns, EPL increases the cost of reducing employment and therefore leads to fewer dismissals. This in turn may result in costs to the firm from keeping non-productive workers or from remaining overstaffed even during periods of reduced demand (OECD (1999)). Conversely, in good times, the fact that workers may have to be fired in the future is taken into account when the optimal level of employment is decided, and this deters employers from increasing their labour force (Boeri and van Ours (2008)). This means that EPL inhibits both hiring and firing decisions and overall labour reallocation and so the strictness of EPL has been seen as a hindrance to the achievement of a sufficient level of flexibility, which in turn is essential for economic growth as it facilitates structural changes towards more productive activities.

Hence the current economic environment with rapid changes and intense competitive pressures has led countries to find ways of increasing the flexibility of labour markets. This was also done in Estonia, where the new Employment Contracts Act (ECA) came into force in July 2009. According to the explanatory note of the draft law, one of the principal goals of the employment law reform was to increase labour market flexibility and improve labour reallocation (Ministry of Social Affairs (2008)). A key change was the reduction in the cost of terminating an employment relationship through a reduction in the notice period and the amount paid in severance payments. Since such regulatory changes easing EPL for regular contracts are quite rare (Martin and Scarpetta (2011)), this reform gives us a good chance to evaluate the impacts of EPL, and so the purpose of this paper is to evaluate the effects of the relaxation of employment protection on labour reallocation.

Although labour reallocation is considered to be an important driver of productivity and economic growth, an excessive degree of reallocation can discourage investments in firm-specific human capital and thereby hamper productivity growth (see e.g. Cazes and Nesporova (2003)). At the same time, larger reallocation provides more job opportunities leading to better skills-matches and higher wages (see e.g. Martin and Scarpetta (2011)). But not all workers benefit from greater mobility. Workers who are dismissed or have to experience unemployment have to bear the welfare costs of income losses from unemployment and lower wages at re-employment. Empirical evidence suggests that only voluntary movements and job-to-job transitions lead to more efficient reallocation of labour (see e.g. OECD (2010)). This means that greater reallocation cannot always be considered as improved

reallocation. The policies aimed at improving labour reallocation should also include supporting measures to mitigate the welfare losses for workers who are forced to move and to facilitate their re-integration into employment.

Therefore another intention of the employment legislation reform at first was to compensate for the relaxation of EPL by improving the social protection for the unemployed (Ministry of Social Affairs (2008)). However, since the new law came into force in economically difficult times, the changes that were supposed to enhance income security were initially postponed and eventually cancelled. At the same time, the tax burden on labour was increased in order to provide a sufficient level of contributions to the unemployment insurance fund. This meant that the reform mainly introduced changes in EPL, together with some changes in labour taxation, while leaving other labour market institutions unchanged. Therefore an evaluation of this reform can provide useful input for discussions of whether easing EPL alone is enough to improve the reallocation of labour. This is the politico-economic contribution of this study, providing new evidence on the relationship between EPL and labour reallocation and also on the importance of interactions with other labour market institutions.

The effects of EPL have motivated a large body of empirical research, and in general the studies can be divided into two categories. One group consists of a large number of macro-level studies using various EPL measures and macro-indicators for the economy and the labour market to obtain evidence on the impacts of EPL from the differences between countries. Consistently with the theoretical predictions, a majority of the studies have found significant effects from EPL on labour flows (e.g. Haltiwanger et al. (2006)). However, as greater flexibility in employment protection increases both hiring and firing, the results concerning the total effect of EPL on employment and unemployment stocks are ambiguous.

There are studies which have found a statistically significant negative effect from strict EPL on employment (e.g. Heckman and Pages (2000)), and a number of empirical studies have also found a positive impact from EPL on unemployment. Countries with more rigid employment laws tend to have higher unemployment (Feldmann (2009)), especially among youth (Djankov and Ramalho (2009)). However, the findings of Nickell (1997) indicate that EPL reduces short-term unemployment and increases long-term unemployment, but the overall impact on unemployment is likely to be quite small, as these effects tend to cancel out. The effect of stricter EPL increasing long-term unemployment was also found by DiTella and MacCulloch (2005). However, Jackman et al. (1996) have found no effect on unemployment, because the effect on firings is almost offset by the effect of hirings.



The strictness of EPL should also influence the flows between jobs and those effects have also been examined in many studies, though the findings of those studies have been mixed. There is evidence of negative effects from strict EPL on job-to-job mobility (e.g. Gielen and Tatsiramos (2012)) but Bassanini and Garnero (2013) found this result to be significant only for within-industry job-to-job movements and insignificant for job-to-job transitions involving an industry change. Boeri and Garibaldi (2009) found that the negative effect of EPL on job-to-job shifts is driven by temporary contracts as it is not significant for temporal contracts.

The other group of empirical literature consists of microeconomic studies based on the variation in the enforcement of EPL within a country (e.g. according to the size of a firm, formal and informal sector, permanent or temporary contracts, etc.). These studies exploit both time-series variation in the level of employment protection (before and after the reform) as well as within-country variation in the coverage and actual enforcement of these regulations. The most common strategy for using this asymmetry in the application of employment protection is the difference in differences approach, which compares the pre-reform and post-reform labour market outcomes of different subgroups of the population in order to identify the effects of EPL.

Kugler (1999) carried out a policy evaluation using this methodology where she examined the impact of the reform reducing dismissal costs in Colombia in 1990 and estimated its effects on worker turnover by exploiting the variation in coverage for workers in the formal and informal sectors. She found evidence that this reform reduced unemployment by generating greater flows out of unemployment than into unemployment. Boeri and Jimeno (2005) and Kugler and Pica (2008) examined the effects of a reform in the Italian labour market in 1990 by using the differences in the coverage of EPL, as workers in units with less than 15 employees and workers under temporary contracts were not covered by EPL. They found evidence that the increase in dismissal costs reduced both separations and accessions for workers. It can be concluded that these micro-data studies are also consistent with the theoretical predictions about the significant negative effects of EPL on labour flows.

In this paper, the methodological aim is to go beyond the standard approaches for estimating the effects of EPL and to extend the common within-country micro-econometric strategy based on the variation in application of EPL between different subgroups of population to a cross-country perspective. In this paper, two close and similar countries are used to provide the double variation of before and after the reform and between the people affected and unaffected by the reform that is required for the effects of EPL to be identified. The evaluation is based on a difference in differences (DID)

strategy comparing labour mobility in Estonia and Lithuania before and after the employment law reform in Estonia.

A similar approach has been used by Masso et al. (2013), who estimated the outcomes of the Estonian corporate tax reform with DID analysis using firms from the other two Baltic countries, Latvia and Lithuania, as the control group for Estonian firms. Compared to a within-country micro-econometric evaluation this approach has the advantage of identifying the effects from a comparison of whole populations not just subgroups. With the within-country variation in the application of the policy, the resulting subgroups might not be representative of the population and so the differences in their outcomes might not indicate the effects on the whole population.

The analysis uses individual-level data from the Labour Force Surveys of Estonia and Lithuania. Annual labour flows between labour market statuses and employers are calculated to examine labour reallocation and the probabilities of transitions are estimated with probit models using the regression formulation of the difference in differences approach in order to identify the effects of the reform.

The paper is organised as follows: the next section presents the economic and institutional developments in the treatment and control groups. Section 3 describes the data and presents the worker flows. The fourth section describes the evaluation methodology and specifies the models. Section 5 displays the estimation results and tests the robustness. Finally, section 6 concludes.

## **2. Design of the control group: the institutional background and main trends in the Estonian and Lithuanian labour markets**

Identifying the effects of the employment law reform on labour mobility requires an appropriate control group to capture the developments that would have taken place anyway without the reform. Since the new Employment Contracts Act was enacted in Estonia simultaneously and uniformly, it is difficult to identify a control group within Estonia. An alternative way of constructing a control group is to use people from some other countries. As the control group needs to be as similar as possible to the treatment group in terms of its pre-treatment characteristics and structure, the main candidates for constituting an appropriate control group for Estonia are the other Baltic countries, Latvia and Lithuania. As the economic and labour market dynamics are more similar between Estonia and Lithuania than between Estonia and Latvia, this paper uses Lithuanians as the control group.

One possible criticism of this approach is that Estonia and Lithuania may not have had sufficiently similar trends, so that in addition to the Estonian employment legislation reform there might have been other developments in Estonia or Lithuania during the observed period that might have caused the effects on labour mobility. Therefore this section looks at the main trends in the Estonian and Lithuanian labour markets and describes developments in their institutional framework.

Estonia and Lithuania have had similar historical backgrounds, starting with simultaneous liberation from the Soviet Union and then moving towards Western political and economical structures. At the beginning of the 1990s political, economic and social reforms were begun in both Estonia and Lithuania. Both countries also started to work towards membership of the EU and NATO and they achieved these goals in 2004. Hence the economic environments and institutional frameworks of Estonia and Lithuania are similar in many aspects.

Both countries have relatively open economies which are dependent on developments in the global economy. Trade and manufacturing are the most important economic activities in terms of employment, followed by construction, education and transportation in Estonia and education, agriculture and transportation in Lithuania (see Appendix 2). Wages are relatively flexible in both Estonia and Lithuania. One reason for this might be the weak role of labour unions as trade union density is below 10% in both countries and the collective bargaining coverage is relatively low at around 30% in Estonia and 15% in Lithuania (Homann (2011)). Furthermore, in Estonia and Lithuania flexible remuneration methods like hourly and piece-rate compensation schemes are more common than in other EU member states (Dabušinskas and Rõõm (2011)). However, flexible work arrangements such as part-time work and temporary contracts are not very common in either country and far below the EU average, with around 10% of workers doing part-time work and less than 5% working on temporary contracts (see Appendices 6–7).

Even though Estonia and Lithuania have demonstrated considerable flexibility in wages, their labour market regulations had become outdated and unfavourable for job creation and labour reallocation, so both countries started to look for ways to increase the flexibility of the labour market. Only Estonia actually implemented totally new EPL, while in Lithuania there were discussions about liberalising the labour market, but they led to only a few rather minor and temporary legislative changes.

Estonia reformed its employment legislation in mid-2009. The main aim of this was to encourage the reallocation of labour to more productive jobs and to improve the social protection of the unemployed (Ministry of Social Affairs (2008)). The rules were lightened in many ways, but the main change

was the reduction in notice periods for dismissals and in severance payments (see Table 1). The administrative burden for employers was also reduced. In order to improve the income security of the unemployed, the draft of the act included an increase in the replacement rate of the unemployment insurance benefit and the act as it was passed widened the coverage of unemployment insurance benefits and increased the unemployment assistance benefit. However, the economic downturn and budgetary pressures meant that the first measure was cancelled before the act was passed and the other two were postponed to 2013. Then the decision to extend unemployment insurance benefits to cases of voluntary job quits was annulled in 2012 and the increase in unemployment assistance benefit was lower than initially promised.

In Lithuania there were also some changes to the employment legislation in July 2009, but those amendments could not have any significant impact on the flexibility of labour relations in Lithuania, as they were temporary and also relatively unimportant, such as allowing shorter periods of notice of dismissal and lower severance pay to be agreed in collective agreements, or allowing longer overtime hours (Gruzevskis and Blaziene (2011)). From 1 August 2010, there were some more changes in Lithuanian Labour Law, with the minimum notice period for termination of an employment contract at the initiative of the employee changed from calendar days to working days. Firms were allowed to make fixed-term contracts for newly created jobs though this measure expired in August 2012, and the regulation of summary recording of working time and overtime work was eased (Gruzevskis and Blaziene (2011)). However, these changes from 2010 can be considered relatively insignificant in terms of improving labour market flexibility and we can presume that there have been no considerable changes in Lithuanian EPL that compare to the employment law reform in Estonia.

A closer look at the dynamics of the economy reveals significant similarities between Estonia and Lithuania (longer annual trend in Appendix 3 and shorter quarterly trend in Figure 1). The economies of both states were significantly affected by the Russian crisis in 1999, when a steep decline in exports led to a decline in growth rates. However, from 2000 Estonia and Lithuania both saw fast economic growth averaging 7–10% per year. Large inflows of capital from Scandinavian banks led to overheating in 2006–2007 and the subsequent recession in 2008–2009 when both countries were hit hard by the global financial crisis. Both Estonia and Lithuania had large GDP falls in 2009, with only Latvia among EU member states suffering an even bigger decline. As we can see from Figure 1, since 2010 the economies of Estonia and Lithuania have started to recover. The dynamics of GDP growth have been similar, although the Estonian economic cycle has been ahead of the Lithuanian cycle by 1–2 quarters.

Table 1: Notice periods and severance pay following redundancies (terminations for economic reasons)  
in Estonia and Lithuania

Length of tenure with the present employer	Estonia					Lithuania	
	Before 01.07.2009		After 01.07.2009			Notice period	Severance pay
	Notice period	Severance pay	Notice period	Employer	Unemployment Insurance Fund		
Up to 1 year	2 months	2 months' average pay	15 calendar days	1 month's average pay	-	2 months	1 month's average pay
1-3 years	2 months	2 months' average pay	30 calendar days	1 month's average pay	-	2 months	2 months' average pay
4-5	2 months	2 months' average pay	30 calendar days	1 month's average pay	-	2 months	3 months' average pay
6-10 years	3 months	3 months' average pay	60 calendar days	1 month's average pay	1 month's average pay	2 months	4 months' average pay
11-20 years	4 months	4 months' average pay	90 calendar days	1 month's average pay	2 months' average pay	2 months	5 months' average pay
More than 20 years	4 months	4 months' average pay	90 calendar days	1 month's average pay	2 months' average pay*	2 months	6 months' average pay

Source: Republic of Estonia Employment Contracts Act; The Employment Contracts Act of Estonia; The Labour Code of the Republic of Lithuania.

Note: \* Until 31 December 2014 the additional compensation paid by the Estonian Unemployment Insurance Fund to an employee with length of service of over 20 years (by 01.07.2009) is 3 months' average salary.

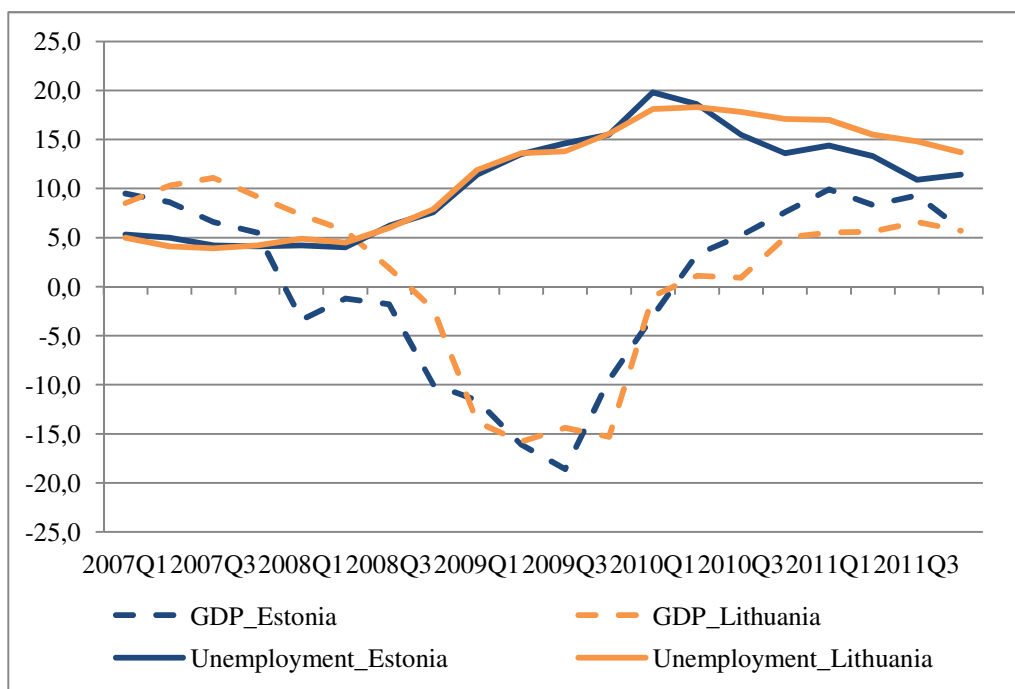


Figure 1: GDP (as a percentage change from the corresponding period of the previous year) and unemployment rate in Estonia and Lithuania, 2007Q1–2011Q4

Source: Eurostat

Significant similarities can also be seen in the dynamics of the main labour market indicators. The labour markets of Estonia and Lithuania were strongly affected by the global economic crisis in 2009 and the first half of 2010. The economic crisis caused the unemployment level to almost quadruple (see Figure 1). The fall in employment and rise in unemployment were bigger in the Baltic States than in other EU member states, but the effects were somewhat larger in Latvia than in Estonia and Lithuania. As economic conditions improved, the first signs of recovery in the labour markets of Estonia and Lithuania could be seen in the second quarter of 2010, though it appears that the reduction in the unemployment rate has been faster in Estonia than in Lithuania. However, despite the recovery of labour markets, both countries are still facing the problem of high long-term unemployment (see Appendices 10–11). The dynamics of the most relevant indicators for describing the labour markets of Estonia and Lithuania in comparison with those of Latvia and Finland and the EU27 average are presented in Appendices 4–12. It appears that Estonia and Lithuania have had very similar labour market dynamics, both in terms of the levels and the trends of these indicators.

Although the regulatory framework of the labour markets of Estonia and Lithuania has been similar, there are a few differences besides EPL which

might have some influence on the effects of EPL. These differences are in the unemployment insurance systems and labour taxes. Firstly, only involuntary movements to unemployment are covered by unemployment insurance in Estonia but in Lithuania voluntary movements are also covered. At the same time, the maximum duration of unemployment insurance is longer in Estonia than in Lithuania. In Lithuania individuals with an unemployment insurance record of less than 25 years can get the benefit for 6 months and only those with an unemployment insurance record of 35 years and over are eligible for the benefit for 9 months (European Commission (2011)). In contrast, in Estonia people with an unemployment insurance record of more than 56 months (4 years and 8 months) can receive the unemployment insurance payments for 9 months and those with an unemployment insurance record of more than 110 months (9 years and 2 months) can receive the unemployment insurance payments for 12 months (European Commission (2012)). Finally, one other important difference comes from the differences in labour taxation. While Lithuania has followed the route of lowering taxes on labour (see Appendix 12), labour taxation in Estonia increased during the crisis because of a rise in contributions to the unemployment insurance fund from 0.9% to 4.2% of gross wages. The possible effects of this change on labour demand also need to be considered in an analysis of the impacts of EPL reform on labour mobility.

The structures of the labour force in Estonia and Lithuania are remarkably similar (see Appendices 1–2). The distributions by gender, age, educational level and marital and labour statuses are very similar, though in Lithuania the proportions of females, the elderly aged 50–74, and people with a secondary educational level are a little higher than in Estonia, and the shares of youth aged 15–24, married or cohabiting people, and the employed is slightly smaller. The proportions of occupations and economic activities among employed people are also quite similar, although in Estonia the shares of plant and machine operators, and assemblers and people employed in manufacturing and construction are somewhat higher, while in Lithuania the shares are a little bigger for professionals and skilled agricultural, forestry and fishery workers, meaning those employed in agriculture, forestry and fishing in terms of economic activity.

The similarity of the structures of the Estonian and Lithuanian labour forces and the main economic and labour market trends support the choice of control group. Lithuanians can be considered to be a close match for Estonians and thereby can provide valuable evidence on what the events in the Estonian labour market would have been if Estonia had not reformed its EPL. This in turn allows us to make inferences about the effects of the Estonian labour legislation reform by using Lithuania as a control group in a methodology based on a difference in differences approach.

### **3. Data and overview of labour flows in Estonia and Lithuania**

#### **3.1. Data source**

This paper uses Labour Force Survey (LFS) microdata to calculate the probabilities of flows between labour market statuses and job positions. The LFS is a sample survey conducted under the methodology of the International Labour Office (ILO) to give a picture of employment, unemployment and the working conditions of the population. The fact that the LFS is based on the methodology developed by the ILO ensures the international comparability of the data (Statistics Estonia (2012)).

The LFS covers the permanently residing population aged 15–74. Every quarter approximately 2200 households containing 4300 people of working age are covered in Estonia and 8000 households containing 13,000 people of working age in Lithuania. This analysis covers the period from 2007 to the 3<sup>rd</sup> quarter of 2011. The total number of individuals in the sample is 325,447, of whom 83,134 are from Estonia and 242,313 from Lithuania.

In the LFS the respondents are asked to report their labour market statuses in the period under observation and also for the last year before the survey. The variables indicating current and prior labour market status and the starting time for the current job are used to calculate annual worker flows involving changes across employment, unemployment and inactivity. In order to obtain the job-to-job transitions, the starting time for the current job is observed for those who were employed both a year ago and in the current year. If a change of employer happened more than a year ago, then the person being observed is classed as still working for the same employer as a year earlier, but if it occurred within the last year, then that person had changed job within the last year.<sup>1</sup>

Respondents who are unemployed or inactive are also asked to report the main reason for leaving their last job. Although the categories for this question are somewhat different in the Estonian and Lithuanian LFSs, this infor-

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<sup>1</sup> One shortcoming of this method for calculating worker flows is that short spells might go missing with this approach. In order to overcome this problem, the worker flows can be calculated using another method. As the LFS has a rotating panel structure, then it is also possible to use the panel dimension for observing the transitions of individuals in the labour market. By using the panel dimension with a retrospective view, it is possible to observe the same individuals for up to 2.5 years. However, the panel dimension of the data has not been exploited in this paper. It has been argued that as the annual rates will miss some temporary movements that occur within a year, the seasonality of flows can be avoided and therefore this method is more suitable for a structural analysis (Meriküll (2011)).



mation can still be used to define whether the separation from the job was voluntary or forced. In the Lithuanian LFS, involuntary separation is defined as a separation from the job for one of two reasons: either the worker is dismissed or made redundant, or a job of limited duration has ended. In the Estonian LFS the categories are more detailed and the definition of involuntary separation covers the closure or bankruptcy of an establishment, the reorganisation or privatisation of the establishment, the dismissal or redundancy of the worker, and the expiration of a temporary employment contract or trial period.

### 3.2. Overview of labour flows in Estonia and Lithuania

Labour market mobility analysis can be conducted by calculating worker flows, which are defined as the number of people changing their job or employment status. Haltiwanger and Vodopivec (2002) have proposed three different rates for analysing labour market flows: hiring, separation and worker reallocation rates. The hiring rate reflects the rate of worker transitions from non-employment to employment and from job-to-job as a fraction of employment in the prior period. The separation rate reflects the rate of worker transitions from employment to non-employment and job-to-job movements as a fraction of employment in the prior period. Thus the hiring rate shows the probability of a worker moving to a job and the separation rate shows the probability of them leaving a job. The worker reallocation rate reflects the rate of all transitions as a share of employment in the prior period, avoiding double counting of those individuals who were both separated and hired.

$$\text{Hiring rate} = \frac{EE_t + UE_t + IE_t}{E_{t-1}}$$

$$\text{Separation rate} = \frac{EE_t + EU_t + EI_t}{E_{t-1}}$$

$$\text{Worker reallocation rate} = \frac{EE_t + UE_t + IE_t + EU_t + EI_t}{E_{t-1}}$$

where

$EE_t$  – number of workers transiting from one job in period  $t-1$  to another job in period  $t$ , i.e., workers remained employed from  $t-1$  to  $t$ , but with a different employer,

$UE_t$  – number of workers transiting from unemployment in period  $t-1$  to employment in period  $t$ ,

$IE_t$  – number of workers transiting from inactivity in period  $t-1$  to employment in period  $t$ ,

$EU_t$  – number of workers transiting from employment in period  $t-1$  to unemployment in period  $t$ ,

$EI_t$  – number of workers transiting from employment in period  $t-1$  to inactivity in period  $t$ ,

$E_{t-1}$  – number of employed individuals in period  $t-1$ .

In describing the aggregate mobility in the labour market, all possible labour flows are examined. The reallocation rate described above is calculated as a share of the working age population. In addition the rates of transitions from employment into non-employment and vice versa and involuntary transitions from employment into non-employment and into unemployment are computed with the following formulas:

$$\text{From employment to non-employment} = \frac{EU_t + EI_t}{E_{t-1}}$$

$$\text{From non-employment to employment} = \frac{UE_t + IE_t}{U_{t-1} + I_{t-1}}$$

$$\text{Involuntarily from employment to non-employment} = \frac{EU_t^{IN} + EI_t^{IN}}{E_{t-1}}$$

$$\text{Involuntarily from employment to unemployment} = \frac{EU_t^{IN}}{E_{t-1}}$$

where

$EU_t$  – number of workers transiting from employment in period  $t-1$  to unemployment in period  $t$ ,

$EI_t$  – number of workers transiting from employment in period  $t-1$  to inactivity in period  $t$ ,

$E_{t-1}$  – number of employed individuals in period  $t-1$ ,

$UE_t$  – number of workers transiting from unemployment in period  $t-1$  to employment in period  $t$ ,

$IE_t$  – number of workers transiting from inactivity in period  $t-1$  to employment in period  $t$ ,

$U_{t-1}$  – number of unemployed individuals in period  $t-1$ ,

$I_{t-1}$  – number of inactive individuals in period  $t-1$ ,

$EU_t^{IN}$  – number of workers transiting involuntarily from employment in period  $t-1$  to unemployment in period  $t$ ,

$EI_t^{IN}$  – number of workers transiting involuntarily from employment in period  $t-1$  to inactivity in period  $t$ .

The aggregate dynamics of labour mobility have been similar in Estonia and Lithuania (Figure 2, see also Appendices 13–14). The labour flows of 2007–2008 are appropriate for periods of rapid economic growth with people moving more from one job to another than from employment into unemployment. During the downturn the movement into employment and from one job to another slowed down and the flows to unemployment increased significantly. But since 2010 the flows into unemployment have started to decrease and flows into employment have begun to increase. This shows that the economic downturn had a great influence on the labour flows in both countries.

Worker flows from employment to non-employment and to unemployment (a. and c. in Figure 2) show that in the years 2007–2008 there was a considerable difference between the Estonian and Lithuanian flows. In 2009, however, the rise in those rates was steeper in Estonia and after that there have been no noteworthy differences between the flows out of employment in Estonia and Lithuania. Looking at the involuntary flows out of employment (b. and d. in Figure 5.1) we can see that the share of those flows was higher in Estonia in 2009–2010.

The flows into employment (e. and f. in Figure 2) show that since 2009 the difference between Estonia and Lithuania has increased. This means that in Estonia a larger share of the non-employed and unemployed have been able to find a job within a year. Looking at the job-to-job transitions (g. in Figure 2) we can see that there has been a decrease in this indicator in both Estonia and Lithuania, but the reduction in Estonia has been considerably steeper than in Lithuania. In 2007 the rate of job-to-job flows was around 9% in both countries, but in 2011 (3 quarters) it was around 8% in Lithuania and around 6% in Estonia. The reallocation rate (h. in Figure 2) shows that the reallocations, or transitions from non-employment into employment or vice versa or from job to job, have increased more in Estonia, but since the difference has been slight we cannot consider it to be significant.

The differences between worker flows in Estonia and Lithuania that have appeared since 2009 might indicate the effects of the new ECA in Estonia, but they might also have been caused by some other factors. Therefore we need to carry out a micro-econometric analysis to control for other factors and acquire estimates of the effects of the EPL reform in Estonia and their significances. The estimation methodology together with the specification of the models is described in the following section and the results are presented in section 5.

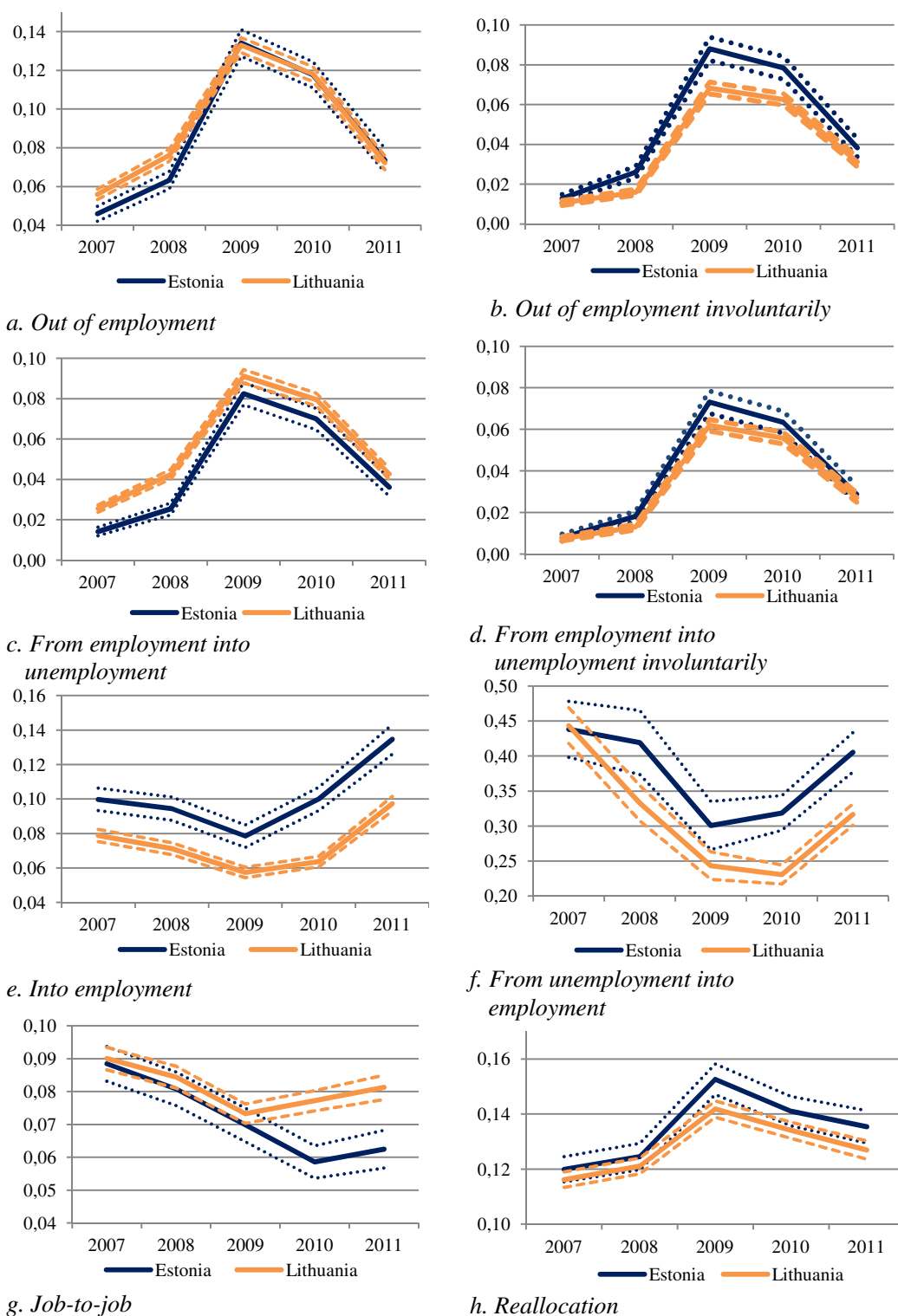


Figure 2: Worker flows, as a share of people in the starting status(es) a year ago, 2007–2011q3 (with 95% confidence interval)

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

## **4. Methodology**

### **4.1. Difference in differences approach in policy evaluation**

After a policy change is implemented, it is important that the achievement of its objectives and the realisation of expected and unexpected effects be evaluated. The main question in policy evaluation is whether the outcome for an individual and for society as a whole was affected by the change in policy. In other words, we would like to know the differences between the outcomes with and without the change of policy. However, since we can never observe both situations for the same individual or group of individuals, the fundamental evaluation problem arises (Caliendo and Hujer (2005)). To solve it, an appropriate control group is needed for the evaluation. In the literature a wide range of evaluation strategies is offered, in general, they can be divided into two groups, the experimental and non-experimental approaches.

The experimental approach uses the random assignment of individuals to the treatment group to whom the policy change applies and to the control group, to whom the policy change does not apply. The groups can be considered as well-designed if they differ only in whether they are treated by the policy change or not and so that any differences in the outcomes can be taken as treatment effects (Caliendo and Hujer (2005)). Thus experimental evaluation will solve the fundamental evaluation problem and provide the best evidence of the policy impacts. However, experimental data are not usually available and so methods using non-experimental data must be applied.

The non-experimental approaches use different econometric and statistical methods to solve the fundamental evaluation problem. In non-experimental studies, the outcome with treatment for the treated and the outcome without treatment for the non-treated are observed. The different strategies can be classified in two dimensions. We can distinguish between longitudinal and cross-sectional methods, depending on the data required. The second dimension concerns the handling of selection bias, which arises because different individuals would have different outcomes even in the absence of the policy change (Caliendo and Hujer (2005)). This might be caused by observable or unobservable factors and therefore two categories exist.

The strategies of the first category rely on the selection on observables assumption, which assumes that selection to treatment is determined by observed characteristics like age, education etc. In that case, a control group with similar characteristics can be used to construct the missing counterfactual outcome. Popular strategies in the first category are, for example, matching and regression analysis. As these methods need a rich dataset containing

all the variables that influence the outcomes, then if the available data are not rich enough to justify the selection on observables assumption we have to rely on the second category of evaluation methods. In any case, controlling for selection on observables may not be sufficient since the remaining unobservable differences, like differences in motivation, may still lead to a biased estimation of the treatment effect (Caliendo (2006)).

The second category of evaluation strategies allows selection on unobservables too. These methods use the assumption that selection is based on both observable and unobservable characteristics. The most commonly used methods in this category are instrumental variable methods and the difference-in-differences (DID) estimator. Instrumental variable methods focus on finding an instrument which determines whether the policy change applies to the individual or not, but does not affect the outcome. A DID estimator compares the situation before and after the policy implementation for those to whom the policy change applied and those to whom it did not apply (Caliendo and Hujer (2005)). Since the DID estimator is the one used in this paper, then a more detailed description of this method is appropriate.

A DID estimator requires repeated observations of the treated and non-treated groups. Whereas the before-after estimator compares the outcomes of the treated group after the policy change to the outcomes before the policy change, the DID estimator eliminates common time trends by subtracting the before-after change in the non-treated outcomes from the before-after change for the treated outcomes (Caliendo (2006)). If reliable estimates of the effect of the policy change are to be obtained, the important requirement is that the average outcomes for the treated and control groups would have followed the same trend in the absence of the policy change, so that any deviation from this in the treatment group must be caused by the policy change (Angrist and Pischke (2009)). This means that the DID estimator takes account of the time dimension, in the sense that the value of the outcome can vary over time even in the absence of any policy change (Bazen (2011)).

The DID estimator is calculated as follows. Firstly we need to calculate the means of the outcome before the implementation of a policy change:  $\bar{y}_1^A$  for the treated group and  $\bar{y}_0^A$  for the control group (this is illustrated in Figure 3.1). Secondly, we need to calculate the means of the outcome after the implementation of the policy change:  $\bar{y}_1^B$  for the treated group and  $\bar{y}_0^B$  for the control group. Since the change in the outcome variable for the treated group is  $\bar{y}_1^B - \bar{y}_1^A$  and for the control group it is  $\bar{y}_0^B - \bar{y}_0^A$ , then the difference between them shows the effect of the policy change on the treated group (DID in Figure 3).

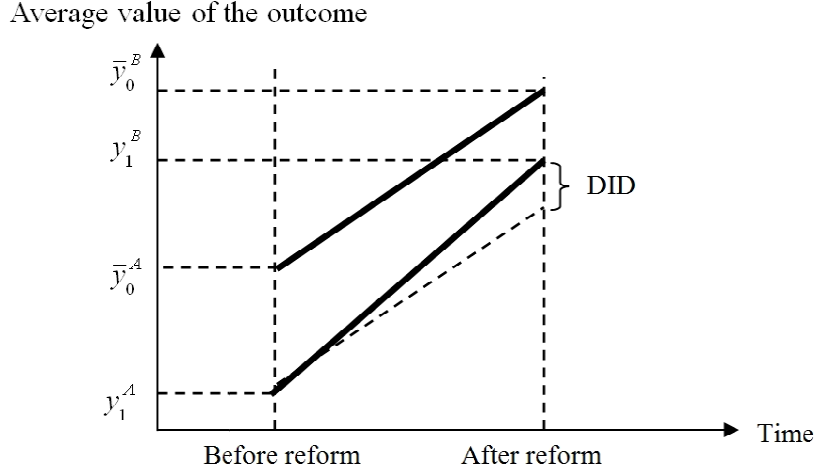


Figure 3: The difference-in-differences evaluation method for a policy reform

Source: Bazen (2011).

The numerical value of the DID estimator can be obtained from a regression formulation. Let  $T_t$  be a time dummy that switches on for observations obtained after the policy change and  $d_i$  be a dummy for people in the treatment group.

$$y_{it} = \alpha + \beta_1 d_i + \beta_2 T_t + \gamma(d_i \cdot T_t) + u_{it}$$

This model includes two main effects for treatment and time and an interaction term indicating treatment status, which is a dummy variable that marks observations from treated subjects after the policy change. The coefficient  $\gamma$  in front of it indicates the treatment effect. This kind of regression formulation of the DID model offers a convenient way to construct DID estimations with standard errors (Angrist and Pischke (2009)).

## 4.2. Modelling labour flows: specification of models

This paper employs probit models to investigate the impacts of various factors, including the new act, on the probabilities of flows between labour market statuses and jobs. In the regressions the dependent variable is a dummy variable, which is set to 1 when there are different movements in the labour market. Following equation is estimated:

$$P_{it} = \alpha X_{it} + \beta_1 State_i + \beta_2 PostReform_t + \gamma(State_i \cdot PostReform_t) + u_{it},$$

where  $P_{it}$  is individual  $i$ 's probability of moving in the labour market in period  $t$  and  $X_{it}$  is a vector of control variables. The selection of control vari-

ables is based on previous empirical studies and on the availability of the data. As is usual, all models include socio-demographic characteristics such as age, gender, marital status and education as explanatory variables. Since the values for occupation and field of economic activity of the employed are available only for the observation period, then those factors are also controlled in the model estimating the probability of job-to-job transitions. In addition, all models include variables indicating GDP plus its lagged values up to four quarters to control for the cyclical developments in the economic environment.

In order to allow the impacts of the new ECA on labour flows in Estonia to be estimated, the *State*, *PostReform* and ECA (which is the product of *State* and *PostReform*) dummies are included in all models. *State* equals one for Estonia and zero for Lithuania. Although the new ECA came into force from the 3<sup>rd</sup> quarter of 2009, the turning point is set one year later because worker flows are calculated one year in retrospect. Therefore the variable *PostReform* equals one for times beginning from the 3<sup>rd</sup> quarter of 2010 and zero before that. ECA equals one for individuals in Estonia at a time beginning from the 3<sup>rd</sup> quarter of 2010 and zero in all other cases. The marginal effect of this variable is the DID-estimation and can be considered as the effect of the new ECA on the probabilities of labour flows in Estonia.

In the probit-analysis, movements between employment and non-employment (unemployment or inactivity) and transitions between jobs are observed. These flows are examined through the following models:

- Movements from employment into unemployment – people who have moved from employment into unemployment within a year compared to people who have remained employed are observed;
- Involuntary movements from employment into unemployment – people who have moved involuntarily from employment into unemployment within a year compared to people who have remained employed are observed;
- Movements out of employment – people who have moved from employment into non-employment within a year compared to people who have remained employed are observed;
- Involuntary movements out of employment – people who have moved involuntarily from employment into non-employment within a year compared to people who have remained employed are observed;
- Movements into employment – people who have moved from non-employment into employment within a year compared to people who have remained non-employed are observed;
- Movements from unemployment into employment – people who have moved from unemployment into employment within a year compared to



- people who have remained unemployed are observed;
- Movements from job to job – people who have changed their employer within a year compared to people who have remained employed by the same employer are observed.
- Reallocation – people who have moved from non-employment into employment or vice versa or from one job to another within a year compared to people who have remained non-employed or in the same job are observed.

## 5. Results

### 5.1. Estimation results

The results of models estimating the probabilities of worker flows out of employment are presented in Table 2 (see also Appendices 15–16). We estimate separately the flows into unemployment (model 1) and into non-employment, which means unemployment and inactivity (model 3), and also involuntary movements out of employment both into unemployment (model 2) and into non-employment (model 4). It appears that being female and being married or cohabiting has a negative effect on the probability of a person moving out of employment and both effects are bigger when moving into unemployment. Education also seems to be a significant factor and there seems to be a negative effect from having secondary or tertiary education rather than just elementary education, and the effect of tertiary education seems to be much larger. All these impacts seem to be weaker in the cases of involuntary flows. The new ECA seems to have a significant positive influence by increasing the probability of a person moving from employment into unemployment by 2.6 pp and from employment into non-employment by 3.5 pp. The effects on involuntary flows are 1.4 pp and 1.6 pp respectively.

Secondly we estimate the probabilities of transitions into employment (models 5–6 in Table 3). It appears that being a woman seems to have a negative influence on the probability of a person moving into employment from non-employment but no statistically significant effect on the probability of moving into employment from unemployment. Being married or cohabiting increases the probability of moving into employment and the effect is bigger for transitions from unemployment. Education also seems to be a significant factor and there seems to be a positive effect from having secondary or tertiary education rather than just elementary education and the effect is larger for tertiary education and in movements from unemployment. Finally, the new ECA seems not to have any significant influence on the transitions into employment.

Table 2: Probabilities of worker flows out from employment, estimations of probit models (marginal effects)

	Model 1: E → U	Model 2: Involuntary E → U	Model 3: E → U/I	Model 4: In- voluntary E → U/I
Age	0.000 (0.0003)	0.001** (0.0003)	-0.017*** (0.0004)	-0.003*** (0.0003)
Age <sup>2</sup> /100	-0.001*** (0.0004)	-0.001*** (0.0003)	0.019*** (0.0004)	0.003*** (0.0003)
Woman ( <i>base man</i> )	-0.018*** (0.0011)	-0.012*** (0.0009)	-0.003** (0.0013)	-0.011*** (0.0010)
Secondary education ( <i>base elementary</i> )	-0.019*** (0.0019)	-0.012*** (0.0015)	-0.024*** (0.0022)	-0.015*** (0.0016)
Tertiary education ( <i>base elementary</i> )	-0.062*** (0.0022)	-0.040*** (0.0018)	-0.081*** (0.0026)	-0.047*** (0.0019)
Married or cohabiting ( <i>base single</i> )	-0.022*** (0.0013)	-0.014*** (0.0011)	-0.015*** (0.0015)	-0.014*** (0.0011)
GDP growth	-0.001*** (0.0001)	-0.001*** (0.0001)	-0.001*** (0.0002)	-0.001*** (0.0001)
GDP growth (-1q)	-0.000** (0.0002)	-0.000** (0.0001)	-0.001*** (0.0002)	-0.000*** (0.0001)
GDP growth (-2q)	-0.000*** (0.0002)	-0.001*** (0.0001)	-0.001*** (0.0002)	-0.001*** (0.0002)
GDP growth (-3q)	0.000 (0.0002)	0.000 (0.0001)	0.000 (0.0002)	0.000 (0.0002)
GDP growth (-4q)	-0.001*** (0.0002)	-0.001*** (0.0001)	-0.002*** (0.0002)	-0.001*** (0.0001)
PostReform (=1 since 2009 III q)	-0.005*** (0.0020)	0.007*** (0.0016)	-0.013*** (0.0024)	0.007*** (0.0018)
State (=1 if Estonia)	-0.025*** (0.0015)	-0.003*** (0.0011)	-0.025*** (0.0018)	0.001 (0.0012)
ECA (=1 if PostReform=1 & State=1)	0.026*** (0.0030)	0.014*** (0.0023)	0.035*** (0.0036)	0.016*** (0.0024)
Number of observations	174202	170300	180846	171409
Likelihood Ratio Chi <sup>2</sup> test (14)	5748.59***	4913.96***	7436.19***	5238.17***
Log likelihood	-34813.65	-23132.41	-51354.45	-26607.21
Pseudo R <sup>2</sup>	0.0763	0.0960	0.0675	0.0896

Notes: Notations: E – employment; U – unemployment; I – inactivity. Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively.

Dependent variables:

- Model 1: 1 if moved from employment into unemployment, 0 if stayed in employment;
- Model 2: 1 if moved involuntarily from employment into unemployment, 0 if stayed in employment;
- Model 3: 1 if moved out of employment, 0 if stayed in employment;
- Model 4: 1 if moved involuntarily out of employment, 0 if stayed in employment.

Table 3: Probabilities of worker flows into employment, job-to-job transitions and reallocation in labour market, estimations of probit models (marginal effects)

	Model 5: U/I → E	Model 6: U → E	Model 7: Job-to-job	Model 8: Reallocation
Age	0.016*** (0.0003)	-0.007*** (0.0024)	-0.004*** (0.0004)	0.010*** (0.0003)
Age <sup>2</sup> /100	-0.023*** (0.0004)	0.001 (0.0029)	0.002*** (0.0005)	-0.014*** (0.0003)
Woman ( <i>base man</i> )	-0.021*** (0.0014)	0.014* (0.0077)	-0.025*** (0.0014)	-0.031*** (0.0012)
Secondary education ( <i>base elementary</i> )	0.075*** (0.0018)	0.112*** (0.0109)	-0.003 (0.0028)	0.088*** (0.0019)
Tertiary education ( <i>base elementary</i> )	0.126*** (0.0024)	0.164*** (0.0141)	-0.027*** (0.0029)	0.063*** (0.0021)
Married or cohabiting ( <i>base single</i> )	0.015*** (0.0018)	0.069*** (0.0085)	-0.011*** (0.0016)	-0.008*** (0.0014)
GDP growth	0.000** (0.0002)	0.003*** (0.0011)	-0.000 (0.0002)	-0.000* (0.0002)
GDP growth (-1q)	0.000 (0.0003)	0.000 (0.0015)	0.000 (0.0003)	-0.000 (0.0002)
GDP growth (-2q)	-0.000 (0.0003)	0.002 (0.0014)	-0.000 (0.0003)	-0.001*** (0.0002)
GDP growth (-3q)	0.001** (0.0002)	0.002* (0.0012)	0.001*** (0.0003)	0.001*** (0.0002)
GDP growth (-4q)	0.001*** (0.0002)	0.003*** (0.0010)	-0.000* (0.0002)	-0.001 (0.0002)
PostReform (=1 since 2009 III q)	0.019*** (0.0023)	-0.026** (0.0117)	0.002 (0.0025)	-0.001 (0.0021)
State (=1 if Estonia)	0.025*** (0.0018)	0.058*** (0.0117)	-0.009*** (0.0018)	0.004** (0.0015)
ECA (=1 if PostReform=1 & State=1)	-0.005 (0.0032)	0.007 (0.0171)	-0.021*** (0.0038)	0.013*** (0.0030)
Number of observations	143289	15083	164414	324135
Likelihood Ratio Chi <sup>2</sup> test (14)	16345.94***	850***	3263.8***	11569.41***
Log likelihood	-31822.59	-9199.85	-46959.20	-119613.39
Pseudo R <sup>2</sup>	0.2043	0.0442	0.0336	0.0461

Notes: Notations: E – employment; U – unemployment; I – inactivity. Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively.

Dependent variables:

- Model 5: 1 if moved from non-employment into employment, 0 if stayed in non-employment;
- Model 6: 1 if moved from unemployment into employment, 0 if stayed in unemployment;
- Model 7: 1 if moved from one job to another, 0 if stayed in the same job.
- Model 8: 1 if moved from one labour market state to another or between jobs, 0 if stayed in same labour market state or same job.

However, when the probability of moving from unemployment to employment is estimated without any controls or with controls only for individual characteristics, the ECA seems to have a positive and statistically significant impact (see Appendix 17). This means that the hiring probability has increased in Estonia, but when the controls for GDP growth are added, this positive effect from the ECA disappears. This suggests that the rise in the hirings is caused by the better economic situation in Estonia and fast economic growth rather than by the EPL reform.

With model 7 we estimate the probability of a person moving from job to another job within a year (Table 3, see also Appendix 18). It appears, that age, being a woman and being married or cohabiting have a negative influence on the job-to-job flow probability. Compared to elementary education, secondary education seems to have no significant effect, but tertiary education lowers the probability of job-to-job transitions. This model gives evidence of the new ECA having a significant negative influence by lowering the probability of a person moving from one job to another by 2.1 pp. When occupations and economic activities are controlled for, this effect seems to be slightly larger at 2.2 pp (see Appendix 19).

Finally we look at the probability of overall reallocation in the labour market. Model 8 shows that being a woman and being married or cohabiting have negative effects on the probability of reallocation (Table 3, see also Appendix 20). This probability seems to increase with age but at a decreasing rate. Education seems to have a positive effect on the reallocation as having secondary or tertiary education increases the probability of reallocation in the labour market compared to elementary education, though the effect of secondary education seems to be higher. There seems to be evidence of the new ECA having a positive impact on the probability of reallocation by increasing it by 1.3 pp.

## 5.2. Robustness

In order to test the robustness of the results we follow the approach of Angrist and Pischke (2009) and estimate the differences between the probabilities of Estonian and Lithuanian worker flows in different periods. In order to do this we firstly introduce a section of dummies to divide the observable period into half-years (first half of 2007, second half of 2007 etc.) and then introduce a section of variables so that all half-year dummies are multiplied by the Estonia dummy. Table 4 presents the results, where each row corresponds to one regression and only the values of the estimated parameters' marginal effects for differences in half-years are reported. Each cell in Table 4 reports how the probabilities of particular labour flows in Estonia differed

in a particular half-year from the probabilities of those labour flows in Lithuania, conditional on the controls used in models 1–8.

The reported dummies are mostly statistically insignificant and have no obvious trend, indicating that by half-year there were only small differences between labour mobility in Estonia and Lithuania. The only significant differences concern movements out of employment and movements from one job to another. The probabilities of movements out of employment were smaller in Estonia before the reform (before 2009) and after the reform those probabilities became significantly larger in Estonia than in Lithuania. Although the effects should appear from the second half of 2010, indicating only the flows that have occurred since the second half of 2009, some effects seem to have already appeared in the second half of 2009. These can be considered as transitional effects since in the period from the second half of 2009 to the first half of 2010 we cannot identify exactly whether the flows occurred under the old law or the new. This means that the new law might already have had some effect and the increase in outflows from employment, including involuntary flows, could be a result of the legislative reform in Estonia.

There also seems to be a noteworthy change with movements from one job to another. Since 2010 the rate of movement has become significantly lower in Estonia than in Lithuania, so this reduction in the probability of job-to-job movement could also be a result of the labour law reform in Estonia. As the reported interaction terms for flows out of employment and between jobs become statistically significant after 2009, this experiment is likely to indicate that the legislative reform in Estonia has had a considerable effect in increasing movements out of employment, including involuntary flows, and in decreasing job-to-job movements.

Table 4: Estimates of differences in different half-years, effects on the probabilities of worker flows, Estonia and Lithuania, 2007–2011q3

Flow	Differences in half-years								
	2007 I–II	2007 III–IV	2008 I–II	2008 III–IV	2009 I–II	2009 III–IV	2010 I–II	2010 III–IV	2011 I–III
E → U	0.004 (0.0054)	−0.024*** (0.0056)	−0.046*** (0.0052)	−0.022*** (0.0043)	−0.004 (0.0037)	0.007** (0.0037)	0.013*** (0.0036)	0.030*** (0.0042)	0.021*** (0.0038)
Involuntary E → U	0.008* (0.0048)	−0.004 (0.0050)	−0.015*** (0.0044)	−0.007** (0.0035)	−0.012*** (0.0027)	−0.001 (0.0027)	0.006** (0.0026)	0.019*** (0.0031)	0.012*** (0.0028)
E → U/I	0.011* (0.0055)	−0.020*** (0.0056)	−0.037*** (0.0053)	−0.028*** (0.0050)	−0.004 (0.0046)	0.004 (0.0046)	0.004 (0.0046)	0.040*** (0.0051)	0.026*** (0.0044)
Involuntary E → U/I	0.007 (0.0046)	−0.004 (0.0049)	−0.012*** (0.0044)	−0.007* (0.0037)	−0.016*** (0.0029)	−0.002 (0.0029)	0.007** (0.0028)	0.019*** (0.0033)	0.014*** (0.0030)
U/I → E	0.001 (0.0046)	−0.003 (0.0047)	0.006 (0.0050)	0.009* (0.0051)	0.010* (0.0054)	−0.016*** (0.0055)	0.007 (0.0052)	0.001 (0.0046)	−0.007* (0.0037)
U → E	−0.140*** (0.0320)	−0.062* (0.0337)	0.103*** (0.0374)	0.018 (0.0364)	0.087*** (0.0341)	−0.048 (0.0306)	0.028 (0.0258)	0.008 (0.0226)	−0.014 (0.0186)
Job → Job	0.020*** (0.0047)	0.004 (0.0048)	−0.014*** (0.0050)	0.024*** (0.0050)	0.003 (0.0054)	0.010* (0.0056)	−0.016*** (0.0058)	−0.017*** (0.0057)	−0.019*** (0.0046)
Reallocation	0.013*** (0.0043)	−0.012*** (0.0043)	−0.025*** (0.0044)	−0.000 (0.0044)	0.001 (0.0044)	0.001 (0.0044)	−0.005 (0.0044)	0.017*** (0.0044)	0.009*** (0.0036)

Notes: Notations: E – employment; U – unemployment; I – inactivity. 2007 I–II denotes the interaction of the country dummy of Estonia with the dummy for the 1st half-year of 2007, etc. The control variables are those from the models 1–8, only the ECA dummy coefficients (marginal effects) are reported.

Standard errors in parentheses. \*, \*\* and \*\*\* indicate statistical significance at the 1%, 5% and 10% levels.

## 6. Conclusion

In this paper, we present new evidence for the effects of EPL on labour mobility. The aim was to estimate the effects of the relaxation of employment protection on labour reallocation by exploiting the employment law reform in Estonia in 2009. We use Labour Force Surveys from Estonia and Lithuania and adopt a difference in differences approach to identify the effects of the new EPL on labour reallocation in Estonia. The results show that the relaxation of EPL seems to have increased the reallocation and the probability of transitions out of employment. At the same time, we do not find any significant effects of this reform on the probability of flows into employment. Furthermore, there appears to be evidence of a reduced probability of job-to-job transitions resulting from the reduction in the strictness of EPL.

The EPL reform was supposed to improve the reallocation of labour in Estonia. Our results indicate the reform has increased the flexibility of the Estonian labour market by making workforce adjustments more flexible for employers and increasing the reallocation of workers. At the same time, the fast recovery of the Estonian labour market from the crisis and the increased flows into employment show that there has been a rise in hirings. However, with our specification of the hiring probability, no significant impact of the EPL reform on the inflows to employment could be identified. This result together with the finding of reduced job-to-job mobility suggests that the relaxation of EPL has not been enough to achieve the goal, which in turn raises the possibility that flexible EPL by itself cannot improve labour reallocation.

Alongside its positive effects, a reduction in the strictness of EPL can also lead to costs related to the higher risk and insecurity perceived by workers and to the loss in productivity resulting from lower incentives to invest in human capital. In order to compensate for these costs, a greater contribution to labour market policy is needed, with both active and passive labour market measures and also life-long learning. Within Estonian labour legislation reform some legislative changes were also introduced to improve active labour market policies and possibilities for life-long learning, but these amendments can be considered as irrelevant compared to the changes made to EPL. In any case, the most important institution in providing security to people, the unemployment insurance system, remained unchanged. Our analysis suggests that this kind of reform, which only liberalises the employment legislation without improving other labour market institutions, may not be sufficient to achieve the expected positive effect on labour reallocation.

The reduction in job-to-job mobility can be seen both in Estonia and Lithuania and this is proper to economic downturns, since not only do the

non-employed have lower probabilities of becoming employed, but the willingness for voluntary job changes is also lower because there are fewer vacancies. However, this leaves the question of why this reduction in job-to-job mobility has been steeper in Estonia than in Lithuania. One reason for this might be the higher risk perceived by Estonians of becoming unemployed because EPL is lighter and no other labour market institutions will compensate for this risk. This might have made workers more vulnerable to uncertainties, which in turn might lead them to hesitate before quitting their jobs voluntarily and moving on to new jobs elsewhere. As voluntary movements into unemployment are covered by unemployment insurance benefits in Lithuania, the discouraging effect of the crisis on the willingness for job-to-job shifts there might have been smaller. One other reason for lower job-to-job flows might be shorter notice periods reducing the chances of the departing worker finding a new job before actual dismissal takes place and moving directly from one job to another without entering unemployment. However, the accuracy of this guess cannot be examined with the data from Labour Force Surveys, since only the non-employed respondents are asked their reasons for leaving their last job.

There is one other labour market institution which needs to be considered and which might have had a negative effect on employment opportunities. This is labour taxation, which increased with the EPL reform in Estonia in the middle of the crisis. According to economic theory the rise in the labour tax wedge has negative effects on employment in the presence of downward wage rigidity. Therefore this change might also be one reason why the EPL reform had no effects on labour transitions into employment. However, the impact of taxation might not be relevant in the longer term because the labour supply is rather inelastic.

The reallocation of workers can occur along different transition paths, either directly from one job to another or through unemployment. Our findings indicate that in Estonia the reallocation has occurred more commonly along the latter path, through unemployment. In order to benefit from this kind of reallocation, the welfare cost to workers who have to move needs to be restrained. Therefore, further contributions should be made in developing other labour market institutions in order to improve the employability of the non-employed. Besides, the willingness for voluntary job changes, which can be said to be more efficient in achieving a better reallocation of labour, would be worth encouraging. Hence the impacts of other labour market institutions on labour reallocation and their interactions with EPL demand further analysis.



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## Appendix 1: Samples of Estonian and Lithuanian labour force surveys, distributions of employed by gender, age group, education level, marital status and labour status, 2007–2011q3

<i>Gender</i>		2007	2008	2009	2010	2011	Total
Estonia	Male	48%	48%	48%	48%	48%	48%
	Female	52%	52%	52%	52%	52%	52%
Lithuania	Male	47%	46%	46%	46%	46%	46%
	Female	53%	54%	54%	54%	54%	54%
<i>Age</i>		2007	2008	2009	2010	2011	Total
Estonia	15–24	25%	23%	22%	22%	20%	23%
	25–49	41%	42%	42%	41%	42%	42%
	50–74	34%	34%	36%	37%	38%	36%
Lithuania	15–24	22%	21%	21%	19%	18%	20%
	25–49	43%	41%	40%	40%	41%	41%
	50–74	35%	39%	40%	41%	42%	39%
<i>Education level</i>		2007	2008	2009	2010	2011	Total
Estonia	ISC 1	26%	26%	25%	24%	23%	25%
	ISC 2	50%	50%	50%	51%	51%	50%
	ISC 3	24%	24%	25%	25%	26%	25%
Lithuania	ISC 1	25%	24%	22%	21%	19%	22%
	ISC 2	55%	54%	55%	56%	55%	55%
	ISC 3	21%	22%	22%	24%	25%	23%
<i>Marital status</i>		2007	2008	2009	2010	2011	Total
Estonia	Single	33%	30%	29%	29%	29%	30%
	Married, cohabiting	57%	59%	60%	59%	60%	59%
	Divorced, widowed	10%	11%	11%	11%	11%	11%
Lithuania	Single	30%	28%	28%	27%	26%	28%
	Married, cohabiting	58%	57%	56%	57%	59%	57%
	Divorced, widowed	13%	15%	15%	15%	15%	15%
<i>Labour status</i>		2007	2008	2009	2010	2011	Total
Estonia	Employed	60%	61%	54%	52%	56%	57%
	Unemployed	3%	4%	9%	10%	8%	6%
	Inactive	37%	36%	37%	38%	37%	37%
Lithuania	Employed	56%	55%	52%	50%	54%	53%
	Unemployed	4%	5%	9%	11%	9%	8%
	Inactive	40%	40%	39%	39%	37%	39%

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

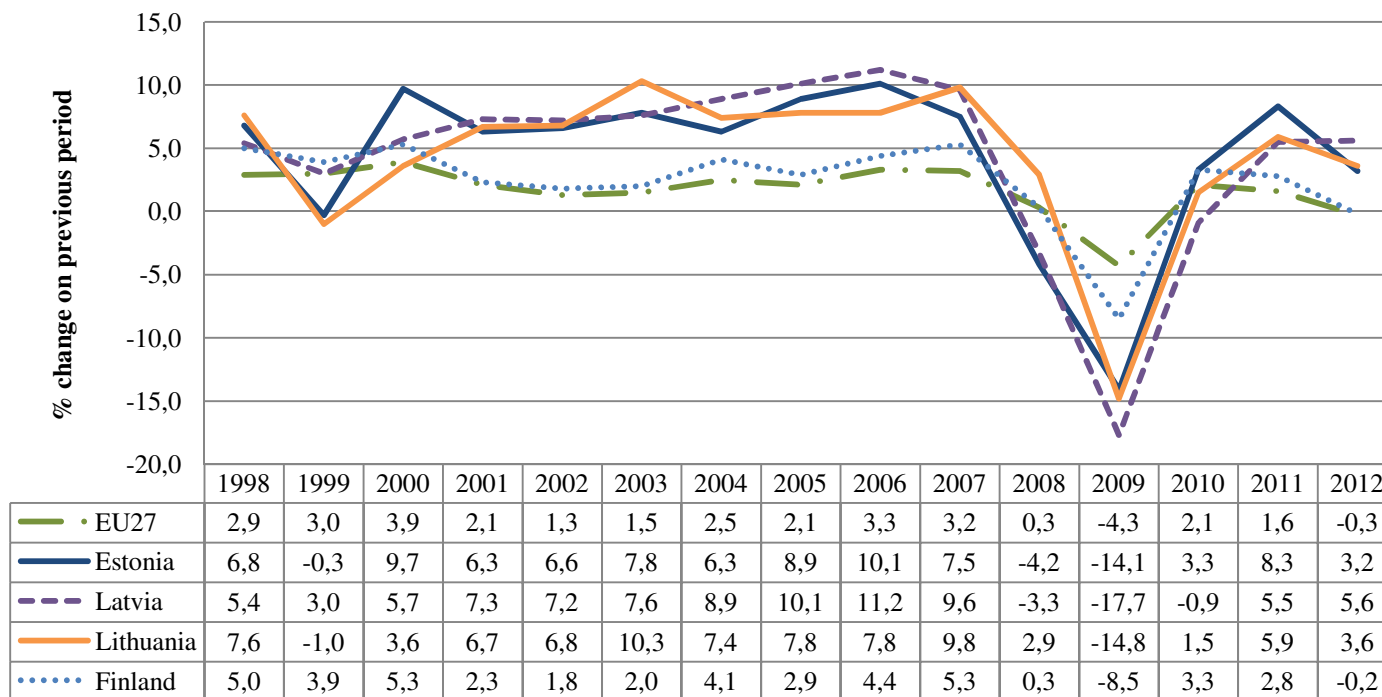
## Appendix 2: Samples of Estonian and Lithuanian labour force surveys, distributions of employed by occupation and economic activity, 2007–2011q3

	<i>Occupation (ISCO)</i>	2007	2008	2009	2010	2011	Total
Estonia	Armed forces occupations	0.5%	0.4%	0.5%	0.6%	0.3%	0.5%
	Managers	12.4%	11.9%	11.4%	11.3%	9.0%	11.4%
	Professionals	13.2%	12.9%	14.6%	18.1%	18.0%	15.0%
	Technicians and associate professionals	11.5%	11.7%	12.9%	10.9%	11.6%	11.7%
	Clerical support workers	4.7%	5.0%	5.0%	5.3%	4.9%	5.0%
	Service and sales workers	11.9%	12.2%	13.0%	12.5%	13.1%	12.5%
	Skilled agricultural, forestry and fishery workers	2.8%	2.8%	2.4%	2.6%	2.9%	2.7%
	Craft and related trades workers	17.2%	17.0%	14.5%	12.8%	15.0%	15.5%
	Plant and machine operators, and assemblers	15.4%	16.0%	15.7%	15.9%	15.4%	15.7%
	Elementary occupations	10.6%	10.0%	10.0%	10.0%	9.7%	10.1%
Lithuania	Armed forces occupations	0.2%	0.2%	0.2%	0.3%	0.3%	0.2%
	Managers	9.1%	10.3%	10.1%	9.9%	9.3%	9.8%
	Professionals	17.5%	17.6%	17.7%	18.4%	21.7%	18.4%
	Technicians and associate professionals	8.5%	10.6%	12.0%	12.5%	10.9%	10.9%
	Clerical support workers	4.2%	4.5%	4.5%	4.7%	4.5%	4.5%
	Service and sales workers	11.9%	12.0%	13.4%	13.5%	14.0%	12.9%
	Skilled agricultural, forestry and fishery workers	8.2%	6.0%	6.5%	6.8%	6.4%	6.8%
	Craft and related trades workers	18.8%	18.3%	16.0%	14.0%	13.2%	16.2%
	Plant and machine operators, and assemblers	10.2%	10.6%	10.4%	11.0%	11.7%	10.7%
	Elementary occupations	11.5%	9.9%	9.0%	8.8%	8.0%	9.5%
	<i>Economic activity (NACE)</i>	2007	2008	2009	2010	2011	Total
Estonia	Agriculture, forestry and fishing	6.5%	5.6%	6.0%	6.2%	6.9%	6.2%
	Mining and quarrying	0.8%	1.0%	1.0%	1.1%	1.0%	1.0%
	Manufacturing	20.7%	21.2%	19.4%	19.1%	20.0%	20.2%
	Electricity, gas, steam and air conditioning supply	1.1%	1.2%	1.3%	1.4%	1.0%	1.2%
	Water supply; sewerage; waste management and remediation activities	0.4%	0.5%	0.5%	0.4%	0.6%	0.5%
	Construction	12.8%	12.7%	10.2%	8.6%	9.4%	11.0%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	12.6%	13.0%	13.6%	13.7%	12.9%	13.1%
	Transporting and storage	8.2%	7.8%	8.0%	8.2%	8.1%	8.1%

	Accommodation and food service activities	2.8%	3.0%	3.2%	2.9%	2.7%	3.0%
	Information and communication	1.6%	1.8%	1.9%	1.8%	2.1%	1.8%
	Financial and insurance activities	1.2%	1.4%	1.5%	1.3%	1.3%	1.3%
	Real estate activities	1.4%	1.3%	1.3%	1.4%	1.4%	1.4%
	Professional, scientific and technical activities	2.3%	2.9%	2.9%	3.0%	3.1%	2.8%
	Administrative and support service activities	2.4%	2.4%	2.6%	2.9%	2.6%	2.5%
	Public administration and defence; compulsory social security	5.8%	5.6%	6.2%	7.3%	6.7%	6.2%
	Education	9.1%	9.5%	10.7%	10.4%	10.3%	9.9%
	Human health and social work activities	5.4%	5.2%	5.7%	5.8%	5.7%	5.5%
	Arts, entertainment and recreation	2.5%	2.0%	2.2%	2.4%	2.3%	2.3%
	Other services activities	2.1%	1.7%	1.7%	2.1%	1.8%	1.9%
Lithuania	Agriculture, forestry and fishing	11.5%	8.8%	9.3%	9.2%	9.0%	9.6%
	Mining and quarrying	0.1%	0.3%	0.2%	0.2%	0.2%	0.2%
	Manufacturing	15.6%	16.1%	15.8%	15.3%	15.1%	15.6%
	Electricity, gas, steam and air conditioning supply	0.4%	1.2%	1.5%	1.3%	1.3%	1.1%
	Water supply; sewerage; waste management and remediation activities	2.0%	1.6%	1.1%	1.1%	1.1%	1.4%
	Construction	1.8%	8.2%	8.1%	6.7%	6.7%	6.3%
	Wholesale and retail trade; repair of motor vehicles and motorcycles	10.8%	15.7%	17.0%	17.2%	17.4%	15.5%
	Transporting and storage	16.4%	8.9%	6.7%	7.0%	7.2%	9.4%
	Accommodation and food service activities	2.2%	2.5%	2.3%	2.4%	2.4%	2.4%
	Information and communication	5.6%	2.4%	1.4%	1.4%	1.6%	2.5%
	Financial and insurance activities	2.3%	1.3%	1.2%	1.3%	1.3%	1.5%
	Real estate activities	0.0%	0.6%	0.9%	1.0%	1.0%	0.7%
	Professional, scientific and technical activities	9.9%	4.7%	2.9%	3.3%	3.2%	4.9%
	Administrative and support service activities	9.9%	4.4%	2.9%	3.1%	3.1%	4.8%
	Public administration and defence; compulsory social security	0.0%	4.1%	5.9%	5.9%	5.8%	4.3%
	Education	6.9%	10.0%	11.6%	12.0%	12.1%	10.4%
	Human health and social work activities	0.0%	5.4%	7.4%	7.6%	7.4%	5.4%
	Arts, entertainment and recreation	4.2%	2.2%	1.8%	1.8%	1.7%	2.4%
	Other services activities	0.3%	1.5%	1.9%	2.0%	2.1%	1.5%

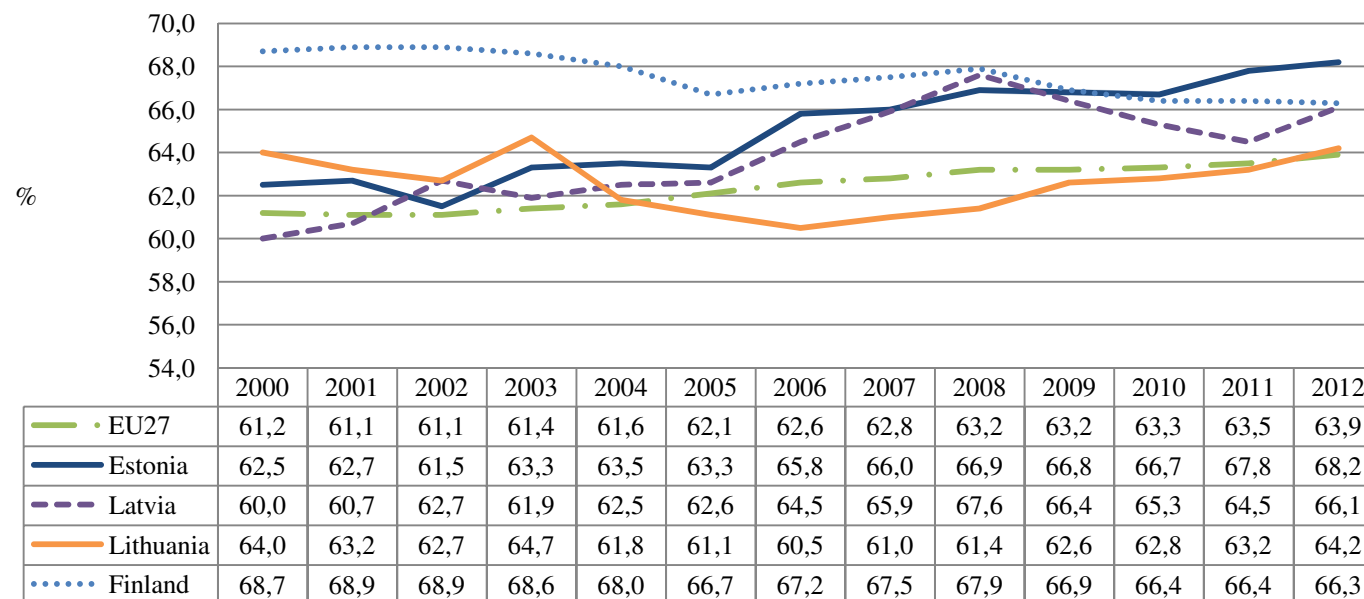
Source: author's own calculations based on Estonian and Lithuanian labour force surveys.

### Appendix 3: GDP at market prices, percentage change on previous period, 1997–2012



Source: Eurostat.

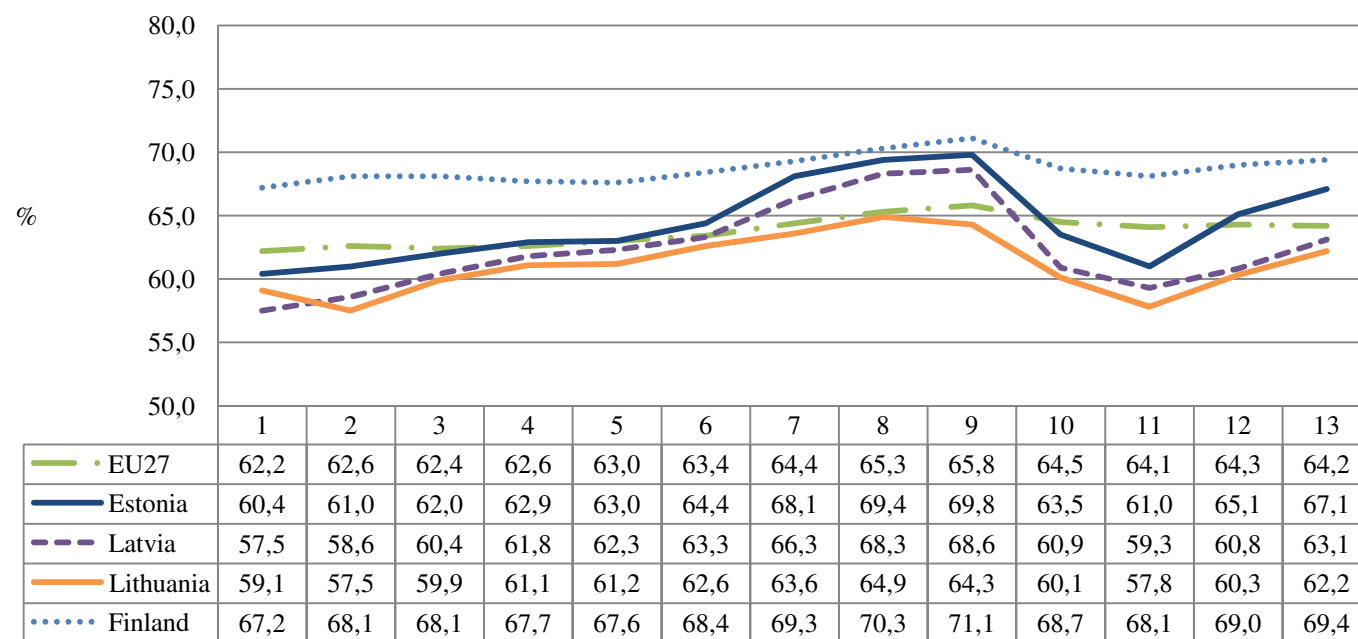
## Appendix 4: Activity rate (15 to 74 years), 2000–2012



Source: Eurostat.

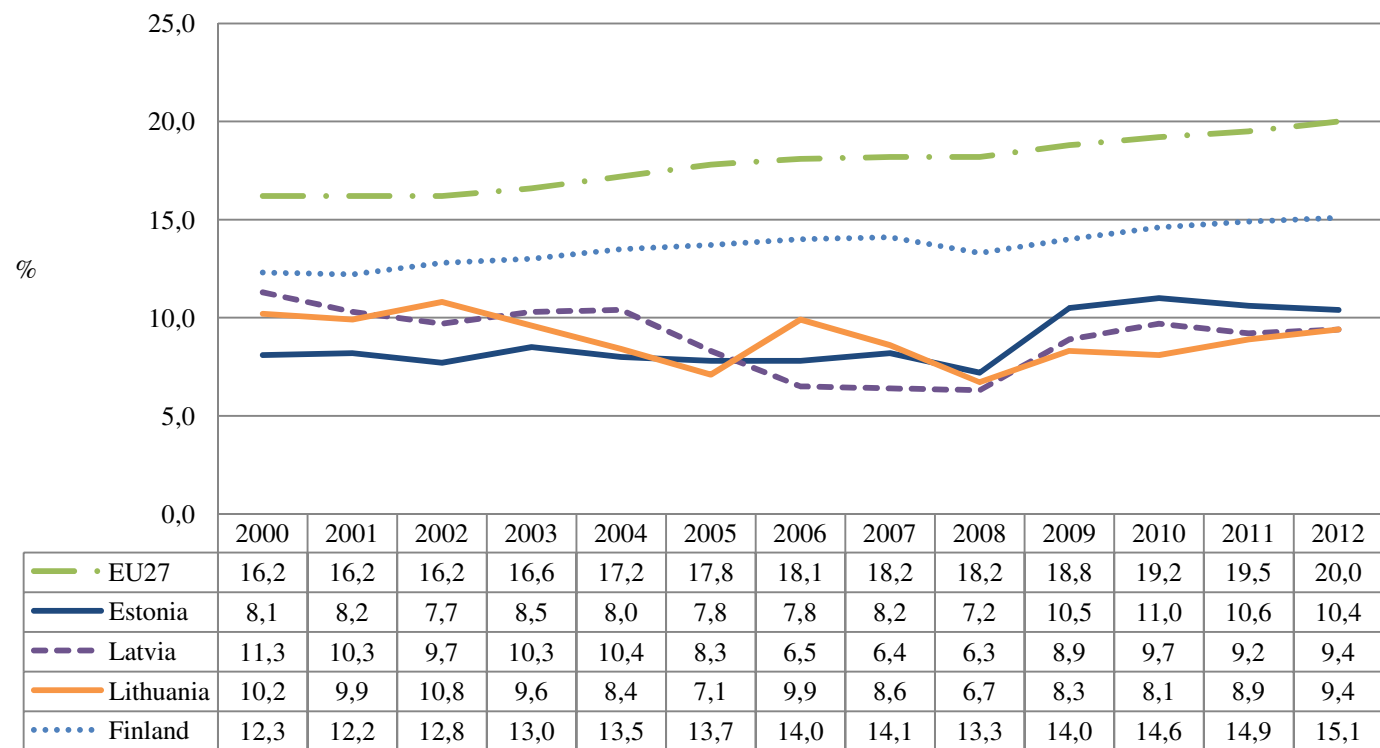


## Appendix 5: Employment rate, (15 to 74 years), 2000–2012



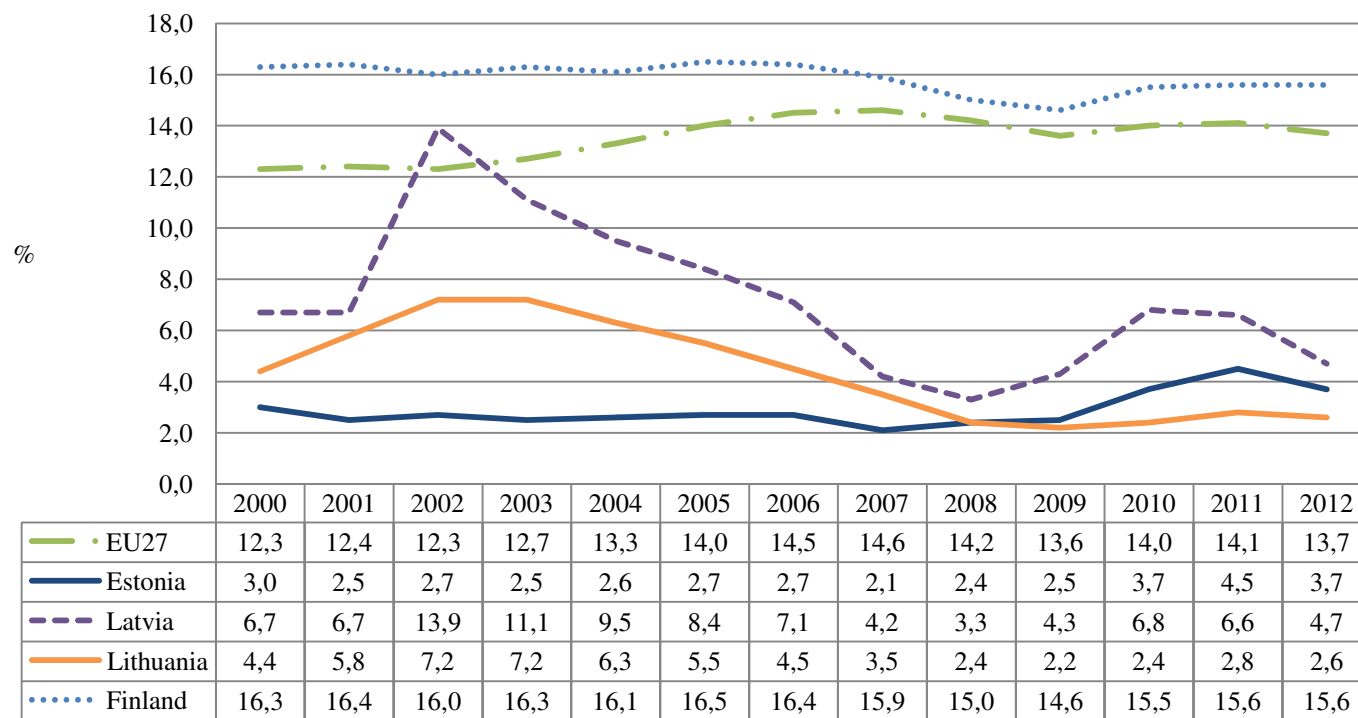
Source: Eurostat.

## Appendix 6: Part-time workers as a percentage of total employment, 2000–2012



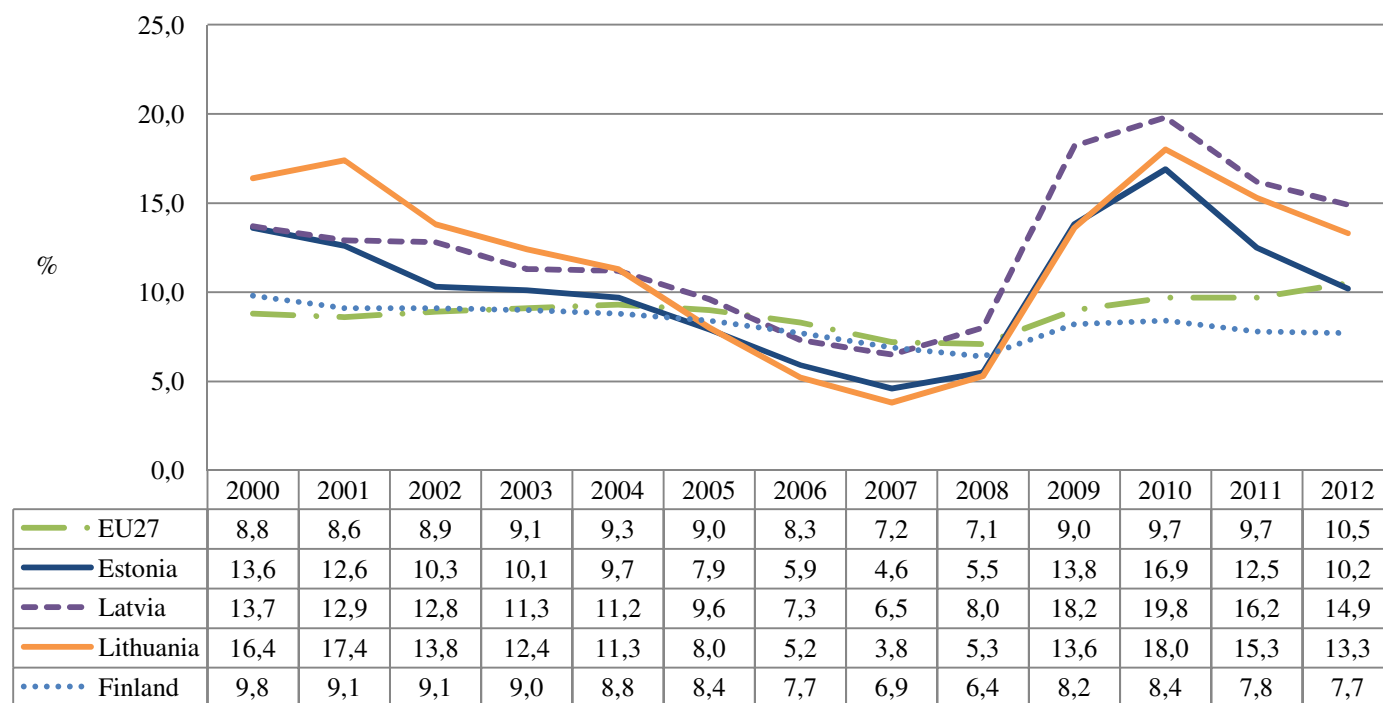
Source: Eurostat.

## Appendix 7: Percentage of employees with temporary contracts, 2000–2012



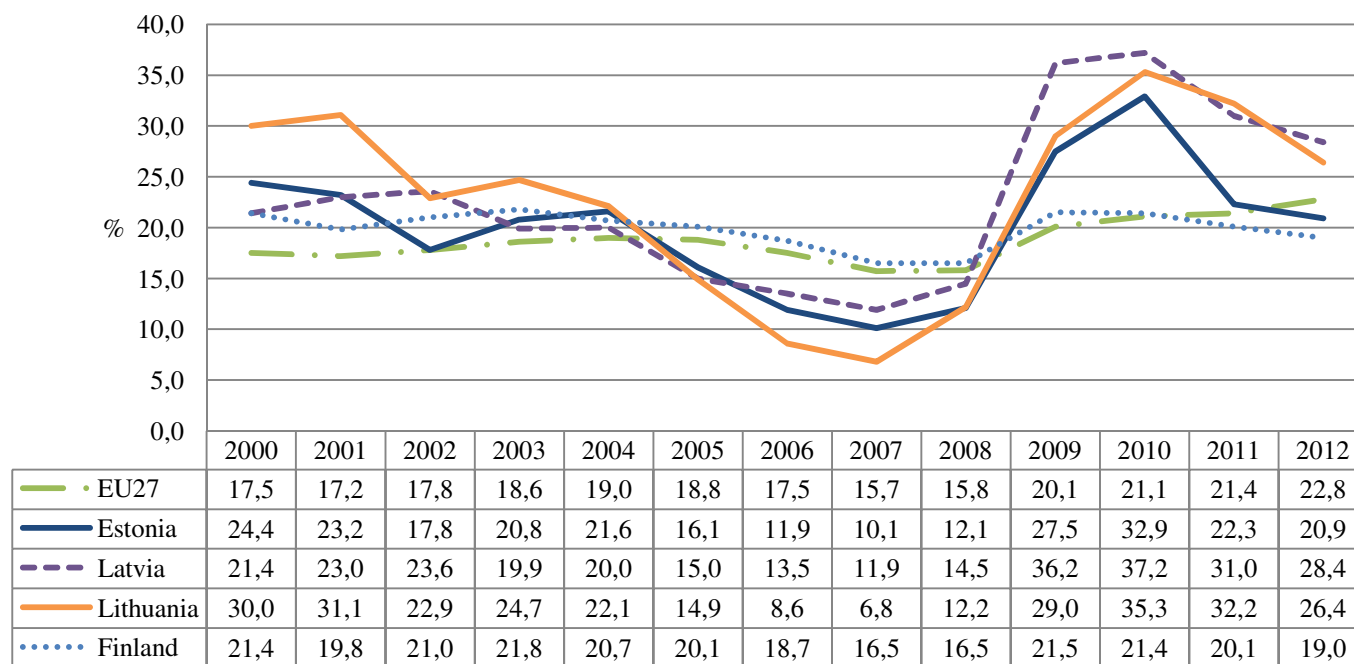
Source: Eurostat.

## Appendix 8: Unemployment rate (15–74 years), 2000–2012



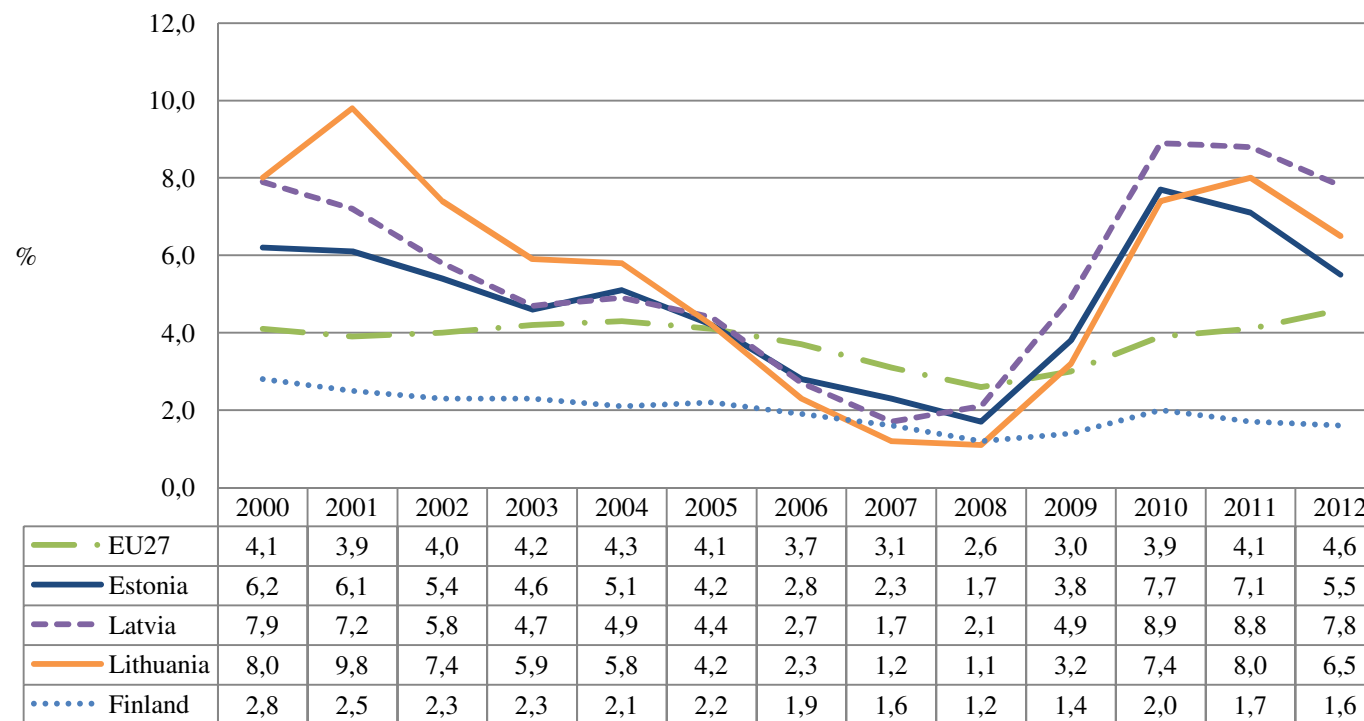
Source: Eurostat.

## Appendix 9: Unemployment rate (15–24 years), 2000–2012



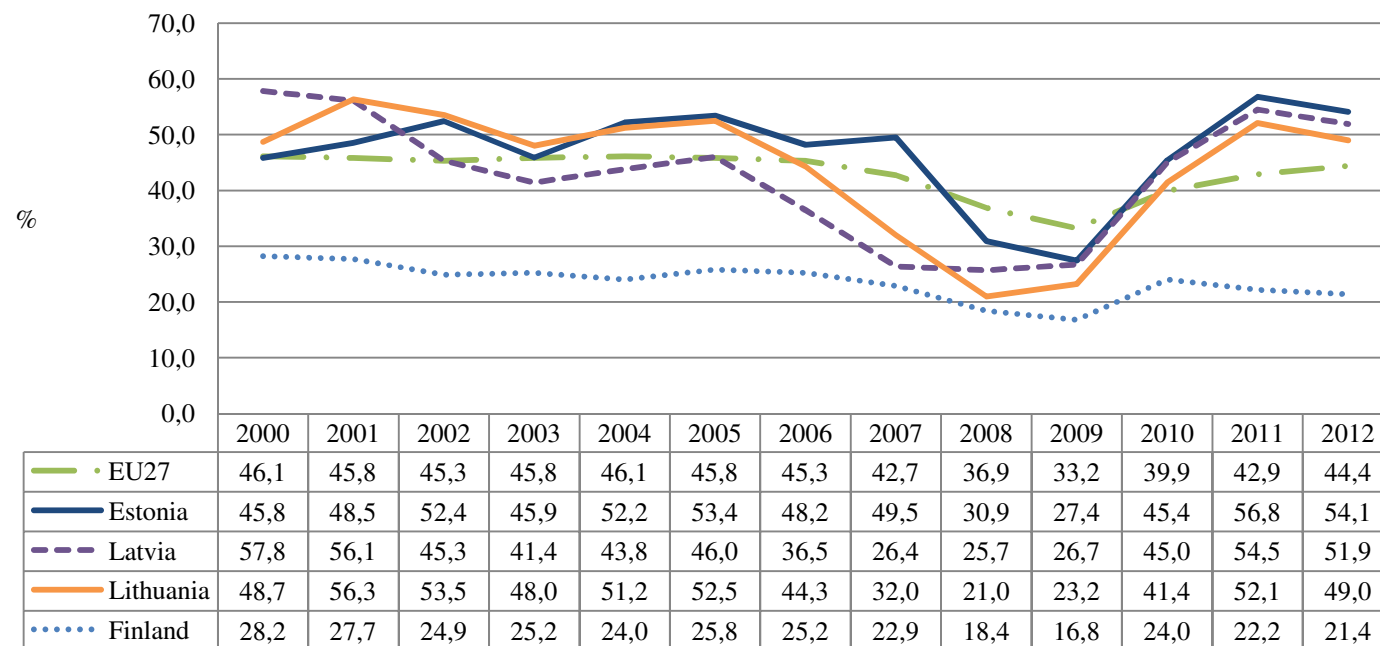
Source: Eurostat.

## Appendix 10: Long-term unemployment as a percentage of active populations, 2000–2012



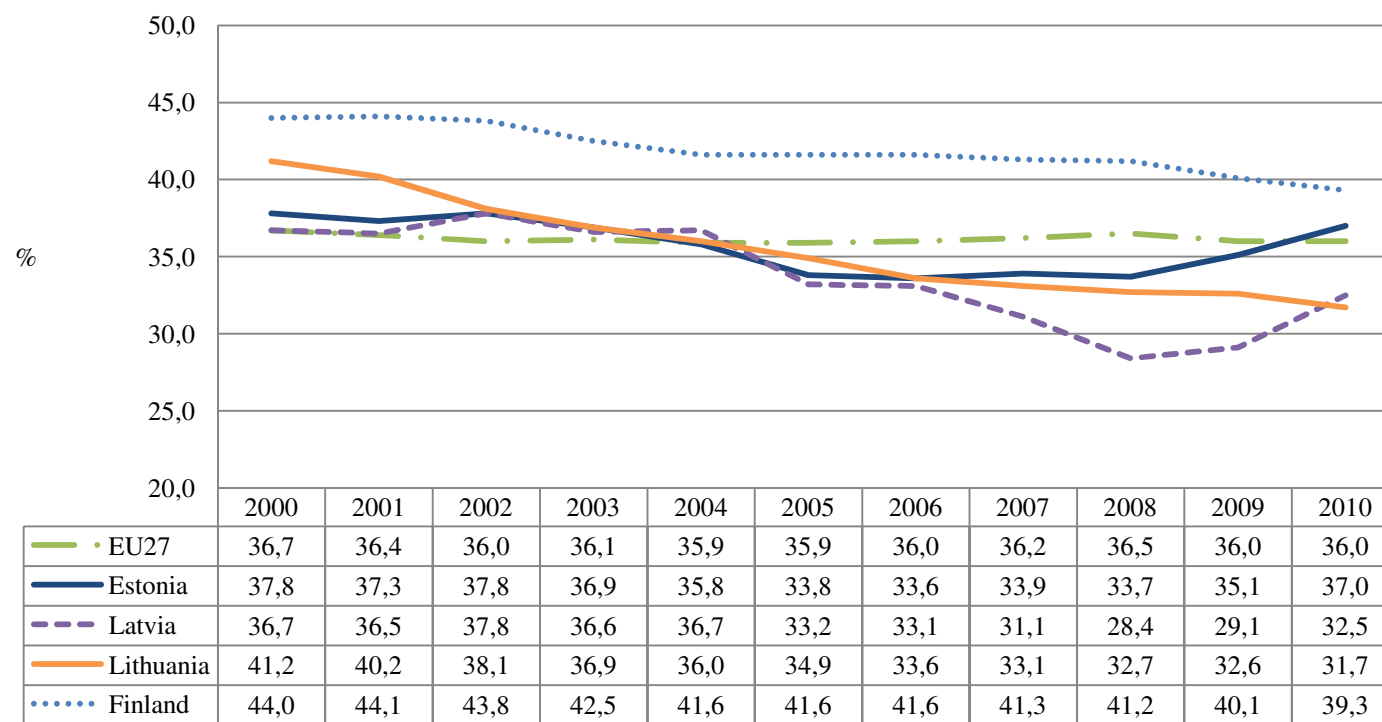
Source: Eurostat.

## Appendix 11: Long-term unemployment as a share of unemployed, 2000–2012



Source: Eurostat.

## Appendix 12: Implicit tax rate on labour, 2000–2010



Source: Eurostat.



### Appendix 13: Worker flows between labour market states, Estonia and Lithuania, 2007–2011(3q)

	Flow	2007	2008	2009	2010	2011q3
Estonia	Remain employed, same job	556032	560683	516074	482389	373800
	Remain employed, changed job	58520	58402	44797	37048	29705
	Employment → unemployment	9077	17650	54498	46953	17758
	Employment → inactivity	20148	25673	34060	27826	16115
	Remain unemployed	17457	13104	29646	56585	40799
	Unemployment → employment	15094	12011	14199	29049	31217
	Unemployment → inactivity	2359	1963	2451	4785	3912
	Remain inactive	331024	313917	305662	310271	224363
	Inactivity → employment	25464	25304	20374	21282	20479
	Inactivity → unemployment	5489	7606	10923	12384	8469
Lithuania	Remain employed, same job	1289361	1271596	1211823	1125474	847977
	Remain employed, changed job	143346	142885	120999	112835	88173
	Employment → unemployment	41660	67735	150726	119783	45301
	Employment → inactivity	44592	51871	61814	49288	27372
	Remain unemployed	37784	46220	68017	139512	117661
	Unemployment → employment	35176	27000	25377	47188	57455
	Unemployment → inactivity	7186	6149	6698	8915	9509
	Remain inactive	933686	895437	866454	875015	625089
	Inactivity → employment	58307	66118	46666	38642	34919
	Inactivity → unemployment	21966	36950	47164	51034	27898

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

## Appendix 14: Worker flow rates between labour market states, Estonia and Lithuania, 2007–2011(3q)

Flow	Country	2007	2008	2009	2010	2011q3
Remained employed	Estonia	95.4	93.7	86.6	88.2	92.6
	Lithuania	94.4	92.4	86.7	88.2	92.8
Remain employed, same job	Estonia	86.6	85.6	79.6	82.4	86.4
	Lithuania	85.4	83.9	79.4	80.5	84.6
Remain employed, changed job	Estonia	8.8	8.1	7.0	5.9	6.2
	Lithuania	9.0	8.4	7.3	7.7	8.1
Into employment	Estonia	10.0	9.4	7.8	10.0	13.5
	Lithuania	7.9	7.1	5.7	6.4	9.7
Out of employment	Estonia	4.6	6.3	13.4	11.8	7.4
	Lithuania	5.6	7.6	13.3	11.8	7.2
Involuntarily out of employment	Estonia	1.3	2.6	8.8	7.8	3.8
	Lithuania	1.1	1.6	6.8	6.3	3.1
Employment → unemployment	Estonia	1.4	2.5	8.2	7.0	3.6
	Lithuania	2.6	4.2	9.1	8.0	4.3
Involuntarily employment → unemployment	Estonia	0.8	1.8	7.3	6.3	2.9
	Lithuania	0.7	1.3	6.2	5.6	2.7
Employment → inactivity	Estonia	3.2	3.8	5.2	4.8	3.8
	Lithuania	3.0	3.4	4.2	3.9	2.9
Remain unemployed	Estonia	49.4	51.2	64.2	62.5	53.7
	Lithuania	46.0	59.0	68.2	71.9	63.3
Unemployment → employment	Estonia	43.8	41.9	30.1	31.9	40.5
	Lithuania	44.4	33.3	24.3	23.1	31.6
Unemployment → inactivity	Estonia	6.7	6.8	5.7	5.7	5.8
	Lithuania	9.7	7.7	7.5	5.0	5.1
Into inactivity	Estonia	3.4	3.9	5.2	4.9	4.0
	Lithuania	3.4	3.6	4.4	4.0	3.3
Remain inactive	Estonia	91.1	90.5	91.3	91.5	90.1
	Lithuania	92.6	91.6	91.6	91.8	92.2
Into activity	Estonia	8.9	9.5	8.7	8.5	9.9
	Lithuania	7.4	8.4	8.4	8.2	7.8
Inactivity → employment	Estonia	7.3	7.3	5.3	5.2	7.0
	Lithuania	5.3	5.4	4.1	3.5	4.4
Inactivity → unemployment	Estonia	1.6	2.3	3.4	3.3	3.0
	Lithuania	2.1	3.0	4.3	4.7	3.4
Reallocation	Estonia	12.0	12.5	15.3	14.1	13.5
	Lithuania	11.6	12.1	14.2	13.4	12.7

*Note: calculated as a share of people in the starting status(es) a year ago.*

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

## Appendix 15: Probabilities of worker flows out from employment, estimations of probit models (marginal effects)

	Model 1: E → U						
	Model 1 <sub>1</sub>	Model 1 <sub>2</sub>	Model 1 <sub>3</sub>	Model 1 <sub>4</sub>	Model 1 <sub>5</sub>	Model 1 <sub>6</sub>	Model 1
Age		0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Age <sup>2</sup> /100		-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
Woman ( <i>base man</i> )		-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)	-0.018*** (0.001)
Secondary education ( <i>base elementary</i> )		-0.017*** (0.002)	-0.018*** (0.002)	-0.019*** (0.002)	-0.019*** (0.002)	-0.019*** (0.002)	-0.019*** (0.002)
Tertiary education ( <i>base elementary</i> )		-0.059*** (0.002)	-0.060*** (0.002)	-0.061*** (0.002)	-0.062*** (0.002)	-0.062*** (0.002)	-0.062*** (0.002)
Married or cohabiting ( <i>base single</i> )		-0.022*** (0.001)	-0.022*** (0.001)	-0.021*** (0.001)	-0.022*** (0.001)	-0.022*** (0.001)	-0.022*** (0.001)
GDP growth			-0.003*** (0.000)	-0.000 (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
GDP growth (-1q)				-0.003*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)	-0.000** (0.000)
GDP growth (-2q)					-0.002*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
GDP growth (-3q)						-0.001*** (0.000)	0.000 (0.000)
GDP growth (-4q)							-0.001*** (0.000)

	Model 1: E → U						
	Model 1 <sub>1</sub>	Model 1 <sub>2</sub>	Model 1 <sub>3</sub>	Model 1 <sub>4</sub>	Model 1 <sub>5</sub>	Model 1 <sub>6</sub>	Model 1
PostReform (=1 since 2009 III q)	−0.015*** (0.002)	−0.010*** (0.001)	0.008*** (0.002)	0.008*** (0.002)	0.008*** (0.002)	0.003* (0.002)	−0.005*** (0.002)
State (=1 if Estonia)	−0.018*** (0.001)	−0.019*** (0.001)	−0.023*** (0.001)	−0.023*** (0.001)	−0.023*** (0.001)	−0.024*** (0.001)	−0.025*** (0.002)
ECA (=1 if PostReform=1 & State=1)	0.012*** (0.003)	0.011*** (0.003)	0.024*** (0.003)	0.025*** (0.003)	0.024*** (0.003)	0.026*** (0.003)	0.026*** (0.003)
Number of observations	174202	174202	174202	174202	174202	174202	174202
Likelihood Ratio Chi <sup>2</sup> test	233.31***	3020.29***	4676.74***	5358.36***	5642.89***	5675.51***	5748.59***
Log likelihood	−37571.29	−36177.80	−35349.571	−35008.76	−34866.50	−34850.19	−34813.65
Pseudo R <sup>2</sup>	0.0031	0.0401	0.0620	0.0711	0.0749	0.0753	0.0763

Notes: E – employment; U – unemployment. Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively. Dependent variable: 1 if moved from employment into unemployment, 0 if stayed in employment.

## Appendix 16: Probabilities of involuntary worker flows out from employment, estimations of probit models (marginal effects)

	Model 2: Involuntary E → U						
	Model 2 <sub>1</sub>	Model 2 <sub>2</sub>	Model 2 <sub>3</sub>	Model 2 <sub>4</sub>	Model 2 <sub>5</sub>	Model 2 <sub>6</sub>	Model 2
Age		0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001** (0.000)	0.001** (0.000)	0.001** (0.000)
Age <sup>2</sup> /100		−0.001*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)
Woman ( <i>base man</i> )		−0.013*** (0.001)	−0.012*** (0.001)	−0.012*** (0.001)	−0.012*** (0.001)	−0.012*** (0.001)	−0.012*** (0.001)
Secondary education ( <i>base elementary</i> )		−0.010*** (0.002)	−0.011*** (0.002)	−0.012*** (0.002)	−0.012*** (0.002)	−0.012*** (0.002)	−0.012*** (0.002)
Tertiary education ( <i>base elementary</i> )		−0.037*** (0.002)	−0.039*** (0.002)	−0.040*** (0.002)	−0.040*** (0.002)	−0.040*** (0.002)	−0.040*** (0.002)
Married or cohabiting ( <i>base single</i> )		−0.015*** (0.001)	−0.014*** (0.001)	−0.014*** (0.001)	−0.014*** (0.001)	−0.014*** (0.001)	−0.014*** (0.001)
GDP growth			−0.002*** (0.000)	0.000 (0.000)	−0.001*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)
GDP growth (−1q)				−0.003*** (0.000)	−0.000*** (0.000)	−0.000*** (0.000)	−0.000** (0.000)
GDP growth (−2q)					−0.002*** (0.000)	−0.001*** (0.000)	−0.001*** (0.000)
GDP growth (−3q)						−0.001*** (0.000)	0.000 (0.000)
GDP growth (−4q)							−0.001*** (0.000)

	Model 2: Involuntary E → U						
	Model 2 <sub>1</sub>	Model 2 <sub>2</sub>	Model 2 <sub>3</sub>	Model 2 <sub>4</sub>	Model 2 <sub>5</sub>	Model 2 <sub>6</sub>	Model 2
PostReform (=1 since 2009 III q)	−0.005*** (0.001)	−0.002* (0.001)	0.015*** (0.001)	0.016*** (0.001)	0.017*** (0.001)	0.014*** (0.001)	0.007*** (0.002)
State (=1 if Estonia)	0.002 (0.001)	0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.001 (0.001)	−0.002* (0.001)	−0.003** (0.001)
ECA (=1 if PostReform=1 & State=1)	0.004 (0.002)	0.003 (0.002)	0.013*** (0.002)	0.014*** (0.002)	0.013*** (0.002)	0.014*** (0.002)	0.014*** (0.002)
Number of observations	170300	170300	170300	170300	170300	170300	170300
Likelihood Ratio Chi <sup>2</sup> test	24.27***	1616.80***	3459.63***	4385.58***	4812.71***	4840.92***	4913.96***
Log likelihood	−25577.26	−24780.99	−23859.58	−23396.60	−23183.04	−23168.93	−23132.41
Pseudo R <sup>2</sup>	0.0005	0.0316	0.0676	0.0857	0.0940	0.0946	0.0960

Notes: E – employment; U – unemployment. Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively. Dependent variable: 1 if moved involuntarily from employment into unemployment, 0 if stayed in employment.

## Appendix 17: Probabilities of worker flows from unemployment to employment, estimations of probit models (marginal effects)

	Model 6: U → E						
	Model 6 <sub>1</sub>	Model 6 <sub>2</sub>	Model 6 <sub>3</sub>	Model 6 <sub>4</sub>	Model 6 <sub>5</sub>	Model 6 <sub>6</sub>	Model 6
Age		−0.007*** (0.002)	−0.007*** (0.002)	−0.007*** (0.002)	−0.007*** (0.002)	−0.007*** (0.002)	−0.007*** (0.002)
Age <sup>2</sup> /100		0.001 (0.003)	0.002 (0.003)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)	0.001 (0.003)
Woman ( <i>base man</i> )		0.021*** (0.008)	0.020** (0.008)	0.017** (0.008)	0.015* (0.008)	0.015* (0.008)	0.014* (0.008)
Secondary education ( <i>base elementary</i> )		0.103*** (0.011)	0.106*** (0.011)	0.109*** (0.011)	0.111*** (0.011)	0.111*** (0.011)	0.112*** (0.011)
Tertiary education ( <i>base elementary</i> )		0.156*** (0.014)	0.159*** (0.014)	0.162*** (0.014)	0.164*** (0.014)	0.164*** (0.014)	0.164*** (0.014)
Married or cohabiting ( <i>base single</i> )		0.068*** (0.009)	0.067*** (0.009)	0.068*** (0.009)	0.069*** (0.009)	0.069*** (0.008)	0.069*** (0.008)
GDP growth			0.007*** (0.001)	−0.002* (0.001)	0.001 (0.001)	0.002* (0.001)	0.003*** (0.001)
GDP growth (−1q)				0.010*** (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)
GDP growth (−2q)					0.007*** (0.001)	0.002* (0.001)	0.002 (0.001)
GDP growth (−3q)						0.004*** (0.001)	0.002* (0.001)
GDP growth (−4q)							0.003*** (0.001)

	Model 6: U → E						
	Model 6 <sub>1</sub>	Model 6 <sub>2</sub>	Model 6 <sub>3</sub>	Model 6 <sub>4</sub>	Model 6 <sub>5</sub>	Model 6 <sub>6</sub>	Model 6
PostReform (=1 since 2009 III q)	−0.012 (0.009)	−0.020** (0.009)	−0.061*** (0.009)	−0.060*** (0.009)	−0.062*** (0.009)	−0.041*** (0.010)	−0.026** (0.012)
State (=1 if Estonia)	0.050*** (0.012)	0.036*** (0.012)	0.047*** (0.012)	0.053*** (0.012)	0.053*** (0.012)	0.058*** (0.012)	0.058*** (0.012)
ECA (=1 if PostReform=1 & State=1)	0.050*** (0.017)	0.053*** (0.017)	0.019 (0.017)	0.010 (0.017)	0.013 (0.017)	0.005 (0.017)	0.007 (0.017)
Number of observations	15083	15083	15083	15083	15083	15083	15083
Likelihood Ratio Chi <sup>2</sup> test	80.73***	485.46***	642.76***	755.22***	820.75***	842.94***	850.00***
Log likelihood	−9584.48	−9382.12	−9303.47	−9247.24	−9214.47	−9203.38	−9199.85
Pseudo R <sup>2</sup>	0.0042	0.0252	0.0334	0.0392	0.0426	0.0438	0.0442

Notes: E – employment; U – unemployment. Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively. Dependent variable: 1 if moved from unemployment into employment, 0 if stayed in unemployment.



## Appendix 18: Probabilities of job-to-job transitions, estimations of probit models (marginal effects)

	Model 7: Job-to-job						
	Model 7 <sub>1</sub>	Model 7 <sub>2</sub>	Model 7 <sub>3</sub>	Model 7 <sub>4</sub>	Model 7 <sub>5</sub>	Model 7 <sub>6</sub>	Model 7
Age		−0.004*** (0.000)	−0.004*** (0.000)	−0.004*** (0.000)	−0.004*** (0.000)	−0.004*** (0.000)	−0.004*** (0.000)
Age <sup>2</sup> /100		0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)	0.002*** (0.000)
Woman ( <i>base man</i> )		−0.025*** (0.001)	−0.025*** (0.001)	−0.025*** (0.001)	−0.025*** (0.001)	−0.025*** (0.001)	−0.025*** (0.001)
Secondary education ( <i>base elementary</i> )		−0.003 (0.003)	−0.003 (0.003)	−0.002 (0.003)	−0.003 (0.003)	−0.002 (0.003)	−0.003 (0.003)
Tertiary education ( <i>base elementary</i> )		−0.027*** (0.003)	−0.027*** (0.003)	−0.027*** (0.003)	−0.027*** (0.003)	−0.027*** (0.003)	−0.027*** (0.003)
Married or cohabiting ( <i>base single</i> )		−0.011*** (0.002)	−0.011*** (0.002)	−0.011*** (0.002)	−0.011*** (0.002)	−0.011*** (0.002)	−0.011*** (0.002)
GDP growth			0.000*** (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	−0.000 (0.000)
GDP growth (−1q)				0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
GDP growth (−2q)					−0.000 (0.000)	−0.000* (0.000)	−0.000 (0.000)
GDP growth (−3q)						0.000** (0.000)	0.001*** (0.000)
GDP growth (−4q)							−0.000* (0.000)

	Model 7: Job-to-job						
	Model 7 <sub>1</sub>	Model 7 <sub>2</sub>	Model 7 <sub>3</sub>	Model 7 <sub>4</sub>	Model 7 <sub>5</sub>	Model 7 <sub>6</sub>	Model 7
PostReform (=1 since 2009 III q)	−0.002 (0.002)	0.003* (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.004* (0.002)	0.002 (0.002)
State (=1 if Estonia)	−0.006*** (0.002)	−0.010*** (0.002)	−0.009*** (0.002)	−0.009*** (0.002)	−0.009*** (0.002)	−0.009*** (0.002)	−0.009*** (0.002)
ECA (=1 if PostReform=1 & State=1)	−0.016*** (0.004)	−0.018*** (0.004)	−0.020*** (0.004)	−0.020*** (0.004)	−0.020*** (0.004)	−0.021*** (0.004)	−0.021*** (0.004)
Number of observations	164414	164414	164414	164414	164414	164414	164414
Likelihood Ratio Chi <sup>2</sup> test	64.73***	3243.27***	3254.42***	3256.78***	3256.86***	3260.92***	3263.80***
Log likelihood	−48558.74	−46969.47	−46963.90	−46962.71	−46962.67	−46960.64	−46959.20
Pseudo R <sup>2</sup>	0.0007	0.0334	0.0335	0.0335	0.0335	0.0336	0.0336

Notes: Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively. Dependent variable: 1 if moved from one job to another, 0 if stayed in the same job.

## Appendix 19: Probabilities of job-to-job transitions, estimations of probit models (marginal effects)

Model 77: Job-to-job			
Age	−0.003*** (0.0004)	Economic activity ( <i>base manufacturing</i> )	
		Agriculture, forestry and fishing	−0.002 (0.0041)
Age <sup>2</sup> /100	0.001** (0.0005)	Mining and quarrying	−0.025** (0.0119)
Woman ( <i>base man</i> )	−0.017*** (0.0016)	Electricity, gas, steam and air conditioning supply	−0.008 (0.0069)
Secondary education ( <i>base elementary</i> )	0.002 (0.0028)	Water supply; sewerage, waste management and remediation activities	0.023*** (0.0060)
Tertiary education ( <i>base elementary</i> )	0.004 (0.0032)	Construction	0.025*** (0.0029)
Married or cohabiting ( <i>base single</i> )	−0.009*** (0.0016)	Wholesale and retail trade; repair of motor vehicles and motorcycles	0.024*** (0.0025)
Occupation ( <i>base elementary occupations</i> )		Transportation and storage	0.027*** (0.0028)
Armed forces occupation	−0.131*** (0.0177)	Accommodation and food service activities	0.054*** (0.0044)
Manager	−0.073*** (0.0033)	Information and communication	0.018*** (0.0046)
Professional	−0.066*** (0.0032)	Financial and insurance activities	0.021*** (0.0059)
Technician or associate professional	−0.064*** (0.0032)	Real estate activities	0.037*** (0.0072)
Clerical support worker	−0.051*** (0.0040)	Professional, scientific and technical activities	0.018*** (0.0039)
Service or sales worker	−0.041*** (0.0029)	Administrative and support service activities	0.016*** (0.0038)
Skilled agricultural, forestry or fishery worker	−0.081*** (0.0051)	Public administration and defence, compulsory social security	−0.015*** (0.0042)
Craft or related trades worker	−0.027*** (0.0028)	Education	−0.014*** (0.0033)
Plant or machine operator or assembler	−0.028*** (0.0029)	Human health and social work activities	−0.018*** (0.0041)
GDP growth	−0.001 (0.0002)	Arts, entertainment and recreation	0.002 (0.0051)
GDP growth (−1q)	0.000 (0.0003)	Other services	0.022*** (0.0056)
GDP growth (−2q)	−0.001** (0.0003)	Activities of households as employers; undifferentiated goods and services-producing activities of households for	0.034 (0.0244)
GDP growth (−3q)	0.001*** (0.0003)		

Model 7 <sub>7</sub> : Job-to-job			
GDP growth (–4q)	–0.000 (0.0002)	own use	
PostReform (=1 since 2009 III q)	0.005** (0.0025)	Activities of extraterritorial organisa- tions and bodies	0.069 (0.0519)
State (=1 if Estonia)	–0.008*** (0.0018)	ECA (=1 if PostReform=1 & State=1)	–0.022*** (0.0038)
Number of observations		164258	
Likelihood Ratio Chi <sup>2</sup> test (43)		4932.1***	
Log likelihood		–46080.30	
Pseudo R <sup>2</sup>		0.0508	

*Notes: Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively. Dependent variable: 1 if moved from one job to another, 0 if stayed in the same job.*

## Appendix 20: Probabilities of worker reallocation in the labour market, estimations of probit models (marginal effects)

	Model 8: Reallocation						
	Model 8 <sub>1</sub>	Model 8 <sub>2</sub>	Model 8 <sub>3</sub>	Model 8 <sub>4</sub>	Model 8 <sub>5</sub>	Model 8 <sub>6</sub>	Model 8
Age		0.010*** (0.000)	0.010*** (0.000)	0.010*** (0.000)	0.010*** (0.000)	0.010*** (0.000)	0.010*** (0.000)
Age <sup>2</sup> /100		-0.014*** (0.000)	-0.014*** (0.000)	-0.014*** (0.000)	-0.014*** (0.000)	-0.014*** (0.000)	-0.014*** (0.000)
Woman ( <i>base man</i> )		-0.032*** (0.001)	-0.032*** (0.001)	-0.032*** (0.001)	-0.032*** (0.001)	-0.031*** (0.001)	-0.031*** (0.001)
Secondary education ( <i>base elementary</i> )		0.088*** (0.002)	0.088*** (0.002)	0.088*** (0.002)	0.088*** (0.002)	0.088*** (0.002)	0.088*** (0.002)
Tertiary education ( <i>base elementary</i> )		0.063*** (0.002)	0.063*** (0.002)	0.063*** (0.002)	0.063*** (0.002)	0.063*** (0.002)	0.063*** (0.002)
Married or cohabiting ( <i>base single</i> )		-0.009*** (0.001)	-0.008*** (0.001)	-0.008*** (0.001)	-0.008*** (0.001)	-0.008*** (0.001)	-0.008*** (0.001)
GDP growth			-0.001*** (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000* (0.000)
GDP growth (-1q)				-0.001*** (0.000)	-0.000* (0.000)	-0.000* (0.000)	-0.000 (0.000)
GDP growth (-2q)					-0.001*** (0.000)	-0.001*** (0.000)	-0.001*** (0.000)
GDP growth (-3q)						0.000** (0.000)	0.001*** (0.000)
GDP growth (-4q)							-0.000 (0.000)

	Model 8: Reallocation						
	Model 8 <sub>1</sub>	Model 8 <sub>2</sub>	Model 8 <sub>3</sub>	Model 8 <sub>4</sub>	Model 8 <sub>5</sub>	Model 8 <sub>6</sub>	Model 8
PostReform (=1 since 2009 III q)	-0.005*** (0.002)	-0.006*** (0.002)	0.000 (0.002)	-0.000 (0.002)	-0.001 (0.002)	0.001 (0.002)	-0.001 (0.002)
State (=1 if Estonia)	0.002 (0.002)	0.005*** (0.002)	0.003** (0.002)	0.003** (0.002)	0.003** (0.002)	0.004** (0.002)	0.004** (0.002)
ECA (=1 if PostReform=1 & State=1)	0.009*** (0.003)	0.009*** (0.003)	0.014*** (0.003)	0.014*** (0.003)	0.014*** (0.003)	0.013*** (0.003)	0.013*** (0.003)
Number of observations	324135	324135	324135	324135	324135	324135	324135
Likelihood Ratio Chi <sup>2</sup> test	26.13***	11225.74***	11452.70***	11537.62***	11561.28***	11566.98***	11569.41***
Log likelihood	-125385.03	-119785.23	-119671.75	-119629.29	-119617.46	-119614.61	-119613.39
Pseudo R <sup>2</sup>	0.0001	0.0448	0.0457	0.0460	0.0461	0.0461	0.0461

Notes: E – employment; U – unemployment; I – inactivity. Marginal effects reported. Standard errors in parentheses. \*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels respectively. Dependent variable: 1 if moved from one labour market state to another or between jobs, 0 if stayed in same labour market state or same job

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