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Driving factors behind the changes in income distribution in the Baltics: income, policy, demography

Jekaterina Navickė

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Jekaterina Navickė
Vilnius University

Abstract
This paper aims at disentangling factors behind the changes in income inequality and relative poverty in the Baltics. The evaluation of the income, policy and demographic effects was based on counterfactual scenarios constructed using tax-benefit microsimulation and re-weighting techniques. Decomposition showed that income and policy effects were dominant for changes in inequality and relative poverty. The policy effects were inequality- and poverty-reducing before the crisis and after the EU accession as a whole. The income effects for the same periods were inequality- and poverty-increasing. Despite rapid demographic changes, the demographic effect on income inequality and relative poverty was marginal.

Keywords:
income inequality, poverty, demographic change, policy reform, Baltics

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J31

Corresponding author
Jekaterina Navicke, jekaterina.navicke@fsf.vu.lt.

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Foundation of Admirers and Mavens of Economics
ull. Mazowiecka 11/14
00-052 Warszaw
Poland

W | grape.org.pl
E | grape@grape.org.pl
TT | GRAPE_ORG
FB | GRAPE.ORG
PH | +48 799 012 202

Introduction

Lithuania, Latvia and Estonia are sometimes referred to as the "Baltic tigers" due to high rates of the economic growth in the region. Nevertheless, the region's economic development is often noted as not socially cohesive or sustainable (e.g. Sommers & Woolfson 2014 (eds), Kallaste & Woolfson 2013, Juska & Woolfson 2015). What is common for all the three Baltic countries are exceptionally high rates of income inequality and relative poverty. According Eurostat (2017a), the at-risk-of-poverty rate in 2015 was the second highest among the EU members in Latvia (at 22.5), the third highest in Lithuania (at 22.2) and the sixth highest in Estonia (at 21.6). In all three countries, relative poverty was on the rise since the onset of the latest economic crisis in 2009. The Gini coefficient in Lithuania was the highest in the EU in 2015, while Latvia scored the forth and Estonia the fifth highest (Eurostat 2017b).

The aim of this paper is to disentangle the driving factors behind the changes in income inequality and relative poverty in the Baltics in the decade since the EU accession in 2004. Three potentially most important effects are analysed: income effect (due to changes in primary income and employment), policy effect (due to discrete changes in the tax-benefit policies) and demographic effect (due to natural demographic change and migration). As far as the author knows, this has never been done for the Baltic region. Previous analysis that included the data for the Baltics (Avram et al. 2013, De Agostini et al. 2014, Figari et al. 2016, De Agostini et al. 2016; Paulus & Tasseva 2017) mostly focused on the effects of fiscal consolidation measures since the onset of the economic crisis and / or did not incorporate the demographic effect.

To single out income, policy and demographic effects on income distribution, a decomposition analysis based on a combination of counterfactual modelling and re-weighting techniques was performed. First, in line with methodology developed in Bargain & Callan (2010), Bargain (2012), Hills et al. (2014) counterfactual scenarios are built by using tax-benefit microsimulation to distinguish between the policy effect and other factors. The latter are further decomposed into income and demographic effects by using static reweighting, similar to the method discussed and used by Bourguignon et al. (2008).

The structure of the paper is as follows. The first section discusses the relevance and dynamics of the three factors potentially driving changes in income distribution in the Baltics: distribution of the primary income, the role of tax-benefit policy reform, and demographic changes. The methodology of combining microsimulation and static reweighting to single out income, policy and demographic effects is discussed in the second section. The paper also discusses the advantages of this approach compared to traditional decompositions by income components by using Shapley values or other decomposition techniques. The results of the paper are presented in the third section. I conclude with the main empirical findings and recommendations for further research.

1. Primary income inequality, policy reforms and demographic changes in the Baltics

Changes in the primary income distribution, tax-benefit reforms and demographic change may all result in a more or less equal income distribution. This section summarizes the situation and the main trends for these three factors for the Baltics, with a focus on a decade after the EU accession in 2004.

1.1 Distribution of the primary income

Primary income includes all income received in the labour market (both employment and self-employment income), income from property and capital, such as rents, dividends or distributed profits. A proxy for a distribution of the primary income (i.e. disposable income[1] before all social transfers) during the decade after the accession of the three Baltic countries is compared to other EU countries in Figure 1.

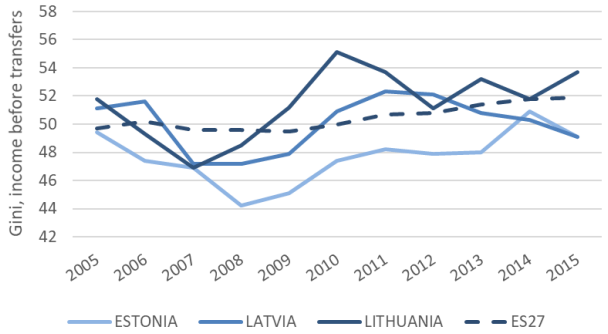

Figure 1. Gini of disposable income before all social transfers in 2005-2015 EU-SILC
Source: Eurostat (2017c). Note: income reference period of the EU-SILC is a year before the survey (t-1)

With regard to the distribution of disposable income before social transfers, Baltic countries cannot be noted as the worst performers, but rather as having inequality levels fluctuating around the EU-average. The trends of the Gini for disposable income before social transfers for the three countries are similar. During the first years after the accession into the EU (economic growth period) inequality in disposable income before transfers went down, most so in Estonia. This trend reversed with the onset of the crisis in 2008-2009, i.e. the Gini in disposable income before transfers increased, most so in Lithuania. In Lithuania, the change towards increase in the Gini before social transfers began as early as since 2008, while in the other two countries – not before 2009 and more substantially since 2010. For the EU in general, we also see a trend towards an increase in the Gini of the disposable income before social transfers, especially since the onset of the crisis.

Wages and salaries are the main component of the primary income, while income from self-employment, property and capital make a lower share and are typically not well captured in the surveys on income (e.g. Fesseau et al. 2013; Eurostat 2013, Navicke & Lazutka 2018). Inequality in earnings in the Baltics among those receiving this type of income is shown in Figure 2. It can be noted that inequality in earnings was on the rise in all the three Baltic countries during the period, which is demonstrated by a linear trend applied to net earnings. The distribution of earnings after the EU accession was most stable for Estonia, albite with an upward shift towards the end of the period. In all three countries taxes and social insurance contributions have little redistributive effects on net earnings.

[1] Household disposable income is the total amount of money households have available for spending and saving after subtracting income taxes and pension contributions (Eurostat 2018).

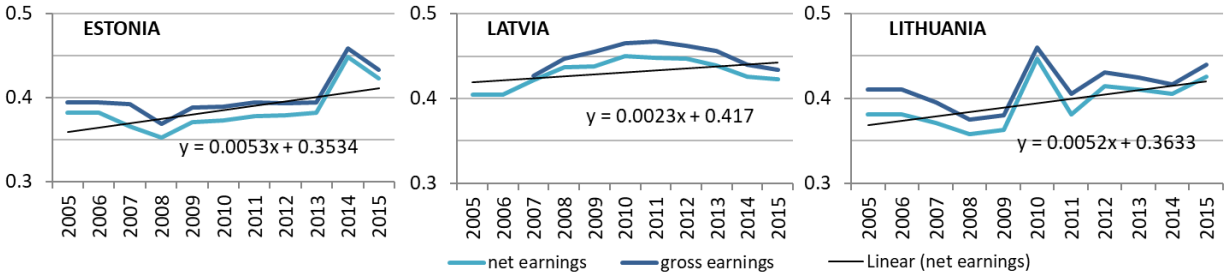

Figure 2. Dynamics of Gini in earnings in 2005-2015 EU-SILC
Source: calculations by author based on SILC 2005-2015 data.

Increasing trends in inequality of earnings in the Baltics may be an important factor driving the overall change in income inequality. Labour market polarization and segmentation were noted among the potential driving factors of growing wage inequalities in the region (e.g. Lazutka & Poviliunas 2010, Leschke 2012, Corluy & Vandernbroucke 2013, Horemans 2014, Juska & Woolfson 2015). The process of the labour market polarization refers to disappearing of the routine labour in the middle of wage distribution, an increasing gap between low-paid and high-paid jobs, as well as an evolution of disparity between individual level and household level employment (Horemans 2014). The process of the labour maker segmentation stresses the divergence between the primary sector relatively secure and protected public employment and increasingly unprotected low-wage low-skill secondary sector in manufacturing, retail, hospitality and other service sectors (Juska & Woolfson 2015).

According to the calculations by Corluy & Vandernbroucke (2013), labour market polarization was on increase in Lithuania in the decade before the crisis. Similar polarization trends were not observed for the same period for Latvia and Estonia. The later studies, however, find high level of labour market polarization in the Eastern Europe in general and in the Baltic countries in particular (Horemans 2014). Horemans (2014) based on 2011 EU-SILC data finds that compared to the random distribution of non-standard employment, the actual level of households where both adults did not work full-year full-time was about 14 p.p. higher in Lithuania, about 10 p.p. higher in Latvia and about 7 p.p. higher in Estonia. Except for Estonia, these levels are the highest in the EU. Non full-year employment was marked as the main factor for high polarization index for the Baltics. Consequential high concentration of non-standard employment and non-employment at the household level may drive the general inequality levels upwards.

Lazutka & Poviliunas (2010) noted segmentation of the labour market as another source of potentially increasing inequality in earnings in Lithuania. Juska & Woolfson (2015) noted further fragmentation of the Lithuanian labour market into advantaged primary (largely public) and informal secondary (low-skilled manufacturing and services) sectors during the latest economic crisis. With regard to Latvia and Estonia, Leschke (2012) noted an increase in part-time and temporary employment in both countries since the onset of the crisis, adding to an increase in the secondary sector of the labour market.

Among the main factors under the polarization and segmentation trends in the Baltic labour markets that perpetuate social inequality is a high level of dependency on the market and low level of decommodification in the Baltic welfare regimes. The latter are characterized by low

levels of social provisions and programmes aimed at protecting individuals against unemployment or under-employment (Lace 2010 p.12), low influence of trade-unions (Kallaste & Woolfson 2013) and high degree of non-compliance to labour law in both formal and informal economy (e.g. Proser 2016). Experts also note that labour market segmentation and in-work poverty is not the sphere of wider political debate or interventions in either of the three Baltic countries (Lace 2010, Lazutka & Poviliunas 2010, Viies 2010). With regards to the prospects of the labour market developments in the Baltic countries, large-scale further deregulation of labour law is either taking place or was announced in all three Baltic countries, especially with regard to changes in dismissal rules and rules on atypical contracts (Clauwaert & Schomann 2017, Rubery & Piasna 2016). While more flexible labour market regulation may have positive effect on the overall employment rates, it can further increase wage dispersion, labour market polarization, segmentation and related inequalities.

Finally, previous research showed that a below EU-average and declining share of the total GDP goes to labour rather than capital in all three Baltic countries, especially in Lithuania and Latvia (Razgune & Lazutka 2015). As noted by the latest research by Piketty et al. (2016), the reducing share of the labour income in relation to capital income is the main driving force of the income inequality, as capital income tends to be much more unequally distributed compared to labour income. Onaran and Obst (2015) attribute the decline in the aggregate wage share and rising inequality in part to the growth of non-standard employment and the reduction of trade union influence. Both of the effects were noted as highly relevant and worrying trends for the Baltics. Another factor reducing the wage share in the total GDP and in relation to productivity gains was an internal devaluation (Blanchard et al. 2013), with cuts on public wage bills in all three Baltic countries and associated spill-over effect on private wages.

1.2 Income redistribution and policy reform

As it was already noted, inequality of the disposable income before social transfers in the Baltic countries has been fluctuating around the EU-average since the EU accession. The picture changes dramatically if we look at the distribution of disposable income after social transfers (Figure 3). Inequality levels of the total disposable income in the Baltics were consistently above the EU-average for the whole period after the EU accession. The levels of Gini for the total disposable income in the Baltics are quite volatile and converge towards the end of the observed period, i.e. Gini in Latvia is decreasing, whereas it is increasing in Estonia and Lithuania.

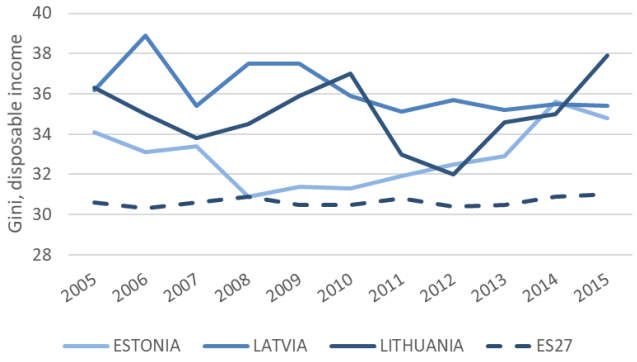

Figure 3. Gini of the disposable income after social transfers in 2005-2015 EU-SILC
Source: Eurostat [2017b]. Note: income reference period of the EU-SILC is a year before the survey (t-1).

The about-average inequality in income before transfers and above-average inequality after transfers indicate lower degree of income redistribution in the Baltics in the EU context. Indeed, the share of the social protection expenditure in relation with GDP is on average around twice lower in the Baltics compared to the EU (see Figure 4). This relation is even less favourable for the expenditures on social protection in terms of PPS per capita. This indicates weak redistributive capacity of the post-communist welfare regimes of the three Baltic countries (see e.g. Aidukaite 2009).

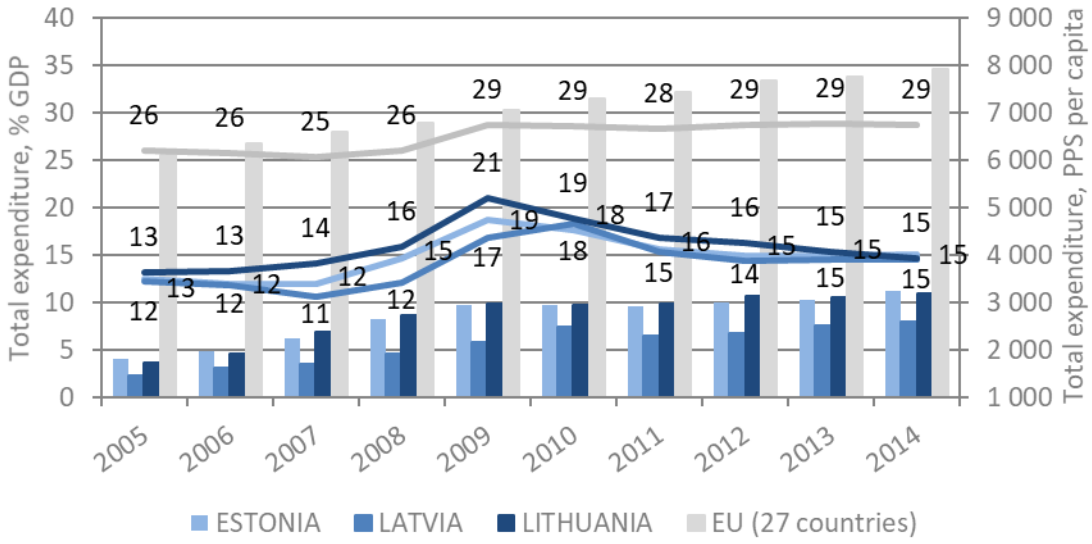

Figure 4. Total expenditure on social protection as % of GDP and in PPS per capita
Source: Eurostat (2017d): Total social protection expenditure [spr_exp_sum]
Note: lines refer to the total expenditure (% of GDP); bars refer to the total expenditure (PPS per capita)

Overall, the tax-benefit reforms since the EU accession can be split into two periods before and after the onset of the economic crisis. The period before the crisis was marked in all three countries by a rapid economic expansion, which let increase generosity of the welfare state provisions in both relative and absolute terms (see Figure 4). After the crisis, we see absolute expenditure on social protection stagnating in all three Baltic countries, while still on the rise across the EU. In general, expenditure on social protection in relation to GDP is most generous in Lithuania. However, in absolute terms and taking into account the purchasing power differences, Lithuania and Estonia have consistently been spending similar amounts per capita on social protection.

Indeed, the period after the EU accession and before the crisis was noted as a period of the welfare state generosity in Lithuania (Ivaskaite-Tamosiune 2013). This both concerned social insurance provisions (especially with regard to ad-hoc increases in pensions) and benefits specifically targeted at families with children. Moreover, all three Baltic countries adopted flat-tax reforms in the mid and late 90s and were reducing their personal income tax rates, i.e. from 33% after the reform in 1994 to 27% in 2007 and 15% in 2016 in Lithuania, from 26% after the reform in 1994 with a gradual reduction to 21% in 2005-2008 and 20% in 2015 in Estonia and from 25% after the reform in 1997 to 23% in 2016 in Latvia. There were also associated changes

in tax allowances, with substantial increase in Lithuania, a slight increase in Estonia and some reduction in Latvia (Greenberg 2009).

Fiscal consolidation measures during the crisis included cuts or freezes of benefits, pensions and public wages, as well as an increased VAT rate in all three Baltic countries; increase of social insurance contributions and reduction of tax concessions took place in Estonia and Latvia; property taxes were increased or introduced in Latvia and Lithuania (Figari et al. 2016). The total effect of the consolidation packages on disposable income was estimated to be the highest in Latvia (at -9.23%), followed by Estonia (at -3.98%) and Lithuania (at -2.93%) (ibid.). According to the authors' estimates, the degree of fiscal consolidation in Latvia was above that in Portugal or Spain and only lower compared to Greece.

The findings on the distributional effect of the tax-benefit reforms during the crisis in the Baltics are mixed. The impact of the direct tax-benefit reforms introduced during the crisis was noted to be inequality-reducing in Latvia, near-neutral in Lithuania and inequality-increasing in Estonia (Avram et al. 2013, Figari et al. 2016). De Agostini et al. (2014) also find progressive effects on the distribution of income in Latvia, but U shaped effects in Estonia and a regressive effect in Lithuania. It can also be noted that while consolidation packages were mainly tax-focused in Estonia and benefit-focused in Latvia and Lithuania, the main effect on inequality came through spending cuts in all cases (Figari et al. 2016).

1.3 Demographic change and its effect on income distribution

The Baltic countries may be distinguished by rapid demographic changes within the EU context, it is especially the case in Lithuania and Latvia. Figure 5 shows the demographic change over the period after the EU accession resulting from natural population change and migration, as well as the population change by age groups.

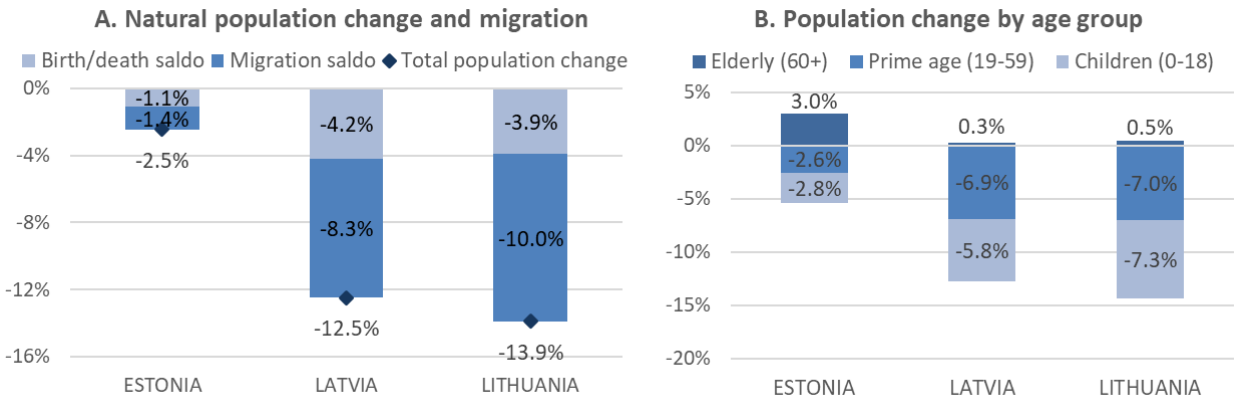

Figure 5. Change in the population size and structure by age group, 2005-2016
Source: Calculations by author based on Eurostat (2017e).

It can be seen that in all three countries the change in the population size was negative in the period after the EU accession. This was both due to natural population change and emigration. In Latvia and Lithuania, the main contributing factor was emigration, with a migration saldo standing at, correspondingly, -8.3% and -10% during the period. It can be noted that emigration in all three countries was unequally distributed among population groups of different educational

status. For example, Hazans & Philips (2009) find that post-enlargement migrants from all three Baltic countries were significantly less educated than stayers. In Estonia, the demographic change due to migration is less dramatic (-1.4%), albite this might be in part due to proximity of Finland and different shuttle migration processes (Anniste et al. 2012). A natural decrease in population added further to the negative demographic dynamics, i.e. -4.2% of population in Latvia and -3.9% in Lithuania and -1.1% in Estonia. As a result, the total population loss during the period was -12.5% in Latvia, -13.9% in Lithuania, while in Estonia it accounted for -2.5%.

Migration processes, increasing life expectancy and low fertility rates in the Baltics also resulted in a rapid change in the structure of population by age. The analysed period was marked by population ageing in all three countries. Despite the negative total population change, the number of elderly population increased in all three Baltic countries, mostly in Estonia (by 3%). This amounted to a similar increase of the share of the elderly population by 3.5-3.9 p.p. in the region within the period after the EU accession. At the same time, the number and the share of children decreased, mostly in Lithuania (-7.3% or -4.5 p.p. reduction in the share of children). The number of the prime-age population decreased by a similar percentage as that of children, albite their share remained relatively stable, i.e. with a reduction of -0.1 p.p. in Latvia, -0.6 p.p. in Lithuania and -1.3 p.p. in Estonia.

Rapid demographic change in the Baltics and important role of emigration in this process may both be seen as an outcome of the high levels of income inequality and relative poverty in the region and as a factor contributing to the changes in income distribution. On the one hand, high levels of income inequality and relative poverty may be an important explanation why people are fleeing one of the most successful regions in the EU in terms of its economic growth. On the other hand, high rates of emigration and population ageing affect the structure of the population and its income, i.e. pensioners are often concentrated around the second-third quintiles of income distribution. As emigration in the Baltics is often an economic survivor strategy, younger people in the lower-middle part of income distribution may also be those mostly inclined to emigrate, i.e. those mostly inclined to do so are neither those at the very bottom nor at the very top of income distribution. Nevertheless, the impact of the demographic change on income distribution in the Baltics has not been previously empirically analysed. The contribution of this paper is to disentangle the demographic effect on income distribution from the other factors, i.e. changes in the primary income distribution and policy effects.

2. Methodology: decomposing distributional changes by using microsimulation and reweighting

The aim of this paper is to disentangle the driving factors behind the changes in income inequality and relative poverty in the Baltics. A number of decomposition methodologies exist, each one of them offering their advantages and limitations. In general, decompositions can be aimed at (i) either assessing the contribution of different income components or population subgroups to the overall income distribution (e.g. Shorrocks 1982, Fields 2003, Brewer & Wren-Lewis 2015) or at analysing the effects of the broader factors driving changes in income distribution, such as income growth, policy effects or demographic changes (Bargain & Callan 2010, Bargain 2012, Hills et al. 2014, Bourguignon et al. 2008, Brewer & Wren-Lewis 2015).

Decompositions by income components or population subgroups use axiomatic decomposability properties of distributional measures to look at the relative contributions of the different income types or non-overlapping population groups (e.g. Shorrocks 1982, Fields 2003, Brewer & Wren-

Lewis 2015). The contribution of each income component depends on its relative size in the total income. It also depends on the distribution compared to the situation when inequality in the income component is zero or when an income component itself is assumed to be equal to zero. Decompositions by population subgroup express the total inequality as the sum of the inequalities within non-overlapping population groups and the inequality that exists between these groups (e.g. Brewer & Wren-Lewis 2015). While such analysis helps to identify relative contribution of different income types or population groups to the overall income distribution, it does not reflect the interactions between the two. Decomposition by income components is also based on a strong assumption of no inter-dependencies between the existence and distribution of different income components.

Decomposition of income inequality by broader factors, such as the economic growth, labour market, demographic or policy changes can help overcome these limitations by simultaneously incorporating analysis of change in the underlying population and incomes. This decomposition framework is based on building counterfactual scenarios (e.g. Bargain & Callan 2010, Bargain 2012, Bourguignon et al. 2008). The counterfactual scenarios may be constructed by using microsimulation techniques, parametric regression methods or non-parametric reweighting. For instance, Bargain & Callan (2010) developed their decomposition framework on the basis of microsimulation techniques to distinguish between policy effects, nominal growth in income and other effects that include changes in the labour market, demographic or family structures. Bourguignon et al. (2008) described and used counterfactual distributions constructed by using parametric regression methods and non-parametric sample reweighting and discussed the links between the two. Importantly, both regression-based and sample reweighting techniques may help distinguish the effects of the changes in the underlying population structure.

This paper aims at distinguishing between three factors of the income distribution: income effect (due to changes in primary income and employment), policy effect (due to discrete changes in the tax-benefit policies) and demographic effect (due to natural demographic change and migration). Hence the author of this paper combines microsimulation-based decomposition approach developed in Bargain & Callan (2010), Bargain (2012), Hills et al. (2014) with the static reweighting technique (Bourguignon et al. 2008). The former is used to single out the policy effects, while the latter is used to distinguish between income and demographic effects. The methodology is discussed in detail below.

Factors of distributional change: income, policy and demography

The income effect reflects the changes in nominal levels of primary income, the changes in the distribution of the income within the population due to changes in employment, changes of the contributory benefit levels that are directly linked to the level of the previously received labour market income. It also captures the changes in fiscal budgets that are not due to policy reforms, e.g. expenditure increase in social assistance transfers due to the increase in low-skilled employment, etc. Finally, it may include changes to the population structure that are not reflected in the demographic effect.

The policy effect is related to discrete tax-benefit changes and reforms that affect the distribution of the household disposable income. These may include the changes to eligibility rules, the tax rate structure, rates and amounts, etc. The policy effect is assessed against a selected benchmark,

in this case – a situation where tax-benefit monetary parameters are nominally adjusted in line with the growth in prices.

The demographic effect is a result of the changes in the demographic composition of the population by age, gender or other characteristics, as well as related changes in the family structure.

Step 1: Building counterfactual scenarios to single out policy effect

The first stage of the decomposition approach used in this paper relies on counterfactual scenarios obtained with tax-benefit microsimulation techniques, and formalised by Bargain and Callan (2010). This method decomposes the changes in income distribution into policy effects and other effects. The latter include both changes due to income growth and composition of the underlying population related to the changes in the labour market situation and demographic changes.

Microsimulations used for constructing counterfactual scenarios are implemented by using a tax-benefit microsimulation model EUROMOD (version G4.0+). EUROMOD is a static tax-benefit model for the EU (Sutherland & Figari 2013). The model runs on the data derived from the representative EU Survey on Income and Living Conditions (EU-SILC). Importantly, the survey is harmonized across the EU countries and is widely used for comparative analysis. The simulations are based on the earliest and latest available data-policy year combination for each of the three Baltic countries, i.e. 2005-2013 for Lithuania and Estonia and 2006-2014 for Latvia. A one-year difference of the period of analysis between the countries should not result in substantial differences of the results. The starting year of the analysis is further referred to as *"year 0"* and the final year of the analysis as *"year 1"*.

Following the notation used in Bargain and Callan (2010), we define *y* as a matrix which contains the information on market income and socio-economic and demographic characteristics of the households, and *d(p,y)* a function that derives disposable income on the basis of *y*, distinguishing between the structure of the tax-benefit system *(d)* and policy parameters with monetary values *(p)*.

G are the chosen income inequality measures, i.e. the Gini coefficient or relative poverty rate at the 60% of the median equivalized household disposable income. The two measures complement each other as Gini coefficient is more sensitive to the changes in the middle of income distribution, while relative poverty reflects the situation of those at the lower part of the income distribution relative to the median household. Moreover, both high rates of income inequality and relative poverty in the Baltics are worrisome and require a detailed analysis.

The overall change in the selected distributional measures between *year 0* and *year 1* is estimated as:

$$\Delta G = G[d_1(p_1, y_1)] - G[d_0(p_0, y_0)] \quad [1]$$

This can be decomposed into the policy effect and other effect by introducing counterfactual income distribution where attributes *(p, y, d)* in one period are replaced sequentially with those from another period, one at a time. The counterfactuals also involve indexing income and monetary parameters of the tax-benefit system (denoted with α). This helps obtain a benchmark,

where the tax-benefit monetary parameters are nominally adjusted in line with income growth or prices. We choose counterfactual indexation by the average price levels, i.e. α = HICP (Eurostat 2017f).

Decomposing the total change in the following way allows assessing the policy effect on Gini, relative poverty or any other inequality measure conditional on the end-period market income and population, i.e. y_1:

$$\Delta G = \underbrace{G[d_1(p_1, y_1)] - G[d_0(\alpha p_0, y_1)]}_{\text{Policy effect}} + \underbrace{G[d_0(\alpha p_0, y_1)] - G[d_0(p_0, y_0)]}_{\text{Other effect}} \quad [2]$$

While the next approach quantifies the policy effect conditional on the start-period market income and population, i.e. y_0:

$$\Delta G = \underbrace{G[d_1(p_1, y_1)] - G\left[d_1\left(\frac{1}{\alpha} p_1, y_0\right)\right]}_{\text{Other effect}} + \underbrace{G\left[d_1\left(\frac{1}{\alpha} p_1, y_0\right)\right] - G[d_0(p_0, y_0)]}_{\text{Policy effect}} \quad [3]$$

As can be seen in equations (2) and (3), the policy effect is obtained by keeping market income *y* constant and altering the tax-benefit parameters *p* to correspond in real terms to *year 1* or *year 0*. The other effect is derived by keeping policy parameters *p* constant in real terms and applying those on the income *y* in *year 1* and *year 0*. Since there is no reason for preferring the first decomposition over the second, the Shorrocks-Shapley decomposition is computed by calculating the average contributions for the two decompositions above, which gives the average policy–and other effects on the selected distributional measure (e.g. Bargain & Callan 2010, Bargain et al. 2016, Paulus & Tasseva 2017).

Step 2: Using static reweighting to disentangle income and demographic effects

Following the logic of constructing counterfactual scenarios, the other effect in [3] can be further decomposed into *income effect* due to the changes in the income and labour market situation *i* and *demographic effect* due to the changes in the demographic structure of the population *s*. Static re-weighting was previously used e.g. by Bourguignon et al. (2008) to construct counterfactual scenarios and decompose demographic effect on income distribution. In general, reweighting procedures are used relatively often to calibrate weights for surveys used for microsimulation modelling (e.g. Creedy 2003, Cai at al. 2006, Brewer at al. 2009). Within the EUROMOD framework, reweighting techniques were previously explored by Immervoll et al. (2005), Kump and Navicke (2014).

In our case, re-weighting is used to make the sample in *year 0* more like the sample in *year 1* in a number of selected dimensions. To single out the demographic effect on income inequality and relative poverty, counterfactual distributions need to be constructed by taking into account the demographic change between the two periods, with selected control variables covering population characteristics that are likely to impact the income distribution. However, the spread of weights is likely to increase with the number of controlling variables. A high number of controls may also result in the re-weighting procedure not converging at all.

In line with the previous research (Immervoll et al. 2005, Kump and Navicke 2014) we chose to control for the age-sex structure, household composition and educational structure. The selected

controls help capture the effect of the population ageing as well as age-biased and skill-biased migration processes in the Baltics.

- *Age-sex structure:* Ten age groups include: 0-6, 7-14, 15-19, 20-25, 26-34, 35-44, 45-54, 55-60, 61-69, 70+. Data of *year 1* is reweighted to match in absolute terms the population size in *year 0* in ten age groups by gender, and *vice versa*.
- *Household composition:* Ten household types include: single adult younger than 65; single adult 65+; couple with no children; three and more adults without children; households with one adult and one, two or three and more children; households with more than one adult and one, two or three and more children. Data of *year 1* is reweighted to match the share of individuals in *year 0* living in different types of households.;
- *Educational structure:* Two education levels: upper secondary and below (ISCED level <4), post-secondary and tertiary (ISCED level >=4). Data of *year 1* is reweighted to match the share of individuals in *year 0* by achieved education level within the age-sex classes. Calibration by more detailed education level within the age-sex classes would not converge.

The number or share of population by selected controlled characteristics is derived from the data in *year 0* and applied on the data in *year 1* (and *vice versa*). According to Eurostat recommendation on constructing EU-SILC weights (Eurostat 2010), calibration is carried out at the household level by using integrative calibration approach, i.e. ensuring consistency between household and individual weights[2]. The distances of new weights to the original ones are minimized by a re-weighting algorithm equivalent to Methods 2 of Deville and Särndal (1992)[3]. In accordance with EU-SILC guidelines (Eurostat 2010, p.32) a bounded logistic method is applied for re-weighting to avoid negative weights, which are not acceptable from the practical point of view in the analysis of household surveys.

Construction of the counterfactual demographic distributions (s^*) allows further decomposition of the other effect in [2] and [3]. The final decomposition conditional on the end-period income and demographic structure (i_1, s_1) would take the following form based on the selected combinations of the attributes *p, i, s, d*:

$$\begin{aligned} \Delta G = {} & G[d_1(p_1, i_1, s_1)] - G[d_0(\alpha p_0, i_1, s_1)] + && \text{[Policy effect]} \\ & G[d_0(\alpha p_0, i_1, s_1)] - G[d_0(\alpha p_0, i_1, s_1^*)] + && \text{[Demographic effect]} \\ & G[d_0(\alpha p_0, i_1, s_1^*)] - G[d_0(p_0, i_0, s_0)] && \text{[Income effect]} \end{aligned} \qquad [4]$$

While the final decomposition conditional on start-period income and demographic structure (i_0, s_0) would take the following form:

[2] For detailed information on integrative calibration, see Eurostat (2010), for the application on EUROMOD data, see Kump & Navicke (2014).

[3] Command "calibrate" in STATA is used in this analysis.

$$\Delta G = G[d_1(p_1, i_1, s_1)] - G\left[d_1\left(\frac{1}{\alpha}p_1, i_0, s_0^*\right)\right] + \quad \text{[Income effect]}$$

$$G\left[d_1\left(\frac{1}{\alpha}p_1, i_0, s_0^*\right)\right] - G\left[d_1\left(\frac{1}{\alpha}p_1, i_0, s_0\right)\right] + \quad \text{[Demographic effect]} \qquad [5]$$

$$G\left[d_1\left(\frac{1}{\alpha}p_1, i_0, s_0\right)\right] - G[d_0(p_0, i_0, s_0)] \quad \text{[Policy effect]}$$

Similar as in case of effects singled out in [2] and [3], the Shorrocks-Shapley decomposition is computed on [4] and [5] by calculating the average of the contributions for the two decompositions above, which gives the average policy, income and demographic effects on the Gini and relative poverty.

It should be noted that other permutations are possible for equations 2 to 5. Moreover, the decomposition technique by Bargain and Callan (2010) also allows estimating nominal income growth effect. However, as demonstrated by the authors, this is a monotonic change with no effect for income inequality. Hence it is not included into the decomposition.

3. Results: counteracting income and policy effects and marginal impact of demographic change

In this section, the results of the empirical analysis are discussed. First, the author looks at the absolute and relative impact of the income, demographic and policy effects on Gini and relative poverty rate. The absolute effects are measured as a percentage point change (p.p.), while the relative impact – as percentage change (%). The results for the whole analysed period (2005-2013 for Lithuania and Estonia and for the period of 2006-2014 for Latvia) are further decomposed by two sub-periods, i.e. before and after the onset of the economic crisis. This helps to understand the impact of income growth, policy reforms and demographic change within the context of economic growth and recession.

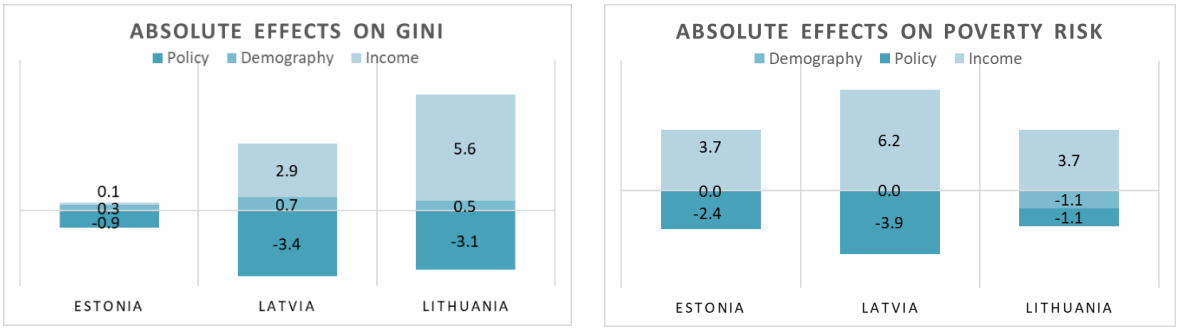

Figure 6. Absolute effects on Gini and poverty risk: whole period

Note: Period for Lithuania and Estonia: 2005-2013; for Latvia: 2006-2014. Real effects (counterfactual of policy indexation by CPI). Floating poverty risk threshold.

Figure 6 shows the counteracting income and policy effects on income inequality and relative poverty and a marginal effect of the demographic change.

On the one hand, income effect was increasing inequality in Latvia and Lithuania and had a marginal effect in Estonia. However, for those at the bottom of the distribution, income effect was detrimental and contributed to an increased relative poverty in all three Baltic countries. Those at the bottom of the income distribution became worse-off relative to the median

household. This is in line with the increasing trends in inequality of earnings and household employment in the Baltics, as well as a reducing wage share in the total GDP, especially in Lithuania and Latvia (see Section 1).

On the other hand, the policy effect was inequality-reducing in all three Baltic countries, mostly in Lithuania and Latvia. This is in line with the previous findings for the period since the onset of the economic recession for Latvia (Avram et al. 2013, Figari et al. 2016, De Agostini et al. 2014). None of the three countries show regressive effect on the income distribution. Lower absolute contribution of policy reform towards reducing overall inequality in Estonia is in line with the lower welfare state intervention in the sphere of social protection discussed in Section 1. The policy effects on relative poverty are consistently poverty-reducing. Latvia stands out as a leader in fiscal reforms oriented both to reducing poverty and overall inequality. In Estonia, the reforms were more oriented towards the poor, i.e. the effect on poverty risk strongly exceeds that on Gini. In Lithuania the reforms were more oriented towards the population in the middle of the income distribution, i.e. stronger effect on reducing inequality measured by Gini is observed compared to that on the poverty risk.

The change in the demographic structure of the population had least effect compared to both income and policy effects, and was inequality-increasing in all three Baltic states, mostly in Latvia. Interestingly, a substantially higher demographic changes in Lithuania and Latvia have similar effects on inequality compared to Estonia. As discussed in Section 1, this could be a result of a growing share and number of the elderly in Estonia with substantially lower emigration rates among the prime-age individuals and families. While in Latvia and Lithuania the population ageing is counter-balanced by a high number of emigrants who would otherwise take a similar position to pensioners in the income distribution, i.e. in the second and third income quintiles, rather than either the top or the bottom of the income distribution. The demographic effect on poverty was marginal in Estonia and Latvia, whereas in Lithuania it had the highest absolute effect and contributed to a 1.1 p.p. reduction in relative poverty. The latter may be due to high emigration rates among the working age adults during the financial crisis. Thus the unemployment burden was ‘exported’, contributing to lower poverty risk rates in Lithuania if compared to the counterfactual demographic situation.

These results demonstrate that demographic processes have a heterogeneous impact on inequality and relative poverty. Increases in Gini suggest that the population in the middle part of income distribution is shrinking, i.e. working age families with children. The mixed demographic effect on those at the bottom of the income distribution can be attributed to the differences in the relative position of pensioners and migrants within the income distribution and across countries. The changes in the shares of these population groups can potentially have counteracting effects on relative poverty, which requires further analysis.

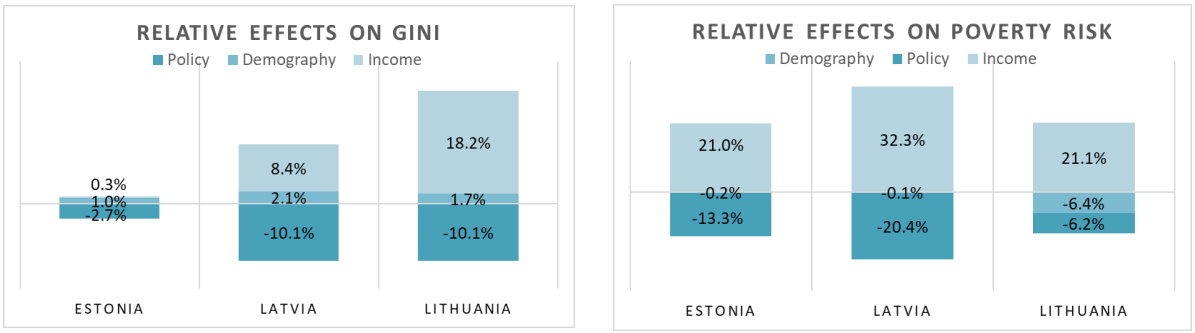

Figure 7. Relative effects on Gini and poverty risk: whole period
Note: Period for Lithuania and Estonia: 2005-2013; for Latvia: 2006-2014. Real effects (counterfactual of policy indexation by CPI). Floating poverty risk threshold.

Figure 7 allows comparing the magnitude of the analysed effects between the two measures of income inequality and relative poverty. First, it should be noted that, in relative terms, the income effect on relative poverty is higher compared to the effect on Gini. This reflects the fact that Gini is more sensitive to the changes in the middle of income distribution and less so at its ends. Hence population at the lower end of income distribution did not benefit from the primary income growth and employment to the same extent as the rest of the population. Second, policy effects on relative poverty is higher, in relative terms, compared to that on inequality in Estonia and Latvia, while the opposite is true for Lithuania. This shows that policy reforms were of a pro-poor nature in the former two countries and were more oriented towards households in the middle of income distribution in Lithuania.

The changes in the Gini and relative poverty can be further decomposed by period (see Figures 8a and 8b, 9a and 9b), i.e. the first five years after the EU accession (the period before the crisis 2005/6-2009) and the next five years (the period since the onset of the crisis 2009-2013/4). As discussed in Section 1, the two periods were different both in terms of the development of policies and changes in the primary income. For all three Baltic countries, the first period can be characterized as a period of rapid economic growth, which gave space to rapid growth in the primary income and expanding generosity of the welfare state. The initial stage of the second period was marked by rapid economic contraction and fiscal consolidation, which had strong impact on primary and secondary income distribution. With regards to the demographic effect, a five-year period is relatively short for the demographic processes to substantially alter the income distribution. Therefore, the demographic effect in the two periods is marginal and only income and policy effects are discussed when disaggregating them by five-year periods.

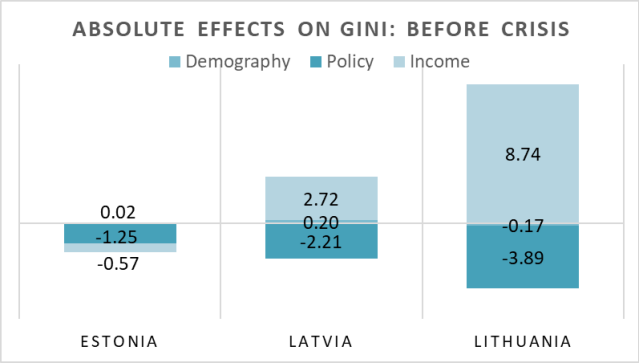

Figure 8a. Effects on Gini: before the crisis
Note: Real effects (counterfactual of policy indexation by CPI). Period for Lithuania and Estonia: 2005-2009; for Latvia: 2006-2009.

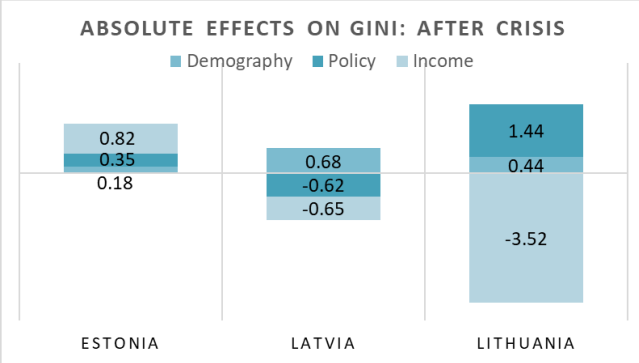

Figure 8b. Effects on Gini: since the crisis
Note: Real effects (counterfactual of policy indexation by CPI). Period for Lithuania and Estonia: 2009-2013; for Latvia: 2009-2014.

The income effect was inequality-increasing during the period of the economic growth, especially in Lithuania and Latvia (see Figure 8a). It was marginal in Estonia. Since the onset of the crisis income effect was inequality-reducing in Lithuania and near-neutral in Latvia and Estonia (see Figure 8b). This suggests that economic recession had an equalizing effect on income, albite to a different extent across countries. In both periods, the income effect is much higher for Lithuania compared to Latvia and Estonia. This is in line with the evidence on the growing polarization and segmentation of the labour market in the Baltics, in Lithuania in particular, as discussed in the first section of the paper.

The policy effect was inequality-reducing in all the three Baltic countries in the first period, least so in Estonia, where the increase in the generosity of welfare provisions was the lowest. After the crisis, the policy effect on inequality is estimated to be close to neutral for Latvia and Estonia and inequality-increasing for Lithuania. The latter may be explained by the structural social assistance reform, substantial cuts on unemployment benefits, child allowances and pensions (De Agostini et al. 2014).

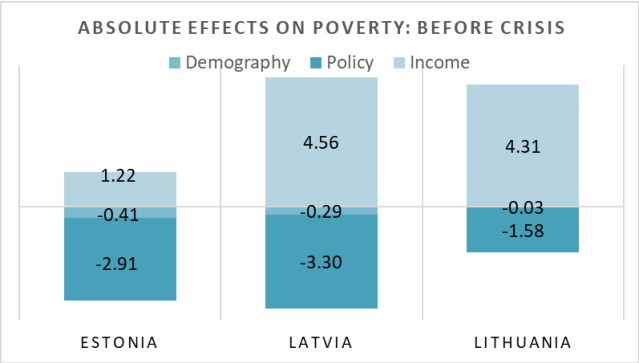

Figure 9a. Effects on relative poverty: before the crisis
Note: Real effects (counterfactual of policy indexation by CPI). Period for Lithuania and Estonia: 2005-2009; for Latvia: 2006-2009. Floating poverty risk threshold.

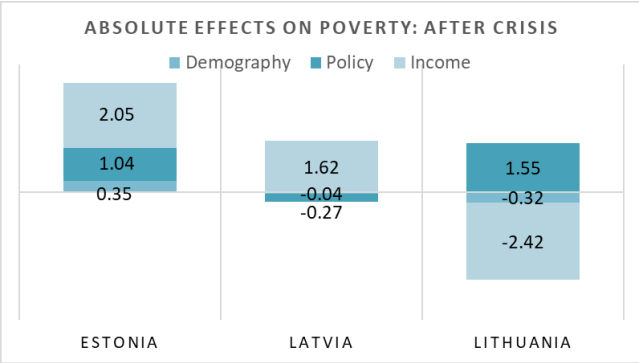

Figure 9b. Effects on relative poverty: since the crisis
Note: Real effects (counterfactual of policy indexation by CPI). Period for Lithuania and Estonia: 2009-2013; for Latvia: 2009-2014. Floating poverty risk threshold.

Finally, policy and income effects on poverty (see Figure 9a and 9b) for both periods are consistent in their direction with those on inequality (see Figure 8a and 8b). The exception is the period after the crisis in Latvia, where income effect on Gini was near-neutral (-0.65 p.p.) but poverty-increasing (+1.62 p.p.). Hence a more rapid improvement of the primary income and employment status can be assumed in the middle of income distribution compared to the population at its lower part. Moreover, countries rank differently according to the magnitude of the effects. For example, the highest counteracting income and policy effects on inequality are observed in Lithuania both before and after the crisis (see Figure 8a and 8b). However, with regard to poverty, the highest effects before the crisis were observed in Latvia. Estonia also shows higher pro-poor policy effects during the pre-crisis period compared to Lithuania. Hence Lithuania did relatively little to decrease relative poverty during the period of economic growth. After the onset of the crisis, the situation of those at the bottom of the income distribution further deteriorated.

Conclusions

The Baltic societies are among the most unequal in the EU with regard to income distribution. The levels of income inequality and relative poverty are exceptionally high. This paper looked into the driving factors behind the changes in income inequality and relative poverty in the Baltics for a decade after the EU accession of the Baltic countries in 2004. The analysis contributes to previous research by quantifying the role of the three factors: the income effect (due to the changes in primary income and employment), the policy effect (due to discrete changes in the tax-benefit policies) and the demographic effect (due to natural demographic change and migration). The paper is methodologically novel in combining tax-benefit microsimulation and re-weighting techniques to decompose changes in income inequality and relative poverty.

Decompositions showed that income and policy effects are the two major factors affecting changes in the levels of income inequality and relative poverty. Demographic effect appears to have limited impact on the changes in income inequality and relative poverty in the region.

Income effect was in general both poverty- and inequality-increasing before the crisis and for the whole analysed period. Income effect on relative poverty was higher, in relative terms, compared to its effect on Gini. Hence the population at the lower end of the income distribution did not benefit from the primary income growth and employment to the same extent as the rest of the population. This is in line with the increasing trends in inequality of earnings and household employment in the Baltics, as well as a reducing wage share in the total GDP, especially in Lithuania and Latvia. The magnitude of income effect both before and after the crisis stands out in Lithuania, which can be linked to higher polarization and segmentation of its labour market. Since the onset of the crisis income effect had heterogeneous impact on inequality and poverty in the Baltics.

Policy effects were both poverty- and inequality-reducing before the crisis and for the period after the EU accession as a whole. This is consistent with the effects on Gini and with the previous research findings. Policy reforms were of a pro-poor nature in Latvia and Estonia and were more oriented towards households in the middle of income distribution in Lithuania. Latvia stands out as a leader in fiscal reforms oriented both to reducing poverty and overall inequality. Overall, had it not been for public interventions in the sphere of fiscal policy, the increase in

inequality and poverty levels would have been substantially more pronounced for all the three Baltic countries.

The demographic changes, while quite dramatic in the Baltics, especially in Latvia and Lithuania, had only marginal effect on inequality and relative poverty. The effect was slightly inequality-increasing for the analysed decade in all three countries. Increases in Gini suggest that demographic processes contribute to the shrinking of the population traditionally situated in the middle of income distribution, i.e. working age families with children. On the other hand, the changes resulting from population ageing and economic migration may counteract each other. This helps to explain similar demographic effects on inequality across the Baltics despite of substantially higher demographic changes in Lithuania and Latvia compared to Estonia. Moreover, despite its generally inequality-increasing effect, the demographic change contributed to 1.1 p.p. reduction in relative poverty in Lithuania. The potentially counteracting effects of the population ageing and migration on inequality and relative poverty should be further analysed.

Notes on contributor

Dr. Jekaterina Navickė is a lecturer and a researcher at the Vilnius University, Faculty of Philosophy and Faculty of Economics. Previously she worked as a research assistant at the Lithuanian Social Research Centre (2009–2012) and as a senior research officer at the Institute for Social and Economic Research, University of Essex (2012–2014). Jekaterina holds a Ph.D degree in Sociology from Vilnius University. Her research interests include poverty, social exclusion and inequality, social policy analysis, welfare state development and microsimulation modeling. Jekaterina is a member of the EUROMOD consortium. She performed consultancies for the World Bank, ISER, JRC, OECD, Eurofound, the Lithuanian Ministry of Labour and Social Affairs, etc.

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