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Essays on Labour Market Institutions and Wealth Inequality

Liina Rebane

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LIINA REBANE

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TALLINN UNIVERSITY OF TECHNOLOGY
School of Business and Governance
Department of Economics and Finance

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Supervisor: Adjunct Professor Tairi Rõõm, Ph.D.
Department of Economics and Finance
Tallinn University of Technology
Tallinn, Estonia

Co-supervisor: Senior Researcher Merike Kukk, Ph.D.
Department of Economics and Finance
Tallinn University of Technology
Tallinn, Estonia

Opponents: Ana Lamo, Ph.D.
Directorate General Research
European Central Bank
Frankfurt, Germany

Associate Professor Jaanika Meriküll, Ph.D.
School of Economics and Business Administration
University of Tartu
Tartu, Estonia

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Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted elsewhere for a doctoral or equivalent academic degree.

Liina Rebane

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Contents

List of Publications

The list of the author's publications, on the basis of which the thesis has been prepared:

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Author's Contribution to the Publications

The contributions to the papers in this thesis are:

I The author of the thesis is the sole author of the article.

II The author of this thesis supported the study by setting the hypothesis, preparing the dataset and carrying out the econometric evaluation.

III The author of the thesis was the lead author of the paper, carried out most of the literature review, prepared the dataset, carried out the quantitative analysis, presented the results, and acted as the corresponding author in the submission and publishing processes. The co-authors gave support by setting the hypothesis, providing the methodology, contributing to the literature review with a historical background, and interpreting the results and co-writing the paper.

Introduction

One important socioeconomic challenge for developed countries is that working-age populations are declining because of low birth rates. This demographic shift is causing the workforce to shrink, putting pressure on pension systems, healthcare, and overall economic growth. It is therefore important to ensure that all those who are capable of working find jobs that match their skills and preferences, and remain active in the labour market as long as possible. To address these challenges, it is crucial to enhance labour mobility, as doing so can reduce unemployment and encourage workforce participation.

Labour mobility, which is defined as the ability of people to move between labour market statuses, jobs, sectors, or geographical locations, can play a significant role in tackling labour shortages and optimising the allocation of labour. However, an essential requirement for mobility is that the labour market must be flexible, meaning that employers can respond quickly and easily to changes in the economy and that employees can move easily between labour market statuses and job positions.

One essential factor that affects the flexibility of the labour market is its institutional framework. Labour market institutions are usually taken to be the range of organisations, regulations and mechanisms that shape the relationship between employers and workers and influence how the labour market functions by affecting wages and employment. The most common examples of labour market institutions are minimum wages, unions with collective agreements, unemployment benefits (UB), employment protection legislation (EPL), and active labour market policies (ALMP).

Boeri and van Ours (2008) explain that minimum wages, unions, and UBs operate mainly on the price of labour. They directly introduce a difference between the value of the job and the reservation wages. Minimum wages for instance are the lowest wages that employers are legally allowed to pay to their employees and so prevent employers from hiring workers at a lower wage even when their reservation wage is below the minimum wage. Other institutions like EPL and ALMP act on the quantity of labour that is supplied or demanded. EPL makes it more costly for employers to adjust the number of workers for example, and so it restricts both firing and hiring decisions and thereby affects the overall level of employment.

Labour market institutions may consequently hinder flexibility and negatively affect employment, but they are also essential for ensuring equity and social protection, which are crucial for individual well-being and economic development. Achieving an optimal balance between labour market flexibility and social protection therefore requires an understanding of the impacts of changes in the institutional framework. This thesis contributes to this understanding by providing evidence for the effects of changes in EPL and minimum wages, which are two of the labour market institutions.

Labour market mobility is not only mobility within countries, but also mobility between countries. Migration can help relieve labour shortages and contribute to economic growth as well, but it raises new challenges of the integration of immigrants and the potential for increased inequality. Integration is a complex process that involves not only economic participation but also social, cultural, and political inclusion. As Marois et al. (2020) highlighted, successful integration is crucial if the benefits of immigration are to be maximised.

It is difficult to measure the success of integration and various indicators can be involved. There is a broad range of research that studies the various labour market outcomes of immigrants, such as their employment prospects or their incomes compared to those of

native-born individuals. An indicator that is less explored but is very relevant for understanding the well-being of immigrants is their wealth. Given that wealth disparities in society tend to be more pronounced than income disparities, concentrating solely on incomes will result in the differences in economic well-being between natives and immigrants being underestimated (Mathä et al., 2011). Analysing the wealth gaps between these two demographic groups is essential for any understanding of how economically integrated immigrants are in the local community.

The issues discussed above are examined in the three publications that make up this thesis. The first two publications focus on estimating the impacts of changes in the labour market institutions of EPL and minimum wages. The focus of the third publication is disparities between natives and immigrants in wealth accumulation. All three papers focus particular interest on Estonia together with the other Baltic States of Latvia and Lithuania, and one of the studies also covers other countries from Central and Eastern Europe (CEE).

At the time the study estimating the effects of changes in EPL was conducted, major reforms in EPL that allow for an assessment of their impact were relatively rare. The US had, for instance, maintained consistently weak EPL for several decades, offering little variation for analysis. Employment protection in Europe in contrast had historically been much stricter, but saw several reforms in the 1990s and 2000s that aimed to ease the regulations and make labour markets more flexible. However, many of these reforms, like those in Spain and Italy, focused on making fixed-term contracts and temporary work more flexible rather than changing protection against dismissal for permanent employees. As a result, the reforms contributed to the emergence of a dual labour market, where temporary workers face significantly lower job security than those with permanent contracts (Boeri, 2011).

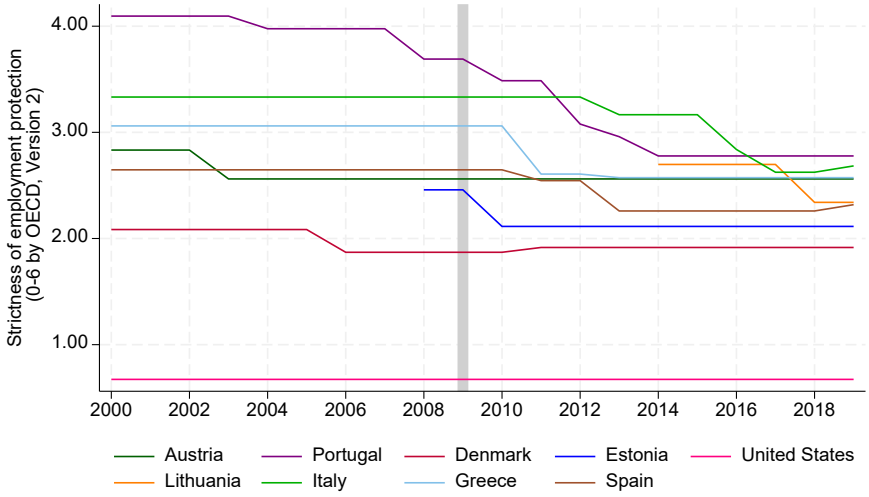

Figure 1. Strictness of employment protection in selected countries, 2000–2019.
Source: OECD, Strictness of employment protection [Data set].

Austria was among the first countries to reduce its EPL notably for amendments to regular contracts in the 2000s, doing so in 2002, and it was followed by Portugal, which introduced a series of gradual adjustments beginning in 2003, and Denmark, which

reduced its EPL in 2005 (see Figure 1). However, the reform in Estonia in 2009 was the most extensive single-step EPL liberalisation in Europe in the 2000s and it provided a valuable opportunity to assess the labour market effects of EPL liberalisation, which is addressed in the first publication in this thesis.

The minimum wage was first introduced in the US in 1938 (Boeri & van Ours, 2008) and countries in western Europe started adopting minimum wage policies after the Second World War (Dolado, et al., 1996). While the minimum wage has declined in the US over the past decades, the opposite trend has been seen in Europe, as significant increases have been observed in many countries (see Figure 2). Minimum wages have been the highest over time in France, but Figure 2 shows that CEE countries, whose minimum wages in 2000 were more comparable to those of the US, have almost caught up with France over the past 20 years. The introduction of minimum wages and changes to them have given rise to debates about their economic effects.

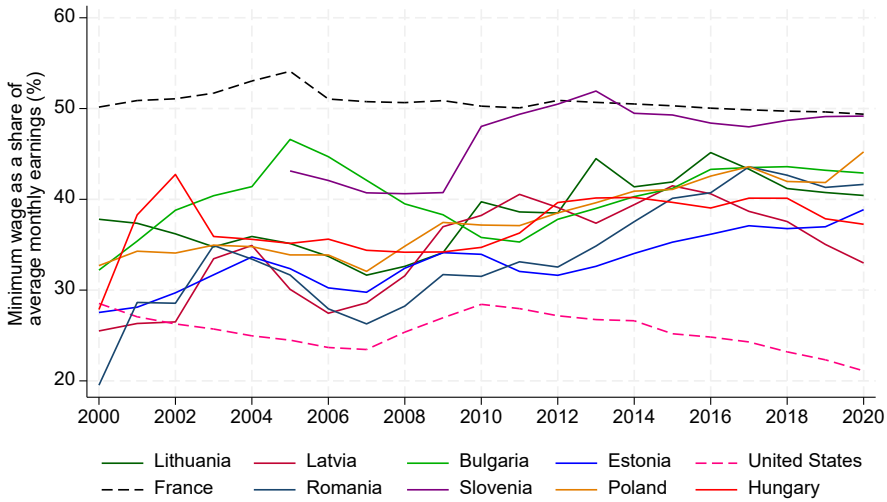

Figure 2. Minimum wage as a share of average monthly earnings in selected countries, 2000–2020. Source: OECD, Minimum relative to average wages of full-time workers [Data set]; Eurostat, Minimum wages [Data set].

Research into the effects of minimum wages has evolved significantly over time. The analysis was mainly theoretical at first, but as more data became available, researchers began to apply empirical methods to assess the actual impacts of minimum wages. While early studies mostly focused on employment and wage outcomes, research in the 21st century has expanded to explore a broader range of impacts. Increasing attention has been given to how various adjustment margins respond to rises in the minimum wage, through changes in prices and productivity for example.

At the time the study estimating the impacts of minimum wages was conducted though, only a very small part of the literature had analysed the different adjustment margins of a rise in the minimum wage by looking at what employers said their preferred strategies were for coping with minimum wage increases, and none of that literature focused on Europe. Having a unique firm-level cross-country survey dataset on the channels preferred by firms for adjusting to a rise in the minimum wage in CEE countries therefore provided a chance to fill the gap in the literature on minimum wages in Europe.

A dominant narrative in the literature on migration and the integration of immigrants suggests that immigrants tend to be less educated (see e.g., Dostie et al., 2023; Hofer et al., 2017; Tomaskovic-Devey et al., 2015) and are less likely to own their homes (Borjas, 2002; Gobillon & Solignac, 2020; Kauppinen et al., 2015), and that these two aspects contribute to immigrants having lower wealth than natives. These patterns do not hold however in two countries, Estonia and Latvia, where immigrants are on average more educated than the natives, particularly among the older population. Nor are there any significant differences in homeownership rates between natives and immigrants in these two countries. At the same time, Estonia and Latvia stand out among other European countries because a substantial share of their older population are immigrants, predominantly Eastern Slavs who migrated during the Soviet era for work. Since this demographic context is significantly different to that of the other countries that are typically studied in this field, it makes Estonia and Latvia particularly interesting cases for examining the native-immigrant wealth gap. The third publication of this thesis addresses this issue and so contributes to the ongoing discussions on migration and nativity wealth gaps by presenting a unique narrative shaped by the historical and demographic context of these countries.

This thesis contributes to the field of microeconomics in several distinct ways. First, it focuses on Central and Eastern Europe, which is a region where the topics it discusses have been relatively underexplored, and so it helps to fill a gap in the existing academic literature.

Second, it demonstrates how various econometric methods can be applied effectively to assess the impact of policy changes, offering a practical example of methodological application. Publication I for instance estimates the probabilities of one-year worker flows with probit models, while a difference-in-differences (DID) approach is applied with Estonia as the treatment group and Lithuania as the control group to identify the effects of the EPL reform. Publication II uses a multivariate probit framework to study the factors that determine the choice of adjustment channel, while controlling for correlations between the different channels. Publication III uses an unconditional quantile regression to estimate wealth differences between native and immigrant households across the wealth distribution. It also applies a Oaxaca-Blinder decomposition to decompose the raw wealth gap into explained and unexplained components.

A third contribution of the thesis is that it promotes the use of different datasets and demonstrates their potential for analysing various issues in labour and wealth economics. The publications that are the basis of this thesis use three different datasets, all of which contain microdata, but which have different sources and units of observation, as the first paper studies individuals, the second looks at firms, and the third considers households. Publication I exploits the micro-data of the Labour Force Survey, which is conducted under the methodology of the International Labour Office (ILO). Publication II uses firm-level data collected as part of the third wave of the Wage Dynamics Network (WDN) survey by the European Central Bank. The data used in Publication III are from the Household Finance and Consumption Survey (HFCS), which is coordinated by the European Central Bank and conducted by national central banks in the EU.

The rest of the thesis is organised as follows. Section 1 provides summaries of the three original empirical research papers. Section 2 highlights the policy implications of the three publications, and also discusses further developments in the field of EPL and minimum wages and their implications in the context of this thesis. The Appendices I–III contain the three publications of the thesis.

1 Summaries of the Studies

1.1 Relaxation of Employment Protection and Labour Reallocation

Publication I is titled "*Relaxation of Employment Protection and Labour Reallocation*" and it explores how Estonia's reform of Employment Protection Legislation (EPL) in 2009 impacted labour reallocation and assesses whether reducing employment protection led to improved labour market mobility in Estonia. The study aims to understand how the relaxation of employment protection affects worker flows, and it looks specifically at transitions into and out of employment, job-to-job transitions, and overall reallocation.

Pissarides (2001) argues that EPL consists of regulations that limit the ability of employers to dismiss workers without delay or cost. In other words, EPL imposes legal restrictions on dismissals and on the compensation to be paid to workers by their former employer if their employment contract is terminated (Boeri, 2011). It consequently increases the costs for employers of adjusting their workforce. One part of these adjustment costs is transfers from the employer to the employee through severance payments and the advance notice of termination, while the other part can be considered as a tax that arises from the difficulties of dismissal and from the procedural inconveniences that the employer may face when starting the dismissal process (Belot, Boone, & van Ours, 2007).

EPL raises the cost of reducing the workforce during an economic downturn, resulting in fewer dismissals being made. However, this can lead to inefficiencies, as employers may face costs from remaining overstaffed even during periods when demand is reduced (OECD, 1999). Equally though, knowing that workers may have to be fired in the future influences employers' decisions during economic upswings, discouraging them from expanding their workforce (Boeri & van Ours, 2008). EPL consequently restricts both hiring and firing decisions, and so hampers overall labour market reallocation. This strictness of EPL is often viewed as an obstacle to a labour market achieving enough flexibility, which is essential for economic growth as it facilitates structural adjustments towards more productive sectors.

The effects of EPL have motivated a considerable amount of empirical research, and the studies can in general be divided into two categories. One group consists of a large number of macro-level studies that use various measures of EPL and macro-indicators for the economy and the labour market to find evidence for the impacts of EPL from the differences between countries. Most of the studies have found that EPL has significant effects on labour flows between labour market states (Haltiwanger, Scarpetta, & Schweiger, 2006). The results for the total effect of EPL on employment and unemployment are ambiguous however, as greater flexibility in EPL increases both hiring and firing. Some studies find evidence that countries with more rigid EPL tend to have lower employment (Heckman & Pages, 2000) and higher unemployment (Feldmann, 2009; Djankov and Ramalho, 2009; Di Tella and MacCulloch, 2005), but Jackman et al. (1996) find no effect on unemployment because the effect on firings is almost offset by the effect on hirings. There is also evidence that strict EPL has negative effects on job-to-job mobility (e.g., Gielen and Tatsiramos, 2012; Bassanini and Garnero, 2013; Boeri and Garibaldi, 2009).

The other group of empirical literature consists of micro-econometric studies that focus on variations in how EPL is enforced within a country, by firm size or type of contracts for example. These studies use both time-series variation from before and after

a reform and within-country differences in enforcement to analyse the effects of EPL. The most common strategy they use is the difference-in-differences (DID) approach, which compares labour market outcomes across subgroups before and after EPL reforms in order to identify the effects of the reforms. Studies using this methodology, like Kugler (1999), Boeri and Jimeno (2005), and Kugler and Pica (2008), provide evidence that stricter EPL has negative effects on labour market flows.

Publication I extends the common within-country, micro-econometric strategy described above to a cross-country perspective. The evaluation in this paper is based on a DID strategy that compares labour mobility in Estonia and Lithuania before and after the employment law reform in Estonia. The similarities in the structures of the Estonian and Lithuanian labour forces and their key economic and labour market trends mean that Lithuania serves as a close match for Estonia, and so using Lithuania as a control group can provide valuable evidence on what the dynamics in the Estonian labour market would have been if Estonia had not reformed its EPL. A similar approach is used by Masso et al. (2013), who used DID analysis to estimate the outcomes of the Estonian corporate tax reform with firms from the other two Baltic countries, Latvia and Lithuania, as the control group for Estonian firms.

The analysis in Publication I uses Labour Force Survey (LFS) micro-data 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), and so the data are fully internationally comparable. This analysis covers the period from 2007 to the third quarter of 2011, and the EPL reform that it evaluates was made in mid-2009, halfway through the period covered. Respondents to the LFS are asked to report about their labour market statuses and job positions both during the observed period and in the year preceding the survey. The variables for current and prior labour market status and the starting time for the current job are used to calculate annual worker flows and changes across jobs, employment, unemployment and inactivity.

This paper employs probit models to investigate how various factors, including the EPL, impact the probabilities of flows between labour market statuses and jobs. The DID estimator is included in the regressions alongside the estimates of the probabilities of one-year transitions in the labour market in order to identify the effects of the reform. A DID estimator compares the situation before and after the reform for those the reform applied to and those to whom it did not apply (see, e.g., Caliendo, 2006; Angrist and Pischke, 2009; Bazen, 2011).

The results of Publication I show that the relaxation of EPL seems to have increased reallocation and the probability of involuntary transitions out of employment. At the same time, the reform is not observed to have had any significant effects on the probability of hiring, while the probability of job-to-job transitions seems to have decreased after the reform.

The EPL reform was supposed to improve the reallocation of labour in Estonia. The results from Publication I indicate that the reform 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 rapid recovery of the Estonian labour market from the crisis and the increased flows into employment show that there was a rise in hirings as well. However, the specification used for hiring probability in this paper could not identify any significant impact from the EPL reform on inflows to employment. This result, together with the finding of reduced job-to-job mobility, suggests that the relaxation of EPL alone was not enough to achieve the goal.

The EPL reform in Estonia was mainly focused on reducing the part of the EPL that covers the transfers from the employer to the employee. However, previous findings (Pissarides, 2001; Bassanini and Garnero, 2013) suggest that decisions about hirings and separations are affected more by the tax part of the EPL. It has been argued that the difficulties of dismissal together with the procedural inconveniences that the employer may face are mainly responsible for the reduction in hirings and separations. The results of this paper together with the earlier findings consequently raise the possibility that this kind of EPL reform, which is intended to improve the reallocation of labour by reducing the transfers from the employer to the employee, may not be sufficient to have the expected positive effect on hiring, and this is important to consider in the context of further developments in the labour market institutions. Furthermore, the Danish flexicurity model argues that workers must be given security through income stability and the provision of ALMPs if they are to benefit fully from labour market flexibility, but these measures remained unaddressed in Estonia during this reform.

1.2 How Do Firms Adjust to Rises in the Minimum Wage? Survey Evidence from Central and Eastern Europe

Publication II uses a unique firm-level dataset to investigate how firms in eight Central and Eastern European countries – Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovenia – adjust to rises in the minimum wage. The data were collected as part of the third wave of the Wage Dynamics Network (WDN) survey by the European Central Bank and provide insights into the strategies that firms employ to cope with increases in the minimum wage, and so the paper makes a valuable contribution to the literature on the effects of minimum wages in Europe.

A variety of theoretical models have been developed to describe the possible effects of rises in the minimum wage. The competitive model (see Lester, 1960; Hirsch, et al., 2015; Wilson, 2012; Kaufman, 2010; Lee and Saez, 2012; Schmitt, 2013) implies that such rises have negative effects on employment, while the monopsony model (see Boal and Ransom, 1997; Manning, 2003; Kuhn, 2004; Ashenfelter et al., 2010) identifies possible positive effects on employment. The search and matching model (see Rogerson et al., 2005; Flinn, 2006; Cahuc, 2014) and the institutional model (see Hall and Cooper, 2012; Wilson, 2012; Schmitt, 2013) both find efficiency gains. All these models suggest that firms have several strategies for reacting to rises in the minimum wage, and these adjustment channels include the pass-through of labour costs to prices, cuts in non-labour costs, wage rises for employees who do not earn the minimum wage, efficiency improvements, and changes in employment.

The effects of the minimum wage have been extensively studied, and most of the studies have provided support for the conventional view that minimum wages reduce employment (e.g., Neumark and Washer, 2006; Neumark et al., 2014; Huang et al., 2014). Empirical findings from the CEE countries also show that rises in the minimum wage have a negative impact on employment and hiring (e.g., Hinnosaar and Rõõm, 2003; Halpern et al., 2004; Zepa, 2006; Fialova and Mysikova, 2009; Vodopivec, 2015), though the study by Ferraro et al. (2018) finds that increases in the minimum wage have no effect on employment retention.

Numerous studies have shown that besides their outcomes on employment, minimum wages generate spillover effects that push up wages above the minimum wage level (Neumark and Wascher, 2008; Manning, 2003; Draca et al., 2011; Hirsch et al., 2015).

A positive effect on the wages of workers earning above the minimum wage has also been found in the CEE countries (Gottvald et al. 2002; Brezigar Masten et al., 2010; Kézdi and Kónya, 2012; Ferraro et al., 2018). Most studies (e.g., Grossberg and Sicilian, 1999; Neumark and Wascher, 2001; Acemoglu and Pischke, 2003) find that increases in minimum wages have no significant impact on productivity. Hirsch et al. (2015) in contrast show that higher minimum wages positively influence labour productivity. Evidence for consumer prices being driven higher by rises in the minimum wage is found by many studies (e.g., Card and Krueger, 1995; Macdonald and Aaronson, 2000; Lemos, 2008; Dolton et al., 2010; Hirsch et al., 2015), including studies of Latvia (Zepa, 2006) and Hungary (Harasztosi & Lindner, 2019). The focus in these studies has predominantly been on a single adjustment channel, but the data employed in Publication II allow multiple possible channels to be analysed, making this study a significant contribution to the existing literature on minimum wages.

The empirical analysis in Publication II uses firm-level data from a survey conducted by the 25 national central banks in the WDN. The survey was run in 2014 using a harmonised questionnaire that covered the period 2010–2013. This study focuses on responses from eight countries – Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovenia – about how firms reacted to a rise in the minimum wage. Firms were asked about the share of their workers who were earning the minimum wage in 2013, and their strategies for adjustment following a rise in the minimum wage.

Although these responses provide valuable insights, there are methodological challenges because the questions about the adjustment channels were not perfectly synchronised across countries, which makes direct comparison and empirical analysis difficult. The analysis in the paper therefore harmonised the questions by combining the answers into a binary relevance indicator (a detailed explanation of the harmonisation process is given in Publication II, which is included as Appendix 2 of this thesis).

Publication II provides detailed cross-country information about the shares of minimum wage workers in the eight CEE countries, which is rarely available in statistical reports. The analysis finds evidence of significant cross-country and sectoral differences in the average share of workers earning the minimum wage, but the common finding is that smaller, domestically-owned, non-exporting firms and firms employing a higher proportion of low-skilled, blue-collar workers tend to pay the minimum wage to a larger share of their employees.

The study focuses on how firms respond to rises in the minimum wage across multiple adjustment channels, including layoffs, reduced hiring, price increases, cuts in non-labour costs, wage rises for employees earning above the minimum, and improvements in productivity. By analysing which of these strategies firms prefer, the paper illustrates how firms adapt to increases in labour costs. The findings reveal that the most common responses are to raise product prices, cut non-labour costs, and enhance productivity. Cutting employment is less popular, and employment effects are realised mostly through reduced hiring rather than direct layoffs.

An important contribution of the paper is that it provides evidence for spillover effects from rises in the minimum wage to firms that do not employ minimum wage workers. The results indicate that nearly a quarter of firms with no employees on the minimum wage also react to the rise in the minimum wage, primarily through price increases, wage adjustments, productivity improvements, or reductions in non-labour costs. This suggests that minimum wage policies can have broader implications for the economy and affect firms beyond those directly employing workers earning the minimum wage.

The study also examines the factors that influence firms' choice of adjustment channels, and considers firm-specific conditions such as size, sector, ownership, demand conditions and access to external financing. A multivariate probit framework is applied for that purpose as it allows the correlations between the channels to be controlled for. The results show that favourable demand conditions and external financing being available for firms are associated with the adjustment channels being less relevant, indicating that economic context and financial resources play an important role in shaping how firms respond to rises in the minimum wage. Foreign-owned firms appear to be less affected by minimum wage rises.

In conclusion, Publication II provides an analysis of how firms in the eight CEE countries respond to increases in the minimum wage, highlighting the diversity of the adjustment channels they employ. By examining a wide range of adjustment strategies and exploring spillover effects, the study enhances the understanding of the impacts of minimum wage policies. The findings consequently provide valuable insights for policymakers, as they demonstrate that rises in the minimum wage not only have direct effects on the labour market but also influence the wider economy as well.

1.3 Wealth Disparities Between Elderly Immigrants and Natives: A Study of Estonia and Latvia

Publication III, "*Wealth disparities between elderly immigrants and natives: a study of Estonia and Latvia"*, examines the wealth disparities between the native-born and immigrant populations in Estonia and Latvia, with a particular focus on elderly individuals aged 60 years or older. This demographic group is unique to these two countries because of the significant proportion of Eastern Slavic immigrants who relocated during the Soviet era for work and have since remained throughout the political and economic transitions that started in the 1990s.

This study is built on the wealth accumulation framework, which shows that differences in wealth accumulation between natives and immigrants can stem from disparities in incomes, saving behaviour, the structure of assets, and inheritances. Earlier empirical studies of these factors found evidence for natives having higher homeownership rates (Borjas, 2002; Gobillon & Solignac, 2020; Kauppinen et al., 2015), more diversified financial portfolios (Bertocchi et al., 2023; Sinning, 2007), and better access to mortgages (Bertocchi et al., 2023). It is usually observed for inheritances that immigrant households are substantially less likely to receive them, and this is an important reason why their level of wealth is lower (Bhutta et al., 2020; McKernan et al., 2014). There is also substantial empirical evidence of unexplained differences in income in favour of natives over immigrants (see among others Dostie et al., 2023; Hofer et al., 2017; Tomaskovic-Devey et al., 2015), while other earlier studies have indicated that natives have higher employment rates than the minority population in this region (Borman et al., 2019; Männasoo et al., 2023), which also contributes to the incomes of the immigrants being lower.

The result of these differences between the two groups is that natives generally tend to be richer than immigrants, and this is confirmed by studies that investigate the nativity wealth gap. Native-born households in the US for instance are found to have 2.5–3 times more wealth than their foreign-born counterparts (Cobb-Clark & Hildebrand, 2006), while immigrants in Europe have 60–90% less wealth than natives (Mathä et al., 2011; Bauer et al., 2011; Dossche et al., 2022; Muckenhuber et al., 2022). However, there is

also evidence that the wealth gap varies with the origin of the immigrants, as immigrants from Western Europe have smaller gaps to natives than those from post-communist or non-European countries (Ferrari, 2020; Semyonov & Lewin-Epstein, 2022). These findings illustrate that the existence of a wealth gap is contingent upon the characteristics of the immigrants, which can vary significantly across countries.

Publication III demonstrates that Estonia and Latvia are different to countries where nativity wealth gaps have been studied before, because they have a distinctive immigrant profile that has been shaped by historical and demographic factors. The two countries experienced significant immigration while they were under Soviet occupation, primarily from Eastern Slavs who arrived as industrial workers after substantial population losses during the Second World War (see Parming, 1980; Harris, 1993; Katus et al., 2002). By the late 1980s, natives were just over half of the population of Latvia and slightly over 60% of that in Estonia (Zvidrinš, 1994). The migration patterns reversed after Estonia and Latvia regained their independence (Hazans, 2019; Robertson, 1996), but many of the immigrants still remained, significantly shaping the demographics of the two countries. By 2017, 15% of the Estonian population and 13% of the Latvian population was born outside the country, with a substantial 13% in Estonia and 11% in Latvia born in non-EU countries. In both countries, around 30% of the population aged 65 and older were foreign-born. This immigrant cohort began in the early 1990s with similarly low levels of wealth to those of the natives, but differences emerged over subsequent decades. This presents a unique case for studying the disparities in wealth between natives and immigrants.

The study employs data for Estonia and Latvia from the 2017 wave of the Household Finance and Consumption Survey (HFCS), which is coordinated by the European Central Bank and conducted by national central banks in the EU. The HFCS provides information on the wealth of households by collecting detailed data on their assets and liabilities, and their incomes, consumption and demographic characteristics. The survey data were imputed using multiple imputation techniques and all five sets of implicates are used in the analysis carried out in Publication III. Survey weights are additionally applied to generalise the results to the elderly population of Estonia and Latvia.

The study analyses the wealth differences between native and immigrant households across the wealth distribution by employing the unconditional quantile regression method developed by Firpo et al. (2009). This method involves estimating a recentred influence function (RIF) that shows how changes in explanatory variables affect unconditional net wealth at different quantiles. The study examines wealth at the 25th, 50th, 75th, 90th, and 95th percentiles and applies the Oaxaca-Blinder decomposition to identify the factors that contribute to the wealth gap between natives and immigrants (see Fortin et al., 2011). The analysis controls for various demographic, labour market, regional and household characteristics, including income and ownership of assets, and so the results offer insights into the relative importance of different household features for explaining wealth disparities.

The study highlights that although the immigrants started from similar economic positions to the native-born individuals in the early 1990s, a notable wealth gap has emerged over time. Native households in Estonia have median net wealth that is 30% higher than that of immigrant households, with the gap widening to 74% at the 95th percentile. The gap in Latvia becomes statistically significant at the upper end of the wealth distribution, reaching 55% at the 95th percentile.

The findings of this study show that several factors contribute to these wealth disparities. One key cause is the differences in property values. While homeownership rates are similar for natives and immigrants, native-born individuals tend to live in areas with higher property values and thus accumulate more wealth. Natives also have better access to business assets and inheritances, further contributing to the wealth gap. However, the study notes that despite immigrants in Estonia and Latvia having higher average levels of education than the natives, their economic integration has probably been hindered by factors such as poor local language skills and labour market segregation, which have limited their ability to capitalise on their human capital. The persistent wealth gap thus points to challenges in the socioeconomic integration of immigrants even after decades of residence.

Overall, the findings of Publication III suggest that while Estonia and Latvia have unique historical and demographic contexts that have shaped the native-immigrant wealth gap, the broader issue of economic disparity remains a critical challenge. The study contributes to the ongoing discussions on migration and economic integration, and offers insights that are particularly relevant for regions with similar post-Soviet histories and ageing immigrant populations.

2 Final Comments

This thesis consists of three publications and investigates the impact of labour market institutions and of wealth disparities between natives and immigrants. Both these topics are important in the context of labour market mobility, which is itself essential for addressing the issue of labour shortages and contributing to overall economic development. Their use of three different micro-level datasets and a variety of econometric approaches means all three papers contribute to the academic literature in their specific fields.

The findings from the three publications that comprise the thesis also offer valuable policy implications that can guide future decisions about employment laws, minimum wages and integration policies. Publication I provides new evidence for the effects of EPL on labour mobility and suggests that reducing EPL may not alone be enough to achieve a better reallocation of labour. Publication II demonstrates that rises in the minimum wage not only have direct effects on the labour market but also influence the wider economy as well, through the price increases that are made to adjust to the minimum wage rises for example. Inflationary effects should therefore also be considered when minimum wage policies are designed. Publication III highlights the need for more targeted integration policies that could help improve the economic outcomes for immigrants by addressing barriers to assimilation such as language skills and labour market segregation, and so could then reduce the inequalities between natives and immigrants.

After the reform of the Estonian EPL in 2009, several other European countries reformed their EPL to make it more flexible as well. EPL was eased significantly between 2010 and 2013 in Portugal, Italy, Greece and Spain for example (see Figure 1). Lithuania carried out a reform in 2017 of the same magnitude as the Estonian one in 2009. The investigation of the effects of EPL has remained relevant, but most of the more recent studies of the effects of EPL focus mainly on outcomes such as labour market dualism and inequality (e.g., Barbieri and Cutuli, 2016), and productivity (e.g., ElFayoumi, 2022).

Only a few studies have been added to the literature that assesses the impacts of EPL on labour mobility. Arestis et al. (2023) provide one example that analyses the impact of employment protection on the dynamics of employment in 16 European countries between 1985 and 2019, and they show that EPL has no impact on job creation. Furthermore, they find that the labour reforms that have reduced EPL in Europe have not helped accelerate the growth in employment, which is in accordance with the findings of Publication I in this thesis. Garcia-Louzao (2022) finds however that the Spanish labour market reform of 2012, which reduced severance pay, led to an increase in voluntary mobility, but only for workers who may expect to be displaced in the near future anyway.

After the EPL reform, Estonia's labour market initially experienced a rapid recovery from the crisis. However, examining the dynamics in the labour market in the years since, makes it evident that the flows between jobs and from employment to unemployment have remained largely unchanged, and have stayed on average at the same levels as those observed in 2011, which was the end of the period studied for Publication I (see Figure 3). The only noticeable increase has been in the unemployment-to-employment transitions, but this trend has also been observed in Lithuania. These flows grew slightly faster in Estonia from 2010 onwards, but then those in Lithuania caught up after 2017.

This may be a consequence of the EPL reform that Lithuania conducted in 2017 to increase the flexibility of its labour market. Despite the possible short-term effects, neither country has managed to catch up with Denmark, which is a benchmark for a flexible labour market, and so it can be assumed that in the long run, these reforms have not fully achieved their goal.

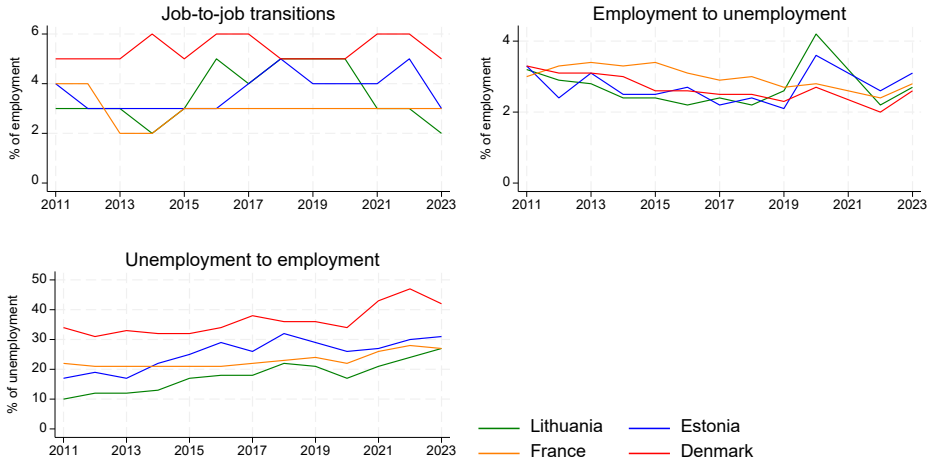

Figure 3. Labour market transitions in selected countries, 2011–2023.
Source: Eurostat, Job-to-job transitions [Data set]; Eurostat, Labour market transitions [Data set]; Eurostat, Transition from unemployment to employment [Data set].

The study analysing how firms adjust to rises in the minimum wage has gathered quite a remarkable number of citations and has been referenced in the Handbook of Labour Economics (Dube & Lindner, 2024) among other places. Many subsequent influential papers have also studied the channels through which firms adjust to rises in the minimum wage, and they confirm the findings of Publication II. It has been found for example that while the employment effects are generally small, firms may adjust through various non-employment margins (Clemens, 2021). These include passing costs to consumers (Harasztosi & Lindner, 2019), reducing profits (Bruttel, 2019), substituting labour with capital (Geng, Huang, Lin, & Liu, 2020), and increasing productivity (Nguyen, 2019; Ku, 2021; Coviello et al., 2022). A review of the more recent studies on the impacts of minimum wages thus adds credibility to the findings of Publication II, since the results of more recent studies are largely consistent with those presented in this study.

In summary, this doctoral thesis emphasises that the institutional framework is a complex and multifaceted structure, where various institutions, such as employment protection legislation, trade unions, the minimum wage, unemployment benefits, active labour market policies, social protection, the education system, and integration policies, are all closely interconnected. These institutions do not function in isolation, but complement each other, influencing one another's efficiencies. Consequently, a reform that focuses only on the costs of terminating employment relationships for example may indeed increase labour flexibility, but it may have a limited impact if it is not accompanied by changes to active labour market policies and the social security system.

If different institutions are not aligned, the desired effects of changes in one area may remain constrained or new challenges may even be created, such as increased unemployment or growing inequality. Changes in labour market institutions may additionally have broader implications for the whole economy, which should also be considered in policymaking. Ensuring that the labour market and the economy more broadly function properly therefore needs a comprehensive approach where all institutions are interconnected and can collaborate to create favourable conditions for labour market mobility and overall economic development.

List of Figures

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Abstract

Essays on Labour Market Institutions and Wealth Inequality

This thesis investigates the impacts of labour market institutions and of wealth disparities between natives and immigrants. Both these topics are important in the context of labour market mobility, which plays a key role in addressing labour shortages and supporting economic development. The purpose of the thesis is to examine: (I) how the reduction in employment protection legislation affects labour market mobility; (II) how firms adjust to rises in minimum wages; and (III) the wealth gap between natives and immigrants and the factors associated with it.

Labour market legislation reforms were relatively rare before the global financial crisis, and previous changes in Europe primarily focused on making temporary employment more flexible. The EPL reform in Estonia in 2009 was one of the first extensive relaxations of permanent employment protections in Europe, and as such it offered a unique opportunity for assessing how that impacted labour mobility.

The main change the reform made was to reduce the costs associated with employment termination, which economic theory said should lead to an increase in both job terminations and new hirings, thereby enhancing labour mobility. The first publication tests this relationship empirically by employing a difference-in-differences approach to evaluate the impact of Estonia's EPL reform on labour mobility, using Lithuania as a control group. The findings indicate that while Estonia's labour market became more flexible and worker mobility increased, the movement was mainly between employment and unemployment rather than between jobs. Although the reform appears to have increased movements out of employment and reduced job-to-job transitions, the expected positive effect on the probability of entering employment was not identified in this study.

The results of the first publication suggest that reducing the transfers from the employer to the employee may not on its own be sufficient to enhance labour mobility. The Danish flexicurity model assumes that the full benefits of labour market flexibility can only be realised when workers are given income security and active labour market measures. However, those measures were not introduced in Estonia by the reform. This is an important aspect to consider when assessing the further development of labour market institutions.

The effects of minimum wages on employment have been widely studied, but the recent literature has increasingly focused on the adjustment mechanisms that firms use to cope with rises in the minimum wage. At the time the study on minimum wage impacts was conducted, very few studies had analysed multiple adjustment channels simultaneously, especially in the European context. Data from a unique international survey of the strategies preferred by firms for adjusting to rises in the minimum wage in CEE countries thus provided an opportunity to fill the gap in the literature on minimum wages in Europe.

The second publication employs a multivariate probit model to examine the adjustment channels used by firms in response to the minimum wage rising. The findings reveal that the most common adjustment channels include raising prices, reducing non-labour costs, and improving productivity. Direct layoffs were the least frequently cited response, with only a slightly higher proportion of firms mentioning a reduction in hiring. The study additionally found that the impact of the minimum wage increasing extends significantly to firms that do not employ any workers on the minimum wage.

The academic contribution of the second publication lies in its approach of examining how firms respond to a rise in the minimum wage through a combination of multiple strategies, and presenting a ranking of those strategies. Previous studies have focused on single transmission channels, most commonly layoffs. Overall, the findings of this publication indicate that changes in minimum wages can have broader economic effects beyond the labour market, such as contributing to price growth, which should be considered in policymaking.

A dominant narrative in the literature on migration and the integration of immigrants suggests that immigrants tend to be less educated and are less likely to own their own homes. However, these patterns do not hold in two countries, Estonia and Latvia, where immigrants are on average more educated than the natives, particularly among the older population, and there are no significant differences in homeownership rates between natives and immigrants. This unique context, along with the distinct historical and demographic background of Estonia and Latvia, provides a new perspective for studies of wealth gaps.

The third article employs an unconditional quantile regression to assess wealth disparities between natives and immigrants across the entire net wealth distribution. It also applies the Oaxaca-Blinder decomposition method to separate total wealth gaps into explained and unexplained components. The results reveal substantial asset gaps in favour of natives, which widen at the upper end of the wealth distribution. The study analyses the factors associated with wealth inequality and finds that the wealth of natives is higher primarily because they gain from higher property values because of geographic segregation, while in Estonia they also have better access to business assets and inheritances, and in Latvia they are more likely to own a second property.

In summary, the third article provides a novel perspective on wealth gaps between natives and immigrants, and is particularly relevant for countries with historical backgrounds similar to those of Estonia and Latvia. The policy implications of the article are that immigrants may not fully integrate even after several decades, and this affects their employment opportunities and financial decision-making. This highlights the need for more targeted integration policies that address barriers to assimilation such as language skills and labour market segregation, and so could help improve the economic outcomes for immigrants and, in turn, reduce the inequalities between natives and immigrants.

Overall, this thesis highlights the complex structure of the institutional framework, where various institutions are closely interconnected. If different institutions are not aligned, the desired effects of changes in one area may remain constrained or new challenges may even be created, such as increased unemployment or growing inequality. Ensuring that the labour market and the economy more broadly function effectively thus needs a comprehensive approach, where all institutions are interconnected and can collaborate to create favourable conditions for labour market mobility and overall economic development.

Lühikokkuvõte

Uurimused tööturu institutsioonidest ja varalisest ebavõrdsusest

Käesolev doktoritöö uurib tööturu institutsioonide mõjusid ning varanduslikke erinevusi kohalike ja sisserännanute vahel. Mõlemad teemad on olulised tööturu mobiilsuse kontekstis, millel on keskne roll tööjõupuuduse leevendamisel ja majandusarengu toetamisel. Käesolevas doktoritöös käsitletakse eelpool kirjeldatud teemasid, uurides: (I) kuidas mõjutab tööseadusandluse paindlikumaks muutmine tööjõu mobiilsust; (II) kuidas kohanevad ettevõtted miinimumpalga tõstmisega; ja (III) milline on varanduslik lõhe kohalike ja sisserännanute vahel ning mis teguritega see seotud on.

Kuni ülemaailmse finantskriisini olid tööseadusandluse reformid pigem harvad ning varasemad muudatused Euroopas olid peamiselt keskendunud tähtajaliste töösuhete paindlikkuse suurendamisele. Eestis 2009. aastal läbiviidud tööseadusandluse reform oli üks esimesi tähtajatute töösuhete ulatuslikke leevendamisi Euroopas, mis pakkus harukordse võimaluse hinnata selle mõju tööjõu mobiilsusele.

Peamise muudatusena vähendati Eestis töösuhte lõpetamisega kaasnevaid kulusid, mis majandusteooria järgi peaks tooma kaasa nii töösuhte lõpetamiste kui ka sõlmimiste kasvu ning seega suurendama tööjõu mobiilsust. Esimeses artiklis analüüsitakse selle seose empiirilist paikapidavust, hinnates diferents-diferentsis meetodil Eesti tööseadusandluse reformimise mõju tööjõu mobiilsusele, kasutades kontrollgrupina Leedut. Artikli tulemused näitavad, et Eesti tööturg on selle reformi järel muutunud küll paindlikumaks ning töötajate mobiilsus on suurenenud, kuid ümberpaiknemine on toimunud rohkem hõive ja töötuse kui töökohtade vahel. Kuigi see reform paistab olevat võimendanud majanduslangusele iseloomulikku hõivest välja liikumise kasvu ning töökohtade vahelise liikumise kahanemist, siis oodatud positiivset mõju hõivesse liikumise tõenäosusele ei õnnestunud antud uuringus tuvastada.

Esimese artikli tulemused viitavad sellele, et ainult töösuhte lõpetamisega kaasnevate kulude vähendamine ei pruugi olla piisav selleks, et parandada tööjõu mobiilsust. Selle reformi eeskujuks võetud Taani turvalise paindlikkuse mudeli kohaselt tuleb tööjõuturu paindlikkusest täieliku kasu saamiseks tagada töötajatele kindlustunne sissetuleku kaitse ja aktiivsete tööturumeetmete kaudu. Need meetmed jäid aga Eestis selle reformi käigus tegemata. See on oluline aspekt, mida tuleks arvestada tööturu institutsioonide edasise arendamise kontekstis.

Miinimumpalga mõjusid hõivele on varasemalt uuritud laialdaselt, kuid värskemas teaduskirjanduses on üha enam tähelepanu pälvinud miinimumpalga tõusuga kohanemise mehhanismid. Samas ajaks, mil viidi läbi miinimumpalga mõjude hindamise uuring, oli teaduskirjanduses veel vähe uuringuid, mis analüüsiks samaaegselt erinevaid kohanemismehhanisme miinimumpalga tõusuga toime tulemiseks, eriti Euroopa kontekstis. Seetõttu pakkus unikaalne rahvusvahelise küsitluse andmestik, mis käsitleb ettevõtete eelistatud kohanemismehhanisme miinimumpalkade tõusule Kesk- ja Ida-Euroopa riikides, võimaluse täita puudujääk miinimumpalkasid käsitlevas teaduskirjanduses Euroopa kohta.

Teise artiklis läbiviidud mitmemõõtmelise *probit* analüüsi tulemustest ilmneb, et levinumad kohanemiskanalid miinimumpalga kasvule on hindade tõstmine, tööjõuväliste kulude vähendamine ja tootlikkuse parandamine. Töötajate otsest koondamist pidas oluliseks kõige väiksem arv vastanuid ning ainult veidi suurem osa ettevõtteid mainisid

värbamise vähendamist. Lisaks ilmnes uurimusest, et miinimumpalga tõusu mõju kandub olulisel määral üle ka ettevõtetele, kus miinimumpalka teenivaid töötajaid ei ole.

Teise artikli akadeemiline panus seisneb eelkõige selles, et esmakordselt vaadeldakse ettevõtete reaktsiooni miinimumpalga tõusule mitme strateegia kombinatsioonina ning esitatakse nende strateegiate eelisjärjestus. Varasemates uuringutes seda tehtud ei ole ning on keskendutud üksnes ühele mõju ülekandumise kanalile, milleks on kõige sagedamini olnud koondamine. Kokkuvõttes näitavad selle artikli tulemused, et miinimumpalga muudatustel võivad olla mõjud lisaks tööturule ka laiemale majandusele, näiteks hinnakasvule, ning seda tuleks poliitikakujundamisel arvesse võtta.

Sisserändajate ja kohalike jõukuse erinevuste uurimisel on peamiselt keskendutud riikidele, kus sisserändajad on keskmiselt madalama haridustasemega ja väiksema tõenäosusega koduomanikud. Eesti ja Läti on aga kaks riiki, kus sisserändajad on sageli haritumad kui kohalikud ning kodu omamise tõenäosuses olulisi erinevusi kohalike ja sisserännanute vahel ei ole. See unikaalne kontekst ning lisaks ka Eesti ja Läti eripärane ajalooline ning demograafiline taust pakub uut perspektiivi varandusliku lõhe uurimiseks.

Kolmandas artiklis hinnatakse mittetingimuslikku kvantiilregressiooni abil jõukuse erinevusi kohalike ja sisserännanute vahel kogu netovarade jaotuse ulatuses ning kogulõhed jagatakse selgitatud ja selgitamata jäävateks osadeks kasutades Oaxaca-Blinderi dekompositsioonimeetodit. Tulemused viitavad märkimisväärsetele varade lõhedele kohalike kasuks, mis suurenevad netovarade jaotuse ülemises otsas. Varalise ebavõrdsusega seotud tegurite analüüsimisel ilmneb, et kohalike suuremasse jõukusesse panustavad neile kuuluva kinnisvara kõrgemad väärtused (tulenevalt geograafilisest segregatsioonist), Eestis lisaks ka parem juurdepääs ärivaradele ja pärandustele ning Lätis lisaks kodule teise kinnisvara omamine.

Kokkuvõttes pakub kolmas artikkel uut perspektiivi varandusliku lõhe uurimisel ja on eriti oluline riikidele, millel on Eesti ja Lätiga sarnane ajalooline taust. Sotsiaalpoliitilise panusena viitab kolmas artikkel, et sisserännanud ei pruugi integreeruda isegi mitme aastakümne jooksul, mis aga mõjutab nii nende tööalaseid võimalusi kui ka finantsvalikuid. Seega rõhutab see artikkel vajadust sihipärasemate lõimumispoliitikate järele, näiteks keeleoskuse puudujääkide ja tööturu segregatsiooni vähendamiseks, mis aitaksid parandada sisserändajate majanduslikku olukorda ja vähendada jõukuse lõhet kohalike ja sisserändajate vahel.

Kokkuvõtvalt rõhutab käesolev doktoritöö seda, et institutsionaalne raamistik on keeruline ja mitmetahuline struktuur, kus erinevad institutsioonid, nagu tööseadusandlus, ametiühingud, miinimumpalk, tööturuteenused ja -toetused, aga ka sotsiaalkaitse, haridussüsteem ja integratsioonipoliitika on omavahel tihedalt seotud. Kui erinevad institutsioonid ei ole omavahel kooskõlas, võivad ühe valdkonna muudatuste soovitud mõjud jääda piiratuks või isegi tekitada uusi väljakutseid, nagu suurenenud tööpuudus või ebavõrdsuse kasv. Seega on tööturu ja laiemalt kogu majanduse toimimise tagamiseks vaja terviklikku lähenemist, kus kõik institutsioonid on omavahel seotud ja loovad koostoimes soodsad tingimused tööturu mobiilsuseks ja üldiseks majandusarenguks.

Appendix 1

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Relaxation of employment protection and labour reallocation

Liina Malk
Department of Finance and Economics,
Tallinn University of Technology and Economics and Research Department,
Bank of Estonia, Tallinn Estonia

Abstract

Purpose – Employment law reform enforced in Estonia in mid-2009 provides a good opportunity to examine the outcomes of employment protection legislation (EPL). The purpose of this paper is to evaluate the effects of the reduction in EPL on labour reallocation.

Design/methodology/approach – The author exploits the micro-data of the Labour Force Survey to estimate the probabilities of one-year worker flows with probit models, and uses a difference in differences (DID) approach to identify the effects of the EPL reform.

Findings – The author finds that the reduction in EPL seems to have increased the probability of transitions out of employment. At the same time, she does not find any significant effect of this reform on the probability of flows into employment. The evaluation also gives evidence of a lowered probability of job-to-job transitions resulting from the reduction in EPL.

Research limitations/implications – In this paper, the DID estimation is conducted by using Lithuanians as the control group for Estonians. However, it should be noted that this approach assumes strong similarities between these countries in order to obtain reliable estimates.

Originality/value – The findings of this paper raise the possibility that the reduction in EPL alone may not have been sufficient for achieving a better reallocation of labour and this is important to consider in the context of further developments in other labour market institutions.

Keywords Difference in differences estimation, Employment protection, Labour reallocation, Policy evaluation

Paper type Research paper

1. Introduction

Employment protection legislation (EPL) is comprised of regulations that limit the employer's ability to dismiss the worker without delay or cost (Pissarides, 2001). In other words, EPL 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). Therefore it makes the work-force adjustments costly for the employer. One part of these adjustment costs includes transfers from the employer to the employee in the form of severance payments and the advance notice of termination. The other part of these costs can be considered as a tax which arise from the difficulties of dismissal (legislative provisions setting conditions under which a dismissal is justified) and the procedural inconveniences that the employer may face

JEL Classifications — J60, K31

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when starting the dismissal process (Belot *et al.*, 2007). Thus, the tax part of the costs is not directly beneficial to the worker.

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 between labour market states (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 Di Tella 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 influence the flows between jobs as well 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 micro-econometric 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 (DID) 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 Columbia 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 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 (LFS) 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 DID 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 gives an overview of the data and worker flows and describes the evaluation methodology. Section 4 displays the estimation results and tests the robustness. Finally, Section 5 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 ECA 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 per cent in both countries and the collective bargaining coverage is relatively low at around 30 per cent in Estonia and 15 per cent 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 per cent of workers doing part-time work and <5 per cent working on temporary contracts (Malk, 2013).

Even though Estonia and Lithuania have demonstrated considerable flexibility in wages, their labour market regulations had become unfavourable for job creation and labour reallocation. In both countries the legal regulation of labour relations was mainly developed in the 1990s. Since then, the economic and social environment has changed a lot due to the integration of both countries to the western economy as well as due to the overall globalisation. Therefore the regulations established in the 1990s had become outdated for today's economy, where flexibility has become an essential prerequisite for competitiveness and economic growth. For this reason, from the second half of the 2000s both countries have started to look for ways to increase the flexibility of the labour market. Only Estonia have managed to implement 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 discussions between the government and the representatives of the social partners about the renewal of the labour law started already at the end of 2006. These negotiations resulted in an agreement of the main principles for the new EPL signed in April 2008. This was followed by the procedure of the draft of the act in the Parliament, where it was adopted in December 2008. Although the main changes imposed by the new act were anticipated for long time in advance, there were some unexpected changes introduced to respond to the economic crisis. One of those was bringing forward the time of the enforcement of the act by half a year.

The main aim of the EPL reform was to encourage the reallocation of labour to more productive jobs and to improve the social protection of the unemployed. 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 I). The administrative burden for

Length of tenure with the present employer	Estonia						Lithuania	
	Before 1.7.2009		After 1.7.2009					
	Notice period	Severance pay	Notice period	Severance pay			Notice period	Severance pay
				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 years	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[a]		2 months	6 months' average pay

Note: [a]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 1.7.2009) is 3 months' average salary

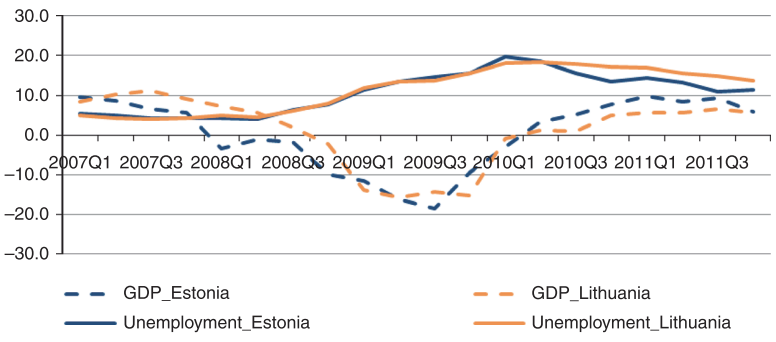
Sources: The Employment Contracts Act of Estonia; The Labour Code of the Republic of Lithuania

Table I.
Notice periods and severance pay following employment contracts' terminations for economic reasons in Estonia and Lithuania

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 had 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. 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. Although no surveys have been conducted to explore the effects of these amendments on labour relations in Lithuania, these changes are considered rather insignificant in terms of improving labour market flexibility (Gruzevskis and Blaziene, 2011). Therefore 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 (see Figure 1). The economies of both states were significantly affected by the Russian crisis in 1999, when a steep decline in exports lead to a decline in growth rates. However, from 2000 Estonia and Lithuania both saw fast economic growth averaging 7-10 per cent 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,



Source: Eurostat

Figure 1.
GDP (as a percentage change from the corresponding period of the previous year) and unemployment rate in Estonia and Lithuania, 2007q1-2011q4

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.

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. Nevertheless, Estonia and Lithuania have had very similar labour market dynamics, both in terms of the levels and the trends of these indicators (Malk, 2013).

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. First, 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 six 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 nine with an unemployment insurance record of more than 56 months (four years and eight months) can receive the unemployment insurance payments for nine months and those with an unemployment insurance record of more than 110 months (nine years and two 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 per cent 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 dynamics 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 an approach.

3. Data and methodology

3.1 Data source

This paper uses LFS micro-data 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 2,200 households containing 4,300 people of working age are covered in Estonia and 8,000 households containing 13,000 people of working age in Lithuania. This analysis covers the period from 2007 to the third 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.

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 information 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

In describing the aggregate mobility in the labour markets of Estonia and Lithuania, labour flows are examined following the methodology of Haltiwanger and Vodopivec (2002). The number of people changing their job or employment status within a year are calculated as a share of people in the starting status(es) a year ago. The overview of the labour flows is presented in Figure 2 (see also Appendices 3-4).

The aggregate dynamics of labour mobility have been similar in Estonia and Lithuania (see Figure 2). The labour flows of 2007-2008 are appropriate for periods of

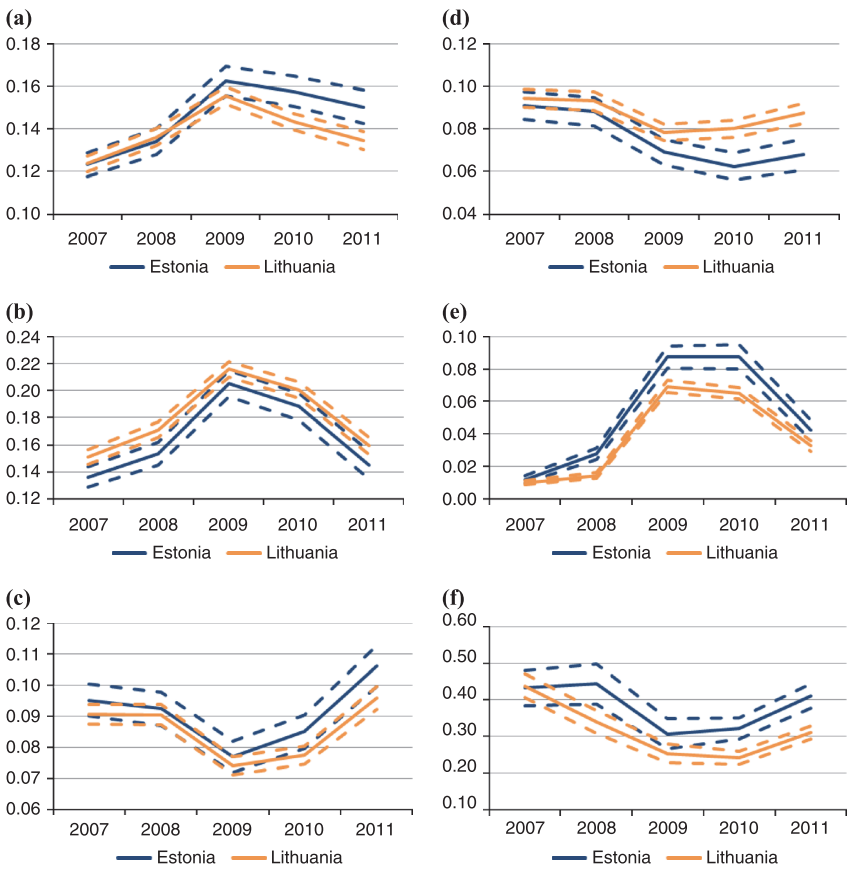


Figure 2.
Worker flows, as a share of people in the starting status(es) a year ago, 2007-2011q3 (with 95 per cent confidence interval)

Notes: (a) Reallocation; (b) separation; (c) hiring; (d) job-to-job; (e) involuntarily out of employment; (f) from unemployment into employment

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

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.

The reallocation rate (Figure 2(a)) shows that the overall reallocation in the labour market (transitions from non-employment into employment or vice versa or from job to job) has increased more in Estonia than in Lithuania. Looking at one component of the reallocation, the separations, we can see that in the years 2007-2008 it was higher in Lithuania (see Figure 2(b)), but in 2009 the rise in this rate was steeper in Estonia and after that there have been no noteworthy differences between the separations in

Estonia and Lithuania. Looking at the involuntary flows out of employment (Figure 2(e)) we can see that the share of those flows was higher in Estonia in 2009-2010.

The hirings and flows from unemployment to employment (Figure 2(c) and (f)) show that since 2009 the difference between Estonia and Lithuania has increased. This means that in Estonia a larger share of the non-employed have been able to find a job or a larger share of employed have changed job within a year. But looking separately at the job-to-job transitions (Figure 2(d)) 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 per cent in both countries, but in 2011 (three quarters) it was around 9 per cent in Lithuania and around 7 per cent in Estonia.

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 a micro-econometric analysis to control for other factors and acquire estimates of the effects of the EPL reform in Estonia and their significances is conducted. The results of the estimations are presented in Section 4.

3.3 Methodology

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:

$$P_{it} = \alpha X_{it} + \beta_1 State_i + \beta_2 \text{PostReform}_t + \gamma(State_i \cdot \text{PostReform}_t) + u_{it}$$

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 variables 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 level as explanatory variables. 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.

Alongside estimating the probabilities of one-year transitions in the labour market, the DID estimator is used to identify the effects of the reform. 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 (see, e.g. Caliendo, 2006; Angrist and Pischke, 2009; Bazen, 2011). 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. 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. In the DID approach the common time trends are eliminated by subtracting the before-after change in the non-treated outcomes from the before-after change for the treated outcomes.

In this paper the regression formulation of DID estimator is employed. 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 third quarter of 2009, the turning point is set one year later because worker flows are calculated one year in retrospect[1]. Therefore the variable PostReform equals one for times beginning from the 3rd quarter of 2010 and zero before that. ECA equals one for individuals in Estonia at a time beginning from the 3rd 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:

(1) 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 in the same labour market state or in the same job are observed;

(2) separation – people who have moved from employment into non-employment or from one job to another within a year compared to people who have remained in the same job are observed:

- involuntary movements out of employment – people who have moved involuntarily out of employment within a year compared to people who have remained employed at the same job are observed.

(3) hiring – people who have moved from non-employment into employment or from one job to another within a year compared to people who have remained non-employed or in the same job 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.

(4) and 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.

4. Results

4.1 Estimation results

The results of models estimating the probabilities of worker flows are presented in Table II (see also Appendices 5-10). The main variable of interest is the ECA which should indicate the effect of the EPL reform on the specific labour flow. Starting with the total reallocation of labour, the ECA seems to have a significant positive influence by increasing the probability of a person moving between labour market statuses or between jobs by 1.3 pp. However, when the probability of reallocating in the labour market is estimated without controlling for GDP growth (see Appendix 5), the effect of ECA becomes insignificant. This indicates that the identified effect of the ECA could not be simply a business cycle effect. So the estimation gives evidence of the EPL reform having a positive influence on the total reallocation of labour.

In the case of total of separations the new ECA seems not to have had any significant influence on the probability of separating from a job. But when looking

Table II.
Probabilities of worker flows, estimations of probit models (marginal effects)

		Separation		Hiring		
	Reallocation	Total	Involuntarily out of employment	Total	From unemployment	Job-to-job
Age	0.0102*** (0.0006)	−0.0219*** (0.0006)	−0.0035*** (0.0003)	0.0078*** (0.0004)	−0.0068** (0.0029)	−0.0042*** (0.0006)
Age^2/100	−0.0144*** (0.0006)	0.0227*** (0.0007)	0.0036*** (0.0003)	−0.0124*** (0.0004)	0.0009 (0.0037)	0.0017*** (0.0006)
Woman (base man)	−0.0315*** (0.0027)	−0.0254*** (0.0044)	−0.0134*** (0.0027)	−0.0196*** (0.0022)	0.0145 (0.0169)	−0.0245*** (0.0022)
Secondary education (base elementary)	0.0876*** (0.0039)	−0.0265*** (0.0033)	−0.0161*** (0.0022)	0.0650*** (0.0034)	0.1116*** (0.0088)	−0.0025 (0.0028)
Tertiary education (base elementary)	0.0626*** (0.0044)	−0.0982*** (0.0047)	−0.0514*** (0.0039)	0.0578*** (0.0045)	0.1641*** (0.0118)	−0.0271*** (0.0038)
Married or cohabiting (base single)	−0.0082*** (0.0031)	−0.0221*** (0.0039)	−0.0158*** (0.0016)	−0.0065*** (0.0017)	0.0691*** (0.0090)	−0.0112*** (0.0020)
GDP growth	−0.0003 (0.0003)	−0.0011** (0.0004)	−0.0013*** (0.0004)	0.0004 (0.0005)	0.0030 (0.0032)	−0.0000 (0.0005)
GDP growth (−1q)	−0.0003 (0.0006)	−0.0004 (0.0009)	−0.0004 (0.0005)	0.0003 (0.0006)	0.0005 (0.0034)	0.0004 (0.0009)
GDP growth (−2q)	−0.0010* (0.0006)	−0.0014 (0.0008)	−0.0013** (0.0005)	−0.0004 (0.0005)	0.0019 (0.0025)	−0.0004 (0.0007)
GDP growth (−3q)	0.0006 (0.0005)	0.0007 (0.0008)	0.0003 (0.0006)	0.0006** (0.0003)	0.0024 (0.0017)	0.0007 (0.0005)
GDP growth (−4q)	−0.0003 (0.0005)	−0.0015* (0.0009)	−0.0013** (0.0006)	0.0003 (0.0003)	0.0028* (0.0016)	−0.0004 (0.0004)
PostReform (= 1 since 2010 III q)	−0.0005 (0.0047)	−0.0111 (0.0071)	0.0074 (0.0057)	0.0128*** (0.0031)	−0.0263 (0.0241)	0.0017 (0.0048)
State (= 1 if Estonia)	0.0036 (0.0038)	−0.0300*** (0.0060)	0.0005 (0.0035)	0.0100*** (0.0028)	0.0579*** (0.0180)	−0.0089** (0.0043)
ECA (= 1 if PostReform = 1 & State = 1)	0.0134** (0.0053)	0.0125 (0.0086)	0.0166** (0.0077)	−0.0061* (0.0035)	0.0066 (0.0238)	−0.0206*** (0.0057)
Number of observations	324,135	180,846	157,105	324,135	15,083	164,414
Pseudo R^2	0.0461	0.0413	0.0937	0.0674	0.0442	0.0336

Notes: Marginal effects reported. Clustered standard errors (at state and quarter level) in parentheses. Dependent variables – reallocation: 1 if moved from one labour market state to another or between jobs, 0 if stayed in same labour market state or same job; separation: total, 1 if moved from one job to another or out of employment, 0 if stayed in same job; involuntarily out from employment, 1 if moved involuntarily out of employment, 0 if stayed in same job; hiring: total, 1 if moved into employment or between jobs, 0 if stayed out of employment or same job; from unemployment, 1 if moved from unemployment into employment, 0 if stayed in unemployment; job-to-job: 1 if moved from one job to another, 0 if stayed in the same job. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

separately the involuntary movements out of employment, the significant effect of the ECA appears. The ECA seems to have increased the probability of moving out of employment due to dismissal by 1.7 pp. Again, this effect becomes insignificant when estimating the probability without controlling for GDP growth (see Appendix 7). Thus, the reduction in the strictness of EPL seems to have increased the probability of transitions out of employment. This result together with the result of increased reallocation 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, the probability of hiring seems not to have changed due to the new ECA. Looking only one subpart of the hirings, the flows from unemployment into employment, same result appears. Thus, with our specification of the hiring probability no significant impact of the EPL reform on the inflows to employment could be identified.

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 by lowering the probability of a person moving from one job to another by 2.1 pp. 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. 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. 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. However, the accuracy of this guess cannot be examined with the data from LFSs, since only the non-employed respondents are asked their reasons for leaving their last job.

4.2 Robustness

In order to test the robustness of the results the placebo treatment models are estimated. In order to do this, placebo policies that occur in mid-2007 and mid-2008 (cut-off's, respectively, mid-2008 and mid-2009) are introduced. Table III presents the results, where each cell corresponds to one regression and only the values of the estimated parameters' marginal effects for the new ECA are reported.

In the case of reallocation and involuntary flows out of employment the placebo tests give at the 5 per cent level insignificant coefficients for the ECA for the years before the real reform took place. This indicates that the effect appearing in the case of cut-off year set to 2010 can be considered as the impact of the new ECA. But in the case of job-to-job movements, the ECA coefficient turns significant already in 2009, which means that there are some other factors confounding the estimation. However, 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 one, then the effects appearing from 2009 might also indicate the effects of the new ECA. This experiment is likely to indicate that the legislative reform in Estonia has had a considerable effect in increasing the reallocation of workers and involuntary

Table III.
Placebo tests for years 2008 and 2009 compared to the reform's cut-off year 2010, effects on the probabilities of worker flows

	Reallocation	Separation		Hiring		
		Total	Involuntarily out of employment	Total	From unemployment	Job-to-job
Reform: 2007						
Cut-off: 2008	0.010 (0.007)	0.011 (0.012)	0.004 (0.004)	−0.0001 (0.004)	0.051 (0.032)	−0.005 (0.008)
Reform: 2008						
Cut-off: 2009	0.008 (0.006)	0.011 (0.009)	0.012* (0.006)	−0.007* (0.004)	0.007 (0.026)	−0.016** (0.006)
Reform: 2009						
Cut-off: 2010	0.013** (0.005)	0.013 (0.009)	0.017** (0.008)	−0.006* (0.004)	0.007 (0.024)	−0.021** (0.006)

Notes: The control variables are those from the models in Table II, Only the ECA dummy coefficients (marginal effects) are reported, Clustered standard errors (at state and quarter level) in parentheses. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

movements out of employment, but in the case of job changing probability the effect of the reform is not that evident.

Since in the case of nonlinear models the assumptions are more complicated than for linear models, it is argued that the DID identification with nonlinear models is not as trivial as with linear models (e.g. Athey and Imbens, 2006). In order to provide some evidence that the estimation of ECA effects with Probit models are robust these are estimated using linear probability models as well. It appears that the OLS gives more or less the same estimations for the ECA coefficients (see Appendix 11). This provides evidence for the validity of the estimated effects.

5. 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 LFSs from Estonia and Lithuania and adopt a DID 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 involuntary transitions out of employment. At the same time, we do not find any significant effects of this reform on the probability of hiring. Furthermore, subsequent to the reform the probability of job-to-job transitions seems to have decreased. However, according to the robustness test this reduction in job-to-job flows could not be considered as policy-relevant.

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.

As described here above, the EPL reform in Estonia was mainly focused on the reduction of the transfers' part of the EPL, namely the transfers from the employer to the employee in the form of severance payments and the advance notice of termination. However, a theory and previous findings (Pissarides, 2001; Bassanini and Garnero, 2013) suggest that the decisions of hirings and separations are more affected by the tax part of the EPL. It has been argued that the difficulties of dismissal together with the possibilities of being challenged by the employee for unjustified dismissal and being engaged in lengthy and expensive negotiations are mainly held responsible for reducing hirings and separations. Thus, the results of this evaluation together with theory and previous findings raise the possibility that this kind of EPL reform, which intends to improve the reallocation of labour through reducing the transfers from the employer to the employee, may not be sufficient to achieve the expected positive effect on hiring and this is important to consider in the context of further developments in the labour market institutions.

In any case, since there are some institutional differences between the Estonian and Lithuanian unemployment insurance systems and labour taxation, all these results could also be affected by interactions between EPL and other labour market institution. For example, the increase in labour taxes that was implemented in Estonia at the same

time as the EPL reform might also be one reason why the EPL reform had no effects on labour transitions into employment. In addition, it must be recognised that the analysis focuses on a short period, which was dominated by the crisis. Possibly, results could be different, if more time after the reform was allowed and no negative shock was affecting the economy.

Note

1. If the turning point will be set in mid-2009 then the PostReform period would also include worker flows, which took place before the new ECA was enforced.

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About the author

Liina Malk is an Economist at the Bank of Estonia and a PhD student at the Tallinn University of Technology. Liina Malk can be contacted at: liinamalk1@gmail.com

Appendix

Table AI.
Samples of Estonian and Lithuanian Labour Force Surveys, distributions of employed by gender, age group, education level, marital status and labour status, 2007-2011q3

		Estonia (%)	Lithuania (%)
Gender	Male	48	46
	Female	52	54
Age	15-24	23	20
	25-49	42	41
	50-74	36	39
Education level	ISC 1	25	22
	ISC 2	50	55
	ISC 3	25	23
Marital status	Single	30	28
	Married, cohabiting	59	57
	Divorced, widow	11	15
Labour status	Employed	57	53
	Unemployed	6	8
	Inactive	37	39

	Estonia (%)	Lithuania (%)
Occupation (ISCO)		
Armed forces occupations	0.5	0.2
Managers	11.4	9.8
Professionals	15.0	18.4
Technicians and associate professionals	11.7	10.9
Clerical support workers	5.0	4.5
Service and sales workers	12.5	12.9
Skilled agricultural, forestry and fishery workers	2.7	6.8
Craft and related trades workers	15.5	16.2
Plant and machine operators, and assemblers	15.7	10.7
Elementary occupations	10.1	9.5
Economic activity (NACE)		
Agriculture, forestry and fishing	6.2	9.6
Mining and quarrying	1.0	0.2
Manufacturing	20.2	15.6
Electricity, gas, steam and air conditioning supply	1.2	1.1
Water supply; sewerage; waste management and remediation activities	0.5	1.4
Construction	11.0	6.3
Wholesale and retail trade; repair of motor vehicles and motorcycles	13.1	15.5
Transporting and storage	8.1	9.4
Accommodation and food service activities	3.0	2.4
Information and communication	1.8	2.5
Financial and insurance activities	1.3	1.5
Real estate activities	1.4	0.7
Professional, scientific and technical activities	2.8	4.9
Administrative and support service activities	2.5	4.8
Public administration and defence; compulsory social security	6.2	4.3
Education	9.9	10.4
Human health and social work activities	5.5	5.4
Arts, entertainment and recreation	2.3	2.4
Other services activities	1.9	1.5
Activities of households as employers; undifferentiated goods – and services – producing activities of households for own use	0.0	0.1
Activities of extraterritorial organisations and bodies	0.0	0.0

Table AII. Samples of Estonian and Lithuanian Labour Force Surveys, distributions of employed by occupation and economic activity, 2007-2011q3

	Flow	2007	2008	2009	2010	2011q3
Estonia	Remain employed, same job	556,032	560,683	516,074	482,389	373,800
	Remain employed, changed job	58,520	58,402	44,797	37,048	29,705
	Employment → unemployment	9,077	17,650	54,498	46,953	17,758
	Employment → inactivity	20,148	25,673	34,060	27,826	16,115
	Remain unemployed	17,457	13,104	29,646	56,585	40,799
	Unemployment → employment	15,094	12,011	14,199	29,049	31,217
	Unemployment → inactivity	2,359	1,963	2,451	4,785	3,912
	Remain inactive	331,024	313,917	305,662	310,271	224,363
	Inactivity → employment	25,464	25,304	20,374	21,282	20,479
	Inactivity → unemployment	5,489	7,606	10,923	12,384	8,469
	Reallocated	128,303	139,040	167,928	162,158	115,274
	Hired	99,078	95,717	79,370	87,378	81,401
	Separated	87,745	101,725	133,355	111,827	63,578
	Involuntarily out from employment	7,486	17,776	53,698	49,869	17,839
Lithuania	Remain employed, same job	1,289,361	1,271,596	1,211,823	1,125,474	847,977
	Remain employed, changed job	143,346	142,885	120,999	112,835	88,173
	Employment → unemployment	41,660	67,735	150,726	119,783	45,301
	Employment → inactivity	44,592	51,871	61,814	49,288	27,372
	Remain unemployed	37,784	46,220	68,017	139,512	117,661
	Unemployment → employment	35,176	27,000	25,377	47,188	57,455
	Unemployment → inactivity	7,186	6,149	6,698	8,915	9,509
	Remain inactive	933,686	895,437	866,454	875,015	625,089
	Inactivity → employment	58,307	66,118	46,666	38,642	34,919
	Inactivity → unemployment	21,966	36,950	47,164	51,034	27,898
	Reallocated	323,082	355,609	405,583	367,735	253,220
	Hired	236,830	236,003	193,043	198,664	180,547
	Separated	229,599	262,491	333,539	281,906	160,846
	Involuntarily out from employment	14,530	20,947	99,052	86,131	31,774

Table AIII.
Worker flows between labour market states, Estonia and Lithuania, 2007-2011(3q)

Source: Author's own calculations based on Estonian and Lithuanian Labour Force Surveys

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
Employment → unemployment	Estonia	1.4	2.5	8.2	7.0	3.6
	Lithuania	2.6	4.2	9.1	8.0	4.3
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
Separation	Estonia	13.4	14.4	20.4	17.6	13.6
	Lithuania	14.6	16.1	20.6	19.5	15.4
Hiring	Estonia	9.3	8.6	7.3	7.8	9.6
	Lithuania	8.5	7.9	6.6	7.1	8.9
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

Table AIV.
Worker flow rates between labour market states, Estonia and Lithuania, 2007-2011(3q)

Table AV.
Probabilities of worker reallocation in the labour market, estimations of probit models (marginal effects)

	Reallocation						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age		0.0102*** (0.0006)	0.0102*** (0.0006)	0.0102*** (0.0006)	0.0102*** (0.0006)	0.0102*** (0.0006)	0.0102*** (0.0006)
$Age^2/100$		−0.0144*** (0.0006)	−0.0144*** (0.0006)	−0.0144*** (0.0006)	−0.0144*** (0.0006)	−0.0144*** (0.0006)	−0.0144*** (0.0006)
Woman (base man)		−0.0316*** (0.0029)	−0.0316*** (0.0028)	−0.0315*** (0.0027)	−0.0315*** (0.0027)	−0.0315*** (0.0027)	−0.0315*** (0.0027)
Secondary education (base elementary)		0.0881*** (0.0042)	0.0878*** (0.0040)	0.0877*** (0.0040)	0.0876*** (0.0039)	0.0876*** (0.0039)	0.0876*** (0.0039)
Tertiary education (base elementary)		0.0633*** (0.0046)	0.0628*** (0.0046)	0.0627*** (0.0045)	0.0626*** (0.0045)	0.0626*** (0.0044)	0.0626*** (0.0044)
Married or cohabiting (base single)		−0.0085*** (0.0032)	−0.0083*** (0.0031)	−0.0082*** (0.0031)	−0.0082*** (0.0031)	−0.0082*** (0.0031)	−0.0082*** (0.0031)
GDP growth			−0.0010*** (0.0002)	−0.0000 (0.0003)	−0.0002 (0.0003)	−0.0002 (0.0003)	−0.0003 (0.0003)
GDP growth (−1q)				−0.0012*** (0.0003)	−0.0004 (0.0006)	−0.0004 (0.0006)	−0.0003 (0.0006)
GDP growth (−2q)					−0.0007 (0.0005)	−0.0011* (0.0006)	−0.0010* (0.0006)
GDP growth (−3q)						0.0004 (0.0003)	0.0006 (0.0005)
GDP growth (−4q)							−0.0003 (0.0005)
PostReform (= 1 since 2010 III q)	−0.0051 (0.0044)	−0.0057 (0.0046)	0.0004 (0.0040)	−0.0004 (0.0038)	−0.0008 (0.0037)	0.0011 (0.0033)	−0.0005 (0.0047)
State (= 1 if Estonia)	0.0024 (0.0060)	0.0049 (0.0061)	0.0032 (0.0047)	0.0033 (0.0039)	0.0034 (0.0038)	0.0037 (0.0039)	0.0036 (0.0038)
ECA (= 1 if PostReform = 1 & State = 1)	0.0094 (0.0065)	0.0089 (0.0065)	0.0141** (0.0056)	0.0144*** (0.0050)	0.0141*** (0.0053)	0.0134*** (0.0051)	0.0134** (0.0053)
Number of observations	324,135	324,135	324135	324,135	324,135	324,135	324135
Pseudo R^2	0.0001	0.0448	0.0457	0.0460	0.0461	0.0461	0.0461

Notes: Marginal effects reported, Clustered standard errors (at state and quarter level) in parentheses, 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. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

Table AVI.
Probabilities of separations, estimations of probit models (marginal effects)

				Separation			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age		−0.0220*** (0.0007)	−0.0220*** (0.0007)	−0.0219*** (0.0006)	−0.0219*** (0.0006)	−0.0219*** (0.0006)	−0.0219*** (0.0006)
$Age^2/100$		0.0229*** (0.0008)	0.0228*** (0.0008)	0.0227*** (0.0007)	0.0227*** (0.0007)	0.0227*** (0.0007)	0.0227*** (0.0007)
Woman (base man)		−0.0253*** (0.0047)	−0.0253*** (0.0046)	−0.0253*** (0.0044)	−0.0254*** (0.0044)	−0.0254*** (0.0044)	−0.0254*** (0.0044)
Secondary education (base elementary)		−0.0243*** (0.0033)	−0.0257*** (0.0033)	−0.0261*** (0.0033)	−0.0264*** (0.0033)	−0.0264*** (0.0033)	−0.0265*** (0.0033)
Tertiary education (base elementary)		−0.0953*** (0.0053)	−0.0970*** (0.0047)	−0.0976*** (0.0047)	−0.0982*** (0.0047)	−0.0981*** (0.0047)	−0.0982*** (0.0047)
Married or cohabiting (base single)		−0.0226*** (0.0041)	−0.0220*** (0.0039)	−0.0221*** (0.0039)	−0.0221*** (0.0039)	−0.0221*** (0.0039)	−0.0221*** (0.0039)
GDP growth			−0.0024*** (0.0003)	0.0003 (0.0005)	−0.0005 (0.0004)	−0.0006 (0.0005)	−0.0011** (0.0004)
GDP growth (−1q)				−0.0031*** (0.0004)	−0.0006 (0.0011)	−0.0006 (0.0011)	−0.0004 (0.0009)
GDP growth (−2q)					−0.0021** (0.0009)	−0.0016 (0.0011)	−0.0014 (0.0008)
GDP growth (−3q)						−0.0004 (0.0005)	0.0007 (0.0008)
GDP growth (−4q)							−0.0015* (0.0009)
PostReform (= 1 since 2010 III q)	−0.0223** (0.0091)	−0.0118 (0.0094)	0.0028 (0.0072)	0.0008 (0.0061)	−0.0003 (0.0046)	−0.0024 (0.0052)	−0.0111 (0.0071)
State (= 1 if Estonia)	−0.0168 (0.0128)	−0.0258* (0.0135)	−0.0298*** (0.0100)	−0.0296*** (0.0075)	−0.0292*** (0.0066)	−0.0296*** (0.0066)	−0.0300*** (0.0060)
ECA (= 1 if PostReform = 1 & State = 1)	0.0033 (0.0142)	0.0003 (0.0147)	0.0122 (0.0109)	0.0129 (0.0082)	0.0119 (0.0075)	0.0127 (0.0077)	0.0125 (0.0086)
Number of observations	180,846	180,846	180,846	180,846	180,846	180,846	180,846
Pseudo R^2	0.0010	0.0355	0.0389	0.0405	0.0411	0.0412	0.0413

Notes: Marginal effects reported, Clustered standard errors (at state and quarter level) in parentheses, Dependent variable: 1 if moved from one job to another or out of employment, 0 if stayed in same job. ***, **, *Statistical significance at the 1, 5 and 10 per cent levels, respectively

Table AVII.
Probabilities of involuntary worker flows out from employment, estimations of probit models (marginal effects)

	Involuntarily out of employment						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age		−0.0037*** (0.0005)	−0.0035*** (0.0004)	−0.0035*** (0.0003)	−0.0035*** (0.0003)	−0.0035*** (0.0003)	−0.0035*** (0.0003)
$Age^2/100$		0.0039*** (0.0005)	0.0037*** (0.0005)	0.0037*** (0.0004)	0.0037*** (0.0003)	0.0036*** (0.0003)	0.0036*** (0.0003)
Woman (base man)		−0.0137*** (0.0037)	−0.0132*** (0.0031)	−0.0132*** (0.0027)	−0.0134*** (0.0027)	−0.0134*** (0.0027)	−0.0134*** (0.0027)
Secondary education (base elementary)		−0.0139*** (0.0026)	−0.0152*** (0.0021)	−0.0157*** (0.0023)	−0.0161*** (0.0023)	−0.0161*** (0.0023)	−0.0161*** (0.0022)
Tertiary education (base elementary)		−0.0487*** (0.0064)	−0.0500*** (0.0046)	−0.0508*** (0.0044)	−0.0514*** (0.0042)	−0.0513*** (0.0041)	−0.0514*** (0.0039)
Married or cohabiting (base single)		−0.0165*** (0.0027)	−0.0158*** (0.0021)	−0.0157*** (0.0016)	−0.0157*** (0.0015)	−0.0157*** (0.0015)	−0.0158*** (0.0016)
GDP growth			−0.0025*** (0.0003)	0.0001 (0.0005)	−0.0007 (0.0005)	−0.0008 (0.0005)	−0.0013*** (0.0004)
GDP growth (−1q)				−0.0031*** (0.0004)	−0.0006 (0.0007)	−0.0006 (0.0007)	−0.0004 (0.0005)
GDP growth (−2q)					−0.0022*** (0.0005)	−0.0016** (0.0007)	−0.0013** (0.0005)
GDP growth (−3q)						−0.0006 (0.0004)	0.0003 (0.0006)
GDP growth (−4q)							−0.0013** (0.0006)
PostReform (= 1 since 2010 III q)	−0.0063 (0.0102)	−0.0029 (0.0097)	0.0173** (0.0084)	0.0183*** (0.0061)	0.0186*** (0.0028)	0.0151*** (0.0038)	0.0074 (0.0057)
State (= 1 if Estonia)	0.0070 (0.0130)	0.0048 (0.0131)	0.0019 (0.0100)	0.0020 (0.0068)	0.0021 (0.0048)	0.0014 (0.0046)	0.0005 (0.0035)
ECA (= 1 if PostReform = 1 & State = 1)	0.0040 (0.0144)	0.0038 (0.0144)	0.0150 (0.0106)	0.0159** (0.0074)	0.0148** (0.0062)	0.0163** (0.0065)	0.0166** (0.0077)
Number of observations	157,105	157,105	157,105	157,105	157,105	157,105	157,105
Pseudo R^2	0.012	0.0361	0.0675	0.0844	0.0920	0.0924	0.0937

Notes: Marginal effects reported, Clustered standard errors (at state and quarter level) in parentheses, Dependent variable: 1 if moved involuntarily out of employment, 0 if stayed in same job. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

Table AVIII.
Probabilities of hiring, estimations of probit models (marginal effects)

	Hiring						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age		0.0078*** (0.0004)	0.0078*** (0.0004)	0.0078*** (0.0004)	0.0078*** (0.0004)	0.0078*** (0.0004)	0.0078*** (0.0004)
Age^2/100		−0.0124*** (0.0005)	−0.0124*** (0.0005)	−0.0124*** (0.0005)	−0.0124*** (0.0005)	−0.0124*** (0.0004)	−0.0124*** (0.0004)
Woman (base man)		−0.0196*** (0.0023)	−0.0195*** (0.0022)	−0.0196*** (0.0022)	−0.0196*** (0.0022)	−0.0196*** (0.0022)	−0.0196*** (0.0022)
Secondary education (base elementary)		0.0647*** (0.0032)	0.0649*** (0.0034)	0.0649*** (0.0034)	0.0650*** (0.0034)	0.0650*** (0.0034)	0.0650*** (0.0034)
Tertiary education (base elementary)		0.0572*** (0.0042)	0.0576*** (0.0044)	0.0577*** (0.0044)	0.0578*** (0.0045)	0.0578*** (0.0044)	0.0578*** (0.0045)
Married or cohabiting (base single)		−0.0064*** (0.0017)	−0.0065*** (0.0017)	−0.0065*** (0.0017)	−0.0065*** (0.0017)	−0.0065*** (0.0017)	−0.0065*** (0.0017)
GDP growth			0.0007*** (0.0002)	−0.0000 (0.0004)	0.0001 (0.0005)	0.0003 (0.0004)	0.0004 (0.0005)
GDP growth (−1q)				0.0009** (0.0004)	0.0003 (0.0007)	0.0004 (0.0006)	0.0003 (0.0006)
GDP growth (−2q)					0.0005 (0.0003)	−0.0004 (0.0004)	−0.0004 (0.0005)
GDP growth (−3q)						0.0008*** (0.0002)	0.0006** (0.0003)
GDP growth (−4q)							0.0003 (0.0003)
PostReform (= 1 since 2010 III q)	0.0100** (0.0042)	0.0104** (0.0040)	0.0065** (0.0031)	0.0073** (0.0029)	0.0076*** (0.0028)	0.0114*** (0.0023)	0.0128*** (0.0031)
State (= 1 if Estonia)	0.0077* (0.0044)	0.0083** (0.0042)	0.0096*** (0.0034)	0.0095*** (0.0030)	0.0094*** (0.0028)	0.0100*** (0.0028)	0.0100*** (0.0028)
ECA (= 1 if PostReform = 1 & State = 1)	−0.0003 (0.0059)	−0.0011 (0.0057)	−0.0049 (0.0049)	−0.0051 (0.0045)	−0.0049 (0.0041)	−0.0061* (0.0036)	−0.0061* (0.0035)
Number of observations	324,135	324,135	324,135	324,135	324,135	324,135	324,135
Pseudo R^2	0.0008	0.0658	0.0667	0.0671	0.0672	0.0674	0.0674

Notes: Marginal effects reported, Clustered standard errors (at state and quarter level) in parentheses, Dependent variable: 1 if moved into employment or between jobs, 0 if stayed out of employment or same job. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

Table AIX.
Probabilities of worker flows from unemployment to employment, estimations of probit models (marginal effects)

	From unemployment to employment						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age		−0.0069** (0.0030)	−0.0073** (0.0030)	−0.0070** (0.0029)	−0.0068** (0.0030)	−0.0068** (0.0030)	−0.0068** (0.0029)
Age^2/100		0.0010 (0.0038)	0.0015 (0.0037)	0.0011 (0.0037)	0.0008 (0.0038)	0.0008 (0.0037)	0.0009 (0.0037)
Woman (base man)		0.0209 (0.0177)	0.0199 (0.0176)	0.0171 (0.0172)	0.0149 (0.0171)	0.0146 (0.0170)	0.0145 (0.0169)
Secondary education (base elementary)		0.1031*** (0.0100)	0.1059*** (0.0101)	0.1093*** (0.0094)	0.1115*** (0.0089)	0.1114*** (0.0089)	0.1116*** (0.0088)
Tertiary education (base elementary)		0.1561*** (0.0125)	0.1589*** (0.0126)	0.1618*** (0.0123)	0.1641*** (0.0120)	0.1638*** (0.0119)	0.1641*** (0.0118)
Married or cohabiting (base single)		0.0682*** (0.0087)	0.0666*** (0.0087)	0.0681*** (0.0088)	0.0691*** (0.0091)	0.0692*** (0.0090)	0.0691*** (0.0090)
GDP growth			0.0069*** (0.0015)	−0.0018 (0.0028)	0.0011 (0.0032)	0.0018 (0.0029)	0.0030 (0.0032)
GDP growth (−1q)				0.0099*** (0.0023)	0.0008 (0.0035)	0.0012 (0.0032)	0.0005 (0.0034)
GDP growth (−2q)					0.0074*** (0.0012)	0.0023 (0.0024)	0.0019 (0.0025)
GDP growth (−3q)						0.0045*** (0.0016)	0.0024 (0.0017)
GDP growth (−4q)							0.0028* (0.0016)
PostReform (= 1 since 2010 III q)	−0.0120 (0.0381)	−0.0196 (0.0384)	−0.0607* (0.0352)	−0.0602** (0.0292)	−0.0617*** (0.0220)	−0.0408* (0.0224)	−0.0263 (0.0241)
State (= 1 if Estonia)	0.0497 (0.0407)	0.0362 (0.0415)	0.0470 (0.0374)	0.0531** (0.0262)	0.0530*** (0.0202)	0.0582*** (0.0183)	0.0579*** (0.0180)
ECA (= 1 if PostReform = 1 & State = 1)	0.0500 (0.0484)	0.0532 (0.0489)	0.0191 (0.0417)	0.0101 (0.0328)	0.0125 (0.0249)	0.0050 (0.0227)	0.0066 (0.0238)
Number of observations	15,083	15,083	15,083	15,083	15,083	15,083	15,083
Pseudo R^2	0.0042	0.0252	0.0334	0.0392	0.0426	0.0438	0.0442

Notes: Marginal effects reported, Clustered standard errors (at state and quarter level) in parentheses, Dependent variable: 1 if moved from unemployment into employment, 0 if stayed in unemployment. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

Table AX.
Probabilities of job-to-job transitions, estimations of probit models (marginal effects)

	Job-to-job						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Age		−0.0042*** (0.0006)	−0.0042*** (0.0006)	−0.0042*** (0.0006)	−0.0042*** (0.0006)	−0.0042*** (0.0006)	−0.0042*** (0.0006)
Age^2/100		0.0017*** (0.0006)	0.0017*** (0.0006)	0.0017*** (0.0006)	0.0017*** (0.0006)	0.0017*** (0.0006)	0.0017*** (0.0006)
Woman (base man)		−0.0246*** (0.0022)	−0.0245*** (0.0022)	−0.0245*** (0.0022)	−0.0245*** (0.0022)	−0.0245*** (0.0022)	−0.0245*** (0.0022)
Secondary education (base elementary)		−0.0027 (0.0029)	−0.0025 (0.0028)	−0.0025 (0.0028)	−0.0025 (0.0028)	−0.0025 (0.0028)	−0.0025 (0.0028)
Tertiary education (base elementary)		−0.0274*** (0.0039)	−0.0271*** (0.0039)	−0.0270*** (0.0039)	−0.0271*** (0.0038)	−0.0271*** (0.0038)	−0.0271*** (0.0038)
Married or cohabiting (base single)		−0.0112*** (0.0020)	−0.0112*** (0.0020)	−0.0112*** (0.0020)	−0.0112*** (0.0020)	−0.0112*** (0.0020)	−0.0112*** (0.0020)
GDP growth			0.0003 (0.0002)	0.0001 (0.0005)	0.0000 (0.0005)	0.0001 (0.0005)	−0.0000 (0.0005)
GDP growth (−1q)				0.0002 (0.0005)	0.0003 (0.0009)	0.0003 (0.0009)	0.0004 (0.0009)
GDP growth (−2q)					−0.0000 (0.0007)	−0.0005 (0.0008)	−0.0004 (0.0007)
GDP growth (−3q)						0.0004 (0.0003)	0.0007 (0.0005)
GDP growth (−4q)							−0.0004 (0.0004)
PostReform (= 1 since 2010 III q)	−0.0023 (0.0031)	0.0030 (0.0029)	0.0016 (0.0027)	0.0019 (0.0028)	0.0018 (0.0029)	0.0038 (0.0034)	0.0017 (0.0048)
State (= 1 if Estonia)	−0.0055 (0.0047)	−0.0096** (0.0044)	−0.0091** (0.0043)	−0.0091** (0.0043)	−0.0091** (0.0043)	−0.0088** (0.0043)	−0.0089** (0.0043)
ECA (= 1 if PostReform = 1 & State = 1)	−0.0162*** (0.0059)	−0.0184*** (0.0052)	−0.0198*** (0.0055)	−0.0198*** (0.0055)	−0.0199*** (0.0055)	−0.0205*** (0.0056)	−0.0206*** (0.0057)
Number of observations	164,414	164,414	164,414	164,414	164,414	164,414	164,414
Pseudo R^2	0.0007	0.0334	0.0335	0.0335	0.0335	0.0336	0.0336

Notes: Marginal effects reported, Clustered standard errors (at state and quarter level) in parentheses, Dependent variable: Job-to-job: 1 if moved from one job to another, 0 if stayed in the same job. ***, **, *Statistical significance at the 1, 5 and 10 per cent levels, respectively

Table AXI.
Probabilities of worker flows, estimations of linear probability models (OLS)

		Separation		Hiring		
	Reallocation	Total	Involuntarily out of employment	Total	From unemployment	Job-to-job
Age	0.0075*** (0.0006)	−0.0253*** (0.0007)	−0.0046*** (0.0007)	0.0032*** (0.0003)	−0.0074** (0.0029)	−0.0079*** (0.0008)
Age^2/100	−0.0106*** (0.0006)	0.0261*** (0.0009)	0.0047*** (0.0007)	−0.0059*** (0.0004)	0.0016 (0.0036)	0.0057*** (0.0008)
Woman (base man)	−0.0304*** (0.0029)	−0.0261*** (0.0049)	−0.0148*** (0.0039)	−0.0184*** (0.0024)	0.0155 (0.0168)	−0.0247*** (0.0023)
Secondary education (base elementary)	0.0756*** (0.0026)	−0.0353*** (0.0043)	−0.0257*** (0.0044)	0.0559*** (0.0018)	0.1073*** (0.0089)	−0.0042 (0.0035)
Tertiary education (base elementary)	0.0479*** (0.0030)	−0.1035*** (0.0064)	−0.0561*** (0.0074)	0.0489*** (0.0025)	0.1628*** (0.0115)	−0.0279*** (0.0043)
Married or cohabiting (base single)	−0.0080** (0.0032)	−0.0248*** (0.0043)	−0.0174*** (0.0029)	−0.0056*** (0.0017)	0.0678*** (0.0088)	−0.0129*** (0.0021)
GDP growth	−0.0002 (0.0003)	−0.0009** (0.0004)	−0.0007* (0.0004)	0.0005 (0.0004)	0.0034 (0.0029)	0.0000 (0.0005)
GDP growth (−1q)	−0.0004 (0.0006)	−0.0005 (0.0010)	−0.0008 (0.0005)	0.0002 (0.0006)	0.0002 (0.0030)	0.0003 (0.0009)
GDP growth (−2q)	−0.0011* (0.0006)	−0.0015 (0.0010)	−0.0016** (0.0006)	−0.0004 (0.0004)	0.0020 (0.0024)	−0.0004 (0.0007)
GDP growth (−3q)	0.0006 (0.0005)	0.0007 (0.0009)	0.0001 (0.0007)	0.0005* (0.0003)	0.0020 (0.0017)	0.0006 (0.0005)
GDP growth (−4q)	−0.0003 (0.0005)	−0.0014 (0.0009)	−0.0010 (0.0006)	0.0003 (0.0003)	0.0031* (0.0016)	−0.0003 (0.0004)
PostReform (= 1 since 2010 III q)	−0.0007 (0.0048)	−0.0120 (0.0072)	−0.0008 (0.0048)	0.0124*** (0.0032)	−0.0317 (0.0248)	0.0010 (0.0047)
State (= 1 if Estonia)	0.0017 (0.0039)	−0.0303*** (0.0060)	0.0001 (0.0038)	0.0087*** (0.0028)	0.0564*** (0.0178)	−0.0088** (0.0043)
ECA (= 1 if PostReform = 1 & State = 1)	0.0144** (0.0055)	0.0144 (0.0087)	0.0168** (0.0067)	−0.0043 (0.0036)	0.0127 (0.0231)	−0.0175*** (0.0055)
Constant	0.0040 (0.0123)	0.8414*** (0.0209)	0.2059*** (0.0235)	0.0322*** (0.0060)	0.4706*** (0.0556)	0.3536*** (0.0201)
Number of observations	324,135	180,846	157,105	324,135	15,083	164,414
Adjusted R^2	0.0297	0.0395	0.0346	0.0279	0.0550	0.0210

Notes: Clustered standard errors (at state and quarter level) in parentheses. Dependent variables – reallocation: 1 if moved from one labour market state to another or between jobs, 0 if stayed in same labour market state or same job; separation: total, 1 if moved from one job to another or out of employment, 0 if stayed in same job; involuntarily out from employment, 1 if moved involuntarily out of employment, 0 if stayed in same job; hiring: total, 1 if moved into employment or between jobs, 0 if stayed out of employment or same job; from unemployment, 1 if moved from unemployment into employment, 0 if stayed in unemployment; job-to-job: 1 if moved from one job to another, 0 if stayed in the same job. ***,**,*Statistical significance at the 1, 5 and 10 per cent levels, respectively

Appendix 2

Publication II

Bodnár, Katalin; Fadejeva, Ludmila; Iordache, Stefania; Malk, Liina; Paskaleva, Desislava; Pesliakaitė, Jurga; Jemec, Nataša Todorović; Tóth, Peter; Wyszyński, Robert (2018). How do firms adjust to rises in the minimum wage? Survey evidence from Central and Eastern Europe. IZA Journal of Labor Policy, vol. 7, no.11, pp. 1–30.
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How do firms adjust to rises in the minimum wage? Survey evidence from Central and Eastern Europe

Katalin Bodnár[1], Ludmila Fadejeva[2*], Stefania Iordache[3], Liina Malk[4], Desislava Paskaleva[5], Jurga Pesliakaitė[6], Nataša Todorović Jemec[7], Peter Tóth[8] and Robert Wyszyński[9]

* Correspondence: Ludmila.Fadejeva@bank.lv
Nataša Todorović Jemec participated in the development of this study while employed by Banka Slovenije.
[2]Latvijas Banka, Riga, Latvia
Full list of author information is available at the end of the article

Abstract

We study the transmission channels for rises in the minimum wage using a unique firm-level dataset from eight Central and Eastern European countries. Representative samples of firms in each country were asked to evaluate the relevance of a wide range of adjustment channels following specific instances of rises in the minimum wage during the recent post-crisis period. The paper adds to the rest of literature by presenting the reactions of firms as a combination of strategies and evaluates the relative importance of those strategies. Our findings suggest that the most popular adjustment channels are cuts in non-labour costs, rises in product prices, and improvements in productivity. Cuts in employment are less popular and occur mostly through reduced hiring rather than direct layoffs. Our study also provides evidence of potential spillover effects that rises in the minimum wage can have on firms without minimum wage workers.

JEL Classifications: D22, E23, J31

Keywords: Minimum wage, Adjustment channels, Firm survey

1 Introduction

The debate on the effects of rises in the minimum wage has run for several decades, and the evidence on the impact remains largely disputed. A variety of theoretical models have been developed to describe the possible effects of rises in the minimum wage, such as the competitive model, where there are negative effects on employment as firms substitute lower-skilled with higher-skilled workers; monopsony models, which identify positive effects on employment from the increased use of low-skilled workers; or efficiency wage models, which find efficiency gains as workers make more effort as they have a higher wage. Other transmission channels for adjusting to a rise in the minimum wage include wage spillovers and wage compressions, pass-through into prices, cuts in non-labour costs, improvements in productivity and production capacity, or changes in the quality of human capital and absorption into profits (see Neumark and Wascher (2008) and Belman and Wolfson (2015)).

Only a very small segment of the literature analyses different effects of a rise in the minimum wage simultaneously. Even fewer studies look directly at the answers employers give about their preferred strategies for adjustment. An example of research combining these two aspects is a study of the US restaurant sector by Hirsch et al. (2015), who use a

qualitative survey of restaurant managers about the adjustment channels they use in response to a change in the minimum wage. The survey approach appears again in a paper by Harding and Harding (2004), who study how a rise in the minimum wage affects employment and wages in small- and medium-sized businesses in Australia. A smaller survey is run each year in the US by Small Business Majority, which collects the views of small businesses on possible increases in the minimum wage (see, e.g. Small Business Majority 2015). To the best of our knowledge, there are no studies using European firm-level data focusing on multiple possible adjustment channels, making our study a valuable addition to the literature on minimum wages in Europe.

The unique questionnaire has been prepared within the third wave of the ECB WDN3[1] and asks firms in eight of the participating countries (Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia) about their strategies for adjusting following the most recent rises in the minimum wage or recent and envisaged rises in Romania. These countries, which joined the EU in or after 2004, have a higher share of low-wage earners than other European Union members and have seen significant rises in the minimum wage in recent years coupled with a growing ratio of the minimum wage to average earnings, and so they provide an excellent setting for analysis of transmission channels for minimum wage rises.

The WDN3 questionnaire of the CEE8 countries included two questions on minimum wages, one asking about the proportion of employees earning the minimum wage[2] and, the second, asking how firms adjusted following the most recent rise in the minimum wage or recent and envisaged rises for Romania.

We find significant cross-country and sectoral differences in the average share of workers earning the minimum wage. However, there are some similarities in that smaller, domestically owned, non-exporting firms and firms employing a higher proportion of low-skilled blue-collar workers tend to pay the minimum wage to a higher share of their employees.

Our results show that the rise in minimum wages is mostly transmitted into higher prices, cuts in non-labour costs, and improvements in productivity. This result is in line with the findings of Hirsch et al. (2015) for the USA. We also show that cutting employment is not a common reaction to a rise in the minimum wage, and when it happens, it is mostly through reduced hiring rather than direct layoffs. Furthermore, we find evidence of an important spillover effect from rises in the minimum wage to firms with no workers earning the minimum wage. Finally, the analysis of the factors driving the choice of particular adjustment channels takes the possible simultaneous use of the channels into account. For this purpose, we estimate a multivariate probit model consisting of several probit equations that are correlated through their error terms.

The structure of the paper is as follows: we first review the theoretical and empirical literature; then, we explain the survey questions and database harmonisation and provide the main descriptive statistics; next, we discuss our empirical results. The last part concludes.

2 Literature review

2.1 Theoretical models

The literature on the effect of changes in the minimum wage covers four main theoretical approaches—the competitive model, the dynamic monopsony model, the search and

matching model, and the institutional model. These approaches are based on different assumptions about how the labour market functions and the mechanisms for adjusting to binding minimum wages (Schmitt 2013, Wilson 2012) and support the evidence that there are other channels for adjustment to rises in the minimum wage than the employment channel. Different theoretical models feature the pass-through of labour costs to prices, cuts in non-labour costs, wage rises for employees not earning the minimum wage, efficiency improvements, and changes in employment adjustments.

The basic competitive model is a baseline framework in this regard (see Lester 1960, Hirsch et al. 2015, Wilson 2012, Kaufman 2010, Lee and Saez 2012, Schmitt 2013). In perfectly competitive labour markets, setting minimum wages above the market clearing level reduces the demand for labour. This results in lower employment if there is no other possible channel for adjustment. Extending the basic competitive model can introduce further adjustment channels, including cuts in working hours instead of in the number of employees, reduced investment in training and other worker benefits, and lower turnover. Prices can also rise in these models if all the firms experience the same cost increase in response to higher minimum wages. As firms under perfect competition operate at maximum productivity, there is no room left in this framework for any improvement in overall efficiency.

The monopsony model is also often used assessing the impact of minimum wages on firms' decision-making. The static monopsony framework is reviewed by Boal and Ransom (1997); the dynamic monopsony model is discussed in, among others, Manning (2003) and Ashenfelter et al. (2010); see also Kuhn 2004, Lee and Saez 2012, Card and Krueger 1995, and Wilson 2012. Labour market frictions are a key component of dynamic monopsony models. Market power and labour market frictions allow profit-targeting firms in monopsonic markets where there are no binding minimum wages to hire less labour than the socially efficient amount and to set wages below the competitive market rate. The upward-sloping labour supply curve, where employment is an increasing function of wages, determines that both employment and wages in such settings rise in response to the binding minimum wage up to a competitive market level. However, monopsonic market power allows firms to pass at least a part of the increase in their costs on to consumers by raising prices. There are also positive spillover effects on wages in this model, as monopsonic firms that already pay more than the minimum wage might decide to maintain the differential to the minimum wage in order to attract new employees.

Like the monopsony framework, the search and matching model accounts for labour market imperfections (see Cahuc 2014, Flinn 2006, Rogerson et al. 2005). This model assumes search frictions, as there are both employed and unemployed workers in the labour market, and jobs are either filled or unfilled. Unemployed workers search for job openings, whereas firms, driven by the objective of profit maximisation, search for employees to fill their vacancies. In this framework, like in monopsonic markets, binding minimum wages could, in fact, reduce unemployment under certain conditions. A rise in minimum wages may lead to stronger job search efforts, an improved matching process, and thus a rise in employment and overall efficiency.

The institutional model (see Kaufman 2010, Hirsch et al. 2015, Lester 1960, Hall and Cooper 2012, Schmitt 2013, Wilson 2012) uses concepts from behavioural economics. It assumes that employees are heterogeneous, that labour markets are imperfectly

competitive, integrated, and exposed to an excess labour supply, and that they operate under certain labour market institutions. Firms in the model respond to a rise in the minimum wage by improving their overall efficiency by either reducing organisational inefficiencies or increasing the productivity of employees. In contrast to the competitive model, where there is no room left for productivity improvements, the institutional framework suggests that it is possible under normal circumstances for firms to improve their overall efficiency, even though it appears to be costly as it requires continuous identification of problems and solutions. Furthermore, the pass-through into higher prices appears in this framework to complement the increase in efficiency in offsetting the rise in labour costs. On the demand side, the increase in binding minimum wages is reflected in higher disposable income, which could boost demand for goods and services, spurring growth in firm revenues and then feeding back into demand for additional labour and higher wages, like in the monopsony model.

In total, these theoretical models suggest that firms have a number of strategies for reacting to rises in the minimum wage. Moreover, rises in the minimum wage can result in both increases and decreases in specific cost components.

2.2 Empirical results for the effects of rises in the minimum wage

Estimates of the effects of rises in the minimum wage are based on several different methodological approaches. These approaches can be divided by the extent to which they account for the transmission mechanism of rises in the minimum wage to macroeconomic outcomes (whole economy vs. specific industries, direct vs. indirect effects; see Lemos 2008). General equilibrium models are claimed to account for the whole transmission mechanism, while other methods, such as input-output models, separate Philips curve equation estimations, difference-in-difference estimation, or regression analysis, account only for part of the transmission.

The following overview of the empirical findings focuses mainly on studies of partial equilibria. Empirical findings on the effects of rises in the minimum wage on employment predominate. Although existing studies indicate potential effects in both directions, negative employment effects dominate slightly. Neumark and Washer (2006) and Neumark et al. (2014) review a number of studies on how minimum wages affect employment, mostly in the USA but also in other countries, including some European countries. The authors provide support for the conventional view that minimum wages reduce employment among low-skilled workers and that the low-wage labour market segment can be reasonably well approximated by the neoclassical competitive model. Similar results are obtained by Huang et al. (2014) for China, where the minimum wage is also found to affect employment negatively, particularly in firms with low-wage earners. In contrast, Levin-Waldman and McCarthy (1998) use information from a qualitative survey of small businesses in the USA and find that jobs are not necessarily destroyed, but job creation may be hindered.

For the wage effects, rises in the minimum wage are found to compress the lower tail of the wage distribution and to have some positive spillover effects on wages up to about 20% above the minimum wage level (Neumark and Wascher 2008) or up to the median wage (Manning 2003). A similar effect is found by Hirsch et al. (2015) for the US restaurant sector. Kambayashi et al. (2010) reveal that the increase in the minimum

wage in Japan from the 1990s until the early 2000s in a period of deflation compressed the lower tail of the wage distribution among women. Strong wage compression not only in the lower tail but also in the upper tail of the wage distribution is found during an economic downturn in the German construction sector, indicating a negative wage spillover effect for high-wage earners and increased bargaining power for firms over workers still in employment (Aretz et al. 2012 and 2013; Kraft et al. 2012, Gregory 2014). Wage-setting institutions might play a role in determining the extent of the spillover effect (Rattenhuber 2014). Draca et al. (2011) find that after the minimum wage was introduced in the UK in 1999, wages above the minimum level were raised significantly, while firm profitability declined considerably. Hirsch et al. (2015) find that the profitability growth of firms is particularly likely to be reduced if due to adverse economic conditions the effect cannot be transmitted into higher prices.

Most empirical studies find rises in the minimum wage have no significant effect on training and through that on productivity (e.g. Acemoglu and Pischke 2003; Grossberg and Sicilian 1999; Neumark and Wascher 2001). In contrast, Hirsch et al. (2015) show that a rise in minimum wages creates pressure on managers to increase labour productivity from the workforce by cross-training, multi-tasking, and tighter work schedules.

For the transmission into prices, Card and Krueger (1995), Macdonald and Aaronson (2000), and Hirsch et al. (2015) find that rises in the minimum wage affect inflation significantly, but Katz and Krueger (1992) do not concur. Lemos (2008) compares over 20 studies on the price effects in the USA and concludes that rise in the minimum wage is associated with a stronger increase in food prices and a weaker increase in overall prices. Similarly, Wadsworth (2010) finds that within 4 years of the introduction of the minimum wage in the UK, prices appear to have risen significantly faster in several minimum wage-intensive sectors than in other sectors.

2.3 Empirical studies from Central and Eastern Europe

Empirical findings from Central and Eastern Europe (CEE) show that rises in the minimum wage have a negative effect on employment and hiring, particularly in small enterprises and for younger, unskilled and minimum wage workers, in Hungary (Kertesi and Köllő 2001, Kertesi and Köllő 2004, Halpern et al. 2004), the Czech Republic and Slovakia (Eriksson and Pytlikova 2004, Fialova and Mysikova 2009), Estonia (Hinnosaar and Rõõm 2003), Latvia (Zepa 2006), and Slovenia (Laporšek et al. 2015, Brezigar Masten et al. 2010). Adverse effects on employment are also reported for rises in the minimum wage in Poland, in particular for the workers with the weakest bargaining position, like young workers and temporary workers (Majchrowska and Żółkiewski 2012, Kamińska and Lewandowski 2015).

Evidence of higher consumer prices being caused by a rise in the minimum wage is found in Hungary (Harasztosi and Lindner 2015) and Latvia (Zepa 2006).

A positive wage effect for workers at and above the minimum wage is found for Hungary (Kézdi and Kónya 2012, Harasztosi and Lindner 2015), the Czech Republic and Slovakia (Gottvald et al. 2002; Eriksson and Pytlikova 2004 for the period 1999–2003), Slovenia (Brezigar-Masten et al. 2010 and Laporšek et al. 2015), Latvia (Zepa 2006), and Estonia (Ferraro et al. 2016). Banerjee et al. (2013) find that the rise in the

minimum wage in Slovenia prevented wage cuts being made and thus contributed to downward wage rigidity.

Finally, non-compliance with the minimum wage (the incidence of paying wages below the minimum wage) in Central and Eastern European countries was studied by Goraus and Lewandowski (2016), who found that higher ratios of the minimum wage to the average wage were associated with higher non-compliance, which may significantly weaken the final effects of minimum wage policies in CEE countries.

Following the designated literature and given the specifics of our data (direct firm responses from the WDN3 survey), the analysis in this study is based on a multivariate probit model and is therefore likely to cover only a part of the transmission mechanism, and thus possibly not take account of second-round effects. The adjustment channels considered in the WDN3 survey were chosen to reflect the main theoretical models presented above.

3 Data

The empirical part of the paper uses firm-level data obtained from a survey conducted within the WDN3. The survey was run in 2014 by 25 national central banks[3] using a harmonised questionnaire that covered the period 2010–2013. This paper concentrates specifically on a block of questions about firms' reaction to a rise in the minimum wage, which was included in the questionnaires of the nine countries (Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia). A question about the share of minimum wage earners in 2013 was included in the questionnaires of all nine countries (see Table 7 in the Appendix), and firms in all of them except Slovakia were asked about adjustment strategies they followed after the most recent rise in the minimum wage (see Table 8 in the Appendix).

An advantage of this survey is that firms were asked directly about their chosen course of action following a rise in the minimum wage. This information is not available in administrative datasets. The main caveat of the survey is that questions and answers about adjustment strategies in the minimum wage section of the questionnaire are not perfectly synchronised across countries, which makes a direct comparison of the obtained data and empirical investigation difficult (see Tables 7 and 8 in the Appendix). To proceed with the analysis, we harmonised data by combining answers into binary relevance indicator of each adjustment channel for each firm. These binary relevance indicators are later used in the descriptive and empirical parts of the paper. The observed adjustment channels are layoffs, cuts in hiring, price rises, cuts in non-labour costs, wage rises for employees earning above the minimum wage, and improvements in productivity.

The total sample size of this dataset is 8079 firms. The composition of the sample by countries, sectors, and firm size categories can be seen in Table 1. This sample is designed to be representative across firm-size categories within each country and its sectoral distribution closely follows the distribution of firms in each country.[4,5] The size of the sample, however, varies across countries both in absolute terms and relative to the population of firms in the country, so individual weights have been used to make the sample representative of the population of firms in each country (firm weights)[6] and to account for the number of workers that the firm represents in the population (employment weights).[7] We use weights in the tables showing descriptive results of the survey (see Tables 2 and 4); this way results are representative of the population of employees

Table 1 Number of respondents by countries, sectors, and firm size (conditional on answers being given to the block of questions on the minimum wage)

Countries	BG	EE*	HU	LT	LV	PL*	RO	SI	SK	Total
Sample size	456	498	2031	515	557	899	2029	493	601	8079
Sectors										
Manufacturing	47	134	798	76	100	295	1094	193	185	2922
Electricity, gas, water	–	17	–	–	–	23	–	18	16	74
Construction	21	84	145	60	69	96	216	63	51	805
Trade	205	92	439	169	173	225	291	61	126	1781
Business services	89	157	596	153	203	232	428	150	199	2207
Financial services	–	5	53	57	12	4	–	8	24	163
Public sector services	–	–	–	–	–	9	–	–	–	9
Arts and entertainment	94	1	–	–	–	3	–	–	–	98
Number of employees										
< 20	312	186	235	297	264	307	–	177	155	1933
20–49	94	177	604	98	144	189	173	93	167	1739
50–199	41	108	807	93	118	259	307	144	196	2073
> 199	9	27	385	27	31	144	1549	79	83	2334

Notes: *The sector of operation is missing for 8 firms in the Estonian sample and for 12 in the Polish sample
Sources: WDN3 survey, authors' estimations

and firms. Whereas regressions are performed without applying weights, since controls included in the regressions take into account possible cross-country, sector, and size effects.

4 Descriptive results

4.1 Share of employees earning the minimum wage

There is in general great uncertainty about the actual number of workers employed at the minimum wage, as estimates by various sources may differ significantly. Overall, the WDN estimates are comparable with the official estimates by national statistical offices or ministries for 2013 (see Table 2), though the WDN estimates other than those for Latvia, Estonia, and Poland are a little higher than the national statistics. The most pronounced differences are observed for Hungary, Romania, and Bulgaria. There are several possible explanations for the differences in terms of the share of minimum wage earners in these countries. First, there are differences in terms of the composition of the sample compared to administrative databases in terms of sectors and size. In addition, official statistics often do not account for the shadow economy, while the WDN survey is likely to have captured some employees affected by tax evasion and unaccounted employees (for example, workers paid below the minimum wage are likely to have been included). To minimise the administrative burden of the respondents, they were asked to provide an estimate and not an exact number which also explains part of the difference. For Hungary, the WDN outcome quite close to other estimations, for example those that are based on tax declarations of individuals (30%, see Krekó and Kiss 2007).

The average share of employees earning the minimum wage in our sample varies quite significantly across countries, sectors, and occupations, but only partially across

Table 2 Average share of employees of firms earning the minimum wage (%)

Countries	BG	EE	HU	LT	LV	PL	RO	SI	SK	CEE9
WDN aggregate‡	20.3	4.8	31.5	15.3	15.5	11.8	24.3	8.0	11.8	17.8
National statistics (2013)†	8.6	5.8	17.8	10.5	16.7	13.8	5.0	7.1	7.0	–
Sectors										
Manufacturing	27.8	4.2	34.5	16.2	16.0	10.7	24.0	4.7	10.0	19.0
Electricity, gas, water	–	2.6	–	–	–	1.4	–	2.4	3.7	1.9
Construction	18.4	5.9	28.5	15.3	10.6	18.6	34.7	15.3	10.5	20.5
Trade	18.9	3.5	30.9	16.6	14.6	12.0	22.4	4.6	13.1	17.7
Business services	18.3	5.8	28.6	14.2	19.1	14.4	21.4	15.6	16.8	18.2
Financial services	–	–	23.7	4.5	2.0	–	–	1.1	1.4	7.8
Arts and entertainment	12.5	–	–	–	–	–	–	–	–	12.5
Number of employees										
< 20	23.9	8.8	29.6	29.7	24.7	30.6	–	12.0	14.9	25.4
20–49	25.2	5.7	30.4	17.9	23.1	16.7	36.5	7.9	11.8	23.8
50–199	12.5	3.2	32.7	11.9	13.2	9.3	32.7	8.9	9.6	17.2
> 199	23.8	1.5	32.2	5.0	9.7	5.8	15.2	5.5	10.7	13.1
Workforce type										
LS BC††	23.6	5.4	41.3	21.1	31.9	13.4	43.6	20.4	19.0	23.0
HS BC	16.2	4.6	27.4	14.7	14.1	10.9	24.1	4.8	13.5	17.7
LS WC	25.7	3.1	29.8	11.4	16.5	15.9	24.5	8.2	10.8	17.8
HS WC	13.0	2.5	18.4	12.2	4.7	5.1	7.8	2.3	3.2	8.0
Ownership										
Mainly domestic	20.3	6.0	32.7	18.0	16.2	14.9	30.1	9.2	10.7	20.2
Mainly foreign	55.6*	1.9	26.1	3.8	9.6	3.9	12.9	4.1	14.8	10.7
Exporting status										
Exporting	29.6	4.0	31.6	13.7	13.4	9.3	21.3	–	13.4	16.4
Non-exporting	18.7	6.8	31.4	18.7	19.0	14.8	28.3	–	10.0	19.9

‡WDN aggregate refers to the time before the corresponding rise in the minimum wage rate. See Table 7 in Appendix for the exact reference period

†Source of national statistics on the share earning the minimum wage in 2013: *BG* National statistical institute; *EE* LFS, Statistics Estonia; *SK* Finance Ministry; *LT* Statistics Lithuania (only full-time employees); *LV* LFS, Central Statistical Bureau of Latvia; *HU* LFS, Hungarian Central Statistical Office; *RO* National Institute for Statistics, estimates for October 2012; *SI* Statistical Office of the Republic of Slovenia for the number of all employees and Agency of the Republic of Slovenia for Public Legal Records and Related Services for the number receiving the minimum wage

††High/low-skilled white/blue-collar workers, based on the ISCO-08 classification of the ILO

*This result is driven by one large manufacturing firm with foreign ownership. If it is excluded, the average share is 7.70

Sources: WDN3 survey, authors' estimations, employment adjusted estimates

firm-size groups (see Table 2). There are several points to note from this. First, the WDN survey results show that fewer than 5% of the employees of the average Estonian firm earn the minimum wage, whereas one third of a typical firm's workforce are employed at the minimum wage in Hungary and Romania. Second, the sector with the highest share of minimum wage earners differs across countries, as manufacturing has the largest share in Bulgaria, Lithuania, and Hungary, business services does in Latvia, Slovenia, and Slovakia, while construction has the largest proportion of workers employed at the minimum wage in Estonia, Poland, and Romania. At the opposite end of the spectrum, energy and financial services have the smallest shares of their workers earning the minimum wage. Third, minimum-wage workers are more frequently employed by firms where low-skilled blue-collar workers are a dominant part of the

workforce. Fourth, although the differences across firm-size categories are not very large, small firms with fewer than 50 employees are more likely to pay the minimum wage than larger firms are. In Bulgaria and Hungary, however, the share of workers in large firms earning the minimum wage is more significant, reflecting the higher share of workers on the minimum wage in manufacturing. Finally, minimum wage workers are slightly more frequently employed in domestic and non-exporting firms.

4.2 The adjustment strategies used following rises in the minimum wage

When answering the questions about their strategies for adjusting to rises in the minimum wage, firms evaluated the relevance of several different adjustment channels for a specified moment of minimum wage increase. In most countries, all firms could answer the question, irrespective of whether they actually had any workers on the minimum wage or not. The exception was Slovenia, where only firms with workers employed at the minimum wage answered. The adjustment channels were we had to lay people off, fewer people were hired, we had to increase prices, we had to reduce other costs, we had to increase wages that were above the minimum wage as well, and we raised productivity.[8] By design, the questions in the WDN3 questionnaire on rises in the minimum wage only consider one side of the effects of the channels explored, with the exception of the Bulgarian survey (see Section 3 for details). Specifically, interviewees could not cite any of the positive effects on employment or hiring that are possible under monopsony, matching or institutional model assumptions.

The answer choices were different in different countries (see Table 8 in the Appendix). Most countries offered the choice of 'not relevant', 'of little relevance', 'relevant', and 'very relevant'. The Slovenian questionnaire gave two options, 'relevant' and 'not relevant'. In Bulgaria, as already mentioned, the choices cover both positive and negative effects. Many countries had a binary yes/no choice for the answer to the question about wage spillover from the higher minimum wage to the wages of other workers.

To evaluate how relevant the different adjustment channels were, the answers from the second block were harmonised across countries (see Table 9 in the Appendix) using a binary measure of relevance. The answer 'Relevant' is assigned if the firm answered that the channel is of little relevance, relevant or very relevant, or if the answer 'yes' is given. The answer 'Not relevant' is assigned for all other cases.[9] For Bulgaria, the answer 'Relevant' is assigned for a decrease in the employment or non-labour costs channels if a firm answered that the decrease in the corresponding measure was strong or moderate; similarly, 'Relevant' is assigned for increases in the measures of prices or labour productivity if the firm showed a moderate or strong increase.

The timing and the size of the analysed rises in the minimum wage differ notably across countries (see Table 3). Several countries referred to a specific date when the minimum wage rose, with the Estonian and Latvian questionnaires asking about firms' reaction to the rise in the minimum wage in January 2014, the Slovenian questionnaire referring to the rise in February 2010, and the Lithuania questionnaire to the rise in January 2013. Other countries referred to longer periods of changes in the minimum wage, with the Bulgarian questionnaire covering the period 2010–2013 for example. The Polish questionnaire focused on changes in the minimum wage after 2013, and since the survey was conducted in 2015, its answers reflect how firms reacted to rises

Table 3 Timing and size of rise in the minimum wage, % (period analysed in bold)

Country	2010 Q1–2	2010 Q3–4	2011 Q1–2	2011 Q3–4	2012 Q1–2	2012 Q3–4	2013 Q1–2	2013 Q3–4	2014 Q1–2	2014 Q3–4	2015 Q1–2	2015 Q3–4
BG	–	–	–	–	**13**	**7**	**7**	**–**	10	–	6	6
EE	–	–	–	–	4	–	10	–	**11**	–	10	–
HU	–	–	6	–	**19**	–	5	–	4	–	4	–
LT	–	–	–	–	–	–	**18**‡	–	–	–	4	8
LV	–	–	11	–	–	–	–	–	**12**	–	13	–
PL	–	–	5	–	8	–	**7**	–	**5**	–	**4**	–
RO	–	–	12	–	4	–	7	7	**6**	**6**	**8**	**8**
SI	**23**	**–**	2	–	2	–	3	–	1	–	–	–
SK	–	–	3	–	3	–	**3**	–	4	–	8	–

‡In Lithuania, there were two rises in the minimum wage between 2012 Q3–4 and 2013 Q1–2, of 6% from 231.7 EUR to 246.18 EUR in July 2012 and of 18% from 246.18 EUR to 289.62 EUR in Jan 2013. In the questionnaire, firms were asked specifically about the 18% increase in the minimum wage
Source: Eurostat, Monthly minimum wages (bi-annual data)

in the minimum wage between 2013 and 2015. No period was specified in the Romanian questionnaire for rises in the minimum wage, and since at the moment of the survey the future path of such rises in 2015 was known to firms, the answers may also reflect the expected change in the minimum wage rather than solely the historical changes before 2013.

The highest single rise in the minimum wage among those analysed was of 23% in Slovenia in 2010, followed by rises of 19% in Hungary in 2012 and of 18% in Lithuania in 2013. The Estonian and Latvian questionnaires focus on relatively small rises of 11% and 12% respectively that occurred more recently in 2014. The Bulgarian, Romanian, and Polish questionnaires refer to extended periods of time with cumulative minimum wage increases of 29% in 2010–2013, 31% in 2014–2015, and 18% in 2013–2015 correspondingly. The correlation between the size of the rise in the minimum wage and the relevance of the adjustment channels is low (0.36). This suggests that cross-country differences in the relevance of the adjustment channels may also rise from differences in institutional characteristics, the sectoral composition of the economies and the economic shocks that were experienced, rather than the extent of minimum wage increases (see Bodnar et al. 2018 for more details).

Overall, more than 90% of all firms in the sample answered that at least one of the six adjustment channels offered was relevant as a response to an increase in the minimum wage (see Table 4). The most frequently chosen channels for adjustment to rises in the minimum wage are increases in productivity, reduction of non-labour costs, and rises in product prices. Cutting employment is relatively less popular, and employment effects are realised mostly through reduced hiring, rather than direct layoffs.

Although around 40% of the firms in the sample do not have any employees on the minimum wage (the share is smaller in Bulgaria and Hungary and larger in Estonia), our results indicate potential spillovers from a rise in minimum wages to these firms (see the lower part of Table 4). More than 80% of firms responded that at least one of the adjustment channels is relevant. The overall importance of the adjustment channels is lower, with the exception of the wage, price and productivity adjustment channels for

Table 4 Share of firms answering that the minimum wage adjustment channel was 'Relevant', in % of the firms in respective sub-group for each country (Relevant + Not Relevant = 100%)

MW rise	BG	EE	HU	LT	LV	PL	RO	SI‡	CEE8
Firms with minimum wage employees (before the MW rise)									
We had to lay people off	25.2	9.7	19.2	9.1	22.7	38.5	35.7	7.1	29.6
We could hire fewer people	–	12.2	47.3	28.2	29.5	46.4	54.7	20.7	45.8
We had to raise product prices	35.0	39.2	57.0	36.6	52.5	52.3	67.8	15.0	52.7
We had to reduce non-labour costs	8.1	27.8	56.1	49.7	55.6	66.6	77.9	63.2	59.1
We had to raise the wages of other employees	29.2	32.9	–	30.0	49.9	43.3	29.8	18.8	40.5
We increased productivity	21.5	25.0	59.4	55.7	45.6	68.7	–	–	61.6
Percentage of firms that regard at least one channel as relevant	100.0	66.7	100.0	66.4	70.6	86.6	100.0	100.0	93.2
Number of observations	317	169	1540	264	283	444	1223	493	4650
Firms without minimum wage employees (before the MW rise)									
We had to lay people off	13.9	3.3	11.7	0.0	6.4	7.2	14.2	–	7.8
We could hire fewer people	–	3.2	20.6	3.6	12.0	14.2	29.7	–	14.5
We had to raise product prices	41.3	15.3	30.4	10.8	20.3	21.0	36.0	–	22.9
We had to reduce non-labour costs	5.6	13.6	23.9	13.9	24.0	26.1	45.7	–	23.8
We had to raise the wages of other employees	50.6	10.9	–	22.3	25.8	27.5	12.3	–	27.2
We increased productivity	35.8	12.4	28.5	28.7	26.3	28.1	–	–	28.1
Percentage of firms that regard at least one channel as relevant	100.0	26.3	100.0	39.2	37.1	41.3	100.0	100.0	80.4
Number of observations	211	329	479	248	241	453	815	–	2776

The option 'Relevant' is assigned if the firm answered that the corresponding adjustment channel is of little relevance, relevant or very relevant; when only a yes or no option was available, 'Relevant' refers to the 'yes' answer. 'Total' shows the average share of firms claiming any of the six adjustment channels as 'Relevant'
‡Slovenian firms without minimum wage employees were not asked the corresponding question
Sources: WDN3 survey, authors' estimations, firm number adjusted estimates

Bulgaria.[10] Around one quarter of firms without any employees on the minimum wage at the moment the minimum wage was raised view rises in prices and productivity and cuts in non-labour costs as relevant measures.

5 Empirical results

The degree of correlation between the adjustment channels for the minimum wage is high[11] (see Table 10 in the Appendix), suggesting that different adjustment strategies seem to be used jointly. Descriptive evidence suggests that the choice of the preferred adjustment channel depends on firm-specific characteristics, such as the share of workers earning the minimum wage, size, sector, use of collective agreements, and the changes in macroeconomic conditions. In this section, we apply a multivariate probit framework to study the factors that determine the choice of the adjustment channels, controlling for correlation between the channels.

The dependent variable takes the value 1 if the firm answered that the particular adjustment channel is 'Relevant' and 0 otherwise (see Section 3, Tables 8 and 9 in Appendix for details).[12] Explanatory variables include dummy variables for country, sector, size, ownership, and collective bargaining coverage[13] (see Table 11 in the Appendix for the full list of explanatory variables). Firm-specific economic conditions are controlled for by including

ordered variables for changes in the demand for the firm's products and services and changes in external financing conditions. In addition, we control for the presence of minimum wage employees at the firm. Therefore, the average marginal effects of the categorical explanatory variables presented in Tables 5 and 6 refer to discrete changes from the base level.

As not all the adjustment channels were included in the questionnaires of all the countries[14] (see Table 8 in the Appendix and Table 4), we run two versions of the multivariate probit models. The first is for a subset of countries containing Poland, Latvia, Lithuania and Estonia, where all the channels are observed, and the second is for a subset of adjustment channels, consisting of lay-offs, price rises and cuts in non-labour costs, that are observed for all countries.

As expected, estimates from the two versions of the model for all channels and for all countries imply that after the abovementioned characteristics are controlled for, the transmission of rises in the minimum wage is stronger, or more relevant, for firms employing workers at the minimum wage than it is for firms where nobody on the payroll earns the minimum wage. Further, an improvement in demand conditions reduces the probability that the firm will consider cutting employment and non-labour costs or improving productivity. The effect of a change in external financing conditions is weaker but still statistically significant with the short country sample.

Next, in line with the descriptive results shown in Table 2, foreign-owned firms seem to be affected less by rises in the minimum wage and are less likely to find any of the adjustment channels relevant, especially the prices, non-labour costs and productivity channels. Institutional features of the labour market, such as the use of a collective pay agreement, tend to increase the relevance of certain adjustment channels, but only in the full country sample (Table 6). The significance is mainly driven by the strong effect in Hungary and Romania. Binding terms in collective agreements can pose additional restrictions on activity and force firms to compensate for rises in the minimum wage by raising prices and cutting non-labour costs and employment in these countries. However, if all the channels are included in the estimation, and so the sample is restricted to the Baltic countries and Poland (Table 5), the marginal effect of collective agreements becomes statistically insignificant.

Looking into the predicted probabilities for the adjustment channels for firms with different shares of employees at the minimum wage adds additional insights (see Fig. 1). In the subsample of four countries, the predicted probability of the channels being favoured increases with the share of employees earning the minimum wage at the firm and peaks when that share is between 60 and 79% (Fig. 1, left-hand graph). For the full sample of countries (see Fig. 1, right-hand graph), the picture is broadly similar, except that the probability of layoffs being relevant increases monotonically with the share of employees on the minimum wage.

The ranking of the adjustment channels changes slightly with the share of minimum wage employees.[15] The productivity adjustment channel has the highest predicted probability for firms where a small share of employees gets the minimum wage. In the firms with larger shares though, cutting non-labour costs is the most popular channel. The importance of the price rise channel is constantly lower than

Table 5 Multivariate probit model of the relevance of adjustment channels, average marginal effects (all channels; sample restricted to the Baltic countries and Poland)

	(1)	(2)	(3)	(4)	(5)	(6)
	Lay off	Hire less	Increase prices	Cut non-lab. costs	Increase wages	Increase prod.
Presence of MW employees at the firm	0.124***	0.175***	0.241***	0.248***	0.175***	0.222***
	(0.013)	(0.014)	(0.017)	(0.017)	(0.019)	(0.018)
Foreign ownership, dummy	− 0.065***	− 0.091***	− 0.149***	− 0.153***	− 0.133***	− 0.126***
	(0.019)	(0.023)	(0.026)	(0.026)	(0.026)	(0.027)
Presence of collective agreement	0.007	− 0.006	− 0.015	− 0.027	0.002	0.030
	(0.022)	(0.027)	(0.034)	(0.034)	(0.035)	(0.036)
Demand level (base: strong decrease)						
- Moderate decrease	0.008	− 0.005	− 0.007	− 0.033	0.023	− 0.031
	(0.021)	(0.027)	(0.036)	(0.035)	(0.037)	(0.038)
- Unchanged	− 0.038*	− 0.017	0.004	− 0.047	0.008	− 0.044
	(0.022)	(0.028)	(0.037)	(0.036)	(0.039)	(0.039)
- Moderate increase	− 0.043**	− 0.036	− 0.010	− 0.061*	0.010	− 0.046
	(0.021)	(0.027)	(0.035)	(0.035)	(0.037)	(0.038)
- Strong increase	− 0.106***	− 0.054	− 0.016	− 0.082*	0.000	− 0.083*
	(0.033)	(0.039)	(0.046)	(0.047)	(0.049)	(0.049)
Access to external finance (base: strong decrease)						
- Moderate decrease	− 0.005	0.010	0.083*	0.095**	0.039	0.092*
	(0.027)	(0.036)	(0.049)	(0.048)	(0.049)	(0.053)
- Unchanged	− 0.018	− 0.023	− 0.001	− 0.012	− 0.055	0.025
	(0.024)	(0.030)	(0.042)	(0.041)	(0.042)	(0.045)
- Moderate increase	− 0.009	− 0.011	0.009	− 0.003	− 0.036	0.073
	(0.029)	(0.036)	(0.047)	(0.047)	(0.049)	(0.052)
- Strong increase	0.001	0.023	− 0.022	− 0.119	− 0.092	0.010
	(0.046)	(0.054)	(0.077)	(0.077)	(0.078)	(0.085)
Sectoral dummies (base: manufacturing)						
Electricity, gas, water	− 0.022	− 0.079	− 0.211***	− 0.200**	− 0.165*	− 0.221***
	(0.044)	(0.062)	(0.079)	(0.082)	(0.087)	(0.077)
Construction	0.010	0.012	− 0.033	− 0.031	− 0.026	− 0.023
	(0.020)	(0.024)	(0.030)	(0.031)	(0.033)	(0.033)
Trade	− 0.010	− 0.019	− 0.067***	− 0.056**	− 0.043	− 0.116***
	(0.017)	(0.021)	(0.026)	(0.027)	(0.028)	(0.028)
Business services	− 0.021	− 0.038*	− 0.075***	− 0.049*	− 0.038	− 0.102***
	(0.017)	(0.021)	(0.025)	(0.026)	(0.027)	(0.027)
Financial intermediation	0.015	− 0.062	− 0.211***	− 0.055	− 0.125**	− 0.129**
	(0.043)	(0.046)	(0.064)	(0.057)	(0.062)	(0.060)
Arts		− 0.022	− 0.136	− 0.176		0.118
		(0.160)	(0.218)	(0.227)		(0.327)
Firm size dummies (base < 20 employees)						
20–49 employees	− 0.033**	− 0.045**	− 0.043*	− 0.043*	− 0.001	− 0.031
	(0.016)	(0.019)	(0.023)	(0.024)	(0.025)	(0.025)
50–199 employees	− 0.004	− 0.016	− 0.026	− 0.013	− 0.007	− 0.005
	(0.015)	(0.019)	(0.025)	(0.025)	(0.026)	(0.027)

Table 5 Multivariate probit model of the relevance of adjustment channels, average marginal effects (all channels; sample restricted to the Baltic countries and Poland) *(Continued)*

	(1) Lay off	(2) Hire less	(3) Increase prices	(4) Cut non-lab. costs	(5) Increase wages	(6) Increase prod.
200+ employees	− 0.041*	− 0.066**	− 0.034	− 0.016	0.053	− 0.007
	(0.024)	(0.031)	(0.037)	(0.036)	(0.037)	(0.039)
Country dummies (base: Poland)						
Latvia	− 0.020	− 0.088***	− 0.022	− 0.066**	− 0.049*	− 0.093***
	(0.016)	(0.022)	(0.027)	(0.028)	(0.028)	(0.030)
Lithuania	− 0.113***	− 0.089***	− 0.120***	− 0.123***	− 0.129***	− 0.054**
	(0.018)	(0.019)	(0.024)	(0.023)	(0.026)	(0.025)
Estonia	− 0.078***	− 0.182***	− 0.077***	− 0.177***	− 0.170***	− 0.230***
	(0.018)	(0.022)	(0.026)	(0.026)	(0.026)	(0.028)
Observations	2083	2083	2083	2083	2083	2083

Note: Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$
Dependent variable—binary measure of relevance used for all countries (1—Relevant, 0—Not relevant)
For a detailed description of the explanatory variable see Table 11 in the Appendix
Source: WDN3 survey, authors' estimation

the channels for productivity improvement or cuts in non-labour costs. The wage increase channel is used to roughly the same extent whatever share of employees earns the minimum wage, and it has a higher probability than the channel of cuts in employment.

The predicted probabilities for the relevance of adjustment channels for firms with and without employees on the minimum wage show that the most popular channels for adjustment for both groups are cuts in non-labour costs, price rises, and the increases in wages and productivity (Figs. 2 and 3). The channels that affect employment levels through laying off workers and reducing hiring are less popular, which is in line with the descriptive results in Table 2. As would be expected, the average predicted probability of either adjustment channel being found relevant is smaller for firms without employees earning the minimum wage, where it is half as much as at firms paying some employees the minimum wage.

The predicted probabilities for the relevance of the adjustment channels vary significantly by country. At the same time, only some of these cross-country differences are due to the aggregate factors represented by the country dummies. The rest of the differences are explained by sample composition effects related to the distribution of sectors, firm-size categories and other firm-specific characteristics in the sample of each country. Estimates based on the full sample of countries and the three adjustment channels included in the questionnaires of all the countries (Fig. 2) suggest, for example, that Romanian firms are slightly more likely to report each channel as relevant than firms in other countries are. Equally, the probability of Bulgarian firms expressing a preference for lay-offs is above the average, but they are the least likely to consider the non-labour costs channel relevant. Further, Slovenian firms are predicted to be least likely to prefer the price channel and to be less likely than the average to choose the lay-off channel. In contrast, an above average share of Slovenian firms is predicted to favour the non-labour costs

Table 6 Multivariate probit model of the relevance of adjustment channels, average marginal effects (all countries; 3 adjustment channels)

	(1) Lay off	(2) Increase prices	(3) Cut non-lab. costs
Presence of MW employees at the firm	0.137***	0.237***	0.263***
	(0.010)	(0.011)	(0.011)
Foreign ownership	− 0.034***	− 0.077***	− 0.071***
	(0.011)	(0.014)	(0.014)
Presence of collective agreement	0.025**	0.045***	0.057***
	(0.011)	(0.015)	(0.014)
Demand level (base: strong decrease)			
- Moderate decrease	− 0.021	0.028	− 0.014
	(0.015)	(0.022)	(0.021)
- Unchanged	− 0.075***	− 0.033	− 0.114***
	(0.016)	(0.022)	(0.022)
- Moderate increase	− 0.095***	0.004	− 0.088***
	(0.017)	(0.023)	(0.023)
- Strong increase	− 0.172***	− 0.027	− 0.149***
	(0.029)	(0.033)	(0.034)
Access to external finance (base: strong decrease)			
- Moderate decrease	− 0.027	0.066**	0.029
	(0.019)	(0.028)	(0.027)
- Unchanged	− 0.088***	− 0.025	− 0.070***
	(0.018)	(0.026)	(0.025)
- Moderate increase	− 0.065***	0.028	− 0.040
	(0.022)	(0.030)	(0.029)
- Strong increase	0.010	0.002	− 0.038
	(0.038)	(0.050)	(0.051)
Sectoral dummies (base: manufacturing)			
Electricity, gas, water	− 0.080	− 0.240***	− 0.210***
	(0.060)	(0.081)	(0.071)
Construction	0.005	− 0.026	− 0.013
	(0.014)	(0.019)	(0.019)
Trade	− 0.027**	− 0.049***	− 0.010
	(0.012)	(0.015)	(0.015)
Business services	− 0.033***	− 0.054***	− 0.040***
	(0.011)	(0.014)	(0.014)
Financial intermediation	− 0.015	− 0.208***	− 0.055
	(0.038)	(0.047)	(0.041)
Arts	− 0.068*	0.044	− 0.022
	(0.036)	(0.052)	(0.072)
Firm size dummies (base < 20 employees)			
20–49 employees	− 0.000	− 0.030*	− 0.022
	(0.014)	(0.018)	(0.017)
50–199 employees	− 0.005	− 0.043**	− 0.021
	(0.014)	(0.018)	(0.017)
200+ employees	− 0.002	− 0.055***	− 0.019

Table 6 Multivariate probit model of the relevance of adjustment channels, average marginal effects (all countries; 3 adjustment channels) *(Continued)*

	(1) Lay off	(2) Increase prices	(3) Cut non-lab. costs
	(0.016)	(0.021)	(0.020)
Country dummies (base: Poland)			
Latvia	− 0.017	0.010	− 0.050*
	(0.022)	(0.029)	(0.029)
Lithuania	− 0.174***	− 0.151***	− 0.153***
	(0.026)	(0.028)	(0.026)
Estonia	− 0.105***	− 0.100***	− 0.208***
	(0.025)	(0.029)	(0.029)
Hungary	− 0.044***	0.078***	− 0.053***
	(0.015)	(0.020)	(0.020)
Bulgaria	0.066***	− 0.041	− 0.403***
	(0.020)	(0.029)	(0.033)
Slovenia	− 0.185***	− 0.328***	− 0.045
	(0.024)	(0.031)	(0.028)
Romania	0.043**	0.133***	0.102***
	(0.017)	(0.023)	(0.023)
Observations	7011	7011	7011

Note: Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. The variable 'Presence of MW employees at the firm' is equal to 1 if the share of minimum wage employees in a firm is greater than 0%, zero otherwise. For detailed variable description see Table 11 in the Appendix
Source: WDN3 survey, authors' estimation

channel. Lithuanian and Estonian firms have consistently lower probabilities of considering all three adjustment channels relevant than do firms in other countries.

Figure 3 presents the results for a subsample of the four countries (PL, LV, LT, EE) where the full set of adjustment channels was available. The predicted probability of the adjustment channels being found relevant is consistently higher in Poland than in the Baltic countries. Interestingly, the wage channel has a higher relative importance than the other channels among firms without employees earning the minimum wage. It ranks second after the productivity channel and overtakes the price and non-labour cost channels for predicted relevance.

6 Conclusions

This paper uses a unique firm-level cross-country survey dataset on the adjustment channels preferred by firms following a rise in the minimum wage. The data were obtained within the third wave of the WDN survey and come from eight CEE countries, namely Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovenia.

Our paper contributes to the literature on the firm-level impacts of rises in the minimum wage in several ways. First, we provide detailed cross-country information about the shares of minimum wage workers in the CEE8 and Slovakia, which is rarely available in statistical reports. We show that the average share of

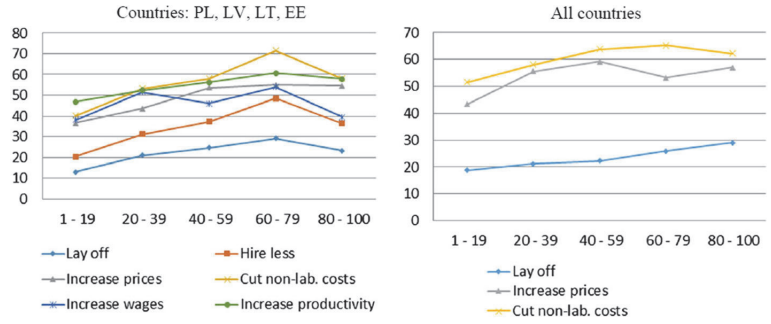

Fig. 1 Predicted probabilities to find the adjustment channel 'Relevant' for a given range of the share of employees earning the minimum wage at the firm. Note: Calculated using a multivariate probit model presented in Tables 12 and 13 in the Appendix, which include different shares of employees at the minimum wage as regressors as opposed to a single regressor for the presence of minimum wage employees, as in Table 5 and 6

workers earning the minimum wage varies significantly across countries, sectors, occupations, ownership, and exporting status, but only partially across firm-size groups.

Second, we look at firms' reaction to rises in the minimum wage as a combination of strategies and report a preference ranking for the adjustment channels in the CEE8. Such information is not available in other studies due to their concentration on a single transmission channel, most frequently layoffs. More than 90% of the subsample of firms which employ workers at the minimum wage responded that at least one of the six adjustment channels proposed was relevant. The most popular adjustment channels are raising product prices, cutting non-labour costs, and improving productivity, which more resembles the theoretical outcome predicted by the institutional model. The

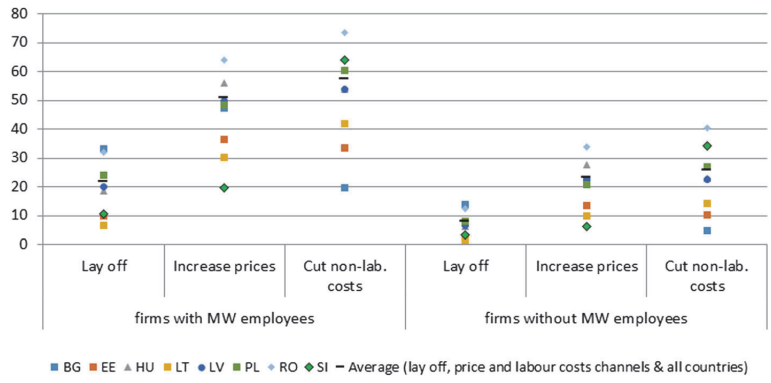

Fig. 2 Predicted probabilities of the adjustment channels being 'Relevant' by country (all countries, a subset of channels). Note: For Slovenia, the effect for firms without MW employees is rather hypothetical, assuming that Slovenian firms (with their characteristics taken into account) would react as firms without MW employees in other countries without actually having the actual responses of Slovenian firms without MW employees included in the sample. Authors' calculations using the multivariate probit model presented in Table 6

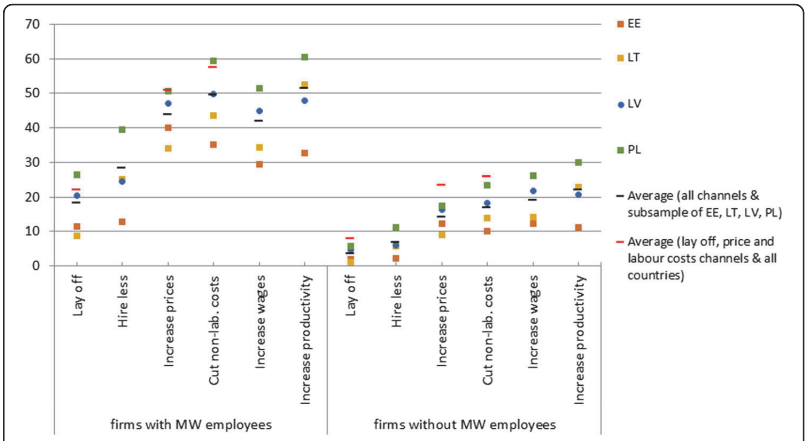

Fig. 3 Predicted probabilities for the relevance of adjustment channels by country (all channels, a subset of countries). Source: Authors' calculations using the multivariate probit model presented in Tables 5 and 6

ranking of the channels remains robust to a range of different estimation procedures and variable specifications.

Third, our results indicate important spillovers from a rise in minimum wages to firms employing no minimum wage earners. Almost one quarter of the firms without any employees on their payrolls at the minimum wage reported that an increase in prices, wages or productivity, or a reduction in non-labour costs are relevant reactions to rises in the minimum wage.

Controlling for firm-specific conditions and correlations between the channels, we show that favourable demand conditions and the availability of external financing are associated with lower relevance for the adjustment channels. Foreign-owned firms seem to be affected less by rises in the minimum wage.

Endnotes

[1]In 2014, 25 European national central banks participated in the third wave of the ECB's WDN, conducting a firm-level survey about labour cost adjustment practices, and wage and price setting mechanisms in 2010–2013.

[2]The first question was asked in an additional country, Slovakia, in which case we will refer to CEE9 countries.

[3]Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, France, Greece, Germany, Hungary, Italy, Ireland, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and the UK.

[4]The survey covered non-agricultural private-sector firms with five or more employees (sectors C-N in the NACE 2. rev. classification).

[5]Please note that the WDN aggregate does not necessarily refer to 2013. See Table 7 in the Appendix for the exact reference period.

[6]The calculation of the firm weights sums up to the ratio of the population of firms within each stratum and the realised sample of firms within each stratum in each country.

[7]The calculation of the employment weights can be summarised as the ratio of population employment by stratum and the realised sample of firms within each stratum in each country.

[8]For the list of adjustment channels offered in each country's questionnaire and for the slight differences in wording, see Table 8 in the Appendix.

[9]As a robustness check we use a different measure of relevance, i.e. when 'Relevant' does not include the answer option 'of little relevance'. The results of the robustness check are presented in the Empirical results in Section 5 of the paper.

[10]One possible explanation for the stronger spillover effects of minimum wage increases on the wages of employees earning above the minimum wage in Bulgaria may be that the minimum wage system is linked to the practice of determining minimum social security thresholds by economic activity and occupation in that country. The stronger wage spillover effect may therefore indirectly lead to a stronger relevance of other adjustment channels in companies without employees on the minimum wage in Bulgaria. It should also be remembered for Bulgaria that the question about adjustment to the minimum wage rise was related to the strategies of companies over a longer period of time, 2010–2013, and not only to the most recent change as in other countries. The reference of the question to a longer period of time makes it more likely that second round spillover effects related to the wage distribution will also materialise at firms without any workers earning the minimum wage.

[11]With the exception of Bulgaria, where the specific questionnaire design allowed for both positive and negative effects of the rise in the minimum wage in all adjustment channels.

[12]We performed a robustness check using a different specification of the relevance indicator, when only answer options 'relevant' and 'very relevant' were included. The main conclusion of this exercise is that the ranking of the adjustment channels remains the same. The effects (both marginal effects and fitted probabilities) are somewhat smaller, which is in line with a lower share of ones in the binary indicator of relevance.

[13]In order to control for potential endogeneity between an increase in the minimum wage share and the presence of a firm-level collective bargaining agreement, we tried two different versions of the variable—presence of any collective agreement and presence of an outside-firm collective agreement. The effect of change in the variable is very small, which was expected due to the relatively low level of collective agreement coverage in the CEE9 countries. Therefore, we keep the broader version of the variable in our estimations.

[14]All countries asked about the relevance of three adjustment channels—lay-offs of workers, price rises, and cuts in non-labour costs, while only four countries—Latvia, Lithuania, Estonia, and Poland—asked about all six of the adjustment channels in the questionnaire.

[15]The structure of firms in different groups by the share of minimum wage employees is not the same. This affects the predicted probability of the adjustment channel being used in each group. Therefore, differences in probabilities between groups should be treated with caution.

Appendix

Table 7 Country specific questions: share of employees earning the minimum wage

Country	Question	Measurement	Period
BG	What was the percentage of employees receiving the minimum wage and secured at the minimum insurance threshold in your company at the end of 2013?		
	% of employees receiving the minimum wage	%	At the end of 2013
	% of secured at the minimum insurance threshold	%	At the end of 2013
EE	What was the percentage of employees receiving the minimum wage in your company before the increase in the minimum wage on 1 January 2014 and what was the percentage after?	%	Before 01/01/2014
		%	After 01/01/2014
HU	What was the percentage of employees receiving the minimum wage in your company before the increase in the minimum wage (Jan 2012) and what was the percentage after?		
	% of employees receiving the minimum wage before the change in the minimum wage	%	Before 01/01/2012
	% of employees receiving the minimum wage after the change in the minimum wage	%	After 01/01/2012
LT	What was the percentage of employees receiving the minimum wage in your company before the increase in the minimum wage in January 2013 and what was the percentage after?	%	Before 01/01/2013
		%	After 01/01/2013
LV	What was the percentage of employees receiving the minimum wage in your company before the increase in the minimum wage on 1 January 2014 and what was the percentage after?	%	Before 01/01/2014
		%	After 01/01/2014
PL	What was the percentage of employees receiving the minimum wage and secured at the minimum insurance threshold in your company at the end of 2013?	%	At the end of 2013
RO	What was the percentage of your employees earning the minimum wage in 2013?	%	In 2013
SI	What percentage of the employees received minimum wage:		
	Before the adoption of the new minimum wage legislation	%	Before 23/02/2010
	After the adoption of the new minimum wage legislation	%	After 23/02/2010
SK	What was the percentage of your employees earning the minimum wage in 2013?	%	In 2013

Source: WDN3 survey

Table 8 Country-specific questionnaires: adjustment channels and answer options

Country	Adjustment channel	Country specific formulation of adjustment channel or question used to derive relevance of adjustment channel	Answer type
LV, LT, HU	Number of employees	We had to lay people off	1
EE, RO, PL			2
SI			3
BG		Number of employees	4
LV, LT, HU	Hiring	We were able to hire fewer people	1
RO, PL			2
SI			3
EE		We could not replace empty positions	2
		We were not able to open new job positions	
BG		n.a.	
LV, LT, HU	Prices	We had to increase product prices	1
EE, RO, PL			2
SI			3
BG		Price of main product/service	4
LV, LT, HU	Non-labour costs	We had to reduce non-labour costs	1
EE, RO, PL			2
RO		We had to reduce other costs	2
SI			3
BG		Non-labour costs	4
LV, LT, HU, PL	Productivity	We increased productivity	1
EE		We had to seek to improve the quality and scope of products through process innovation	2
		We had to seek to increase productivity through organisational innovation	2
		We had to seek to increase productivity through process innovation	2
BG		Labour productivity	4
RO, SI		n.a.	
EE, PL	Hours	We had to reduce working hours	2
LV, LT, HU, RO, SI, SK, BG		n.a.	
LV	Wages above the minimum wage	We had to increase the wages of employees earning above the minimum wage level	1
PL		We had to increase the wages of employees earning above the minimum wage level in order to keep the wage relations in the firm	2
EE		Did the increase in the minimum wage on 1 January 2014 make it necessary to raise wages or any other type of compensation for those employees in your company?	5
		Please indicate the percentage of employees whose wages or other type of compensation increased in response to the rise in the minimum wage (including those who earned minimum wages and who earned higher wages before 1 January 2014)	%
RO		In the event of a rise in the minimum wage, do you raise the wages of your employees earning more than the minimum wage?	5
		Please specify the percentage of employees affected	%

Table 8 Country-specific questionnaires: adjustment channels and answer options *(Continued)*

Country	Adjustment channel	Country specific formulation of adjustment channel or question used to derive relevance of adjustment channel	Answer type
LT		Did the increase in the minimum wage on 1 January 2013 make it necessary to raise wages or any other type of compensation for those employees in your company who earned more than the minimum wage (who earn more than 1000Lt)?	5
		Please indicate the percentage of employees whose wages or other type of compensation increased in response to the rise in the minimum wage (including those who earned minimum wages and who earned higher wages before 1 January 2013	%
SI		We also had to increase wages above the minimum wage	3
BG		Base wages of above minimum wage earners	4
		Flexible wage components (bonuses, benefits etc.)	4

Notes: answer types
(1) 1 = Not relevant, 2 = Of little relevance, 3 = Relevant, 4 = Very relevant, 5 = Do not know
(2) 1 = Not relevant, 2 = Of little relevance, 3 = Relevant, 4 = Very relevant
(3) 1 = Relevant, 0 = Not relevant
(4) 1 = Strong decrease, 2 = Moderate decrease, 3 = Unchanged, 4 = Moderate increase, 5 = Strong increase
(5) 1 = Yes, 0 = No
Source: WDN3 survey

Table 9 Scheme of answer harmonisation for adjustment channel questions

Answer type	Relevant (1)		Not relevant (–)
1 & 2	2, 3, 4		1
3	1		0
4	BG: Number of employees	< 3	≥ 3
	BG: Non-labour costs		
	BG: Prices	> 3	≤ 3
	BG: Labour productivity		
5	1		2

Note: answer types
(1) 1 = Not relevant, 2 = Of little relevance, 3 = Relevant, 4 = Very relevant, 5 = Do not know
(2) 1 = Not relevant, 2 = Of little relevance, 3 = Relevant, 4 = Very relevant
(3) 1 = Relevant, 0 = Not relevant
(4) 1 = Strong decrease, 2 = Moderate decrease, 3 = Unchanged, 4 = Moderate increase, 5 = Strong increase
(5) 1 = Yes, 0 = No
Source: WDN3 survey

Table 10 Tetrachoric correlations between minimum wage adjustment channels

Latvia						
(obs=474)						
	A	B	C	D	E	F
A	1					
B	0.944	1				
C	0.874	0.895	1			
D	0.894	0.885	0.941	1		
E	0.831	0.858	0.876	0.894	1	
F	0.797	0.834	0.852	0.859	0.896	1

Lithuania						
(obs=489)						
	A	B	C	D	E	F
A	1					
B	0.795	1				
C	0.49	0.71	1			
D	0.617	0.73	0.657	1		
E	0.203	0.095	0.341	0.34	1	
F	0.68	0.7	0.626	0.794	0.448	1

Romania					
(obs=2030)					
	A	B	C	D	E
A	1				
B	0.91	1			
C	0.802	0.81	1		
D	0.795	0.85	0.912	1	
E	0.107	0.165	0.252	0.326	1

Slovenia					
(obs=493)					
	A	B	C	D	E
A	1				
B	0.947	1			
C	0.869	0.892	1		
D	0.869	0.871	0.946	1	
E	0.795	0.833	0.857	0.873	1

Estonia						
(obs=500)						
	A	B	C	D	E	F
A	1					
B	0.972	1				
C	0.801	1	1			
D	0.833	0.919	0.945	1		
E	0.215	0.417	0.61	0.556	1	
F	0.78	0.867	0.886	0.916	0.486	1

Hungary					
(obs=1955)					
	A	B	C	D	F
A	1				
B	0.762	1			
C	0.518	0.719	1		
D	0.606	0.777	0.691	1	
F	0.572	0.707	0.782	0.754	1

Bulgaria					
(obs=528)					
	A	C	D	E	F
A	1				
C	0.013	1			
D	0.291	-0.49	1		
E	-0.2	0.638	-0.56	1	
F	-0.27	0.669	-0.37	0.722	1

Poland						
(obs=879)						
	A	B	C	D	E	F
A	1					
B	0.917	1				
C	0.613	0.729	1			
D	0.797	0.845	0.874	1		
E	0.551	0.624	0.645	0.765	1	
F	0.765	0.837	0.819	0.926	0.744	1

Notes: Binary measure of relevance used for all countries (1—Relevant, 0—Not relevant). Slovenian sample does not include firms without minimum wage employees
A—We had to lay people off
B—We were able to hire fewer people
C—We had to increase product prices
D—We had to reduce non-labour costs
E—We had to increase the wages of other employees
F—We increased productivity
Sources: WDN3 survey, authors' estimations

Table 11 Explanatory variable definition

Name	Description	Values
Sector	Sector breakdown constructed from NACE sectors	1 'Manufacturing'
		2 'Electricity, gas, water'
		3 'Construction'
		4 'Trade'
		5 'Business services'
		6 'Financial intermediation'
		8 'Arts'
Size	Agreed size distribution	1 '5–19' 2 '20–49'
		3 '50–199' 4 '200+'
Ownership	Ownership status	= 0 'Mainly domestic'
		= 1 'Mainly foreign'
Demand	Change in level of demand for main products/ services in 2010–2013	1 = Strong decrease
		2 = Moderate decrease
		3 = Unchanged
		4 = Moderate increase
		5 = Strong increase
Access to external finance	Change in level of access to external finance in 2010–2013	1 = Strong decrease
		2 = Moderate decrease
		3 = Unchanged
		4 = Moderate increase
		5 = Strong increase
Collective agreement	Collective pay agreement outside or inside firm	= 1 if there is such agreement, = 0 otherwise
Share of minimum wage employees	Share of employees receiving the minimum wage in total number of employees before the increase in the minimum wage	= 1 if share of employees earning minimum wage is bigger than 0%;
		= 0 otherwise

Sources: WDN3 survey

Table 12 Multivariate probit of adjustment channel relevance, average marginal effects (all channels; sample restricted to Baltic countries and Poland)

	(1) Lay off	(2) Hiring	(3) Increase prices	(4) Reduce non-lab costs	(5) Increase wages	(6) Increase prod.
Share of MW employees at the firm, dummies (base: no MW employees)						
1–19%	0.093***	0.133***	0.188***	0.184***	0.153***	0.200***
	(0.016)	(0.018)	(0.021)	(0.022)	(0.023)	(0.023)
20–39%	0.145***	0.196***	0.244***	0.275***	0.257***	0.238***
	(0.021)	(0.025)	(0.033)	(0.034)	(0.037)	(0.038)
40–59%	0.158***	0.220***	0.301***	0.308***	0.196***	0.260***
	(0.023)	(0.029)	(0.038)	(0.038)	(0.042)	(0.043)
60–79%	0.164***	0.267***	0.302***	0.394***	0.247***	0.276***
	(0.024)	(0.027)	(0.039)	(0.039)	(0.043)	(0.042)
80–100%	0.146***	0.199***	0.313***	0.294***	0.137***	0.249***
	(0.019)	(0.023)	(0.029)	(0.029)	(0.035)	(0.032)
Foreign ownership	− 0.061***	− 0.086***	− 0.144***	− 0.150***	− 0.136***	− 0.125***
	(0.019)	(0.023)	(0.026)	(0.026)	(0.026)	(0.027)
Presence of collective agreement	0.010	− 0.002	− 0.015	− 0.021	0.006	0.027
	(0.022)	(0.027)	(0.033)	(0.033)	(0.034)	(0.035)
Demand level (base: strong decrease)						
- Moderate decrease	0.006	− 0.002	− 0.009	− 0.030	0.027	− 0.029
	(0.020)	(0.027)	(0.036)	(0.035)	(0.037)	(0.038)
- Unchanged	− 0.039*	− 0.013	0.003	− 0.047	0.012	− 0.041
	(0.022)	(0.028)	(0.037)	(0.036)	(0.039)	(0.039)
- Moderate increase	− 0.042**	− 0.029	− 0.010	− 0.057*	0.014	− 0.043
	(0.021)	(0.027)	(0.035)	(0.034)	(0.037)	(0.038)
- Strong increase	− 0.104***	− 0.048	− 0.015	− 0.075	0.004	− 0.080
	(0.032)	(0.038)	(0.046)	(0.047)	(0.049)	(0.049)
Access to external finance (base: strong decrease)						
- Moderate decrease	− 0.006	0.009	0.083*	0.096**	0.039	0.089*
	(0.026)	(0.035)	(0.048)	(0.047)	(0.049)	(0.053)
- Unchanged	− 0.014	− 0.016	0.006	− 0.001	− 0.051	0.026
	(0.023)	(0.030)	(0.041)	(0.041)	(0.042)	(0.045)
- Moderate increase	− 0.005	− 0.005	0.019	0.010	− 0.032	0.076
	(0.028)	(0.035)	(0.047)	(0.047)	(0.049)	(0.052)
- Strong increase	0.004	0.023	− 0.018	− 0.118	− 0.089	0.013
	(0.044)	(0.052)	(0.076)	(0.073)	(0.078)	(0.084)
Sectoral dummies (base: manufacturing)						
Electricity, gas, water	− 0.018	− 0.072	− 0.201***	− 0.191**	− 0.166*	− 0.214***
	(0.045)	(0.063)	(0.078)	(0.077)	(0.085)	(0.074)
Construction	0.014	0.016	− 0.025	− 0.023	− 0.026	− 0.019
	(0.019)	(0.023)	(0.030)	(0.031)	(0.033)	(0.033)
Trade	− 0.006	− 0.013	− 0.060**	− 0.050*	− 0.043	− 0.111***
	(0.017)	(0.021)	(0.025)	(0.027)	(0.028)	(0.028)
Business services	− 0.019	− 0.035*	− 0.069***	− 0.045*	− 0.040	− 0.099***
	(0.017)	(0.020)	(0.025)	(0.025)	(0.027)	(0.027)

Table 12 Multivariate probit of adjustment channel relevance, average marginal effects (all channels; sample restricted to Baltic countries and Poland) *(Continued)*

	(1) Lay off	(2) Hiring	(3) Increase prices	(4) Reduce non-lab costs	(5) Increase wages	(6) Increase prod.
Financial intermediation	0.022	− 0.048	− 0.189***	− 0.037	− 0.134**	− 0.120**
	(0.042)	(0.046)	(0.065)	(0.055)	(0.063)	(0.060)
Arts		− 0.026	− 0.163	− 0.185		0.106
		(0.152)	(0.211)	(0.217)		(0.327)
Firm size dummies (base < 20 employees)						
20–49 employees	− 0.026*	− 0.038**	− 0.027	− 0.028	− 0.001	− 0.025
	(0.016)	(0.019)	(0.023)	(0.024)	(0.025)	(0.025)
50–199 employees	0.011	0.003	0.004	0.017	− 0.003	0.008
	(0.016)	(0.019)	(0.025)	(0.025)	(0.027)	(0.027)
200+ employees	− 0.020	− 0.039	0.008	0.025	0.063*	0.016
	(0.025)	(0.031)	(0.037)	(0.036)	(0.038)	(0.039)
Country dummies (base: Poland)						
Latvia	− 0.020	− 0.088***	− 0.019	− 0.068**	− 0.055*	− 0.093***
	(0.016)	(0.021)	(0.027)	(0.028)	(0.028)	(0.030)
Lithuania	− 0.116***	− 0.092***	− 0.123***	− 0.127***	− 0.130***	− 0.058**
	(0.018)	(0.019)	(0.024)	(0.023)	(0.026)	(0.025)
Estonia	− 0.069***	− 0.169***	− 0.064**	− 0.164***	− 0.170***	− 0.227***
	(0.018)	(0.022)	(0.026)	(0.026)	(0.027)	(0.028)
Observations	2083	2083	2083	2083	2083	2083

Note: Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$
Dependent variable—binary measure of relevance used for all countries (1—Relevant, 0—Not relevant). For detailed description of the explanatory variables see Table 11 in the Appendix. The model is used for the calculation of the predicted probabilities in Fig. 1
Sources: WDN3 survey, authors' estimations

Table 13 Multivariate probit model of the relevance of adjustment channels, average marginal effects

Variables	(1)	(2)	(3)
	Lay off	Increase prices	Reduce non-lab costs
Share of MW employees at the firm, dummies (base: no MW employees)			
1–19%	0.110***	0.182***	0.198***
	(0.012)	(0.014)	(0.014)
20–39%	0.142***	0.269***	0.289***
	(0.014)	(0.017)	(0.017)
40–59%	0.137***	0.286***	0.338***
	(0.016)	(0.020)	(0.020)
60–79%	0.169***	0.246***	0.342***
	(0.016)	(0.020)	(0.021)
80–100%	0.181***	0.284***	0.300***
	(0.014)	(0.018)	(0.018)
Foreign ownership	− 0.031***	− 0.076***	− 0.069***
	(0.011)	(0.014)	(0.014)
Presence of collective agreement	0.026**	0.045***	0.058***
	(0.011)	(0.015)	(0.014)
Demand level (base: strong decrease)			
- Moderate decrease	− 0.021	0.027	− 0.014
	(0.015)	(0.022)	(0.021)
- Unchanged	− 0.074***	− 0.033	− 0.116***
	(0.016)	(0.022)	(0.022)
- Moderate increase	− 0.095***	0.002	− 0.090***
	(0.016)	(0.023)	(0.022)
- Strong increase	− 0.170***	− 0.030	− 0.151***
	(0.029)	(0.033)	(0.034)
Access to external finance (base: strong decrease)			
- Moderate decrease	− 0.032*	0.059**	0.022
	(0.019)	(0.028)	(0.027)
- Unchanged	− 0.090***	− 0.026	− 0.071***
	(0.018)	(0.026)	(0.025)
- Moderate increase	− 0.066***	0.026	− 0.041
	(0.022)	(0.030)	(0.029)
- Strong increase	0.008	− 0.003	− 0.047
	(0.037)	(0.050)	(0.051)
Sectoral dummies (base: manufacturing)			
Electricity, gas, water	− 0.073	− 0.233***	− 0.198***
	(0.060)	(0.080)	(0.067)
Construction	0.008	− 0.023	− 0.009
	(0.014)	(0.019)	(0.019)
Trade	− 0.024**	− 0.045***	− 0.004
	(0.012)	(0.015)	(0.015)
Business services	− 0.031***	− 0.052***	− 0.037***
	(0.011)	(0.014)	(0.014)

Table 13 Multivariate probit model of the relevance of adjustment channels, average marginal effects *(Continued)*

Variables	(1)	(2)	(3)
	Lay off	Increase prices	Reduce non-lab costs
Financial intermediation	− 0.009	− 0.197***	− 0.045
	(0.038)	(0.048)	(0.041)
Arts	− 0.061*	0.050	− 0.014
	(0.036)	(0.052)	(0.073)
Firm size dummies (base < 20 employees)			
20–49 employees	0.009	− 0.016	− 0.005
	(0.014)	(0.018)	(0.017)
50–199 employees	0.007	− 0.024	0.001
	(0.014)	(0.018)	(0.018)
200+ employees	0.018	− 0.025	0.014
	(0.016)	(0.021)	(0.021)
Country dummies (base: Poland)			
Latvia	− 0.016	0.011	− 0.050*
	(0.022)	(0.029)	(0.028)
Lithuania	− 0.177***	− 0.155***	− 0.155***
	(0.026)	(0.027)	(0.026)
Estonia	− 0.097***	− 0.093***	− 0.197***
	(0.025)	(0.029)	(0.029)
Hungary	− 0.055***	0.053**	− 0.087***
	(0.015)	(0.021)	(0.020)
Bulgaria	0.064***	− 0.046	− 0.411***
	(0.020)	(0.029)	(0.033)
Slovenia	− 0.182***	− 0.319***	− 0.036
	(0.024)	(0.031)	(0.027)
Romania	0.032*	0.121***	0.087***
	(0.017)	(0.023)	(0.022)
Observations	7010	7010	7010

Note: Standard errors in parentheses. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Dependent variable—binary measure of relevance used for all countries (1—Relevant, 0—Not relevant). For detailed variable description see Table 11 in the Appendix
The model is used for the calculation of the predicted probabilities in Fig. 1. Sources: WDN3 survey, authors' estimations

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Author details
[1]Magyar Nemzeti Bank and European Central Bank, Budapest, Hungary. [2]Latvijas Banka, Riga, Latvia. [3]Banca Națională a României, Bucharest, Romania. [4]Eesti Pank, Tallin, Estonia. [5]Bulgarian National Bank, Sofia, Bulgaria. [6]Lietuvos Bankas, Vilnius, Lithuania. [7]Institute of Macroeconomic Analysis and Development of the Republic of Slovenia, Ljubljana, Slovenia. [8]Národná banka Slovenska, Bratislava, Slovakia. [9]Narodowy Bank Polski, Warsaw, Poland.

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Appendix 3

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Wealth disparities between elderly immigrants and natives: a study of Estonia and Latvia

Liina Rebane [a,b], Merike Kukk[a,b] and Tairi Rõõm[a,b]

[a]Department of Economics and Finance, Tallinn University of Technology, Tallinn, Estonia; [b]Economics and Research Department, Bank of Estonia, Tallinn, Estonia

ABSTRACT

This study investigates wealth disparities between native and immigrant populations in Estonia and Latvia, focusing on individuals aged 60 years or older as the vast majority of immigrants in the Baltic region fall within this age group. We estimate the wealth differences between natives and immigrants across the wealth distribution and decompose the raw gap into its explained and unexplained parts. Our estimations show that the gaps in mean net wealth are of similar magnitude in Estonia and Latvia among the people aged 60 or older, with natives being on average about 40% wealthier than immigrants in both countries. Wealth disparities widen at the upper tail of the net wealth distribution. Although the factors contributing to the wealth gap are largely similar in both countries, some differences emerge. In Estonia, self-employment business assets and inheritances play a significant role, whereas in Latvia, additional real estate ownership contributes to the disparity.

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1. Introduction

Increasing global migration flows have initiated debates on the socioeconomic integration of immigrants and their standing within societies. A wealth of literature exists that studies various labour market outcomes of immigrants, such as their employment prospects or incomes compared to native-born individuals. A less explored yet very relevant indicator for understanding the well-being of immigrants is wealth. Given that wealth disparities tend to be more pronounced than income disparities, solely concentrating on incomes will result in the underestimation of the differences in economic well-being between natives and immigrants (Mathä et al., 2011). Analysing the wealth gaps between these two demographic groups is key to understanding the level of integration of immigrants into the local community.

This paper assesses the native-immigrant wealth gap in two Baltic countries, Estonia and Latvia, and examines the factors that might contribute to this gap. Estonia and

CONTACT Liina Rebane liinarebane1@gmail.com Bank of Estonia, Estonia pst 13, 15095 Tallinn, Estonia
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Latvia present a unique case study due to their substantial elderly foreign-born populations, predominantly Eastern Slavs who migrated during the Soviet era. This demographic context differs significantly from that of other countries typically studied in this field, making Estonia and Latvia particularly interesting cases for examining the native-immigrant wealth gap. Accordingly, this paper contributes to the ongoing discussions on migration and nativity wealth gaps by presenting a distinctive narrative shaped by the historical context of these countries. In this analysis, we define immigrants as individuals not born in the country in which they reside, focusing specifically on first-generation immigrants.[1] The data from the 2017 wave of the Household Finance and Consumption Survey are used for the analysis.

Immigrants typically move to destination countries from poorer regions and are only able to start accumulating wealth after they have arrived. They also tend to be less educated and face worse employment opportunities, and consequently tend to earn lower incomes than natives do (e.g. Dostie et al., 2023; Hofer et al., 2017; Tomaskovic-Devey et al., 2015). Since the value of wealth depends on the stream of savings over a lifetime and those savings are dependent on income, immigrants are typically less wealthy than natives are, and the gaps in wealth tend to be substantially wider than those in incomes (e.g. Cobb-Clark & Hildebrand, 2006; Mathä et al., 2011; Bauer et al., 2011). However, the typical drivers of native-immigrant income and wealth gaps identified in earlier literature largely do not apply to Estonia and Latvia, as we will discuss below. This makes these two Baltic countries an interesting case study.

The majority of immigrants in Estonia and Latvia are Eastern Slavs, including Russians, Belarusians, and Ukrainians, who resettled in these countries during the Soviet occupation. The most significant immigration wave occurred in the 1950s, with substantial inflows continuing in the following decades until Estonia and Latvia regained their independence in 1991. The local population has a different ethnic background, consisting mostly of Latvians in Latvia and Estonians in Estonia. The migrant flows reversed in the 1990s and many migrants returned to their former homelands (Robertson, 1996). A substantial share remained however, and the proportion of foreign-born population is currently 15% in Estonia and 13% in Latvia. Estonia and Latvia stand out from other European countries by the demographic composition of their immigrant populations, with a predominant majority being elderly individuals aged 60 or above. This contrasts with the more diverse age profiles typically seen in immigrant populations across the rest of Europe.

Given the age concentration, we focus on the population aged 60 and over to make the subgroups of immigrants and natives more comparable. We analyse the wealth disparities between these two demographic groups, focusing on individuals who are predominantly retired and have reached a stage in life where they have ceased accumulating wealth and are dissaving instead (in line with the life cycle theory of asset accumulation, as outlined by Modigliani in 1966). The pension replacement rates are low in Estonia and Latvia relative to those in other developed countries (OECD, 2023), and so accumulated wealth is important for economic welfare in this segment.

It is also relevant for our study that these individuals spent a significant portion of their working-age years at the time of the Soviet occupation. During this period, as Latvia and Estonia were not independent nations but de facto part of the Soviet Union, Russian-speaking immigrants constituted the ethnic majority and often had better employment

prospects in the labour market compared to native residents (Leping & Toomet, 2008). However, their advantages in the labour market disappeared after the political and economic system changed and since the beginning of the current century the ethnic wage gaps have consistently been in favour of natives in both Estonia and Latvia (Borman et al., 2019; Hazans, 2007; Leping & Toomet, 2008; Vilerts & Krasnopjorovs, 2017).

As the ownership of property (such as real estate and business assets) was largely prohibited during the Soviet era, with only limited exceptions, it is not readily apparent that either native-born or foreign-born individuals held a wealth advantage at the outset of the transition period in the 1990s. Most families had the opportunity to privatise their dwellings, leading to some dispersion in wealth. However, this dispersion was limited, as real estate prices were relatively uniform across Estonia and Latvia at the start of the 1990s. Residents living in houses that were reclaimed by their previous owners from before the Soviet era or their heirs were unable to privatise their dwellings. This predominantly impacted the native population, who were more likely to reside in such properties, thus providing immigrants with a wealth advantage (Kährik, 2002). On the other hand, natives were able to reclaim property through the restitution of assets that were nationalised during the Soviet period, thereby gaining an advantage in wealth.

After regaining independence, both Estonia and Latvia faced the immediate challenge of high and rising inflation. In Estonia, annual inflation exceeded 200 percent in 1991 and surged to nearly 1,100 percent by 1992 (Staehr, 2004). In Latvia, it surpassed 900 percent in 1992 (Bitāns & Purviņš, 2012). Consequently, any financial wealth accumulated before the collapse of the Soviet Union became almost worthless due to this hyperinflation. Estonia introduced its own currency, the kroon, which was put into circulation on 20 June 1992 (Laar, 2002). Since each permanent resident of Estonia could exchange up to 1,500 roubles worth of cash at an exchange rate of 10:1, allowing them only 150 kroons (Lepik, 2014), this policy further equalized the level of financial wealth across the population.[2]

The upshot is that the foreign-born and native populations aged 60 and over exhibit greater similarity in Estonia and Latvia compared to other European countries. Only minor discrepancies exist in their employment history, current labour market standing, and current income level. Additionally, immigrants in this age bracket are, on average, more educated than their native counterparts. However, despite all this, our estimations show that natives tend to be wealthier than immigrants. In Estonia, the native-immigrant wealth gaps at the 50th, 75th and 95th percentiles of net wealth stand at 30%, 37%, and 74%, respectively. In Latvia, while the gap is not statistically significant at the median level, it reaches 35% at the 90th percentile and 55% at the 95th percentile. On average, natives in the population aged 60 and over are approximately 40% wealthier than immigrants in both countries.

The asset accumulation function that is defined in the next section shows that the disparities in net wealth can stem from differences in incomes, saving behaviour, the structure of assets, or inherited property. Using this framework, we explore what factors contribute to the immigrant-native wealth gap in Estonia and Latvia. We apply the method of unconditional quantile regressions based on a recentered influence function developed by Firpo et al. (2009) to estimate the wealth differences between natives and first-generation immigrants across the wealth distribution. Thereafter we use the Oaxaca-Blinder decomposition to decompose the raw gap into its explained and unexplained parts.

We observe that the factors contributing to the wealth gap are largely similar across our two sample countries. For instance, disparities in home values favouring natives and intra-city segregation, where natives reside in more affluent areas, contribute equally to the wealth gap in both countries. However, our estimations also reveal some differences. In Estonia, self-employment business assets and inheritances play a role, whereas in Latvia, additional real estate ownership beyond primary residence contributes to the disparity.

The paper is structured as follows. In the second section we review the related literature. The third section discusses the history of migration in the Baltic states and describes the profile of migrants in Estonia and Latvia. The fourth section gives an overview of the data employed in the analysis. The fifth section explains the methodology of the empirical analysis and the sixth section presents the results. In the final section we provide the discussion and conclusions.

2. Differences in wealth accumulation between natives and immigrants: literature review

The accumulation of wealth at the household level relies on three main components. Firstly, returns on previously accumulated assets contribute to the growth of current wealth. This is contingent upon the asset structure, as returns vary across different asset types. Secondly, wealth is augmented through additional savings, influenced by income levels and saving rates. Thirdly, household wealth expands when inheritances or gifts are acquired.

We can express wealth accumulation as:

$$W_{h,t} = \sum_{a=1}^{n} (1 + r_{h,a,t}) w_{h,a,t-1} + S_{h,t} + H_{h,t} \quad (1)$$

where $W_{h,t}$ is the net wealth of household h in period t, $W_{h,a,t-1}$ is the accumulated value of a particular asset type a at the end of the previous period, and a household may hold n types of assets. The term $r_{h,a,t}$ captures the return of a particular asset in period t, $S_{h,t}$ are the savings of the household, i.e. the difference between disposable income and consumption, and $H_{h,t}$ denotes gifts and inheritances received in period t.

The differences in accumulated wealth between natives and immigrants may be caused by any of these three components. Most of the earlier empirical evidence shows that natives have more wealth than immigrants (e.g. Cobb-Clark & Hildebrand, 2006; Mathä et al., 2011). Based on the wealth function described above, these gaps can stem from differences in incomes, saving behaviour, the structure of assets, or the likelihood of inheriting property. In the following discussion, we review the earlier literature that has examined the various factors contributing to the prevailing wealth gaps between natives and immigrants.

Several studies have found differences between natives and immigrants in the structure of assets that cannot be fully explained by observed socio-economic factors. It has been shown for example that natives have a higher homeownership rate (Borjas, 2002; Gobillon & Solignac, 2020; Kauppinen et al., 2015), are more likely to own shares, and have more diversified portfolios of financial assets (Bertocchi et al., 2023; Sinning, 2007). All of this contributes to a higher level of wealth. Homeowners are on average

considerably wealthier than renters (e.g. Meriküll & Rõõm, 2016, 2019). Stock market investments and portfolio diversification yield higher returns on assets in the long run, contributing to wealth increases (e.g. Pawasutipaisit & Townsend, 2011). Gaps in favour of natives have also been found in mortgage holdings (Bertocchi et al., 2023), as well as in interest rates paid on mortgages (Diaz-Serrano & Raya, 2014).

There is ample empirical evidence of unexplained differences in income in favour of natives over immigrants (see among others Dostie et al., 2023; Hofer et al., 2017; Tomaskovic-Devey et al., 2015). However, the few studies that have investigated the differences in saving behaviour have not found gaps between the saving rates (Bauer & Sinning, 2011). It is usually observed that immigrant households are substantially less likely to receive inheritances (they typically do not receive them at all), and this is an important reason why their level of wealth is lower (Bhutta et al., 2020; McKernan et al., 2014).

Several papers have found that the financial choices depend on the institutional and cultural background of the immigrant's country of origin and the institutional barriers in the host country (Osili & Paulson, 2004, 2008). The duration of residing in the destination country is also relevant; it matters for two reasons. Firstly, the longer immigrants live in the destination country, the more they assimilate into the local culture, and assimilation reduces the differences between natives and immigrants in financial behaviour and labour market outcomes (Kushnirovich, 2016; Maroto & Aylsworth, 2016; Muckenhuber et al., 2022). Secondly, immigrants usually start to accumulate wealth only after they have arrived in the destination country, especially when they arrive from low-income countries, while natives have typically been able to save and to accumulate wealth for longer.

The outcome of the above-described differences between the two groups in their wealth structure and wealth accumulation is that natives generally tend to be richer than immigrants. The studies that investigate the nativity wealth gap confirm that this is indeed the case. For example, it has been found in the USA that immigrants on average accumulate less wealth than comparable natives. The study by Cobb-Clark and Hildebrand (2006) for example shows that the median level of wealth of US-born couples is 2.5 times the median for foreign-born couples, while the median level of wealth of US-born singles is three times that of foreign-born singles.

Studies in Europe also provide evidence for immigrant households being less wealthy than native households. Bauer et al. (2011) show that immigrant households at the median of the wealth distribution in Germany are 90% less wealthy than native-born households, and Muckenhuber et al. (2022) show that immigrants in Austria also have less wealth than natives as the gap in net wealth at the median is 73%.

Bauer et al. (2011) show that wealth differentials can be attributed to differences in the educational attainment and demographic characteristics of the native and immigrant populations, while Dossche et al. (2022) find that only a small fraction of differences between natives and immigrants, approximately 30%, can be explained by differences in demographic variables. They find that the wages earned by immigrants in Germany, Italy, Spain and France are on average about 30% lower than those of natives, and the net wealth of immigrants is roughly 60% less.

There are two studies that focus on the nativity wealth gap among older households in Europe, and both use data from the SHARE (Survey of Health, Ageing and Retirement in Europe). Ferrari (2020) employs four waves of the SHARE covering the period from 2007 to

2015 for 17 European countries, and finds that the immigrant households in the upper part of the wealth distribution are better off than comparable native households, while those in the lower part of the wealth distribution are worse off. The reasoning behind this finding is that immigrant households in the upper part of the wealth distribution migrated in most cases from the richer European countries, have higher incomes, are better educated and healthier, and come from more affluent families. Semyonov and Lewin-Epstein (2022) utilise SHARE data from three waves (2013, 2015 and 2017) across ten European countries and show that the mean wealth accumulated by immigrants is 16% lower than the wealth holdings of native-born households. Furthermore, they show that the nativity wealth gap is the most pronounced for non-European immigrants at 41%. In contrast, the gap is narrowest for immigrants originating from Western, Central, and South European countries, at 5%. Conversely, for immigrants from post-communist nations, the wealth gap stands at 22%. Consequently, these two studies illustrate that the existence of a wealth gap is contingent upon the characteristics of immigrants, which can vary significantly across countries.

3. Migration to the Baltic states

The Baltic states, especially Estonia and Latvia, stand out due to their immigrant profile, which differs significantly from that of other European countries. The majority of immigrants in these nations are Eastern Slavs, including Russians, Belarusians, and Ukrainians, who relocated during the Soviet occupation, with the largest influx occurring in the 1950s. Estonia and Latvia faced substantial population losses during the Second World War, with approximately one-fifth of their populations affected, among the highest proportions in Europe (Parming, 1980). The onset of the Soviet occupation prompted mass migration of industrial workers from other parts of the Soviet Union to the Baltic countries, notably Estonia and Latvia (Harris, 1993; Katus et al., 2002). Unlike Estonia and Latvia, Lithuania did not experience as significant population losses during the war, resulting in less acute labour shortages and immigration needs (Hiden & Salmon, 1995). By the late 1980s, only slightly more than half of the Latvian population and just over 60% of the Estonian population were natives (Zvidrinš, 1994).

After the Baltic countries regained their independence at the beginning of the 1990s, the migrant flows reversed as many migrants returned to their former homelands (Hazans, 2019; Robertson, 1996). However, a substantial share of the immigrants remained shaping the situation 25 years after the end of the Soviet era. According to Eurostat data on the share of the foreign-born population in European countries in 2017, Lithuania, with its 4% share, ranks among the countries with the lowest proportion of immigrants in their population (Figure 1). In contrast, Latvia has 13% of its population born outside the country, while Estonia has a slightly higher share at 15%. When examining the origin of immigrants, Estonia and Latvia stand out as the countries with the largest proportions of immigrants from non-EU countries, with 13.1% and 11.5% respectively.

Age, alongside country of origin, is another defining characteristic of the immigrant population, Estonia and Latvia being again the most distinctive among EU countries. While in most EU nations the share of immigrants in the population aged 65 and over is less than 14%, in Latvia and Estonia it is around 30% (Figure A1 in the Appendix). Moreover, in Latvia 92% of immigrants aged 65 and over originate from non-EU countries and

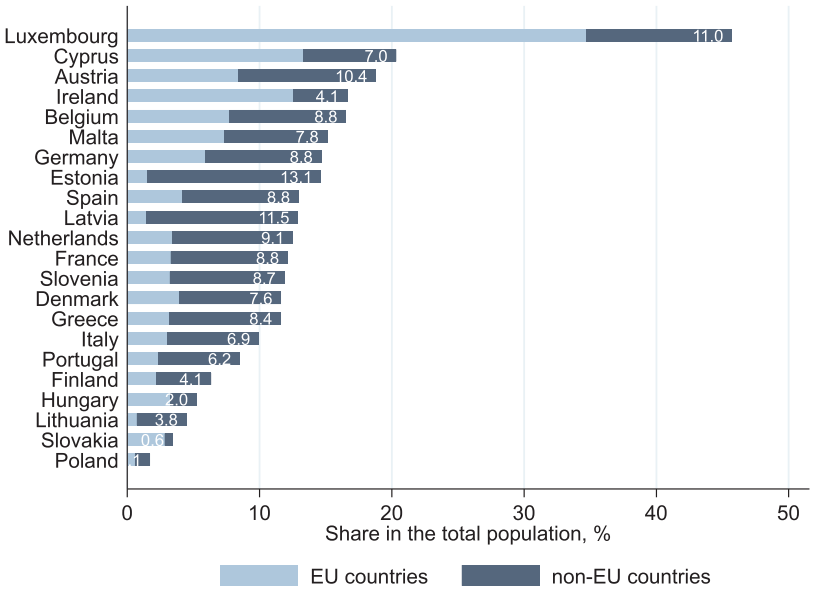

Figure 1. Share of immigrants in the population in 2017 (total, from EU countries and from non-EU countries). Source: Authors' calculations from Eurostat.

Notes: Immigrants are defined as people born in a country different from the one where they reside.

the figure is 96% in Estonia (Figure A2). This highlights that Latvia and Estonia are distinguished by their substantial proportion of immigrants among the older population originating from non-EU countries.

In the subsequent analysis, our focus is on immigrants aged 60 years and over, as this group represents a relatively homogeneous cohort of immigrants that arrived in Estonia and Latvia for employment during the Soviet period. Both native and immigrant populations started at similarly low levels of wealth at the outset of the 1990s. The disparities in wealth within the population aged 60 and over by the end of the 2010s consequently emerged over the preceding 25 years.

4. Data and descriptive statistics

This paper uses data from the 2017 wave of the Household Finance and Consumption Survey (HFCS) in Estonia and Latvia. The HFCS is a harmonised survey coordinated by the European Central Bank and conducted by the national central banks in the EU. The main aim of the HFCS is to provide information on households' wealth by collecting detailed data on their assets and liabilities. Besides various components of net wealth, the survey also covers households' incomes, consumption and demographic characteristics. With harmonized data collection procedures, the survey enables the implementation of similar analyses across multiple countries, yielding comparable results.

The data are obtained from household interviews and complemented with register data. The reliance on registers is more prevalent in Estonia, where the data on most of the wealth components are collected from administrative sources (Meriküll & Rõõm, 2016, 2019). Since Latvia began using administrative data sources for data collection for the HFCS only from

the 2020 wave onward, the earlier Latvian data from the 2017 wave may suffer from under-reporting of financial assets. Additionally, the self-employment data in the 2017 Latvian wave are incomplete. As self-reported liabilities might also be under-reported, particularly the smaller ones, the measurement error of net wealth could introduce either an upward or downward bias. Consequently, it is unclear whether there are systemic differences in reporting between natives and immigrants. Missing observations are imputed by the data providers using multiple imputation techniques. More detailed information about the survey methodology can be found on the ECB's HFCS website.[3]

The following analysis uses five sets of implicates created by multiple imputation. We apply survey weights, so the results are generalisable to the whole elderly population of Estonia and Latvia. The wealth components in the HFCS are mostly collected at the household level, therefore the unit of observation in this study is the household, while the reference person's records are used for individual-level characteristics (age, education etc.). The reference person is defined using the Canberra definition, and is typically the highest income earner.

We follow the standard definition that immigrants are people who were born in a country other than the one where they reside at the time of the survey. However, we use household-level data for the analysis and since households can have multiple members, immigrant status can be assigned to a household in different ways. The broadest definition is to assign immigrant status to all households where at least one member is an immigrant. A slightly narrower definition considers immigrant households to be only those where the reference person or their partner is an immigrant. The strictest definition for an immigrant household assigns this status only when all household members are immigrants.

On the one hand, the strictest definition constrains the sample substantially and on the other hand, assigning immigrant status to households on the basis of the immigration status of members who do not make financial decisions could be misleading. Given that the reference person is usually the main earner in the household and so presumably has an important role in making financial decisions, the following analysis defines the household as having immigrant status when its reference person is an immigrant. Using this definition, immigrant households make up around 24-25% of the population aged 60 and over and around three quarters of immigrant households have a reference person who is the only immigrant in the household (Table A1 in the Appendix).

The analysis focuses on net wealth, calculated as the sum of real and financial assets, minus liabilities. Real assets include the home and any secondary property, self-employment business assets, vehicles and valuables, while financial assets cover deposits, bonds, stocks, investment funds, voluntary pension funds and other financial assets. Liabilities encompass both collateralised and non-collateralised loans. The components of net wealth are measured at the household level, but for the sake of comparability the household-level asset and liability items and the value of net wealth are divided by the number of adult household members.

Table 1 presents the descriptive statistics of the households in Estonia and Latvia, differentiating between the subgroups of native and immigrant households. Comparing native and immigrant households in the total population in Estonia and Latvia indicates that there are significant differences in many characteristics such as average age, time in employment, income, labour market status, type of household, ownership of the home or any other real estate property, and having received any substantial gift or inheritance.

Table 1. Selected household characteristics in Estonia and Latvia: differences between the subgroups of natives and immigrants.

	ESTONIA						LATVIA					
	All households			60 + households			All households			60 + households		
	Native households	Immigrant households	Gap	Native households	Immigrant households	Gap	Native households	Immigrant households	Gap	Native households	Immigrant households	Gap
Reference person's …												
… age	50.7	63.9	0.260***	71.8	72.5	0.010	53.5	63.5	0.186***	72.0	71.7	−0.005
… time in employment	24.2	32.4	0.338***	38.2	37.0	−0.031	26.3	34.6	0.314***	37.8	39.5	0.045
… yearly income	12724	9260	−0.272***	7446	7324	−0.016	7488	6651	−0.112	5175	5385	0.041
Education of the reference person												
Up to lower secondary	14.3%	15.1%	0.051	23.4%	18.1%	−0.224	15.5%	13.9%	−0.100	25.9%	15.5%	−0.400*
Upper secondary	49.3%	43.0%	−0.127*	47.9%	42.0%	−0.124	50.9%	55.4%	0.089	50.9%	53.4%	0.049
Tertiary	36.4%	41.9%	0.152	28.7%	39.9%	0.389**	33.6%	30.6%	−0.088	23.3%	31.1%	0.338
Labour market status of the reference person												
Employee	56.3%	38.7%	−0.314***	17.1%	16.3%	−0.048	52.4%	44.2%	−0.155	16.4%	16.6%	0.013
Self-employed	4.7%	2.2%	−0.526***	…	…	…	7.7%	1.2%	−0.851***	…	…	…
Unemployed	4.4%	4.3%	−0.037	…	…	…	4.7%	1.5%	−0.681**	…	…	…
Inactive	34.5%	54.8%	0.587***	80.8%	82.0%	0.014	35.2%	53.1%	0.507***	81.0%	81.2%	0.003
Household type												
Single adult	42.5%	50.5%	0.189**	57.0%	55.3%	−0.030	40.7%	42.1%	0.034	56.8%	53.7%	−0.055
Two adults	46.3%	37.6%	−0.187***	36.7%	35.2%	−0.041	46.5%	47.5%	0.020	32.8%	44.5%	0.358*
Three or more adults	11.2%	11.8%	0.057	6.3%	9.5%	0.513	12.8%	10.5%	−0.180	10.4%	1.8%	−0.829***
With children	30.8%	11.6%	−0.622***	…	…	…	34.0%	19.4%	−0.428***	7.0%	5.4%	−0.223
Households owning …												
… HMR	73.8%	82.9%	0.123***	79.2%	83.8%	0.058	72.1%	75.4%	0.046	75.4%	73.7%	−0.022
… other real estate property	33.0%	30.4%	−0.078	26.0%	26.0%	0.001	38.4%	26.6%	−0.306***	32.6%	21.1%	−0.352**
… self-employment business wealth	13.5%	3.9%	−0.713***	4.7%	2.0%	−0.567**	11.4%	3.7%	−0.671***	5.4%	3.1%	−0.424
Households that received …												
… a substantial gift or inheritance	25.3%	14.3%	−0.434***	26.7%	13.8%	−0.483***	12.0%	5.0%	−0.582***	10.0%	3.8%	−0.620**
… a dwelling as a gift or inheritance	16.4%	8.9%	−0.458***	16.8%	8.3%	−0.508***	8.9%	4.0%	−0.548**	6.8%	3.7%	−0.461
Households living in …												

(*Continued*)

Table 1. Continued.

	ESTONIA						LATVIA					
	All households			60 + households			All households			60 + households		
	Native households	Immigrant households	Gap	Native households	Immigrant households	Gap	Native households	Immigrant households	Gap	Native households	Immigrant households	Gap
… Harjumaa	42.90%	46.90%	0.094	37.0%	48.4%	0.309**	N/A	N/A	N/A	N/A	N/A	N/A
… Riga	N/A	N/A	N/A	N/A	N/A	N/A	33.0%	50.50%	0.530***	29.8%	56.3%	0.886***
… eight other big towns in Latvia	N/A	N/A	N/A	N/A	N/A	N/A	19.4%	22.40%	0.156	21.2%	21.9%	0.032
Moved to Estonia/Latvia before 1991	*N/A*	90.8%	N/A	*N/A*	96.8%	*N/A*	*N/A*	92.7%	*N/A*	*N/A*	98.6%	*N/A*
Country of birth other than EU	*N/A*	94.9%	N/A	*N/A*	95.5%	*N/A*	*N/A*	93.5%	*N/A*	*N/A*	92.0%	*N/A*
Mean value of household's …												
… net wealth	66.7	42.8	−0.358***	61.5	43.9	−0.286***	26.1	19.3	−0.263**	24.60	17.4	−0.289*
… real assets	74.4	42.7	−0.426***	59.4	41.1	−0.308*	32.6	24.2	−0.253**	29.10	22.4	−0.228
… financial assets	8.5	7.0	−0.169	11.2	8.7	−0.220	1.9	1.0	−0.503*	2.10	0.9	−0.579
Observations	*2267*	*378*		*698*	*229*		*1065*	*181*		*412*	*121*	

Notes: The table shows either the share of households with a given characteristic or the mean value of a given variable. The gaps are estimated by subtracting the mean (share) for natives from that for immigrants and dividing it by mean (share) for natives. 60 + households are defined as households with a reference person who is at least 60 years old. Immigrant households are defined as households with a reference person born in a country different from the one where they reside at the time of the survey. The mean values of net wealth, real and financial assets are shown in thousands of EUR per adult household member. Gaps are calculated for the mean values. *, **, *** indicate statistical significance at the 10%, 5% and 1% level.

Source: Authors' calculations from the Estonian and Latvian HFCS.

However, most of these differences disappear in the population of people aged 60 and over. This table demonstrates that the contrast between the profiles of immigrants and natives is primarily attributed to age differences. Consequently, focusing on the population aged 60 and over proves useful for better aligning the groups of natives and immigrants when comparing their wealth.

Although most of the differences in household characteristics are statistically insignificant for the population aged over 60, some relevant differences remain. Firstly, immigrants in this age group are more educated than natives and this holds for both Latvia, where the share of people with education up to lower secondary is smaller among immigrants, and Estonia, where the share of people with higher education is larger among immigrants.[4] Secondly, immigrant households are less likely to have inherited property. Thirdly, there are differences in the ownership rates of some net wealth components, as immigrant households are less likely to own other real estate property besides the household main residence (HMR) in Latvia or to own business assets in Estonia. A fourth difference is that immigrant households are more likely to live in the capital region (Riga for Latvia, Harjumaa for Estonia).

As shown in the last section of Table 1, native households, on average, own considerably more wealth than immigrant households, and the gaps are of similar magnitude in Estonia and Latvia. The gap in mean net wealth for the total population is 36% in Estonia and 26% in Latvia, whereas for the population aged over 60, it is about 29% in both countries. The gaps in real assets resemble those for total net wealth, although for the 60 + population, the real asset gap is insignificant in Latvia. The gaps in financial assets are mostly insignificant.

The composition of assets changes across the wealth distribution for households aged 60 and over (Figure 2). In the lowest decile, households mainly own deposits, while from the second decile onward, the importance of real estate begins to grow, eventually constituting the largest share of assets for the upper deciles, starting from the fourth decile. It is evident that for home-owners real estate holdings constitute the largest share of total assets. The importance of real estate is fairly similar for natives and immigrants in both Estonia and Latvia. In the wealthiest decile of 60 + households, the share of self-employment businesses is larger for natives.[5] In Estonia, this share is 17% for natives and 14.5% for immigrants. The difference in Latvia is much more substantial, as the share for natives is 8%, whereas for immigrants it is only marginal.[6] In the same decile, the share of stocks in total assets is 6.5% in immigrant households, while it is 3% in native households in Estonia.

Figure 3 shows that across the net wealth distribution, the wealth gaps in the population aged 60 and over are similar to those in the total population. The raw gap in net wealth is increasing over the distribution: it becomes significant at the centre of the distribution, and at the upper end, the net wealth of immigrants is only half of the wealth of natives. It appears that the gaps are somewhat wider in Estonia than in Latvia. The distributions of real assets have very similar patterns in Estonia and Latvia, as do the distributions of net wealth, and also the gaps between native and immigrant households (Figure B1 in Online Appendix). This is to be expected, given that most of the assets of households are held in the form of real assets, especially at the lower end of the wealth distribution. As the share of financial assets in total assets grows towards the right tail of the wealth distribution, the gaps in financial assets between native and immigrant households become considerable only at the upper end of it (Figure B2). The gaps in financial assets are larger in relative terms in Latvia than in Estonia.

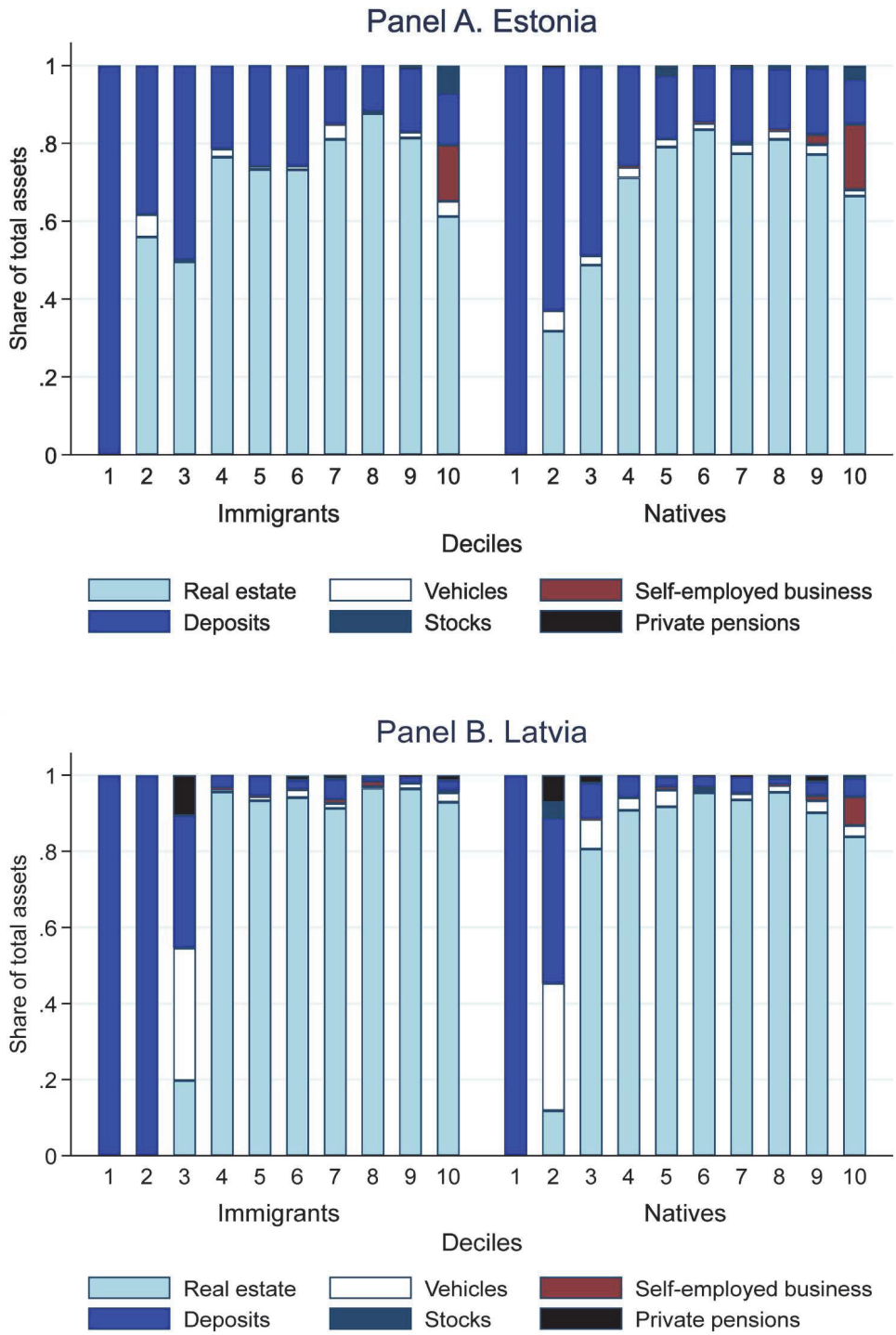

Figure 2. The shares of different types of assets and average values for deciles of total assets in the households with a reference person aged at least 60 in Estonia (EE) and in Latvia (LV). Source: Authors' calculations from the Estonian and Latvian HFCS.

Notes: Immigrant households are defined as households with a reference person born in a country different from the one where they reside at the time of the survey. 60 + households are defined as households with a reference person who is at least 60 years old. Wealth items are calculated at the household level.

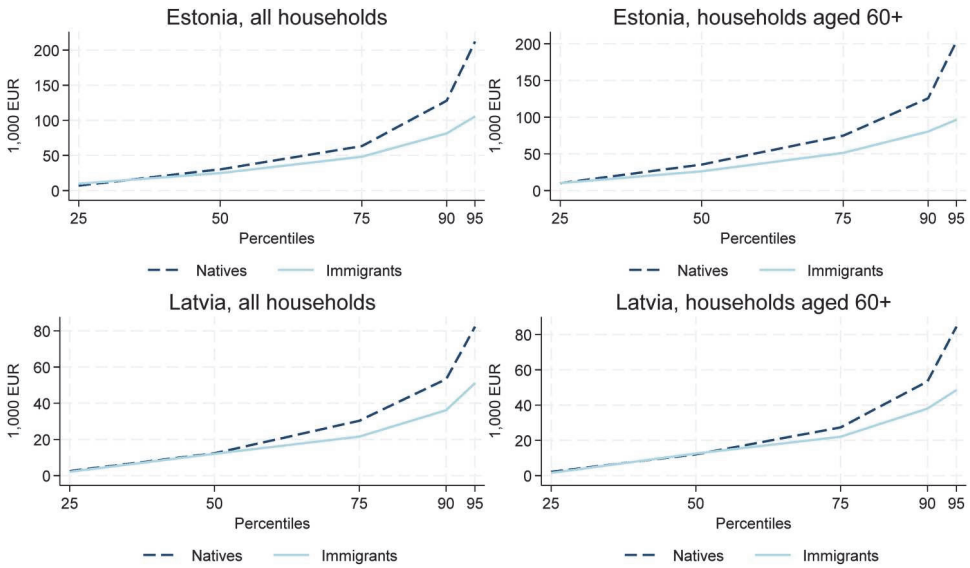

Figure 3. Households' net wealth distribution by immigration status, in Estonia (EE) and in Latvia (LV). Source: Authors' calculations from the Estonian and Latvian HFCS.

Notes: Net wealth is calculated per number of adult household members and is presented in thousands of euros. 60 + households are defined as households with a reference person who is at least 60 years old. Immigrant households are defined as households with a reference person born in a country other than the one where they reside at the time of the survey. Distributions are calculated for each group separately.

To summarise, the descriptive statistics show that the profile of immigrants in the age group 60 and over is quite similar to that of natives in both Estonia and Latvia, with only a few dissimilarities. However, the differences in wealth levels between native and immigrant households in the older population are similar to those in the total population. That makes the groups of natives and immigrants aged 60 + useful comparison groups for studying the differences in wealth. Given that the starting point of wealth accumulation for these two groups was similar in the beginning of the 1990s, we ask what explains the different outcomes for the two groups after more than 25 years of wealth accumulation since independence was regained. The following analysis focuses only on native and immigrant households with a reference person aged 60 and over.

5. Methods

To study the wealth differences between native and immigrant households across the wealth distribution, we use the unconditional quantile regression method of Firpo et al. (2009). The method has been applied extensively in estimations of gender wealth gaps (Cordova et al., 2022; Kaas et al., 2019; Kukk et al., 2023; Meriküll et al., 2021), and also for racial and migrant wealth gaps; see Muckenhuber et al. (2022) and Petach and Tavani (2021) among others.

We estimate a recentered influence function (*RIF*) that shows how a small local change in the distribution of explanatory variables influences unconditional net wealth. In the *RIF*, the dependent variable, net wealth, is first transformed into the probability of being in a

given quantile, then re-weighting is used to make the transformed net wealth equal to the value of the quantile. After these steps, an Ordinary Least Squares (OLS) regression is computed, with the *RIF* as the dependent variable, for natives and immigrants separately:

$$RIF(W_h;\ Q_\tau) = \alpha_\tau^0 + \sum\nolimits_{k=1}^{K} \alpha_\tau^k x_{h,\tau}^k + \varepsilon_{h,\tau} \tag{2}$$

where W_h is the net wealth of household h at the τ^{th} quantile denoted by Q_τ; x^kcontains a set of k explanatory variables; and α_τ^k captures the partial effects of explanatory variables on the τ^{th} quantile of net wealth, while α_τ^0 is a constant and $\varepsilon_{h,\tau}$ is an error term.

The set X of explanatory variables, $k = 1, \ldots K$, covers[7]:

- A dummy for the immigrant status defined by the country of birth;
- Age and age squared;
- Labour market status: A dummy for being active covering employees, the self-employed and the unemployed;
- Total personal income during the past calendar year and its squared term;
- Labour market experience in years and its squared term;
- Education level: A dummy for having tertiary level education;
- Household characteristics: Categorical variables for the number of adults in an household (one, two or more), and a dummy for being a household with children;
- Ownership of assets: A set of four dummy variables for (a) owning the HMR; (b) owning other real estate property; (c) owning self-employment business wealth; (d) having received a gift or inheritance;
- Regional characteristics: Estonian sample: A dummy variable for living in Harjumaa (the capital region). Latvian sample: A categorical variable for living in (a) Riga (the capital city); (b) one of the eight other biggest towns in Latvia; (c) rest of Latvia.

The population group aged 60 and over has been accumulating wealth for several decades, but the explanatory variables in equation (2) are only from the survey period. Consequently, the relationship between wealth and some explanatory variables, such as labour market status and income can be bidirectional, as the decision to work beyond the age of 60 depends among other things on the amount of wealth that can be de-accumulated during retirement. The results consequently do not show any causal effects, but rather explain which household features are related to net wealth.

The RIF method is flexible in the choice of the number of estimation points on the wealth distribution, while also allowing the contribution of the explanatory variables to differ across the estimation points. We perform the estimations for the 25th, 50th and 75th percentiles, while also adding the 90th and 95th percentiles at the right tail.

Fortin et al. (2011) show that the *RIF* method can be used to decompose the contribution of each explanatory variable to the wealth gap between the two groups. We apply the Oaxaca-Blinder decomposition on the estimated RIF regressions at the selected quantiles:

$$\bar{W}_\tau^N - \bar{W}_\tau^{IM} = (\bar{X}^N - \bar{X}^{IM})_\tau^N + \bar{X}^{IM}(_\tau^N - _\tau^{IM}) \tag{3}$$

where $\bar{W}_\tau^N$ and $\bar{W}_\tau^{IM}$ represent the net wealth of natives (N) and immigrants (IM) at quantile τ, and $\bar{X}^N$ and $\bar{X}^{IM}$are the average values of the covariates for natives and immigrants in that

quantile. The terms α_τ^N and α_τ^{IM} are the coefficients from the RIF regressions for natives and immigrants. The first term on the right-hand side is an explained component, also called the composition effect, as it shows how much of the wealth gap can be explained by the differences between the characteristics observed for the two groups. The first term is calculated using the estimated partial effects of the characteristics for natives as if the same coefficients applied for immigrants. This part of the gap is interpreted as though immigrants had the same wealth accumulation function as natives, but had different characteristics.

The second term on the right-hand side represents the gap resulting from differences in the contributions to net wealth of specific characteristics for natives and immigrants. This gap is calculated assuming that natives had the same characteristics as immigrants, but with different contributions from these characteristics. The second part is commonly interpreted as an unexplained gap because there are no theory-based explanations for the discrepancies between the wealth accumulation functions of natives and immigrants.

To address the issue of right-skewedness of net wealth and the negative values in the left tail of the distribution, we transform the net wealth with an inverse hyperbolic sine (IHS) transformation by applying the formula $sinh^{-1}(w_i) = \ln\left(w_i + \left(w_i^2 + 1\right)^{\frac{1}{2}}\right)$. This is a standard approach in wealth studies introduced by Pence (2006) and used by Kapelle and Lersch (2020), Mathä et al. (2017), Taylor and Meschede (2018), and Williams (2017) among others. The estimated coefficients in the regressions for IHS-transformed wealth can be interpreted as elasticities, similarly to how coefficients for log-transformed variables are interpreted.

Since missing observations in the HFCS data are imputed by using multiple imputation techniques, we use all the five imputed datasets that result from this in the RIF estimations. We apply the Rubin's rules to estimate the parameters and the standard errors.

6. Results

6.1. RIF regression estimations

We first run the RIF regression with both groups pooled and a dummy added for immigrant households. Table 2 shows the regression results for the 50th percentile of net wealth using the RIF and the net wealth transformed by the inverse hyperbolic sine. The coefficient on the immigrant dummy in column (1.1) is statistically significant, showing that when observable characteristics are controlled for there is still a nativity wealth gap in the Estonian population aged 60 and over at the median level of net wealth. The estimated coefficient indicates that in Estonia, the median net wealth of immigrants is approximately 47% lower than that of natives. For Latvia, the coefficient on the immigrant dummy in column (2.1) is statistically insignificant.

However, the wealth gap may vary over the distribution of net wealth. Tables A2 and A3 in the Appendix present the regression results for the 25th, 50th, 75th, 90th and 95th quantiles for Estonia and Latvia, indicating that the coefficients for the immigrant dummy are negative and statistically significant for the 75^{th} and higher percentiles for Latvia, i.e. the nativity gap in net wealth is present at the upper end of the wealth distribution in the Latvian population aged 60 and over. The additional estimations for real wealth and for

Table 2. The net wealth regressions, RIF estimates for the median.

	Estonia			Latvia		
	(1.1) All 60 + households	(1.2) 60 + native households	(1.3) 60 + immigrant households	(2.1) All 60 + households	(2.2) 60 + native households	(2.3) 60 + immigrant households
Immigrant	−0.467***	-	-	−0.202	-	-
	(0.127)			(0.183)		
Income (1000 EUR)	0.055***	0.059***	0.062	0.115***	0.113***	0.118
	(0.018)	(0.019)	(0.043)	(0.032)	(0.038)	(0.082)
Income^2/100	−0.056**	−0.059**	−0.079	−0.231***	−0.229***	−0.161
	(0.024)	(0.025)	(0.068)	(0.066)	(0.077)	(0.216)
Active labour market status	−0.225	−0.335	0.065	−0.453*	−0.538*	−0.534
	(0.215)	(0.251)	(0.394)	(0.241)	(0.291)	(0.542)
Age	0.07	−0.036	0.362	−0.317	−0.379	−0.292
	(0.147)	(0.197)	(0.247)	(0.218)	(0.26)	(0.508)
Age^2	−0.041	0.036	−0.237	0.218	0.259	0.195
	(0.1)	(0.133)	(0.169)	(0.149)	(0.177)	(0.348)
Tertiary education	0.35***	0.222	0.363	0.525***	0.437*	0.787**
	(0.123)	(0.157)	(0.225)	(0.174)	(0.227)	(0.32)
Time in employment	−0.007	−0.004	0.002	0.044	0.064	0.000
	(0.012)	(0.013)	(0.022)	(0.047)	(0.055)	(0.09)
Time in employment^2	0.018	0.015	−0.015	−0.073	−0.09	−0.031
	(0.022)	(0.024)	(0.044)	(0.063)	(0.076)	(0.135)
Owns HMR	1.518***	1.54***	1.312***	2.249***	2.367***	2.34***
	(0.12)	(0.142)	(0.194)	(0.15)	(0.192)	(0.32)
Owns other real estate property	0.637***	0.82***	0.569**	0.767***	0.874***	0.475
	(0.141)	(0.171)	(0.247)	(0.21)	(0.242)	(0.53)
Has self-employment business wealth	0.821***	0.984***	0.615	0.625	0.811*	−0.533
	(0.227)	(0.278)	(0.449)	(0.427)	(0.412)	(0.936)
Received gift/inheritance	0.127	0.277*	−0.16	0.296	0.353	0.151
	(0.14)	(0.166)	(0.282)	(0.234)	(0.276)	(0.329)
Single adult household (base two-adult household)	0.140	0.021	0.290	0.377**	0.451*	0.286
	(0.127)	(0.152)	(0.192)	(0.191)	(0.244)	(0.387)
Three and more adults household (base two-adult household)	−0.53**	−0.603**	−0.142	0.008	−0.127	1.084**
	(0.205)	(0.249)	(0.284)	(0.373)	(0.414)	(0.528)
Household with children	−0.579**	−0.301	−0.949**	−0.107	0.199	−0.593
	(0.239)	(0.293)	(0.384)	(0.46)	(0.457)	(1.076)
Household lives in Harjumaa	0.782***	0.772***	1.078***	-	-	-
	(0.116)	(0.139)	(0.191)			
Household lives in Riga (base rest of Latvia)	-	-	-	1.213***	1.259***	1.368***
				(0.185)	(0.226)	(0.413)
Household lives in one of the eight other biggest towns (base rest of Latvia)	-	-	-	0.718***	0.857***	0.538
				(0.226)	(0.269)	(0.536)
Constant	6.098	9.666	−4.976	17.665**	19.314**	17.848
	(5.364)	(7.261)	(8.996)	(7.884)	(9.443)	(18.141)
N	*927*	*698*	*229*	*533*	*412*	*121*

Notes: Net wealth is calculated as household net wealth per adult in the household (in thousand euros). 60 + households are defined as households with a reference person who is at least 60 years old. Immigrant households are defined as households with a reference person born in a country other than the one where they reside at the time of the survey. The values of net wealth are IHS-transformed. *, **, *** indicate statistical significance at the 10%, 5% and 1% level. Standard errors in parentheses (survey weights applied).

Source: Authors' calculations from the Estonian and Latvian HFCS.

financial assets show that the nativity wealth gap at the median exists for real assets in both Estonia and Latvia, but does not exist for financial assets (Table B1 and B2 in Online Appendix).

We also present the results from the RIF regressions for the native and immigrant households separately. The estimated coefficients at the median presented in columns (1.2) and (1.3); and in (2.2) and (2.3) in Table 2 show that there are some differences between native and immigrant households in how the explanatory variables are related to net wealth, indicating that the wealth functions of natives and immigrants may be different.

The regression coefficient for current income (i.e. income of the last 12 months) is statistically significant for native households, but not for immigrant ones. This implies that current income is correlated with accumulated wealth for natives but not for immigrants. The regressions for both real and financial assets yield similar results (Table B1 and B2). However, the relationship with income is strongly inversely U-shaped, so the direction of the effect at the median is actually negative, implying that higher income is related to lower net wealth for natives in the centre of the wealth distribution. This suggests that the income of the past 12 months is not a proxy for the previous income levels of the household but rather demonstrates the effect from wealth to income – when having less wealth to use during retirement age, one tends to have additional earnings.

Tertiary education is associated with larger net wealth for the Estonian population aged 60 and over. The estimated coefficients for this variable are significant for the range of the 50th to 90th percentiles of the wealth distribution (Table A2). The coefficient estimates at the median level of net wealth are also positive, but are insignificant when estimated separately for native and immigrant households (Table 2, columns 1.2 and 1.3). The coefficients are not statistically significant, which probably stems from the sample sizes being small for both subgroups. However, tertiary education is also related to larger financial assets for natives in Estonia at the median.

Tertiary education in Latvia is significantly positively associated with net wealth at the median, both for the whole elderly population and when the net wealth regressions are estimated separately for the native and immigrant households (Table 2). This relationship increases monotonically across the upper quantiles of the net wealth distribution (Table A3). Furthermore, the coefficient on tertiary education for immigrant households is higher and significant at the 50th and 75th percentiles. This shows that in Latvia, immigrant households benefit from higher education in terms of net wealth more than natives do.

As expected, ownership of the HMR is associated with a higher value for real assets and thereby for net wealth as well. The estimated effects at the median are similar in magnitude for natives and immigrants, and this holds both for Estonia and for Latvia (Table 2). Homeownership is prevalent among both native and immigrant households in both countries (Table 1) and this can be explained by the possibility to privatise dwellings at the beginning of the 1990s, both by natives and immigrants (Kährik, 2000). This sets the immigrant population in Estonia and Latvia apart from those in other European countries, where natives are typically more likely to own real estate and where the immigrant-native wealth gaps tend to be wider (e.g. Borjas, 2002; Gobillon & Solignac, 2020; Kauppinen et al., 2015).

The positive association between net wealth and owning the HMR is stronger in the lower quantiles of the net wealth distribution, while the effect disappears at the top

tail, becoming insignificant at the 90th percentile in Latvia and at the 95th percentile in Estonia (Tables A2 and A3). This suggests that the HMR is the dominant asset for less wealthy households, while other wealth components become more relevant for shaping the value of wealth in higher wealth deciles. In addition, almost all the households in the upper wealth deciles own their HMR, so there is no variation in this variable. The relationship between owning the HMR and the value of financial assets is insignificant at the median level of wealth, suggesting that residential property does not substitute holdings of financial assets. This finding applies to both countries (Tables B1 and B2).

Ownership of other real estate properties is also associated with a higher level of net wealth. The relationship is positive over the total wealth distribution, but in contrast to the ownership of the HMR it is not weaker in the upper part of the distribution, and the effects are actually similar across the 50th and 90th percentiles. The point estimate is larger for native households in Estonia, but the difference between the subgroups is not statistically significant. In Latvia, this regression coefficient is statistically significant only for native households.

Having business wealth is positively related to the net wealth of native households, but this relationship is insignificant for immigrant households at the median level of net wealth. This finding applies for both countries, but the effect for natives in Latvia is only marginally significant at the 10% confidence level. Assessing this relationship for the total 60 + population across the net wealth quantiles in Estonia shows that the importance of business wealth increases with the level of net wealth as the estimated coefficients become larger in the upper tail of the distribution (Table A2). It appears that the net wealth of natives is positively related to the ownership of business wealth over the total distribution, but the net wealth of immigrants is only associated with business wealth in the upper part from the 75th percentile onwards. Owning business wealth seems to contribute to the real assets in both groups in Estonia (Table B1), but it is positively associated with the value of financial assets for natives, indicating that financial assets and business wealth are complements (Table B2). In Latvia, the relationship between net wealth and owning business wealth is insignificant for almost all net wealth quantiles (it is marginally significant and positive only for the 75th percentile, see Table A3). Weak positive association can be observed at the median with the real wealth of natives (Table B1) and the financial wealth of immigrants (Table B2).

We next look at the importance of receiving gifts or inheritances. The estimated effects presented in Table 2 show that the association between net wealth and having received an inheritance is mostly insignificant at the median level of net wealth, with the only exception being a marginally significant positive relationship for Estonian native households. In the Estonian case, the estimates over net wealth quantiles for the whole population aged 60 and over are also significantly positive for the 75th and 90th percentiles (Table A2). The estimates for Latvia are insignificant throughout the net wealth distribution (Table A3). Having received an inheritance appears to be positively related to financial wealth for natives in Estonia and to real wealth for natives in Latvia (Tables B1 and B.2). However, these two connections are only estimated at the median level of wealth.

Finally, living in the wealthier capital region (Harjumaa in Estonia, Riga in Latvia) is also associated with a higher value of household real assets and net wealth, not only at the median level of wealth but over almost the entire wealth distribution. This is not

surprising, since the value of real estate in these regions tends to be much higher than elsewhere. However, the contribution to both real assets and net wealth is stronger for immigrants. One possible explanation for this may be that the difference in wealth between the immigrants living in the capital region and those living elsewhere in the country is wider than that between natives. The positive effect from living in the capital region is also stronger at the lower net wealth quantiles.

6.2. Decomposition of the estimated RIF regressions

We go further in studying the conditional nativity wealth gap by using the decomposition method described in equation (3) that lets us test whether the RIF-regression coefficients are statistically significantly different for the two groups. The results over the set of percentiles of net wealth, real assets and financial assets are presented in Table 3.[8]

The results presented for Estonia confirm the findings from the descriptive statistics and from the regression results that natives have more net wealth than non-natives do. However, the raw gaps are only significant in the upper half of the wealth distribution, starting from the median level where the gap is 30%. In Latvia, the raw gap is only statistically significant at the top tail of the net wealth distribution, starting from the 90th percentile. The raw gaps in net wealth at the upper tail are wider in Estonia than in Latvia, reaching 74% and 55%, respectively, at the 95th percentile for the 60 + population. The gaps in real assets in Estonia tend to be larger from the 50th percentile upwards than the gaps in financial assets, and in Latvia, the raw gaps in financial assets remain insignificant throughout the net wealth distribution. Overall, the gaps largely remain unexplained by observable characteristics in both countries. It is worth noting that the unexplained

Table 3. Net wealth, real assets and financial assets: Gaps between native and immigrant households aged at least 60 in Estonia and Latvia.

		Estonia 60+			Latvia 60+		
		Gap in Net Wealth	Gap in Real Assets	Gap in Financial assets	Gap in Net Wealth	Gap in Real Assets	Gap in Financial assets
p25	Explained	−0.243	−0.209*	−0.267	0.281	−0.390**	0.136
	Unexplained	0.217	0.378*	−0.297	−0.063	0.083	−0.645
	Raw	−0.026	0.169	−0.564	0.218	−0.306	−0.509
p50	Explained	−0.095	−0.078	−0.041	−0.253	−0.241**	0.050
	Unexplained	0.396***	0.45***	0.048	0.204	0.325**	−0.455
	Raw	0.302**	0.372***	0.007	−0.049	0.084	−0.405
p75	Explained	−0.030	0.020	−0.040	−0.127	−0.123	0.135
	Unexplained	0.398***	0.291**	0.158	0.318*	0.289*	0.060
	Raw	0.369***	0.311**	0.118	0.191	0.166	0.195
p90	Explained	0.033	0.028	−0.063	−0.049	−0.061	−0.175
	Unexplained	0.404***	0.483***	0.447**	0.398*	0.469**	0.633*
	Raw	0.437***	0.511***	0.384**	0.349*	0.408**	0.458
p95	Explained	0.052	0.141	−0.112	−0.175	−0.184	−0.028
	Unexplained	0.687***	0.596***	0.495**	0.723***	0.789**	0.489
	Raw	0.739***	0.737***	0.383**	0.548***	0.605**	0.461

Notes: Immigrant households are defined as households with a reference person born in a country other than the one where they reside at the time of the survey. 60 + households are defined as households with a reference person who is at least 60 years old. Gaps are estimated on median HIS-transformed values of net wealth, real assets and financial assets (per adult in the household) and can be interpreted as log differences between natives and immigrants. *, **, *** indicate statistical significance at the 10%, 5% and 1% level.

Source: Authors' calculations from the Estonian and Latvian HFCS.

gaps are in some cases larger than the raw gaps, and these differences are most pronounced for the 95th percentile in Latvia. We are able to explain a slightly smaller share of the immigrant wealth gap compared to studies on other European countries. For instance, in the study by Bauer et al. (2011), 70% of the gap in Germany remains unexplained, while in Dossche et al. (2022), the unexplained portion of the gap is 70-80% in the four largest euro area countries.

Table A4 shows the contributions to the explained and unexplained parts of the gap of all the control variables that are included in the regressions. Although the gaps in total net wealth largely remain unexplained by the observable characteristics, several variables have statistically significant effects on the explained part of the gap. These effects can be positive or negative and it seems that the effects in opposite directions cancel each other out, yielding the result that the explained part of the gap is in total insignificant. The results imply that the nativity wealth gap in Estonia can be explained by the ownership of business wealth and by having received a gift or inheritance. The descriptive statistics indicate that ownership of business wealth is lower among immigrants in Estonia (Table 1), contributing to a larger gap in net wealth, and even more so in real assets (Table A4 and Table B3). In Latvia, the difference in owning business wealth is not that remarkable and therefore it makes no significant contribution to the wealth gaps there.

Average probability of inheriting is larger among natives than among immigrants in Estonia (Table 1) and the return from inheritances is also larger for natives (Table A4), so receiving inheritance contributes to the wealth gap in both ways, through a higher prevalence of receiving heritances among natives and through higher contribution of inheritance to net wealth in the case of natives. Investigating this for different asset types shows that inheritance plays a role for real wealth gaps throughout the entire distribution but only has a significant impact on the gaps in financial wealth at the median level (Tables B.3 and B.4). Although in both countries the inheritance rate is higher among natives than among immigrants, the prevalence of receiving inheritance is 2.5 times greater in Estonia than in Latvia.[9] This explains the difference in the results for Latvia, where receiving a gift or inheritance seems to have no significant effect on the wealth gap.

Two factors that help to explain the gap in net wealth, and especially the gap in real assets, are ownership of the HMR and living in the capital region. Since ownership of the HMR is associated with larger real assets and thereby greater net wealth as well (Table 2 and Table A2), and the homeownership rate is higher among immigrant households in Estonia than among native ones, it affects the wealth gap in favour of immigrant households. In the Latvian population aged over 60, there are slightly more homeowners among native households than among immigrant ones, and therefore owning the HMR has no evident effect there.

The positive relationship with wealth of living in Harjumaa (the capital region of Estonia) is stronger for immigrant households, as seen from Table 2. Immigrant households among the population aged 60 and over in Estonia are more likely to live in Harjumaa (Table 1), so living in the capital region narrows the wealth gap between native and immigrant households (Table A4). However, living in Harjumaa plays a role only for real assets, and the returns from living in the capital region are higher for native households in the upper part of the net wealth distribution (Table A4 and Table B3).

There is also a greater tendency in Latvia for immigrants to live in the capital city, Riga, which reduces the wealth gap. Higher returns for natives from living in the capital region stem from the inner-city geographical segregation pointed out by several studies (see, among others, Tammaru et al., 2013), where natives tend to live more in city districts with higher real estate prices, while immigrants reside in districts with lower real estate prices.

One difference between Estonia and Latvia is evident in the ownership of other real estate property. The descriptive results illustrate that while immigrant households in Latvia are less likely to own other real estate property, there is no significant difference between native and immigrant households in Estonia (Table 1). This finding also becomes evident from the decomposition, the results of which imply that owning other real estate property in Latvia plays a role in the nativity gaps in wealth (Table A4 and Tables B3–B4). In Estonia, owning other real estate property seems to widen the unexplained gap in real wealth at the upper end of the net wealth distribution.

Wealth is also associated with higher levels of education (Girshina, 2019), and our analysis also indicates that the tertiary level of education contributes positively to wealth (Table 2), especially to financial wealth (Table B2). Since the share of people in the population aged 60 and over that have completed higher education is larger for immigrants, this reduces the gap in financial wealth (Table B4). However, the reduction in the gap resulting from higher education is evident only in Estonia.

The variable that reduces the unexplained part of the nativity wealth gap in Estonia is the labour market status of being active, especially in the higher end of the wealth distribution and for real assets. However, there's a possibility of a reverse causal relationship between activity and wealth. It is possible that older individuals who have accumulated more wealth might be more likely to have retired and therefore are inactive, while those with less wealth might still actively participate in the labour market.

7. Discussion and conclusion

This study assesses the immigrant-native wealth gaps in Estonia and Latvia, two countries with a sizable immigrant population. Most of the immigrants in this region are elderly people aged 60 or over, and so we focus on this age segment. The majority of elderly immigrants have resided in Estonia and Latvia for decades, and since the early 1990s, they began accumulating wealth, starting from similarly low levels as natives did. The analysis reveals, however, that despite starting from similar points, native households have been able to accumulate more assets. In Estonia, the level of net wealth is 30% higher for native households at the median and 74% higher at the 95th percentile. In Latvia, the wealth gap is not statistically significant at the median level, but it becomes significant from the 90th percentile, reaching 55% at the 95th percentile of net wealth.

Like some earlier studies (e.g. Bauer et al., 2011; Mathä et al., 2011; Muckenhuber et al., 2022), we document that the immigrant-native wealth gap increases towards the upper end of the net wealth distribution. In comparison to other countries with available empirical evidence, however, the gaps in Latvia and Estonia are smaller. The gap in net wealth at the median level is 30% in Estonia and insignificant in Latvia, while it is 60% in the US (Cobb-Clark & Hildebrand, 2006), 73% in Austria (Muckenhuber et al., 2022), and 90% in Germany (Bauer et al., 2011).[10] The native-immigrant wealth gaps in Estonia and Latvia

are smaller for three reasons. First, the education level of the immigrant population is similar to that of the natives, and the immigrants among people aged 60 or more are actually more educated than the natives are. Second, and again diverging from the evidence from other countries, the home ownership rates are similar for immigrant and native households in the two sample countries.[11] Empirical research on household wealth conducted under the Household Finance and Consumption Network (HFCN) has demonstrated a positive relationship between wealth and education level. Additionally, homeowners are, on average, considerably wealthier than renters.[12] The third reason is that most of the immigrants in Estonia and Latvia first moved to the two countries several decades ago and have lived most of their adult lives in the region, while the age profile of immigrants in the other countries studied tends to be much more dispersed. This means that the period during which they could accumulate assets is of similar length for immigrants and natives in the Baltic region, while in other countries it is mostly shorter for immigrants.

Although the HMR ownership rates are similar, their mean values differ in favour of natives. The value of the household main residence (HMR) in Estonia is, on average, 32% lower for immigrant households, while in Latvia, it is 20% lower. This could be the result of geographical segregation, as there are certain industrial regions and suburbs in cities where urban apartments were built during the Soviet period, and these apartments were allocated to immigrants and then privatised by them (Tammaru et al., 2013). By now, real estate prices tend to be lower in these regions, while native households tend to live in other areas where real estate prices are higher. So even though the homeownership rate may favour the immigrants, the values of the HMR tend to be higher for natives, contributing to the wealth gap.

Like the homeownership rate, the probability of owning secondary real estate is similar for the native and immigrant households in Estonia, and so it does not explain the wealth gap. In Latvia, where the share of households owning secondary property is one of the highest in the euro area countries (see footnote 11), the ownership rate differs by one third in favour of native households, resulting in a significant contribution to the wealth gap over the entire wealth distribution in Latvia. The contribution of secondary real estate to wealth is quite similar for native and immigrant households, so owning real estate matters for the wealth gap more than the value of the property does.

Since wealth accrues through savings that in turn depend on incomes, differences in incomes could be a potential explanation for the wealth gaps, as has been found by many studies (e.g. Dostie et al., 2023; Hofer et al., 2017; Tomaskovic-Devey et al., 2015). The focus in our study is on the older population, who have accumulated their wealth over several decades, but we do not have a good proxy for their lifetime income. We use the income of the previous 12 months, which reveals a negative relationship with net wealth for natives, suggesting that those older people who have accumulated more wealth tend to be inactive, while others with less wealth are still working to have extra earnings on top of their pensions.[13] Apparently a snapshot of the most recent incomes cannot explain the wealth gap between older natives and immigrants.

Although we cannot use longitudinal income data in the current study, earlier empirical evidence has shown that in the previous two decades there existed an ethnic wage gap of about 10% in favour of natives both in Estonia and Latvia (Borman et al., 2019;

Hazans, 2007; Leping & Toomet, 2008; Vilerts & Krasnopjorovs, 2017). Since most immigrants in this region have different ethnicity from the locals, it can be expected that the ethnic wage gap is of a similar magnitude as the immigrant-native wage gap. A more recent study by Amo-Agyei (2020) documents a sizable immigrant-native wage gap in 2015 of approximately 20% in Estonia and 15% in Latvia. In addition to that, earlier studies have indicated that natives have higher employment rates than the minority population in this region (Borman et al., 2019; Männasoo et al., 2023), which also contributes to the incomes of the immigrants being lower. The conclusion drawn from this earlier evidence is that since the end of the transition period in the 1990s, natives in the two countries have, on average, had higher incomes than immigrants. This likely contributed to the wealth differences observed in this study. Given that lifetime earnings play a significant role in wealth accumulation, we would expect them to explain differences in wealth if such information were available.

Our analysis shows that native households own more business assets than immigrant households do. This is particularly the case in Estonia, where the share of business wealth in total wealth is the largest among the euro area countries (see footnote 11). Business wealth is concentrated in the top tail of the net wealth distribution in both Estonia and Latvia, while the differences in business ownership rates between native and immigrant households are largest in the wealthiest decile. In Latvia the business ownership rate of native households is 3.5 times the rate for immigrant households in the top decile, and in Estonia this ratio is 1.5 times. A study on the gender wealth gap shows that business wealth is an important contributor to the wealth gap among the wealthiest 10% and this difference plays an important role in explaining the overall gender wealth gap in Estonia (Meriküll et al., 2021). We can see a similar pattern when comparing the wealth of native and immigrant households.

In line with evidence from earlier studies (Bhutta et al., 2020; McKernan et al., 2014), the probability of inheriting is higher among elderly native households than among immigrants both in Estonia and in Latvia. Although all households started to accumulate wealth only after independence was regained at the beginning of the 1990s, the nationalised property was restituted to the heirs in 1990s, resulting in a gap in inherited property between natives and immigrants. The contribution of inheritance to the wealth gap is observed more clearly in Estonia, where the restituted and inherited property is well recorded by the HFCS. Our findings confirm the importance of intergenerational transfers in wealth accumulation and also as an explanatory factor for the native-immigrant wealth gap.

Earlier research has shown that assimilation reduces the differences between natives and immigrants in financial choices (Kushnirovich, 2016; Muckenhuber et al., 2022), in the home ownership rate, and in net wealth (Maroto & Aylsworth, 2016). Although most of the immigrants have lived in Estonia and Latvia for several decades, having had long employment spells in those countries, having a family there and planning to retire or having already retired, many of them have not assimilated nor integrated into the local society during this period. Because there are large communities of Russian-speakers and there is geographical segregation, the local language skills of the immigrants are poor, while they have retained close social connections to Russia (Ehala, 2013; Vihalemm et al., 2020). Although the formal level of education of the elderly immigrants is higher than that of the natives, the immigrants were typically not able to use

their human capital to the same extent as locals because of their poor language skills and the labour market segregation (evidence on the role of language skills is provided in Borman et al., 2019; and Männasoo et al., 2023). The case of Estonia and Latvia reveals that immigrants might not assimilate even over a period spanning several decades and this apparently affects employment opportunities and financial choices, with the ultimate result that the immigrants have less wealth than the natives.

Notes

1. This definition is followed throughout the paper.
2. Although no such restriction was implemented in Latvia during the 1992–1993 monetary reforms, the newly introduced Latvian lats were significantly undervalued, similar to the Estonian kroons.
3. https://www.ecb.europa.eu/pub/economic-research/research-networks/html/researcher_hfcn.en.html
4. A similar pattern for the tertiary education level of those aged 55–74 can be found in the Eurostat database, indicator [edat_lfs_9912]
5. Wealth of self-employment businesses is defined in the HFCS database as the value of businesses which the household owns and where at least one household member works. It is a subcomponent of real assets.
6. Households with wealth below the median do not own business wealth, but ownership starts to increase in the upper wealth deciles, reaching 22% for natives and 16% for immigrants in Estonia. In Latvia, 33% of native households in the highest wealth decile own business wealth, while the share is 10% for immigrants. In the Latvian 2017 HFCS, under-reporting of self-employment business wealth results in a smaller sample size.
7. Immigrant status, age, labour market status and experience, income and education refer to household's reference person, other variables are at the household level.
8. We obtain similar results when the decomposition is carried out using the immigrants as a base category instead of natives.
9. The property and land that was restituted in the 1990s to families whose property was nationalised by the Soviet Union is considered an inheritance in the Estonian HFCS, while in the Latvian HFCS the restitution of property and land is not classified explicitly. The differences in the share of inheritance between Estonian and Latvian natives could partly originate from the methodology of the survey as a consequence. More details on the nationalisation, restitution and privatisation of housing can be found in Kährik (2000).
10. The gaps for the other countries are estimated for the total population, while in the current study we focus on the elderly. Even so, the raw net wealth gaps over the wealth distribution are similar for the total population to those for the population aged 60 and over (see Figure 2), and they are substantially smaller than the immigrant-native wealth gaps found for the US, Germany and Austria in the studies cited above.
11. A lower probability of home ownership for immigrants has been documented in France for example (Gobillon & Solignac, 2020), and in the Nordic countries (Kauppinen et al., 2015).
12. The statistics on wealth for all euro area countries are available on the HFCN webpage: https://www.ecb.europa.eu/stats/ecb_surveys/hfcs/
13. Public pensions are equally distributed across the natives and the immigrants and the differences in incomes originate from other sources of income.

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Notes on contributors

Liina Rebane is a doctoral student in the Department of Economics and Finance at Tallinn University of Technology (TalTech) and an economist in the Economics and Research Department at the Bank of Estonia (Eesti Pank). She focuses her research on labour market institutions and their effects on labour market outcomes. Additionally, she researches on household financial behaviour and inequality.

Merike Kukk, PhD is a senior economist in the Economics and Research Department at the Bank of Estonia (Eesti Pank), a senior researcher in the Department of Economics and Finance at Tallinn University of Technology (TalTech) and a visiting fellow in the Department of Finance at Aalto University. She teaches Microeconomics and Public Economics for master-level students at TalTech. Her research interests are focused on household consumption, saving, borrowing behaviour and their interactions with the aggregate economy while she researches also in the areas of the banking sector and financial stability.

Tairi Rõõm, PhD, is the head of the Research Division in the Economics and Research Department at the Bank of Estonia (Eesti Pank) and an adjunct professor in the Department of Economics and Finance at Tallinn University of Technology (TalTech). In 2024, she also is the president of the Baltic Economic Association. She teaches Microeconomics, Labour Economics and Econometrics to master-level and doctoral students at TalTech. Her research interests encompass labour economics, household financial behaviour, wealth distribution and gender disparities in wealth and incomes.

ORCID

Liina Rebane http://orcid.org/0000-0003-1245-634X

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Appendix

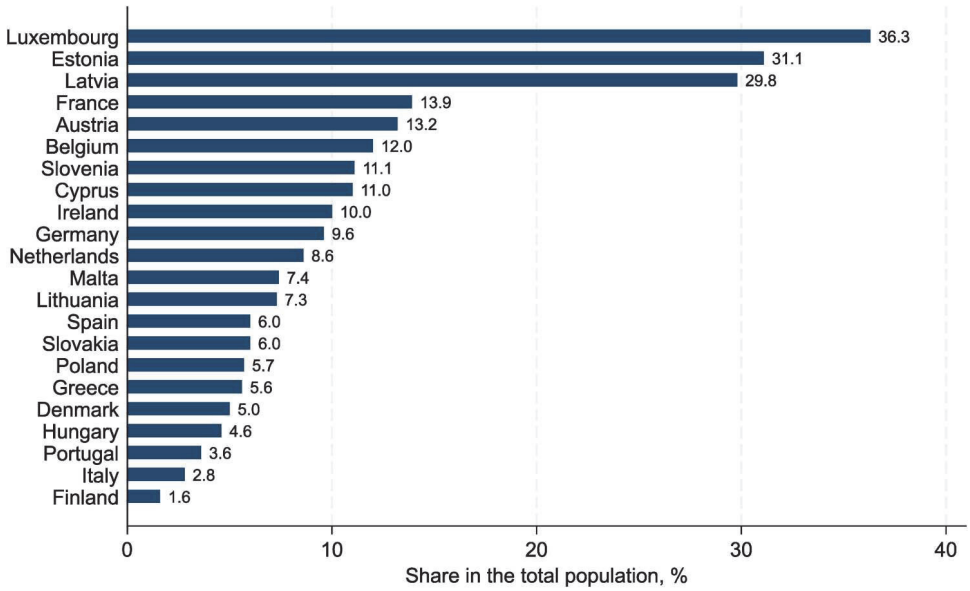

Figure A1. Share of immigrants in the population aged 65 and over in 2017. Source: Authors' calculations from the Eurostat.

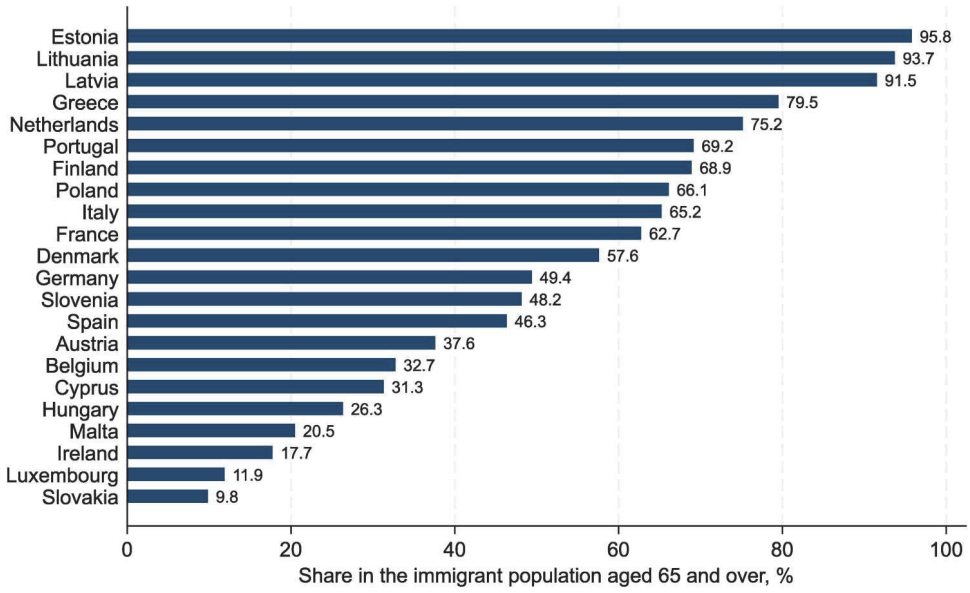

Figure A2. Share of immigrants aged 65 and over from non-EU countries in the total immigrant population aged 65 and over in 2017. Source: Authors' calculations from the Eurostat.

Table A1. The share of immigrant households in Estonia and Latvia, by different definitions of an immigrant household.

	Estonia		Latvia	
	Total population	60 + population	Total population	60 + population
At least one member of the household is an immigrant	19.5%	28.4%	23.2%	28.7%
Reference person or his/her partner is an immigrant	18.1%	27.7%	21.4%	28.7%
Reference person is an immigrant	15.0%	25.5%	15.5%	24.1%
Reference person is the only immigrant in the household	10.9%	18.4%	12.0%	18.8%
Reference person is the only member in the household and an immigrant	7.3%	14.1%	6.0%	12.6%
Reference person and their partner are both immigrants	3.5%	6.6%	3.1%	5.3%
Partner of the reference person is the only immigrant in the household	2.9%	2.1%	5.9%	4.5%
At least one household member who is not a reference person is an immigrant	1.4%	0.7%	1.8%	0.0%

Notes: Household is considered 60 + when its reference person is at least 60 years old.
Source: Authors' calculations from the Estonian and Latvian HFCS.

Table A2. The net wealth regressions, RIF estimates for the 25th, 50th, 75th, 90th and 95th percentiles, for the Estonian households with a reference person aged 60 and over.

All households	p25	p50	p75	p90	p95
Immigrant	−0.258	−0.467***	−0.477***	−0.418***	−0.399***
	(0.25)	(0.127)	(0.099)	(0.095)	(0.145)
Income (1000 EUR)	0.081*	0.055***	0.04**	0.052**	0.078
	(0.042)	(0.018)	(0.017)	(0.022)	(0.047)
Income^2/100	−0.108*	−0.056**	−0.033	−0.021	−0.023
	(0.057)	(0.024)	(0.026)	(0.035)	(0.078)
Active labour market status	−0.252	−0.225	−0.375**	−0.754***	−1.441***
	(0.43)	(0.215)	(0.175)	(0.204)	(0.396)
Age	−0.215	0.07	−0.168	0.016	0.044
	(0.3)	(0.147)	(0.131)	(0.177)	(0.297)
Age^2	0.174	−0.041	0.12	−0.009	−0.043
	(0.205)	(0.1)	(0.09)	(0.121)	(0.201)
Tertiary education	0.223	0.35***	0.305***	0.271**	0.369
	(0.207)	(0.123)	(0.114)	(0.132)	(0.244)
Time in employment	−0.02	−0.007	−0.012	−0.005	−0.002
	(0.026)	(0.012)	(0.01)	(0.01)	(0.017)
Time in employment^2	0.036	0.018	0.039*	0.015	0.003
	(0.051)	(0.022)	(0.02)	(0.022)	(0.036)
Owns household's main residence	4.246***	1.518***	0.694***	0.257***	0.19
	(0.296)	(0.12)	(0.089)	(0.088)	(0.133)
Owns other real estate property	1.038***	0.637***	0.513***	0.672***	1.027***
	(0.203)	(0.141)	(0.13)	(0.16)	(0.294)
Has self-employment business wealth	0.823***	0.821***	1.223***	1.681***	3.736***
	(0.269)	(0.227)	(0.233)	(0.357)	(0.824)
Received gift/inheritance	0.276	0.127	0.342***	0.406**	0.328
	(0.223)	(0.14)	(0.125)	(0.164)	(0.273)
Single adult household (base two-adult household)	0.297	0.14	0.193*	−0.038	0.192
	(0.23)	(0.127)	(0.101)	(0.124)	(0.195)
Three and more adults household (base two-adult household)	0.176	−0.53**	−0.465***	−0.467**	−0.799***
	(0.296)	(0.205)	(0.152)	(0.192)	(0.243)
Household with children	−0.539	−0.579**	−0.118	0.046	−0.128
	(0.681)	(0.239)	(0.174)	(0.218)	(0.242)
Household lives in Harjumaa	0.898***	0.782***	0.633***	0.419***	0.596***
	(0.191)	(0.116)	(0.112)	(0.131)	(0.2)

(*Continued*)

Table A2. Continued.

All households	p25	p50	p75	p90	p95
Constant	11.668	6.098	16.11***	10.744*	10.693
	(10.959)	(5.364)	(4.742)	(6.374)	(10.86)
N	*927*	*927*	*927*	*927*	*927*
Native households:	p25	p50	p75	p90	p95
Income (1000 EUR)	0.095**	0.059***	0.057***	0.077**	0.067
	(0.037)	(0.019)	(0.021)	(0.031)	(0.063)
Income^2/100	−0.122**	−0.059**	−0.061*	−0.069	−0.032
	(0.049)	(0.025)	(0.034)	(0.051)	(0.106)
Active labour market status	−0.316	−0.335	−0.52**	−1.033***	−1.512***
	(0.447)	(0.251)	(0.216)	(0.279)	(0.514)
Age	−0.097	−0.036	−0.191	−0.022	−0.095
	(0.38)	(0.197)	(0.168)	(0.23)	(0.365)
Age^2	0.095	0.036	0.133	0.011	0.046
	(0.261)	(0.133)	(0.116)	(0.157)	(0.247)
Tertiary education	0.02	0.222	0.326**	0.2	0.299
	(0.253)	(0.157)	(0.152)	(0.171)	(0.358)
Time in employment	−0.021	−0.004	−0.007	−0.002	0.007
	(0.034)	(0.013)	(0.012)	(0.013)	(0.014)
Time in employment^2	0.045	0.015	0.025	0.006	−0.011
	(0.069)	(0.024)	(0.022)	(0.027)	(0.03)
Owns household's main residence	4.795***	1.54***	0.685***	0.212*	0.139
	(0.364)	(0.142)	(0.104)	(0.109)	(0.161)
Owns other real estate property	1.169***	0.82***	0.54***	0.704***	1.157***
	(0.257)	(0.171)	(0.172)	(0.215)	(0.34)
Has self-employment business wealth	0.939***	0.984***	1.215***	1.712***	3.4***
	(0.343)	(0.278)	(0.271)	(0.414)	(0.906)
Received gift/inheritance	0.245	0.277*	0.322**	0.445**	0.265
	(0.263)	(0.166)	(0.157)	(0.191)	(0.266)
Single adult household (base two-adult household)	0.266	0.021	0.213	−0.064	0.282
	(0.277)	(0.152)	(0.133)	(0.156)	(0.246)
Three and more adults household (base two-adult household)	0.16	−0.603**	−0.397**	−0.504**	−0.869***
	(0.4)	(0.249)	(0.192)	(0.225)	(0.287)
Household with children	−1.045	−0.301	−0.25	−0.018	−0.088
	(0.966)	(0.293)	(0.196)	(0.21)	(0.339)
Household lives in Harjumaa	0.787***	0.772***	0.635***	0.536***	0.659***
	(0.235)	(0.139)	(0.122)	(0.14)	(0.231)
Constant	6.815	9.666	17.062***	12.325	16.024
	(13.838)	(7.261)	(6.044)	(8.286)	(13.239)
N	*698*	*698*	*698*	*698*	*698*
Immigrant households:	p25	p50	p75	p90	p95
Income (1000 EUR)	0.115	0.062	0.036	0.007	−0.006
	(0.076)	(0.043)	(0.044)	(0.037)	(0.036)
Income^2/100	−0.161	−0.079	−0.028	0.075	0.138*
	(0.124)	(0.068)	(0.068)	(0.068)	(0.082)
Active labour market status	−0.475	0.065	0.22	−0.159	−0.146
	(0.743)	(0.394)	(0.358)	(0.324)	(0.252)
Age	−0.344	0.362	−0.096	−0.175	0.226
	(0.491)	(0.247)	(0.228)	(0.293)	(0.202)
Age^2	0.263	−0.237	0.068	0.128	−0.147
	(0.337)	(0.169)	(0.158)	(0.202)	(0.136)
Tertiary education	0.49	0.363	0.346*	0.149	0.221
	(0.366)	(0.225)	(0.194)	(0.213)	(0.162)
Time in employment	0.002	0.002	−0.036*	−0.019	−0.02
	(0.037)	(0.022)	(0.021)	(0.031)	(0.02)
Time in employment^2	−0.024	−0.015	0.084**	0.049	0.036
	(0.068)	(0.044)	(0.036)	(0.064)	(0.036)
Owns household's main residence	3.115***	1.312***	0.423**	0.269*	0.075
	(0.485)	(0.194)	(0.18)	(0.161)	(0.104)

(*Continued*)

Table A2. Continued.

All households	p25	p50	p75	p90	p95
Owns other real estate property	0.829***	0.569**	0.594***	0.617**	0.388**
	(0.314)	(0.247)	(0.207)	(0.274)	(0.196)
Has self-employment business wealth	0.137	0.615	1.328***	1.964**	2.845***
	(0.546)	(0.449)	(0.453)	(0.76)	(0.996)
Received gift/inheritance	0.377	−0.16	−0.369*	0.092	0.124
	(0.383)	(0.282)	(0.21)	(0.233)	(0.22)
Single adult household (base two-adult household)	0.329	0.29	0.33*	0.195	0.061
	(0.376)	(0.192)	(0.189)	(0.217)	(0.155)
Three and more adults household (base two-adult household)	−0.16	−0.142	−0.583**	−0.257	−0.198
	(0.446)	(0.284)	(0.282)	(0.339)	(0.321)
Household with children	0.459	−0.949**	−0.072	−0.059	0.213
	(0.518)	(0.384)	(0.349)	(0.434)	(0.504)
Household lives in Harjumaa	1.145***	1.078***	0.506**	0.36	0.189
	(0.314)	(0.191)	(0.201)	(0.254)	(0.137)
Constant	16.82	−4.976	13.67*	16.94	3.296
	(17.74)	(8.996)	(8.189)	(10.409)	(7.394)
N	*229*	*229*	*229*	*229*	*229*

Source: Authors' calculations from the Estonian HFCS.

Notes: Household is considered 60 + when its reference person is at least 60 years old. Immigrant households are defined as households with a reference person born in a country other than the one where they reside at the time of the survey. Net wealth is calculated as household net wealth per adult in the household (in thousand euros). The values of net wealth are IHS-transformed. *, **, *** indicate statistical significance at the 10%, 5% and 1% level. Standard errors in parentheses.

Table A3. The net wealth regressions, RIF estimates for the 25th, 50th, 75th, 90th and 95th percentiles, for the Latvian households with a reference person aged 60 and over.

All households	p25	p50	p75	p90	p95
Immigrant	0.006	−0.202	−0.42**	−0.486***	−0.617***
	(0.39)	(0.183)	(0.189)	(0.176)	(0.223)
Income (1000 EUR)	0.192**	0.115***	0.053	0.062	0.185**
	(0.09)	(0.032)	(0.034)	(0.053)	(0.077)
Income^2/100	−0.354**	−0.231***	−0.08	−0.03	−0.209
	(0.175)	(0.066)	(0.08)	(0.131)	(0.185)
Active labour market status	−0.66	−0.453*	−0.083	−0.485	−1.204**
	(0.692)	(0.241)	(0.244)	(0.343)	(0.498)
Age	0.406	−0.317	0.421**	0.029	0.035
	(0.725)	(0.218)	(0.186)	(0.242)	(0.295)
Age^2	−0.284	0.218	−0.293**	−0.031	−0.042
	(0.49)	(0.149)	(0.127)	(0.166)	(0.202)
Tertiary education	0.098	0.525***	0.654***	0.963***	1.061***
	(0.351)	(0.174)	(0.197)	(0.3)	(0.366)
Time in employment	−0.138*	0.044	0.066**	−0.012	−0.042
	(0.081)	(0.047)	(0.029)	(0.037)	(0.049)
Time in employment^2	0.18*	−0.073	−0.091**	0.032	0.065
	(0.107)	(0.063)	(0.04)	(0.054)	(0.071)
Owns household's main residence	13.339***	2.249***	0.909***	0.221	0.147
	(0.837)	(0.15)	(0.139)	(0.171)	(0.199)
Owns other real estate property	1.856***	0.767***	0.905***	0.812***	0.821***
	(0.634)	(0.21)	(0.195)	(0.222)	(0.302)
Has self-employment business wealth	0.325	0.625	0.783*	1.067	0.48
	(0.901)	(0.427)	(0.428)	(0.669)	(0.755)
Received gift/inheritance	0.015	0.296	0.286	0.285	−0.443
	(0.88)	(0.234)	(0.214)	(0.442)	(0.436)
Single adult household (base two-adult household)	0.449	0.377**	0.562***	0.279	0.317
	(0.48)	(0.191)	(0.159)	(0.193)	(0.248)
Three and more adults household (base two-adult household)	1.971**	0.008	0.203	0.044	−0.002
	(0.766)	(0.373)	(0.25)	(0.445)	(0.627)
Household with children	−0.272	−0.107	−0.323	−0.152	−0.521

(*Continued*)

Table A3. Continued.

All households	p25	p50	p75	p90	p95
	(0.602)	(0.46)	(0.273)	(0.435)	(0.427)
Household lives in Riga (base rest of Latvia)	0.695	1.213***	0.887***	0.264	0.439
	(0.424)	(0.185)	(0.182)	(0.221)	(0.321)
Household lives in one of the eight other biggest towns (base rest of Latvia)	0.665	0.718***	0.064	−0.017	−0.146
	(0.582)	(0.226)	(0.179)	(0.208)	(0.307)
Constant	−15.565	17.665**	−7.159	9.898	10.89
	(26.313)	(7.884)	(6.671)	(8.634)	(10.465)
N	*533*	*533*	*533*	*533*	*533*
Native households:	p25	p50	p75	p90	p95
Income (1000 EUR)	0.183*	0.113***	0.082**	0.098	0.147
	(0.099)	(0.038)	(0.04)	(0.065)	(0.098)
Income^2/100	−0.356*	−0.229***	−0.15*	−0.12	−0.173
	(0.193)	(0.077)	(0.086)	(0.144)	(0.199)
Active labour market status	−0.788	−0.538*	−0.093	−0.604*	−0.901
	(0.688)	(0.291)	(0.269)	(0.352)	(0.556)
Age	0.175	−0.379	0.481**	−0.03	0.217
	(0.682)	(0.26)	(0.224)	(0.256)	(0.346)
Age^2	−0.143	0.259	−0.341**	0.005	−0.168
	(0.466)	(0.177)	(0.153)	(0.176)	(0.238)
Tertiary education	0.101	0.437*	0.566**	1.096***	1.004**
	(0.471)	(0.227)	(0.267)	(0.389)	(0.428)
Time in employment	−0.159*	0.064	0.04	−0.046	−0.096
	(0.094)	(0.055)	(0.035)	(0.049)	(0.058)
Time in employment^2	0.22*	−0.09	−0.049	0.088	0.145*
	(0.126)	(0.076)	(0.047)	(0.068)	(0.087)
Owns household's main residence	11.538***	2.367***	0.819***	0.046	0.107
	(0.747)	(0.192)	(0.175)	(0.206)	(0.241)
Owns other real estate property	1.782**	0.874***	1.085***	0.824***	0.696**
	(0.735)	(0.242)	(0.229)	(0.256)	(0.3)
Has self-employment business wealth	0.12	0.811*	0.774	1.234	1.109
	(0.933)	(0.412)	(0.463)	(0.85)	(0.941)
Received gift/inheritance	0.049	0.353	0.293	0.133	−0.596
	(0.856)	(0.276)	(0.267)	(0.461)	(0.419)
Single adult household (base two-adult household)	0.432	0.451*	0.628***	0.371	0.653***
	(0.641)	(0.244)	(0.213)	(0.235)	(0.247)
Three and more adults household (base two-adult household)	1.932**	−0.127	0.144	−0.204	0.103
	(0.781)	(0.414)	(0.287)	(0.454)	(0.425)
Household with children	−0.131	0.199	−0.084	0.113	−0.551
	(0.693)	(0.457)	(0.317)	(0.564)	(0.429)
Household lives in Riga (base rest of Latvia)	0.777*	1.259***	0.917***	0.085	0.464
	(0.462)	(0.226)	(0.218)	(0.234)	(0.284)
Household lives in one of the eight other biggest towns (base rest of Latvia)	0.624	0.857***	0.01	−0.04	−0.168
	(0.657)	(0.269)	(0.206)	(0.252)	(0.24)
Constant	−4.733	19.314**	−8.696	12.729	5.171
	(24.528)	(9.443)	(8.02)	(9.214)	(12.388)
N	*412*	*412*	*412*	*412*	*412*
Immigrant households:	p25	p50	p75	p90	p95
Income (1000 EUR)	0.075	0.118	−0.013	0.005	−0.031
	(0.11)	(0.082)	(0.084)	(0.087)	(0.1)
Income^2/100	−0.289	−0.161	0.191	0.237	0.369
	(0.371)	(0.216)	(0.222)	(0.241)	(0.263)
Active labour market status	2.162	−0.534	−0.376	−1.064*	−0.733
	(1.721)	(0.542)	(0.583)	(0.633)	(0.804)
Age	1.237	−0.292	−0.555	−0.701	0.011
	(0.943)	(0.508)	(0.534)	(0.516)	(0.366)
Age^2	−0.837	0.195	0.366	0.482	−0.016

(*Continued*)

Table A3. Continued.

All households	p25	p50	p75	p90	p95
	(0.636)	(0.348)	(0.359)	(0.355)	(0.245)
Tertiary education	−0.236	0.787**	0.91**	1.084**	0.852*
	(0.568)	(0.32)	(0.36)	(0.434)	(0.48)
Time in employment	−0.17	0	0.084	0.143*	0.031
	(0.152)	(0.09)	(0.158)	(0.082)	(0.071)
Time in employment^2	0.225	−0.031	−0.148	−0.188	−0.031
	(0.19)	(0.135)	(0.183)	(0.117)	(0.105)
Owns household's main residence	14.737***	2.34***	1.253***	0.738**	0.406
	(1.066)	(0.32)	(0.333)	(0.34)	(0.298)
Owns other real estate property	0.185	0.475	0.773	0.116	0.498
	(0.428)	(0.53)	(0.523)	(0.368)	(0.388)
Has self-employment business wealth	0.417	−0.533	0.102	1.464	−0.753**
	(1.115)	(0.936)	(0.938)	(1.139)	(0.353)
Received gift/inheritance	−0.033	0.151	0.426	0.207	−0.099
	(0.926)	(0.329)	(0.444)	(0.566)	(0.585)
Single adult household (base two-adult household)	0.533	0.286	0.619*	0.197	−0.038
	(0.447)	(0.387)	(0.34)	(0.273)	(0.247)
Three and more adults household (base two-adult household)	−0.397	1.084**	0.731	0.794	0.879
	(0.669)	(0.528)	(0.755)	(1.311)	(1.506)
Household with children	−0.74	−0.593	−0.663	0.057	0.065
	(0.78)	(1.076)	(0.555)	(0.435)	(0.48)
Household lives in Riga (base other than Riga and the other eight biggest towns)	−0.103	1.368***	1.007**	0.826*	0.349
	(0.326)	(0.413)	(0.444)	(0.439)	(0.371)
Household lives in one of the eight other biggest towns in Latvia (base other than Riga and the other eight biggest towns)	−0.169	0.538	−0.071	−0.151	−0.435
	(0.403)	(0.536)	(0.45)	(0.339)	(0.319)
Constant	−45.503	17.848	28.316	32.32*	10.206
	(34.034)	(18.141)	(18.591)	(17.59)	(12.463)
N	*121*	*121*	*121*	*121*	*121*

Notes: Household is considered 60 + when its reference person is at least 60 years old. Immigrant households are defined as households with a reference person born in a country other than the one where they reside at the time of the survey. Net wealth is calculated as household net wealth per adult in the household (in thousand euros). The values of net wealth are IHS-transformed. *, **, *** indicate statistical significance at the 10%, 5% and 1% level. Standard errors in parentheses.

Source: Authors' calculations from the Latvian HFCS.

Table A4. Net wealth: Explained and unexplained gaps between native and immigrant households aged at least 60 in Estonia and Latvia.

	Estonia 60+									
	Explaine part					Unexplainded part				
	p25	p50	p75	p90	p95	p25	p50	p75	p90	p95
Income (1000 EUR)	0.012	0.007	0.007	0.009	0.008	−0.149	−0.022	0.158	0.515	0.533
Income^2/100	0.005	0.003	0.003	0.003	0.002	0.044	0.023	−0.036	−0.162	−0.192
Active labour market status	−0.004	−0.004	−0.006	−0.012	−0.018	0.028	−0.072	−0.133*	−0.157**	−0.246**
Age	0.068	0.025	0.134	0.015	0.067	17.898	−28.867	−6.881	11.084	−23.285
Age^2	−0.098	−0.037	−0.136	−0.012	−0.047	−8.902	14.526	3.436	−6.224	10.275
Tertiary education	−0.002	−0.025	−0.036*	−0.022	−0.033	−0.188	−0.056	−0.008	0.020	0.031
Time in employment	−0.025	−0.005	−0.009	−0.002	0.009	−0.831	−0.251	1.07	0.659	1.012
Time in employment^2	0.047	0.016	0.026	0.007	−0.011	1.063	0.464	−0.906	−0.655	−0.728
Owns household's main residence	−0.22	−0.071	−0.031	−0.01	−0.006	1.407***	0.191	0.219	−0.047	0.054
Owns other real estate property	0.000	0.000	0.000	0.000	0.000	0.089	0.065	−0.014	0.023	0.2*
Has self-employment business wealth	0.025	0.026*	0.032*	0.046*	0.091*	0.016	0.008	−0.002	−0.005	0.011
Received gift/inheritance	0.032	0.036	0.041*	0.057**	0.034	−0.018	0.0600	0.095**	0.049	0.019
Single adult household (base two-adult household)	0.005	0.000	0.004	−0.001	0.005	−0.034	−0.149	−0.065	−0.143	0.122
Three and more adults household (base two-adult household)	−0.005	0.019	0.013	0.016	0.028	0.03	−0.044	0.018	−0.023	−0.064
Household with children	0.007	0.002	0.002	0.000	0.001	−0.058	0.025	−0.007	0.002	−0.012
Household lives in Harjumaa	−0.09**	−0.088***	−0.073**	−0.061**	−0.075**	−0.173	−0.148	0.063	0.085	0.227*
Constant						−10.005	14.642	3.392	−4.615	12.728
Total	−0.243	−0.095	−0.03	0.033	0.052	0.217	0.396***	0.398***	0.404***	0.687***
	Latvia 60+									
	Explained part					Unexplained part				
	p25	p50	p75	p90	p95	p25	p50	p75	p90	p95
Income (1000 EUR)	−0.039	−0.024	−0.017	−0.021	−0.031	0.585	−0.024	0.513	0.503	0.961
Income^2/100	−0.045	−0.029	−0.019	−0.015	−0.022	−0.032	−0.032	−0.162	−0.169	−0.256
Active labour market status	−0.002	−0.001	0.000	−0.001	−0.002	−0.553	−0.001	0.053	0.086	−0.032
Age	0.058	−0.126	0.16	−0.01	0.072	−76.077	−6.277	74.234*	48.079	14.771
Age^2	−0.065	0.119	−0.156	0.002	−0.077	36.125	3.356	−36.816*	−24.799	−7.878
Tertiary education	−0.008	−0.034	−0.044	−0.086	−0.079	0.105	−0.109	−0.107	0.004	0.047
Time in employment	0.268	−0.108	−0.067	0.078	0.162	0.428	2.507	−1.75	−7.492**	−5.001
Time in employment^2	−0.254	0.104	0.056	−0.101	−0.167	−0.080	−0.962	1.606	4.458**	2.839
Owns household's main residence	0.189	0.039	0.013	0.001	0.002	−2.358**	0.020	−0.320	−0.510*	−0.220
Owns other real estate property	0.204*	0.100**	0.124**	0.094**	0.080*	0.337*	0.084	0.066	0.149	0.042
Has self-employment business wealth	0.002	0.017	0.016	0.027	0.024	−0.005	0.048	0.024	−0.002	0.060
Received gift/inheritance	0.003	0.022	0.018	0.008	−0.037	0.003	0.008	−0.005	−0.003	−0.019

(*Continued*)

Table A4. Continued.

	Estonia 60+									
	Explaine part					Unexplainded part				
	p25	p50	p75	p90	p95	p25	p50	p75	p90	p95
Single adult household (base two-adult household)	0.014	0.014	0.02	0.012	0.021	−0.054	0.088	0.005	0.093	0.371*
Three and more adults household (base two-adult household)	0.166**	−0.011	0.012	−0.018	0.009	0.041	−0.021	−0.010	−0.018	−0.014
Household with children	−0.002	0.003	−0.001	0.002	−0.009	0.033	0.043	0.032	0.003	−0.034
Household lives in Riga (base rest of Latvia)	−0.205	−0.333***	−0.242***	−0.022	−0.123	0.495	−0.061	−0.051	−0.417	0.065
Household lives in one of the eight other biggest towns (base rest of Latvia)	−0.004	−0.006	0.000	0.000	0.001	0.174	0.070	0.018	0.024	0.058
Constant						40.77	1.466	−37.011*	−19.592	−5.036
Total	0.281	−0.253	−0.127	−0.049	−0.175	−0.063	0.204	0.318*	0.398*	0.723***

Notes: Household is considered 60 + when its reference person is at least 60 years old. Immigrant households are defined as households with a foreign-born reference person. *, **, *** indicate statistical significance at the 10%, 5% and 1% level.

Source: Authors' calculations from the Estonian and Latvian HFCS.

Curriculum vitae

Personal data

Name:	Liina Rebane (formerly Malk)
Date of birth:	27.11.1987
Place of birth:	Viljandi, Estonia
Citizenship:	Estonian

Contact data

E-mail:	liinarebane1@gmail.com

Education

Period	Educational institution	Field, degree
2012–…	Tallinn University of Technology	Economics, PhD
2018–...	University of Tartu	Conversion Master in IT, MA
2013–2014	Kiel Institute for the World Economy	Advanced Studies Program in International Economic Policy Research
2009–2012	Tallinn University of Technology	Public economics, main speciality public sector finance, MA (cum laude)
2006–2009	University of Tartu	Economics, BA
1994–2006	Carl Robert Jakobson Gymnasium	Basic and secondary education

Language competence

Language	Level
Estonian	Native
English	Fluent
German	Basic skills

Professional employment

Period	Organisation, department	Position
2024–...	Bank of Estonia, Economics and Research Department, Fiscal Council Secretariat	Economist
2022–2023	Bank of Estonia, Economics and Research Department, Research Division	Visiting researcher
2021–2024	Self-employed	Freelance business analyst
2012–2015	Bank of Estonia, Economics and Research Department, Research Division	Economist
2010–2012	Ministry of Social Affairs, Labour Policy Information and Analysis Department	Analyst

Publications

Rebane, L., Kukk, M., Rõõm, T. (2024). Wealth disparities between elderly immigrants and natives: a study of Estonia and Latvia. Baltic Journal of Economics, 24 (2), 203−238. DOI: 10.1080/1406099X.2024.2395671.

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Malk, L. (2010). Riskirühmad tööturul. Marksoo, Ü. Töövaldkonna areng 2009-2010. (37−50). Sotsiaalministeeriumi toimetised.

Siimer, K.; Malk, L. (2010). Noored töötud Eesti tööturul. 1−19.

Honours and awards

2024	Vello Vensel Doctoral Research Prize by Estonian Economic Association (EMS) for the research paper "Wealth disparities between elderly immigrants and natives: a study of Estonia and Latvia"
2024	Rein Otsason Scholarship for young outstanding Estonian economics student, Rein Otsason Foundation

Elulookirjeldus

Isikuandmed

Nimi:	Liina Rebane (endine Malk)
Sünniaeg:	27.11.1987
Sünnikoht:	Viljandi, Estonia
Kodakondsus:	Eesti

Kontaktandmed

E-post:	liinarebane1@gmail.com

Hariduskäik

Periood	Haridusasutus	Eriala, kraad
2012–…	Tallinna Tehnikaülikool	Majandusteadus, PhD
2018–...	Tartu Ülikool	Infotehnoloogia mitteinformaatikutele, MA
2013–2014	Kieli Maailmamajanduse Instituut	Kraadijärgse õppe programm rahvusvahelises majanduspoliitikas
2009–2012	Tallinna Tehnikaülikool	Avaliku sektori majandus, spetsialiseerumisega avaliku sektori rahandusele, MA (cum laude)
2006–2009	Tartu Ülikool	Majandusteadus, BA
1994–2006	Carl Robert Jakobsoni nimeline Gümnaasium	Põhi- ja keskharidus

Keelteoskus

Keel	Tase
Eesti keel	emakeel
Inglise keel	kõrgtase
Saksa keel	algtase

Teenistuskäik

Periood	Asutus, osakond	Ametikoht
2024–...	Eesti Pank, rahapoliitika ja majandusuuringute osakond, eelarvenõukogu sekretariaat	Ökonomist
2022–2023	Eesti Pank, rahapoliitika ja majandusuuringute osakond, majandusuuringute allosakond	Külalisuurija
2021–2024	Iseseisev ettevõtja	Vabakutseline ärianalüütik
2012–2015	Eesti Pank, rahapoliitika ja majandusuuringute osakond, majandusuuringute allosakond	Ökonomist
2010–2012	Sotsiaalministeerium, tööpoliitika info ja analüüsi osakond	Analüütik

Publikatsioonid

Rebane, L., Kukk, M., Rõõm, T. (2024). Wealth disparities between elderly immigrants and natives: a study of Estonia and Latvia. Baltic Journal of Economics, 24 (2), 203−238. DOI: 10.1080/1406099X.2024.2395671.

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Autasud ja auhinnad

2024	Vello Venseli teaduspreemia silmapaistva uurimustöö eest, Eesti Majandusteaduse Selts (EMS), uurimustöö "Wealth disparities between elderly immigrants and natives: a study of Estonia and Latvia" eest
2024	Rein Otsasoni stipendium Eesti noorele silmapaistvatele majandusüliõpilasele, SA Rein Otsasoni Fond

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