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## Factors of the income inequality in the Baltics: Income, policy, demography

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**EUROMOD WORKING PAPER SERIES**

**EM 11/17**

**Factors of the income inequality in the Baltics:  
income, policy, demography**

Jekaterina Navicke

May 2017

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# Factors of the income inequality in the Baltics: income, policy, demography\*

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## Abstract

This paper aims to disentangle the driving factors behind the changes in income inequality in the Baltics since the EU accession, distinguishing between primary income effect, discrete changes in tax-benefit policies and demographic effect. Evaluation of the three effects was based on counterfactual scenarios, which were constructed using tax-benefit microsimulation and re-weighting techniques. Decomposition of the total change in inequality showed that income and policy effects are dominant in the Baltics. Policy effects were inequality reducing before the crisis and for the period after the EU accession as a whole. Income effects were inequality increasing before the crisis and as a whole. Despite rapid demographic changes in the Baltics, the demographic effects on income inequality were marginal and in general inequality-increasing.

**JEL:** D31, H23, I38, J10

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

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## 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 it is often mentioned in the literature that the region’s economic development path is 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 the relative poverty risk and income inequality. According to the latest statistics, 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) (Eurostat 2017a). In all three countries poverty risk 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 fourth and Estonia the fifth highest (Eurostat 2017b).

In this paper I aim to disentangle the driving factors behind changes in income inequality in the Baltics since the EU accession, distinguishing between three potentially most important effects: primary income effect, secondary income effect due to discrete changes in the tax-benefit policies and demographic effect. To the author’s knowledge this has never been done for the Baltic region. Previous analysis that included 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 reform and demographic effects on income distribution I perform decomposition analysis based on a combination of counterfactual modelling and re-weighting techniques. First, in line with methodology developed in Bargain & Callan (2010), Bargain (2012), Hills et al. (2014) counterfactual scenarios are built using tax-benefit microsimulation to distinguish between the effect of policy changes on income inequality and other factors. I further disentangle the other effects by singling out the effect of the demographic change in the underlying population. This further decomposition is done using static reweighting technique, similar to the method discussed and used by Bourguignon et al. (2008).

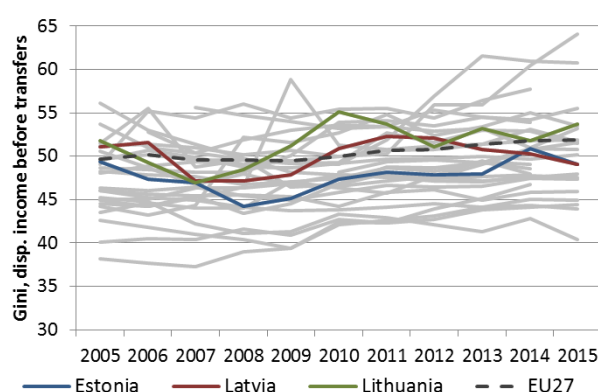
The structure of the paper is the following. In the first section I discuss the relevance and dynamics of the three factors potentially driving changes in income inequality in the Baltics: distribution of the primary income, the role of income redistribution and policy reform, and the demographic change. The way methodologies of microsimulation and static reweighting are combined to single out the impact of these factors on income inequality is discussed in the second section. I also discuss advantages of this approach compared to traditional decompositions by income components using Shapley values or other decomposition techniques. The results of the paper are presented in the third section. I conclude by presenting the main empirical findings and methodological insights for further research.

## 1. Primary income inequality, policy reform and demographic change 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 in the country. In this section I summarize the situation and the main trends for these three factors for the Baltics, with a focus on a decade after the EU accession.

### *Distribution of the primary income*

Primary income includes all income received in the labour market (both employment and self-employment income), but also 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 before all social transfers) for the decade after the accession of the three Baltic countries is compared to the other EU countries in Figure 1.



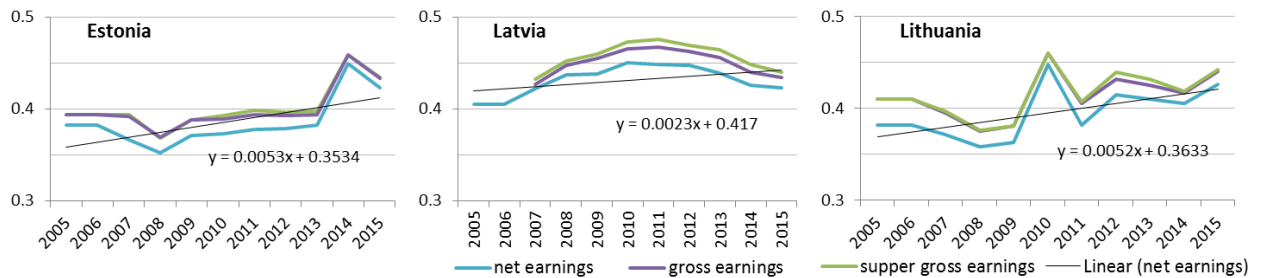
**Figure 1.** Gini of disposable income before all social transfers in 2005-2015 EU-SILC

Source: Eurostat (2017c). Note: grey lines represent other EU member states; income reference period of the EU-SILC is a year before the survey (t-1)

With regards 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 incomes before social transfers for the three countries, are similar with one exception. 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 as in all countries the Gini in disposable incomes 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 during in the last decade, especially since the onset of the crisis. Increased divergence in the Gini estimates in the EU can be noted towards the end of the period.

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 2017). Inequality in earnings in the Baltics among those receiving this type of income is shown in

the 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, albit 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.



**Figure 2.** Dynamics of Gini in earnings in 2005-2015 EU-SILC

Source: calculations by author based on SILC 2005-2015 data.

Note: super gross earnings include gross earnings and employer social insurance contributions

Increasing trends in inequality of earnings in the Baltics may be an important factor driving the overall change in the income inequality. Labour market segmentation and polarization were noted among the potential driving factors of growing wage inequalities in the Baltics (e.g. Lazutka & Poviliunas 2010, Leschke 2012, Corluy & Vandernbroucke 2013, Horemans 2014, Juska & Woolfson 2015).

According to calculations by Corluy & Vandernbroucke (2013) labour market polarization was on increase in Lithuania during a 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 a 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 of 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. The research indicated potentially high levels of assortative mating in the Baltics. In result there is high concentration of non-standard employment and non-employment at the household level, which 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 regards to Latvia and Estonia Leschke (2012) noted an increase

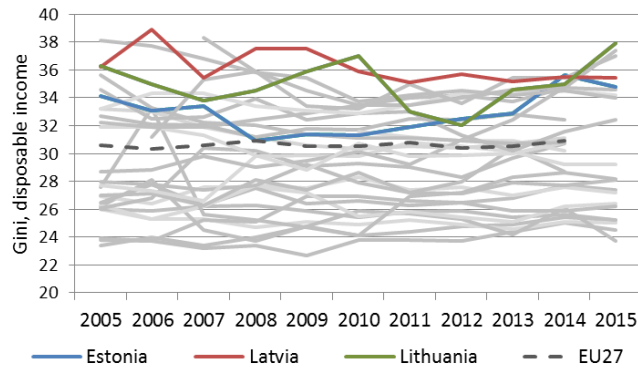
in the part-time and temporary employment in both countries since the onset of the crisis, adding to an increase in the secondary sector of the labour market.

Among the main factors under the polarization and segmentation trends in the Baltic labour markets that perpetuate social inequality, is the high level of dependency on the market and low level of decommodification in the Baltic welfare regimes, which 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 Baltics, large-scale further deregulation of labour law is either taking place or was announced in all three Baltic countries, especially with regards 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 dualization, segmentation and related inequalities.

Finally, previous research showed a below EU-average and declining share of the total produced GDP goes to labour compared to 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 tend 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.

### ***Income redistribution and policy reform***

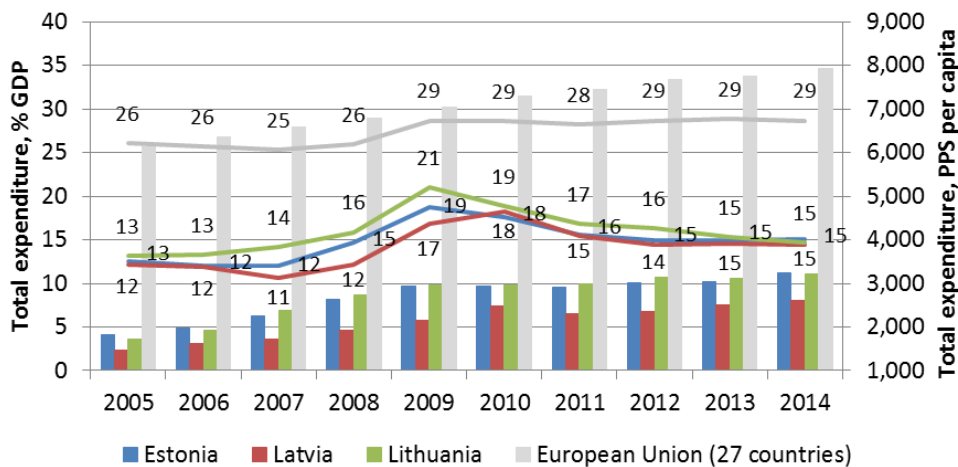
As it was already noted, inequality of the disposable income before social transfers in the Baltic countries fluctuated around the EU-average since the EU accession. The picture changes dramatically if we look at the distribution of disposable income after social transfers (Figure 3). Inequality levels 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 also quite volatile and converge towards the end of the observed period, i.e. Gini in Latvia being on decrease, while it increases in Estonia and Lithuania.



**Figure 3.** Gini of the disposable income after social transfers in 2005-2015 EU-SILC

Source: Eurostat [2017b]. Note: grey lines represent other EU member states; 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 lack of income redistribution in the Baltics. Indeed, the share of the social protection expenditure with relation to 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 Baltics if expenditures on social protection are compared to the EU average 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 reform 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, but mostly in absolute terms. In relative terms, the share of GDP spent on social protection in all three Baltic counties remained near-stable, with a more visible increase in generosity in 2008 in Lithuania and Latvia (Figure 4). Expenditure on social protection is most generous in Lithuania in relation to GDP and least so in Estonia. However in absolute



terms the two countries consistently spent similar amounts on social protection per capita, taking purchasing power differences into account.

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 in regards to ad-hoc increases in pensions) and benefits specifically targeted at families with children. The author estimated inequality-reducing mostly benefit-related impact of policy changes on the Lithuanian income distribution for the period before the economic crisis (ibid.).

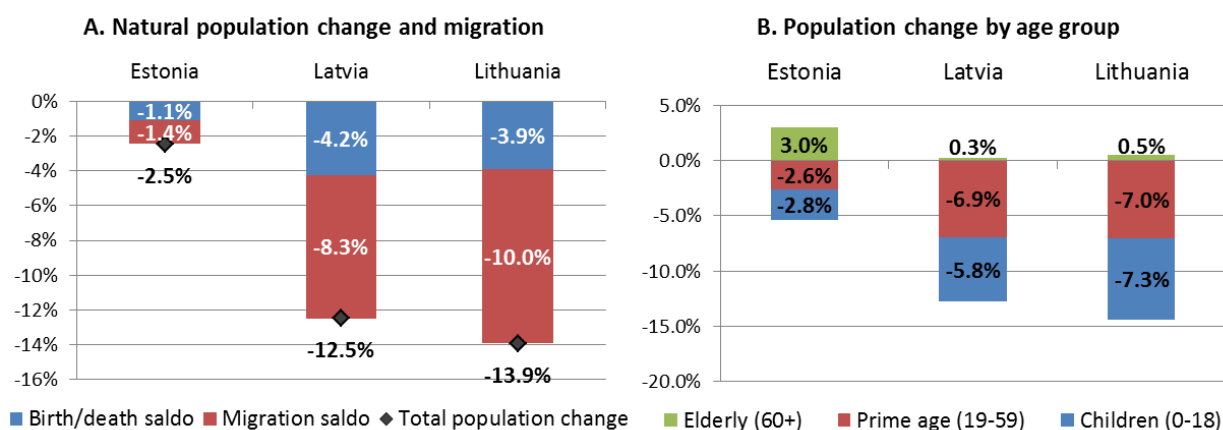
Moreover, all three Baltic countries adopted flat-tax reforms in the mid and late 90s and were reducing their personal income tax rates, i.e. from 33% after the reform in 1994 to 27% in 2007 and 15% in 2016 in Lithuania, from 26% after the reform in 1994 with a gradual reduction to 21% in 2005-2008 and 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, slight increase in Estonia and some reduction in Latvia (Greenberg 2009).

Fiscal consolidation measures during the crisis included cuts or freezes on 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 on inequality was noted to be inequality-reducing for Latvia, near-neutral in Lithuania and inequality-increasing for 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 a U shaped effects for Estonia and a regressive effect for 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).

### ***Demographic change and its effects on income distribution***

Baltic countries may be distinguished by rapid demographic changes within the EU context, which especially concerns Lithuania and Latvia. Figure 5 shows the demographic change over the period after the EU accession due to natural population change and migration, as well as the population change by age group.



**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 for 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 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 a different shuttle migration processes (Anniste et al. 2012). 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 of -12.5% in Latvia, -13.9% in Lithuania, while in Estonia total population loss amounted to -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 of the negative total population change, the number of elderly population increased in all three Baltic countries, most so 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 reduced, most so in Lithuania (by -7.3% or -4.5 p.p. reduction in the share of children). The number of the adults reduced by a similar percentage compared to children, albite the share of the prime-age population 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 in the region and as a factor contributing to the changes in the income distribution. On the one hand, high levels of income inequality may be an important explanation why people are fleeing one of the most

successful region in the EU what concerns its economic growth pace within the last decade. 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 the income distribution. As emigration in the Baltics is often an economic survivor strategy, younger people situated in the lower-middle part of the income distribution may also be those most prone to emigrate, i.e. neither those at the very bottom nor at the very top of the 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 demographic effect on income distribution from the other factors, i.e. changes in the primary income distribution and policy effects.

## **2. Methodology: decomposing inequality using microsimulation and reweighting**

The aim of this paper is to disentangle the driving factors behind the changes in income inequality in the Baltics. Within the literature on inequality, there exist a number of decomposition methodologies, each with their own advantages and limitations. In general, decompositions can be aimed at (i) either assessing the contribution of different income components or population sub-groups 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 the 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 inequality measures to look at the relative contributions of the different income types or non-overlapping population groups to the total Gini or other inequality measures (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 and on its distribution compared to the situation when inequality in the income component is zero or to the situation when an income component itself is assumed to be equal to zero. Decompositions by population subgroup express 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 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 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 using microsimulation techniques, parametric regression methods or non-parametric reweighting. E.g. Bargain & Callan (2010) developed their decomposition

framework based on 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 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. The methods are however less sensitive to the impact of discrete policy changes on income distribution.

This paper is aimed at distinguishing between three factors of the income distribution: primary income effect, secondary income effect due to discrete changes in the tax-benefit policies and demographic effect. Hence I combine microsimulation-based decomposition approach developed in Bargain & Callan (2010), Bargain (2012), Hills et al. (2014) to single out the effects of discrete policy changes with the static reweighting technique (Bourguignon et al. 2008) to split the remaining effect into that due to demographic change and income growth effect. Below methodology is discussed in detail.

***Factors of income inequality: income effect, policy reforms and demographic change***

*The income effect* reflects changes in nominal levels of primary incomes, changes in the distribution of these incomes 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 incomes.

*Policy reforms* or discrete policy changes are understood as ad-hoc changes in the tax-benefit structure, e.g. eligibility rules, tax rate structure, amounts, etc. The policy impact 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 changes* are changes in the demographic composition of population by age, gender or other characteristics, as well as associated 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 changes in the income distribution into (direct) policy effects and other effects. The latter include both changes due to income growth and composition of the underlying population related to changes in the labour market situation and demographic change. Policy effects are related to discrete tax-benefit changes and reforms that affected distribution of the household disposable income.

Microsimulations used for constructing counterfactual scenarios are implemented using tax-benefit microsimulation model EUROMOD (version G4.0+). EUROMOD is a static tax-benefit model of 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. One-year discrepancy of the period of analysis between the countries should not result in major differences of the substantial results of the empirical analysis. 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  $y$  a matrix which contains information on market incomes and socio-economic and demographic characteristics of the households, and  $d(p,y)$  a function that derives disposable incomes on the basis of  $y$ , distinguishing between the structure of the tax-benefit system ( $d$ ) and policy parameters with monetary values ( $p$ ).  $G$  is a chosen income inequality measure, i.e. the Gini coefficient. The overall change in the distribution of disposable income between two periods (*year 0* and *year 1*) for the changes in the Gini 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 distributions where attributes ( $p, y, d$ ) in one period are replaced sequentially with those from another period, one at the time. The counterfactuals also involve indexing incomes and monetary parameters of the tax-benefit system (denoted with  $\alpha$ ). This helps obtain a benchmark, where 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.  $\alpha = \text{HICP}$  (Eurostat 2017f).

Decomposing the total change in the following way allows assessing the policy effect on the Gini 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 on Gini or any other inequality measure conditional on 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 equation (2) and (3) the policy effect is obtained by keeping market incomes  $y$  constant and altering the tax-benefit parameters  $p$  to correspond in real terms to the *year 1* or *year 0*. The other effect is derived by keeping policy parameters  $p$  constant in real terms and applying those on the incomes  $y$  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 averaging the contributions for the two decompositions above, which gives the average policy-and other effects on the Gini (e.g. Bargain & Callan 2010, Bargain et al. 2016, Paulus & Tasseva 2017).

It can be noted that 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.

### ***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 changes in incomes and labour market situation  $i$  and *demographic effect* due to 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 the income distribution. In general, reweighting procedures are used relatively often to calibrate weights for surveys used for microsimulation modelling (e.g. Creedy 2003, Cai et al. 2006, Brewer et al. 2009). Within the EUROMOD framework reweighting techniques were previously explored by Immervoll et al. (2005), Kump & 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 counterfactual distributions need to be constructed by accounting for 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.

To capture the effect of the population ageing as well as age-biased and skill-biased migration processes in the Baltics we chose the following characteristics from the input data to control for:

- age-sex structure (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 (data of *year 1* is reweighted to match the share of individuals in *year 0* living in different types of households with and without children);
- educational structure (data of *year 1* is reweighted to match the share of individuals in *year 0* by achieved education level within the age-sex classes).

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 using integrative calibration approach, i.e. ensuring consistency

between household and individual weights<sup>1</sup>. 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)<sup>2</sup>. 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 end-period income and demographic structure ( $i_1, s_1$ ) would take the following form based on the selected combinations of the attributes  $p, i, s, d$ :

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

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

$$\begin{aligned} \Delta G &= G[d_1(p_1, i_1, s_1)] - G\left[d_1\left(\frac{1}{\alpha} p_1, i_0, s_0^*\right)\right] + && \text{[Income effect]} \\ &G\left[d_1\left(\frac{1}{\alpha} p_1, i_0, s_0^*\right)\right] - G\left[d_1\left(\frac{1}{\alpha} p_1, i_0, s_0\right)\right] + && \text{[Demographic effect]} \\ &G\left[d_1\left(\frac{1}{\alpha} p_1, i_0, s_0\right)\right] - G[d_0(p_0, i_0, s_0)] && \text{[Policy effect]} \end{aligned} \quad [5]$$

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

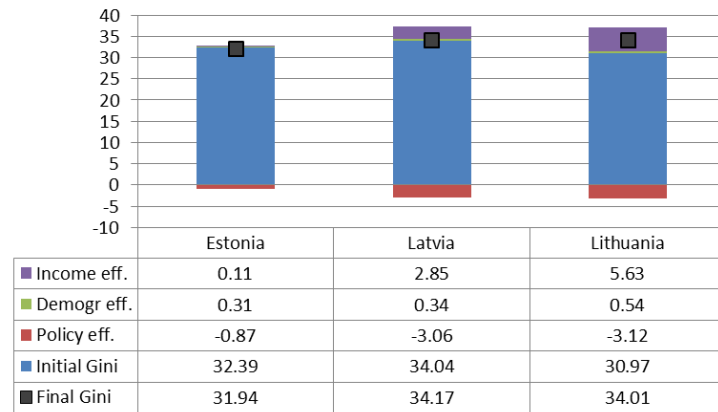
### 3. Results: negative effect of primary income and demographic change on inequality counteracted by policy change

Figure 6 shows the income, demographic and policy effects on the Gini for the period of 2005-2013 for Lithuania and Estonia and for the period of 2006-2014 for Latvia.

Changes in primary market income (both due to income growth and change in employment) contributed to an increase in inequality in Latvia and Lithuania and a (statistically) insignificant change in Estonia. A contribution of changes in primary income to the increase in the level of income inequality is in line with the increasing trends in inequality of earnings in the Baltics and a reducing wage share in the total GDP, especially that in Lithuania and Latvia (see Section 1).

<sup>1</sup> For detailed information on integrative calibration see Eurostat (2010), for the application on EUROMOD data see Kump & Navicke (2014).

<sup>2</sup> Command 'calibrate' in STATA is used in this analysis.



**Figure 6.** Decomposition of the Gini change by income, demographic and policy effects: whole period

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

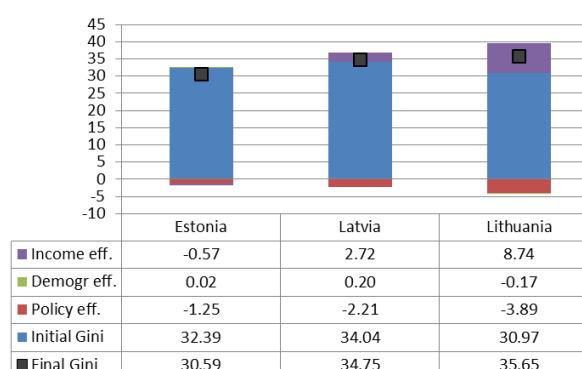
The effect of the policy change was inequality-reducing in all three Baltic countries, most so and to a similar extent in Lithuania and Latvia. This is in line with the previous finding for the period since the onset of the economic recession for Latvia (Avram et al. 2013, Figari et al. 2016, De Agostini et al. 2014). None of the three countries show regressive effect on the income distribution, with the policy effect in Estonia being near-neutral, but still positive. The latter is in line with the overall lower welfare state intervention in sphere of social protection and the tax-focused nature of reforms in Estonia discussed in Section 1.

The change in the demographic structure of the population had least effect compared to both change in income and policies, and was inequality-increasing in all the three Baltic states, most so in Lithuania. Interestingly, a substantially higher demographic change in Lithuania and Latvia has similar effects on inequality compared to Estonia. As discussed in the Section 1, this could be due to 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 to a larger extent by 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 changes in the Gini can be further decomposed by period (see Figures 7a and 7b), i.e. first five year after the EU accession (the period before the crisis 2005/6-2009) and the next five years (period since the onset of the crisis 2009-2013/4). As discussed in Section 1, the two periods were different both with regards to 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 both 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 also had strong effects on primary and secondary income distribution. With regards to the demographic change, a five-year period is relatively short for the demographic processes to substantially affect the income distribution and effects in the two periods are marginal (see Figures 7a and

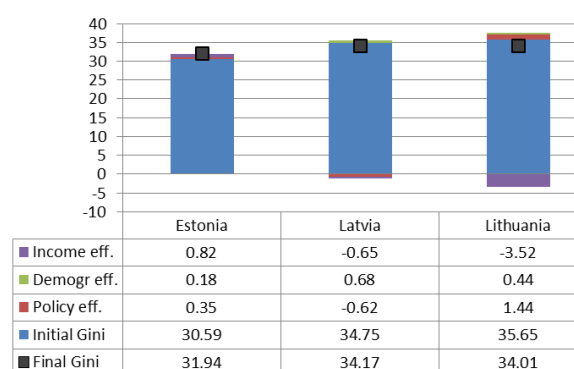


7b). Hence, only income and policy effect are discussed in more detail below disaggregating by five-year periods and the demographic change is analysed for the whole period.



**Figure 7a.** Decomposition of the 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 7b.** Decomposition of the 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 effects of the labour market income was inequality-increasing during the period of the economic growth, especially so in Lithuania and Latvia. Income effect was statistically insignificant in Estonia. Since the onset of the crisis change in income had an inequality-reducing effect in Lithuania and much smaller near-neutral effects in Latvia and Estonia. 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, discussed in the first section of the paper.

Policy effect was inequality-reducing in all the three Baltic countries in the first five years after the EU accession, least so in Estonia where there was least increase in the generosity of welfare provisions. 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).

The effect of the demographic change on inequality was more pronounced and inequality-increasing after the crisis compared to the period before the crisis in all three Baltic countries. As mentioned before five-year periods are relatively short for demographic processes to have a substantial effect on the income distribution.

## Conclusions

This paper aims to disentangle the driving factors behind the changes in income inequality in the Baltics, distinguishing between three effects: primary income effect, secondary income effect due to discrete changes in the tax-benefit policies and demographic effect. Evaluation of the three effects was based on counterfactual scenarios, which were constructed using tax-benefit microsimulation and re-weighting techniques.

Decomposition of the total change in inequality showed that income and policy effects are the two major factors affecting income inequality levels. Demographic changes, while quite dramatic in the Baltics, especially in Latvia and Lithuania, had lower effects on inequality. Policy effects were inequality reducing before the crisis and for the period after the EU accession as a whole. Income effects were inequality increasing before the crisis and as a whole. Demographic effects were in general inequality-increasing. The effects were most pronounced for Lithuania and Latvia and less so for Estonia. Hence the governments of the Baltics, especially in Lithuania and Latvia, had to put political will and effort into public interventions to counteract negative inequality-increasing factors of the changing primary income distribution and demography. Had it not have been for public interventions, the increase in the inequality levels would have been substantially more pronounced for all the three Baltic countries.

As for the measures to stabilize and decrease income inequality, efforts should be put into counter-acting increasing primary income inequalities in the Baltics, especially in Lithuania and Latvia. Among the factors potentially contributing to the growing polarization and segmentation of the labour market are growth of non-standard employment, low influence of trade-unions and high degree of non-compliance to labour law in both formal and informal economy in the region. Moreover, there are close links between the functioning of the labour market and public provisions aimed at decommodification of the labour force, i.e. low levels of social provisions and programmes aimed at protecting individuals against unemployment or under-employment. Progressive redistributive tax-benefit reforms should be further implemented. Moreover, stabilization and reduction of income inequality in the Baltics could potentially reduce emigration flows with second-order spill-over effect on reduction in the Gini.

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