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Abstract
We model the household disposable income distribution in Lithuania and explore the drivers of the increase in income inequality between 2007 and 2015. We quantify the contributions of four factors to changes in the disposable income distribution: (i) demographics; (ii) labor market structure; (iii) returns and prices; and (iv) tax–benefit system. Results show that the effects of the factors were substantial and reflected heterogeneous developments over two subperiods: changes in the tax and benefit system cushioned a rapid rise in market income inequality because of the global financial crisis during 2007–2011, but failed to do so during the subsequent years of economic expansion, when rising returns in the labor and capital markets significantly increased disposable income inequality. We also find that declining marriage rates contributed to the increase in income inequality in Lithuania..

Keywords:
income inequality, redistribution, decompositions, microsimulation, tax-benefit policies

JEL Classification
D31, H23, J21

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1 Introduction

Economic inequality has been rising since the 1980s in most advanced economies, as well as in post-Soviet countries and other emerging markets Alvaredo *et al.* (2018); Atkinson *et al.* (2011); Nolan *et al.* (2014); OECD (2011). Concerns about inequality have surged in the aftermath of the Great Recession, fuelled also by the rise in economic distress caused by the unequal distribution of gains stemming from globalization and economic growth. Rising inequalities in market incomes, changes in taxes and benefits, changes in the structure of the labour market (e.g. increasing female labour market participation or occupational structure dynamics), and changes in demographics (e.g. expansion of post-secondary education, spread of non-traditional family structures) are highlighted among the main determinants of the increase in income inequality in most OECD countries since the 1980s (e.g. Daly and Valletta, 2006; OECD, 2011; Smeeding *et al.*, 2011).

The role of tax-benefits systems in tackling inequality increases has been extensively studied, as disposable income is a product of both market incomes and tax-benefit rules. Much less research has examined why redistribution did not manage to tame the increase in inequality. The evidence is at odds with conclusions reached by the majority of studies that tax-benefit systems have become more redistributive since the 1980s (e.g. Immervoll and Richardson, 2011). This is due to a methodological limitation that did not control for interactions between market incomes and tax-benefit rules. Failing to control for changes in market income distributions may lead one to wrongly conclude that redistribution has increased, when in fact the effect has been driven by increasing market income inequality; any progressive system will show an increase in redistribution with increasing inequalities in market incomes. The literature shows that inequality in market income grew twice as much as redistribution. This implies that the redistributive effect has weakened over time in most countries, which is consistent with redistributive policies' failure to tackle inequality increases (Alvaredo *et al.*, 2018; Immervoll and Richardson, 2011).

This question becomes even more important for countries where the increase in inequality was striking, especially in the recovery period following the Great Recession. The post-Soviet countries stand out in the European context with respect to their dramatic changes in the distribution of disposable income over time. Despite this, they have received little attention in the inequality literature. We contribute to this literature with a systematic analysis that seeks to understand the trends in income inequality and the redistributive effects of the tax-benefit system in Lithuania by disentangling the role played by changes in policy design from changes in market income distributions (and their driving forces: labour market structure, returns, and demographics).

Since regaining independence from the Soviet Union in 1990, Lithuania has implemented numerous liberal reforms, which allowed the country to move rapidly from a centrally planned to a market economy. After joining the European Union (EU) along with the other Baltic states in 2004, Lithuania enjoyed high growth rates and economic convergence towards EU-15. The period of rapid economic expansion came to a halt in 2008, when the country was hit by a deep recession due to the Global Financial Crisis and the real GDP plummeted by almost 15% in 2009 as compared to 2008. A rapid recovery followed, with a GDP growth of 6% in 2011. Since then, the growth has stabilized but income inequality has shot up as well, despite numerous changes in the tax and benefit system. According to Eurostat, the Gini index of household equivalized disposable income in Lithuania grew by 5 points over the period 2011-2015, the highest growth rate of income inequality observed in the European Union (EU) (which saw an average increase in the Gini index of only 0.2 points over the same period).[1] As a result, as measured by the Gini index, Lithuanian income distribution was the second most unequal in the EU in 2015. While unequal economic growth could explain this rising inequality, there are also other possible explanations. The Lithuanian economy was affected by important secular demographic changes, namely, negative net migration, ageing, and declining marriage rates. The goal of this paper is to quantify what factors drove large changes in Lithuanian income distributions over the period 2007-2015, which is a central issue for economic research and policy analysis.

In order to answer this question, we apply the latest methodological advancements in inequality decomposition techniques, which rely on counterfactual scenarios to isolate the impact of relevant factors. We build on the approach developed in Bourguignon *et al.* (2008) and Sologon *et al.* (2021), and adapt it to study changes in income distributions over time instead of differences in income distributions across countries at one given moment.[2] Traditional approaches compute one particular inequality summary index over time, and then decompose it into the contribution of specific characteristics, such as age, gender, labour market status or the source of income (see Reynolds and Smolensky 1977, Shorrocks 1980, Shorrocks 1982, Shorrocks 1984 and Lerman and Yitzhaki 1985). Rather than looking at summary measures, the main object of our analysis are changes in the whole income distribution. Our method integrates micro-econometric and microsimulation

[1]Eurostat reports the Gini index based on the year the survey was conducted. By contrast, survey respondents are asked to provide their previous calendar year's income. Throughout the text, we report statistics of the income year, not the survey year.

[2]Sologon *et al.* (2019) use the same approach to study changes in the income distribution in Portugal between 2007 and 2013, accounting for the distributional effects of the 2007-2008 crisis and the aftermath policies.

approaches into a flexible parametric household income-generation process based on a system of equations for multiple income sources for the household and the European tax-benefit microsimulation engine EUROMOD (Sutherland and Figari, 2013). Such an infrastructure permits an accurate representation of the relationship between household characteristics, market incomes (from labour and capital), and tax-benefit rules. This is used to generate counterfactual distributions of household disposable incomes obtained via transformations of the income generation process, by "swapping" the characteristics between different periods along four dimensions: (i) labour market structure (e.g. employment, occupation, industry, sector), (ii) returns structure (e.g. labour income, capital incomes), (iii) demographic composition of the population, and (iv) tax-benefit rules. The comparison of these counterfactual distributions allows us to quantify the contribution of each factor to the changes in the income distribution observed over time.

By applying this approach, we provide a more detailed decomposition than existing studies that seek to unpack the drivers of inequality changes. Most research on the topic follows the approach proposed by Bargain and Callan (2010) and Bargain (2012), which uses two "swaps": market incomes and tax-benefit rules. For Lithuania, Navickė (2020), besides the policy and income effect, also added the demographic effect via re-weighting following DiNardo *et al.* (1996) to decompose the changes in the Gini index. The findings suggest that while the income effect dominated the increase in the Gini index, the rising income inequality was partly offset by the policy effects. Across the EU, Paulus and Tasseva (2020) identified the direct effect of policy changes, as well as the effect of automatic stabilizers and of changes in market incomes and demographics. For Australia, Li *et al.* (2021) identifies the policy, demographic, and market income effect, with the extension that the income effect captures both a semi-parametric re-weighting of the industrial and occupational distribution, besides the income adjustment, similar to the semi-parametric approach in Biewen and Juhasz (2012). Tasseva (2020) decomposes disposable income changes in the United Kingdom, focusing on the role of education on income inequality. Specifically, the study used policy swaps to identify the tax and benefit effect, re-weighting techniques to identify the compostion effect of education, and parametric techniques to identify the effect of returns to education, while other market income components were allocated to the residual. We, however, engage in a higher level of disaggregation by breaking up market income into institutional structures in terms of employment rates, the number of people with income sources, the distribution of income sources, the distribution of the returns, and the demographics using both parametric and semi-parametric techniques. [3] We clearly need to trade off parsimony and complexity. Given the novelty of the work, the computational time, and the limit of how much we can disaggregate, we tried to 'optimize' the balance between model complexity and degree of disaggregation. Future work will assess the sensitivity to different degrees of disaggregation. We have more disaggregation than Bargain and Callan (2010) and Bargain (2012), as we wanted to decompose the drivers of market incomes. The model is constructed on the basis of the European Union Statistics on Income and Living Conditions (EU-SILC) survey, a household survey that is available in a harmonised form for all European Union (EU) countries.

The next section presents the evolution of income inequality and of the economic climate in Lithuania. This is followed by section 3 which discusses the income generation model used to characterize and simulate the distribution of household disposable income, the decomposition methodology, and the data. Section 4 discribes the changes in the income distribution and redistribution between 2007 and 2015 in Lithuania. In section 5 we present the results of the decomposition analysis in Lithuania between 2007 and 2015, followed by a concluding section that discusses several policy implications.

2 Evolution of income inequality in Lithuania

Lithuania displayed one of the highest levels of income inequality across the European Union (EU) in 2015. According to the European Union Statistics on Income and Living Conditions (EU-SILC), the most reliable data on income inequality currently available, the Gini index of household equivalized disposable income was 37 Gini points in Lithuania in 2015 (see Figure 1). This made Lithuania the second most unequal country in the EU, ranking 6.2 Gini points higher than the EU average and a staggering 12.7 Gini points higher than Slovakia, a country with the most equal income distribution in the European Union and another country formerly behind the Iron Curtain.

[Figure 1 about here.]

Income inequality in Lithuania has been on the rise over the past two decades. Figure 2 portrays the dynamics of the Gini coefficient for Lithuania, Slovakia, and the European Union as a reference from 2007 to 2015. In Lithuania, the rise in income inequality (as measured by the Gini index) has not been monotonic, displayinga strong procyclicality. It fell during the crisis and then grew

[3] We could potentially break it up even further, namely, in terms of individual markets; for example, we could swap different industries, swap different parts of the tax-benefit system, swap taxes and benefits separately.

rapidly during the post-crisis expansion. Moreover, it appears to be significantly more volatile than the Gini coefficient in Slovakia. Overall, income inequality in Lithuania has consistently exceeded income inequality in Slovakia and the EU in general. In what follows, we discuss potential drivers of changes in the Lithuanian income distribution: demographics, structural and cyclical changes in the economy, and changes in the tax and benefits system.

Demographics

The demographic situation of Lithuania has been affected by three important trends over this period: negative net migration, ageing, and changing household composition. Outmigration, which accelerated significantly after Lithuania's accession to the EU, had a sizeable negative effect on the total size of the population. Specifically, the population of Lithuania decreased by 18% from 2004 to 2016, most of which was due to the negative net migration over the period. This trend has also affected the composition of the population: according to Statistics Lithuania, young workers (those between 15 and 34) are significantly more likely to migrate, causing an increase in the share of elderly in Lithuania. In addition, and similarly to most of Europe, life expectancy has been on the rise. As a result of these two trends, Lithuania's population has become older. In 2004, there were 22 people over 65 for every 100 working-age persons. This number rose to 28 by 2016. This shift might have had important consequences for income distribution, since a greater fraction of the population became dependent on pension income. Finally, the household composition in Lithuania changed. In 2007, almost 60% of households had dependent children, but this has fallen to 51% in 2015. Likewise, there were fewer (legally) married households: 48% of the households indicated that they were married in 2007, but only 39% in 2015. Since the income of married households tends to be more equallly distributed this could also contribute to income inequality.

Cyclical and structural changes in the economy

Looking at Figure 2, the Gini coefficient in Lithuania appears to be strongly procyclical, much more so than in Slovakia or the average in the EU, which appears highly stable in the period under discussion. The Gini in Lithuania grew somewhat during 2005-2008, peaked at 37% in 2009 and then fell to a low of 32% in 2011, before starting to rise again, reaching 37% in 2015. This pattern coincides with the business cycle of Lithuania, with a bit of a lag.

The financial and economic turmoil that emerged in the global economy following the eruption of the 2007-2008 crisis in the US hit Lithuania particularly hard. Figure 3 portrays GDP growth of the Lithuanian economy versus the average in the EU. During the peak of the crisis in 2009, the Lithuanian economy contracted by almost 15% in real terms. Although similar contractions where observed in other Baltic states, this is about three times as severe as in the EU overall. The contraction in Lithuania was due to both internal and external reasons. The economic expansion preceding the crisis was characterized by significant imbalances: double-digit inflation, a housing boom, appreciating real exchange rates, and accelerating wage growth — which exceeded productivity growth. The domestic bubbles burst in early 2008, when the credit supply decelerated and banks started tightening credit conditions. The downturn was further exacerbated by negative developments in the external economic environment after the Lehman Brothers' bankruptcy. The sharp decline was followed by a rapid recovery in Lithuania, with growth rates above the EU average in the early 2010s.

[Figure 2 about here.]

Labour market conditions following the the financial crisis of 2008 worsened dramatically. As shown in Figure 4, the unemployment rate rose steadily between 2008 and 2011, from 4% to almost 18%. For the sake of comparison, the fluctuations in the average unemployment rate in the EU were significantly less pronounced. Again, the labour market bounced back rather quickly during the expansion period: the unemployment rate fell below the EU average in 2015. In the face of economic turbulence, the government of Lithuania had to choose between internal and actual devaluation. Internal devaluation was chosen to tackle the external and domestic macroeconomic instability. This generated sharp declines in public and private earnings in the labour market: top public salaries were cut by more than 20 percent and the gross average wages declined by 12.4 percent from the pre-crisis peak to the bottom.

The labour market has also experienced several important structural changes common to most developed countries. One of the most significant changes was a gradual move away from employment in agriculture towards employment in the service sector. The share of employed in agriculture almost halved, from 14% in 2004 to 8% in 2016. As agriculture is the least productive sector, these structural changes in the economy might have affected the income inequality. Additionally, around 8% of Lithuania's population is self-employed and subject to different tax regimes. The share of self-employed has been rising steadily since 2011.

Reforms in the tax and benefit system

The government implemented a large number of reforms in the tax and benefit system during this period.

In 2007-2009, many existing benefit levels were increased. The largest increase in benefit expenditure was due to old age pensions, which constituted 62% of all social protection benefits in 2007. This was partly due to the 35% increase in the state-approved social insurance basic monthly pension. Since pensioners are bunched at the bottom of the income distribution, this had an important redistributive impact. The second highest change in benefit expenditure was due to family/child benefits. The length of parental leave benefit payout duration increased from one to two years. The effect was particularly strong because parental leave benefits are calculated based on the basis of average monthly reimbursable income (AMRI), which largely consisted of earnings. Since 1 July 2009, AMRI was averaged over 9 months, and since 1 October 2009 – over 12 months, one month before the right to parental leave benefits. This implies that payouts in 2009-2010 were paid based on the all-time-high pre-crisis earnings of 2007-2008. In addition, several child benefits were also increased in this period. The combined result was that expenditure on family/child benefits increased by 2.6 times in 2009 as compared to 2007, and constituted close to 16% of social protection benefits paid in 2009, up from 9% in 2007. State Supported Income, which affects social benefit payouts and unemployment insurance payouts, also increased by 70%.

The legislation which took effect in the 2007-2009 period was largely accepted prior to the crisis and proved unsustainablein a crumbling economy. Therefore, the government cut the spending on benefits substantially in an effort to stabilize the budget deficit by passing the Provisional Law on Recalculation and Payment of Social Benefits. The plan was to reduce the benefits, but only provisionally – between 1 January 2010 and 1 December 2011. The new law capped or reduced a number of benefits in Lithuania. For example, unemployment benefits were capped at 188 euro and old-age pensions either were frozen or decreased. Additionally, a lower ceiling was applied to parental leave benefits. While most of these temporary provisions expired at the end of 2011, several of them, such as reduced state pensions for officers, soldiers, and academic workers, remained in effect until the end of 2013.

During 2011-2015, the benefit system gradually recovered and extended payouts. The Provisional Law on Recalculation and Payment of Social Benefits ended, resulting in higher payout ceilings. Additionally, in 2015, the sickness benefit, which is paid from the State Social Insurance Fund, was increased. Moreover, the economy started to recover, leading to higher earnings and payouts linked to them.

Overall, benefit payouts increased in nominal terms much more in the 2007-2011 period as compared to 2011-2015. The average benefit payouts for the two periods are found in Table 1. As can be seen, social assistance increased by 95%, maternity and paternity benefits by 83%, and old age pensions by 26% in the first period in nominal terms. This means that the increase in benefits in 2007-2009 greatly outweighed the provisional cuts in 2009-2011. In contrast, we see much milder increases or even declines in average payouts in the 2011-2015 period (with sickness benefits being the exception). Changes in real terms are harder to interpret in this case, as they crucially depend on the deflator. The relative decline of real growth rates would be just as apparent if we deflate the benefit payouts by wages (e.g. old age pensions grew in the first period by 11%, but fell in the second by 6%), but less apparent if we deflate by the harmonized index of consumer prices (e.g. old-age pensions grew by 3% in the first and by 9% in the second). This is because wages have grown much faster than inflation in Lithuania since 2011. This table does not allow us identify the extent to which changes in the tax structure (such as changing social insurance basic monthly pension or prolonging parental leave benefits) and market forces (such as dynamics of earnings) affected these payouts. However, it is expected that both factors should play a strong role and that the decomposition procedure should help disentangle the two.

[Table 1 about here.]

There were important changes in retirement policies over the period. First, from 2006 to 2011, the old-age pension age in Lithuania was 62.5 for men and 60 women. From 1 January 2012, the state pension age gradually increased by 4 months annually, from 60 to 65 years, for women, and by 2 months annually, from 62.5 to 65 years, for men. In 2015, it was 63 years and 2 months for men and 61 years and 4 months for women. Second, in 2004, the pension system was reformed to allow for an opportunity to accumulate and invest a part of the funds in the private sector. Every person insured for full pension insurance was allowed to voluntarily choose either to stay only in the public social insurance system or to switch to the 2nd pension pillar by directing a part of social insurance contributions to a personal account in a chosen privately managed pension fund.

In addition, there have been a number of reforms in the tax system. The personal income tax rate was decreased from 33 to 24% during the course of 2005-2008. Since 2011, all income, except income from distributed profit and income which is subject to a tax rate of 5%, is subject to a uniform tax rate of 15%. During the period of 2011-2013, income from distributed profit was taxed at a 20% rate. Since 1 January 2014, this tax rate was lowered to 15%.

There were also changes in one of the largest components of labour costs, namely, social insurance contributions. These contributions are flat-rate without ceilings, but they differ for employees and self-employed. Employees contribute 3% of gross wages and salaries as contributions to pension social insurance and, since 2009, an additional 6% to health social insurance. Employers, for their part, pay on behalf of their employees 31% of gross wages and salaries to pension social insurance, sickness and maternity social insurance, unemployment social insurance, health insurance, employment injuries, and occupational diseases social insurance. Until 2009, self-employed persons paid contributions only to pension social insurance, depending on their income. Since 2009, self-employed persons additionally contribute to sickness and maternity social insurance. Starting in 2009, social insurance contributions had to be paid on income from sports, performing or authorship/copyright agreements (until 2009, those were only taxed by the personal income tax).

In what follows, we focus on the period between 2007 and 2015, which was a very dynamic period for the Lithuanian economy. We further divide this period into two sub-periods. We are particularly interested in the 2011-2015 sub-period for two reasons. First, the business cycle was in the economic expansion phase throughout the period, making the results easier to interpret. Second, income inequality in Lithuania has increased dramatically during this period. This naturally leaves us with the 2007-2011 period as the second sub-period, which is dominated by the financial crisis of 2008.[4]

3 Methodology and data

The objective of this paper is to decompose changes in the income distribution over time in Lithuania. Given the complex drivers of the income distribution, including demographics, factor markets, market income, and public policy, we require a multidimensional framework to undertake the decomposition. Decomposing by population characteristics, income sources, and policy drivers, we utilise the simulation-based approach developed in Sologon *et al.* (2021)(for disposable income) and Bourguignon *et al.* (2008) (for market income) for the purpose of cross-national decompositions and extended in O'Donoghue *et al.* (2020) to "nowcast" the distributional impact of the COVID-19 crisis. We used the generic household income-generation model (IGM) developed by Sologon *et al.* (2021) to simulate the labour market situation and household market income distribution as a function of personal and household attributes and to generate counterfactual distributions under alternative

[4]We also avoid analysing the period before 2007 as fewer variables were available in EU-SILC.

scenarios. The IGM relies on a system of hierarchically structured, multiple equation models for detailed income sources, combining: a set of personal characteristics, parameters describing how the receipt and level of income sources vary with personal characteristics, and residuals linking model predictions to observed income sources. Taxes and benefits are partly calculated using the EUROMOD microsimulation model (Sutherland and Figari, 2013) and partly with the help of equation models, as done for IGM. The framework is flexible in comparing disposable income distributions across countries, across regions, or over time to disentangle the role of labour market structure, returns, demographics, and tax-benefit rules. The same factors identified as driving cross-national differences are valid when studying changes in inequality over time.

This framework allows us to decompose overall changes in inequality to changes into 4 factors. The first factor is called "demographics", which captures changes in income distribution due to changes in the distribution of demographic characteristics such as age, sex, and family composition. The second factor is called "labour market structure", which assesses the impact of a changing distribution of the employed, unemployed, the industry at which people work, and their occupations on the income distribution. The third factor is called "prices and returns". This factor quantifies the returns due to demographic factors and labour market factors. Therefore, it includes wages per hour worked, returns for a given occupation, industry, and capital returns (the price of rent and dividends). The fourth factor is the "tax-benefit" system. It quantifies changes in the tax-benefit policy rules on the distribution of disposable income.

All 4 factors and their components vary over time, and crucial to consider when trying to disentangle the factors influencing the distribution of income over time. The methodology simulates counterfactual incomes associated with market, policy, and demographic characteristics of the alternative year, and assesses the impact of changes in these individual components on the total household disposable income distribution. Specifically, we take the underlying demographic structure in time period (s) and simulate the presence of counter-factual market incomes and their level as well as incomes from public policies that exist in the alternative year (t). Doing this in sequence allows us to assess the impact of replacing the market structure, the distribution of market incomes, or the structure of public policies of time (s) with time (t), holding all other components constant. This enables us to work out how much of the change in the distribution of disposable income was due to individual components (see Sologon *et al.*, 2021) for a detailed description of the micro-simulation micro-econometric approach using the household income distribution model).[5]

[5] It is important to note that model parameters do not capture causal relationships between the various endogenous and exogenous variables considered. Rather, parametric relationships are reduced-form projections which describe

In this section, we describe the individual simulation components of the IGM and the mechanism for decomposing disposable income inequality.

3.1 Components of the income distribution

We consider 5 broad components of disposable income:

- gross labour incomes, y_h^L (including employee, self-employed incomes),
- household capital incomes, y_h^K (including capital, rental incomes),
- and other household non-benefit pre-tax incomes, y_h^O(including private pension, private transfers, and other incomes),
- public benefits, y_h^B , and
- household direct taxes, y_h^T, which include social security contributions.

We define household disposable income as:

$$y_h = \underbrace{y_h^L + y_h^K + y_h^O}_{Market} + \underbrace{y_h^B - y_h^T}_{Non-market} \tag{1}$$

Some market income components are aggregates of smaller components, which are modelled separately to achieve a fine level of disaggregation. *Gross labour income* is aggregated from employment and self-employment income, while *capital income* - from investment and property income. Each component of market income is estimated at the individual level. For each household, the incomes of all individual members are added to obtain the household's income. For each income source, we follow two steps. First, we estimate a binary participation indicator $I_{hi}()$ equal to one if the individual i of household h receives that type of income, and zero otherwise.Second, for the individuals receiving it, we estimate the level $y_{hi}()$. For labour income, we first estimate a binary indicator equal to one if the individual is working, and zero otherwise. Then, for those individuals working, we assign the estimated income, either from employment or self-employment. *Other non-benefit pre-tax income* are not modelled at such a granular level because too few households had such income. Formally, this is represented by:

statistical relationships between basic conditioning variables and various components of income.

$$y_h^L = \sum_{i=1}^{n_h} I_{hi}^{lab} \left(I_{hi}^{emp} y_{hi}^{emp} + I_{hi}^{semp} y_{hi}^{semp} \right) \tag{2}$$

$$y_h^K = \sum_{i=1}^{n_h} \left(I_{hi}^{inv} y_{hi}^{inv} + I_{hi}^{prop} y_{hi}^{prop} \right) \tag{3}$$

$$y_h^O = \sum_{i=1}^{n_h} I_{hi}^{O} y_{hi}^{O} \tag{4}$$

where: n_h is the total number of individuals in household h; I_{hi}^{lab} is an indicator equal to one if individual i belonging to household h (individual hi from now on) is working; and for $S \in$\{emp, semp, inv, prop, other\}, I_{hi}^{S} is an indicator equal to one if individual hi receives any income from source S, and y_{hi}^{S} refers to the level of income received from source S.

To simulate counterfactual distributional characteristics, we first statistically estimate individual equations for the presence and level of each of the income sources. For the presence of a market incomes source, we first estimate a binary participation using a logistic model. We model occupation (8 categories, based on the ISCO-08 classification) and industry (primary, secondary, or tertiary) using a multinomial logistic regression model.

For the distribution of wages, we utilise individual characteristics conditional on the whole wage distribution and not only on the conditional mean, as in the regressions used for other income sources; assuming a Singh-Maddala distribution, F_X:

$$F_{X=z}(w) = \text{SM}(w; a(z), b(z), q(\text{z})) = 1 - \left[1 + \left(\frac{w}{b(z)} \right)^{a(z)} \right]^{-q(z)} \tag{5}$$

where X indicates that the distribution is conditional on a vector of characteristics z; $q(z)$ is a shape parameter for the 'upper tail'; $a(z)$ is a shape parameter ('spread') affecting both tails of the distribution, and $b(z)$ is a scale parameter. $a, b$and q parameters are allowed to vary log-linearly with individual characteristics, following Biewen and Jenkins (2005) and Van Kerm (2013). The approach utilises a flexible unimodal three-parameter distribution which provides a good fit to wage distributions (Van Kerm *et al.*, 2016). The wage, estimated separately for males and females, is then given by:

$$w_{hi} = F_{X=z}^{-1}(\upsilon_{hi}^{emp}) = b(z)[(1 - \upsilon_{hi}^{emp})^{-\frac{1}{q(z)}} - 1]^{\frac{1}{a(z)}} \tag{6}$$

where υ_{hi}^{emp} is a random term uniformly distributed and z contains both demographic variables, x_{hi} occupation, occ_{hi} and industry sector, ind_{hi}. The female wage model is participation-corrected

(Van Kerm, 2013). The level of non-wage income sources are estimated using a log-linear model for those individuals receiving the income source.

Non-market incomes resulting from public policy such as income taxes, social insurance contributions, social assistance benefits (including housing support), social insurance benefits, and universal benefits are simulated using the EUROMOD tax-benefit microsimulation model (see Sutherland and Figari, 2013). EUROMOD incorporates the tax-benefit schemes of EU member countries, with harmonised input datasets. It simulates social benefits, taxes, and social insurance contribution entitlements, utilising the actual legal rules of the individual policies. Encompassing present and historic tax-benefit policies, EUROMOD allows a user to swap policies between different periods (see e.g. Levy *et al.* 2007,Bargain and Callan 2010 and Bargain 2012). We sum income derived from household benefits (y_h^B) and household direct taxes (y_h^T) individually. Household benefits are defined as the sum of household pension income, means-tested benefits and non-means tested benefits:

$$y_h^B = y_h^{pens} + y_h^{mtb} + y_h^{nmtb} \tag{7}$$

Direct taxes are defined as a combination of income taxes and social security contributions (ssc):

$$y_h^T = y_h^{tax} + \sum_{i=1}^{n_h} y_{hi}^{ssc} \tag{8}$$

All direct taxes and some of the benefits are modelled by EUROMOD. We use regression techniques to model the partially simulated and non-simulated variables. A summary of the variables modelled by EUROMOD and by regression models is available in Appendix Tables 7 and 8.

3.2 Simulating counterfactual distributions

As outlined at the start of the section, we utilise these market and non-market models to simulate counterfactual distributions and to undertake a decomposition of changes in the income distribution over time, between period t and period s. The income generation model (IGM) can be defined as:

$$Y = m(X, \Upsilon; \xi) \tag{9}$$

where:

- Y is household disposable income,
- X is a vector of exogenous characteristics,
- ξ is the vector of parameter values and
- Υ is a vector of unobserved heterogeneity terms.

The income generating process is not a 'structural' model, but rather a statistical representation of the structure of the presence and the level of market incomes, as well as the the tax-benefit rules.

The objective of this approach is to understand how the distribution F of a random variable Y (such as disposable income) as well as any functional of interest $\theta(F)$ (such as inequality indices, quantiles) varies over time, to answer the question: 'What would the income distribution of time t be if its IGM was the one of time s along one or more of the dimensions considered?'. In particular, we are interested in the degree to which changes in the individual components affect changes in the distribution of disposable income.

The change depends on the (joint) distribution of X and Υ in the population through m and ξ resulting from differences in the distributions of observable characteristics as well as unobservable residual heterogeneity and differences in the model's parametric structure and parameter values. We assume that all years can be represented by a common parametric model of the form m but that years differ in the values taken by the parameters ξ. We undertake the decomposition in the income distribution over time by swapping individual income components between periods, one at a time. To do this, we estimate the IGM for each year separately and calibrate transformations so as to replace components of the IGM of year t with components of the IGM of year s.This is analogous to the standard Oaxaca-Blinder decomposition but implemented in a multiple equations model and over time.

In swapping components between periods, there are many combinations that are possible, given the range of different incomes and income components. In this study, we focus on four 'transformations':

- a labour market structure transformation;
- a returns transformation;
- a demographic transformation; and
- a tax-benefit system transformation.

Below we outline the transformation in a general form and leave the exact variables on which the transformations are applied to the Appendix tables 7 and 8 (see columns “variables” and “factors” in particular). We also included the main model tables (Tables 10 to 25 in the Appendix) while the rest of the model tables are available on request.

The labour market structure transformation changes important characteristics of the labour market structure such as employment, occupation, and industry sector, and involves swapping between periods the elements of the parameter vector ξ characterising the labour market to simulate an alternative parameter vector, $\tilde{l}(\xi)$,which will result in an alternative outcome Y^l:

$$Y^l = m(X, \Upsilon; \tilde{l}(\xi)). \tag{10}$$

Y^l is the counterfactual distribution that would prevail in period t if we "import" the labour market structure of period s, while keeping everything else the same.

The returns transformation acts through the parameter vector ξ, changing the parameters of the equations for each market income source (employment income, self-employment income, capital income, modelled benefit income, other income) to produce an alternative parameter vector, $\tilde{r}(\xi)$, which would result in an alternative outcome Y^r :

$$Y^r = m(X, \Upsilon; \tilde{r}(\xi)). \tag{11}$$

Y^r is the counterfactual distribution that would prevail in period t if we "import" the structure of returns of period s, while keeping everything else constant. This follows the logic of the manipulation of the vector of coefficients in Mincerian earnings regressions aimed to capture ‘price’ effects (as distinct from ‘composition’ effects) in traditional Oaxaca-Blinder decomposition exercises. It resembles the decomposition of Juhn *et al.* (1993) in the way residual variances are accounted for: it swaps the variance terms by rescaling the residuals of time t for each of the five income components, but preserves the rank correlation of the residuals.

The demographic transformation changes the values of variables relating to socio-demographic characteristics of the population (education, age, sex, number of children by age, legal marital status, citizenship, and whether the individual is over 65 without any children to account for single elderly households) and involves a modification of the distribution of the random variables in X as in Sologon *et al.* (2021). We reweigh the population at time t to resemble the population structure at time s by a factor obtained semi-pametrically following DiNardo *et al.* (1996) and Barsky *et al.*

(2002):

$$\omega(X) = \frac{\Pr(X|s)}{\Pr(X|t)} = \frac{\Pr(s|X)}{\Pr(t|X)} \frac{\Pr(t)}{\Pr(s)} \tag{12}$$

The alternative distribution of $\tilde{X}(X)$ results in obtaining a counterfactual outcome for income,Y^d:

$$Y^d = m(\tilde{X}(X), \Upsilon; \xi). \tag{13}$$

Y^d is the counterfactual distribution that would prevail in period t if we "import" the demographic structure of period s, while keeping everything else constant.

The tax-benefit system transformation modifies the level and eligibility of benefits and tax liabilities, simulated by EUROMOD, to produce an alternative parameter vector $\tilde{tb}(\xi)$. This involves swapping model parameters as above for the equations describing the benefits not fully simulated by EUROMOD, and using EUROMOD to apply the tax-benefit rules and parameters of period s onto the market incomes and household characteristics of period t. For these simulations, pre-fiscal monetary variables are inflated (deflated) to the year of the tax-benefit system being considered by using the EUROMOD uprating indices. Most non-benefit monetary variables, including employment and self-employment incomes, are uprated by the average gross monthly earnings index. Several income components, such as investment income, private pensions, private transfers, and some benefit monetary variables are uprated by the harmonized index of consumer prices. Most benefit monetary variables are uprated by benefit specific indices (for example, social assistance benefits are uprated by an index that captures the change in the average amount of monetary social assistance benefit received between years). Similar swapping of tax-benefit policy rules and parameters were implemented for analysing trends in income distributions (see Bargain, 2012; Bargain and Callan, 2010; Herault and Azpitarte, 2016; Paulus and Tasseva, 2020) and cross-country differences (see Dardanoni and Lambert, 2002; Levy *et al.*, 2007; Sologon *et al.*, 2021).

The resulting counterfactual is formalized as:

$$Y^{tb} = m(X, \Upsilon; \tilde{tb}(\xi)) \tag{14}$$

Y^{tb} is the counterfactual distribution that would prevail in period t if we "import" the tax-benefit rules of period s, while keeping everything else constant.

For each of the four transformations, the impact is assessed by comparing the original distribution in period t with each counterfactual. We can compute the impact on any distribution functional of interest, θ, such as the Gini index or the quantiles. This type of measure is called a partial distributional policy effect in Rothe (2012) or simply a policy effect in Firpo *et al.* (2009). For transformation k with $k \in${l, r, d, tb}, this impact is given by:

$$\Delta_\theta^k(F) = \theta(F) - \theta(F^k). \tag{15}$$

In our approach, the disposable incomes obtained in the simulations are aligned to the year of the tax-benefit system being applied. For example, when we apply the period t tax-benefit system to market incomes, the resulting disposable incomes are in period t values. This implies that counterfactuals obtained by importing in period t the demographics, labour market structure, and returns from period s are aligned with period t values. When we "import" the tax-benefit rules from period s, however, the resulting simulated incomes are aligned with period s, in terms of both productivity level and prices. As we need to compare this counterfactual with the original t distribution using a scale-variant distributional functional, such as the quantiles, we need to index disposable incomes by the average market income index to ensure all incomes are expressed in period t values (in terms of productivity and prices), in line with the other counterfactual differences. As the aim of the tax-benefit transformation is to evaluate actual policy changes, we use a distributional neutral benchmark given by the actual change in average market income levels between period t and s (Bargain and Callan, 2010). Specifically, we adjust the simulated incomes expressed in 2011 values by the ratio between the mean market income in 2015 and 2011. We perform a similar adjustment for 2007. This way we account for the price changes and for the productivity growth between the years. This ensures that the "tax and benefit effect" measures the change in relative position of those who do get market incomes and those who do not (e.g. welfare payments), thereby capturing the change in generosity of the system. That is, we measure the marginal effect of the tax and benefit system on disposable income when we control for the level of productivity growth and prices (as well as demography and labour market structure). When we compare distributions using scale-invariant distribution functionals, such as the Gini index, inflating (deflating) disposable incomes has no impact on the comparison.

3.3 Decomposition of changes in the income distribution over time

Next, we decompose the observed differences between income distributions and their corresponding functionals in years t and s. We compute a certain functional $\theta(F)$ for each of the two years, $\theta(F^t)$ and $\theta(F^s)$. Our procedure aims to decompose the total observed difference, $\theta(F^t) - \theta(F^s)$, into the contributions of each of the individual determinants k of a set K:

$$\Delta_\theta(F^t, F^s) = \theta(F^t) - \theta(F^s) = \sum_{k=1}^{K} \Delta_\theta^k(F^t, F^s) \tag{16}$$

One approach is to apply each transformation sequentially, one after the other, from the original distribution, F^t, to the target distribution, F^s, and take the difference between two consecutive steps of the sequence. The drawback of such a sequential decomposition is path-dependence, i.e. the estimated contribution of each factor depends on the chosen sequence. To reduce issues of path-dependence[6], we focus on 'direct effects' following Biewen and Juhasz (2012) and Biewen (2014). The direct effect assesses the impact of each factor from the same initial benchmark distribution:

$$D_\theta^k(F^t, F^s) = \theta(F^t) - \theta(F_t^k) \tag{17}$$

where F_t^k is the counterfactual distribution obtained by applying one transformation k to the initial distribution F^t. Comparing direct effects is a natural way to assess the effects of alternative transformations (Biewen and Juhasz, 2012).[7] The sum of all direct effects and unexplained factors does not add up to the overall observed difference. The discrepancy reflects interactions between components. In the context of our decomposition, we have four direct effects of each transformation, the unexplained component, and an interaction term:

[6] We do not eliminate path-dependence completely. For example, our results are conditional on the choice of the reference year.

[7] In eq.(18)-(20), all pre-fiscal incomes are expressed in period t values, to which we apply the period t tax-benefit system and the resulting household disposable incomes are expressed in period t values. In eq.(21), the counterfactual distribution in period t under the tax-benefit rules of period s relies on 2 steps. First, as pre-fiscal incomes are expressed in period t values, we adjust the vector of pre-fiscal income components $\vec{Y}_{prefiscal_t}$ with the EUROMOD uprating factors (vector U) to match the year of the tax-benefit system (period s). The resulting simulated household disposable incomes $Y_{disposable_s}$ are aligned with period s: $(\vec{U} * \vec{Y}_{prefiscal_t})|TB_s = Y_{disposable_s}$. Second, as we compare all distributions in period t values, the simulated disposable income needs to be adjusted accordingly. For adjusting the household disposable income variable, we use scalar a closely related to vector $\vec{U}$, namely the average market income index: $Y_{disposable_t} = 1/a * Y_{disposable_s}$. Scalar a is essentially the average across elements of $\vec{U}$, weighted by corresponding income components' relative share in total pre-fiscal income $a = \overline{\vec{U}}$.

$$D^l_\theta(F^t, F^s) = \theta(F^t) - \theta(F^l_t) \tag{18}$$

$$D^r_\theta(F^t, F^s) = \theta(F^t) - \theta(F^r_t) \tag{19}$$

$$D^d_\theta(F^t, F^s) = \theta(F^t) - \theta(F^d_t) \tag{20}$$

$$D^{tb}_\theta(F^t, F^s) = \theta(F^t) - \theta(F^{tb}_t) \tag{21}$$

$$\Delta\Upsilon_\theta(F^t, F^s) = \theta(F^t) - \theta(F^{l,r,d,tb}_s) \tag{22}$$

$$I_\theta(F^t, F^s) = \Big(\theta(F^t) - \theta(F^s)\Big) - \left[\left(\sum_{k\in\{l,r,d,tb\}} D^k_\theta(F^t, F^s)\right) + \Delta\Upsilon_\theta(F^t, F^s)\right]. \tag{23}$$

The term $\Delta\Upsilon_\theta(F^t, F^s)$ captures the contribution of differences in the distribution of scaled residual or unobserved heterogeneity terms Υ between period t and s. Following the original approach in Sologon *et al.* (2021), we did not perform specific transformations involving the residual terms since they do not have clear-cut economic interpretations: they mostly reflect the correlation of scaled residuals across all income sources and differences over time in residual distributions that may be due to unmodelled heteroscedasticity or model misspecification.[8] $I_\theta(F^t, F^s)$ is an interaction term. Following Biewen (2014) and Sologon *et al.* (2021), it is calculated as the total difference in θ (net of the unexplained effect) minus the sum of direct effects, accounting for all two-way and three-way interactions between the four components in the model.

The total observed change over time is decomposed into:

$$\Delta_\theta(F^t, F^s) = D^l_\theta(F^t, F^s) + D^r_\theta(F^t, F^s) + D^d_\theta(F^t, F^s) + D^{tb}_\theta(F^t, F^s) + \Delta\Upsilon_\theta(F^t, F^s) + I_\theta(F^t, F^s) \tag{24}$$

As a robustness check, we also use the Shapley value approach, as in Shorrocks (2013) and Sastre and Trannoy (2002) (see, e.g., Deutsch *et al.*, 2018, for a recent application). The procedure calculates marginal contributions of each component in all possible decompositions, and then averages them out. We report the Shapley value decomposition results for the full sample period in the Appendix, while we use the direct effects throughout the text. Our conclusions are robust across the two approaches.

[8] $\Delta\Upsilon_\theta(F^t, F^s)$ is obtained by swapping residuals across periods. Starting from time s we jointly apply all four transformations calibrated to period t parameters. Subtracting this construct from time t's original distribution we capture the difference between the residuals of period t and period s.

3.4 Data

We use the nationally representative household survey for Lithuania: the European Union Statistics of Income and Living Conditions (EU-SILC) for period 2007 to 2015. This yearly survey contains detailed information about income in the preceding year as well as the socio-economic characteristics of households and their members, largely during the survey year. Therefore, we focus on 2008, 2012 and 2016 EU-SILC survey waves for Lithuania.

Given that a central component of our income generation process is the tax-benefit microsimulation engine EUROMOD, we use the 'EUROMOD input data' versions of the EU-SILC dataset for Lithuania, which have been standardized for common definitions of income variables and household characteristics (Sutherland and Figari, 2013). The disposable household income in EUROMOD is composed of the sum across all household members of market incomes and public pensions plus cash benefits, minus taxes and social insurance contributions. The 'EUROMOD input data' that we feed to EUROMOD are already modified by the IGM. That is, the labour market transformation, the returns transformation, and part of tax and benefit transformation (for values not modelled by EUROMOD) have been applied to the data to derive hypothetical income distributions. Additionally, the values have been uprated (i.e. indexed to nominal averages of respective system years) before being fed to EUROMOD. The uprating values differ depending on the monetary value (for example, pensions are uprated to average statutory pension each year, while labour income is uprated to average gross wages of that year). Then, direct taxes, social insurance contributions and a part of cash benefits are calculated by EUROMOD. EUROMOD assumes full take-up of benefits (no tax evasion). All incomes are expressed in single adult equivalent by dividing total household income by the square root of household size. Sample sizes exceed 10 thousand individuals, corresponding to just under 5 thousand households in each year.

[Table 2 about here.]

The demographic, cyclical, and structural changes discussed previously are visible in the EU-SILC data. Table 2 shows several population socio-economic characteristics for each of the three years based on the samples in our database, as well as changes of these characteristics from 2007 to 2011 and from 2011 to 2015. Standard errors of the changes are in parenthesis, and we label the changes as significant if t values exceed 1.96.

In terms of demographics characteristics, we see a relative increase in education attainment and life expectancy, both of which increased significantly in the 2007-2011 period. We also see a decline in the presence of children, especially those aged 12 to 15 in 2011-2015 period and a significant relative decline in (legal) marriage rates (from 58 percent in 2007 to 47 percent in 2015).

Changes in the labour market structure are more nuanced. In 2007, an average respondent worked for 6.6 months during the year; this significantly fell to 5.9 in 2011. This constitutes a greater than 10% reduction in employment time during the crisis years. The economy recovered in 2015, when an average person worked for 6.5 months. The crisis has also changed the composition of employees and self-employed among those who were employed. In 2011, self-employment plummeted by about half, reflecting the vulnerability of this type of work during turbulent times. The distribution of workers across types of occupation also experienced some changes: the economy experienced an increase in the share of professionals and a decrease in the share of associate professionals. This change in composition of occupations relates to an increase in the share of people with tertiary education: a larger share of high-skilled workers were able to take more qualified jobs. There was also a large shift towards the service sector, especially during 2007-2011, at the expense of the agricultural and industry sectors, as expected.

Finally, looking at the participation and returns in the labour and capital markets, we can see that the share of people with capital income doubled since 2007. The increase is highly significant in the 2011-2015 period. Average capital income increased by about 87 percent after accounting for inflation, while it decreased by 46 percent during the first sub-period. We observe similar dynamics in the labour market: wages have fallen by 12 percent and increased by 23 percent during the first and second sub-periods, respectively. We take this as evidence of significant changes in the returns of investments in both the labour and the capital markets.

4 Changes in the income distribution and redistribution between 2007 and 2015 in Lithuania

4.1 Changes in disposable income inequality

We start by characterizing the changes in the distribution of equivalised household disposable incomes in Lithuania between 2007 and 2015, considering both the period 2007-2015 as a whole and two sub-periods: 2007-2011 and 2011-2015.

Table 3 shows the mean and median monthly disposable incomes and the Gini index associated with each of these periods. We present both nominal and uprated values in order to assess the evolution of incomes relative to price developments (the harmonized index of consumer prices, HICP). Nominal values do not differ a lot between 2007 and 2011, but there is a rapid increase in 2015. The HICP uprated mean and median income values, however, were significantly lower in 2011 as compared to 2007. Therefore, we observe a decline in purchasing power during the economic crisis period. In contrast, the mean and median income rose roughly by 34% increase since 2011. The Gini moved in tandem with real incomes. It slightly fell between 2007 to 2011, but then increased by 2.9 Gini points in 2015.

[Table 3 about here.]

The rise of the Gini alongside rising mean and median incomes suggests that incomes rose unevenly for the population, particularly from 2011 to 2015. We see this in Figure 5 in the form of Pen's parades. When comparing the distributions of 2007 and 2015, it can be seen that almost all quantiles experienced an income increase, including the quantiles at the bottom of the income distribution. Furthermore, income increased the most since 2011 and barely changed in the previous period. What we also see is that the income of different quantiles increased by different absolute amounts - those at the top gained significantly more than those at the bottom.

[Figure 3 about here.]

The relative increase in income is presented in two panels of Figure 6. Panel 6a shows the pairwise differences between the three distributions shown in Figure 5, as a percentage of the 2015 distribution. For each percentile, the change between 2007 and 2015 is equal to the sum of the change between 2007 and 2011 and the change between 2011 and 2015. Therefore, for each percentile, the change over the whole period can be decomposed into the contributions of each of the two sub-periods. The 2007-2015 period comprised two very distinct sub-periods in what concerns the evolution of incomes across the income distribution. The years between 2007 and 2011 brought mild increases in the income of some of the poorer and the richer, while the bottom 5% and the 40-50% actually lost income. This contrasts with the 2011-2015 period, where income of the entire distribution rose. However, the rise in income in 2011-2015 period differs along the distribution: it rose by around 20% for the bottom 20% of the population and around 30% for the top of the population. The top 10% of the distribution gained even more than 30% in their disposable income. Therefore, the economic upturn increased inequality between the tails of the distribution. Panel 6b contains the HICP deflated quantile differences. Therefore, it captures the drop in purchasing power from 2007 to 2011 across the income distribution. Even though this was followed by a rapid recovery, incomes at the bottom of the income distribution increased by far less that those at the top. As a result, the purchasing power of those at the bottom of 25 percent of income distribution was the same in 2015 as in 2007.

[Figure 4 about here.]

4.2 The redistributive effect of the tax and transfer system

An important determinant of the disposable income distribution is the redistributive action of the tax and transfer system, which typically cushions developments in the market income distribution. In Table 4 we provide summary indicators of the effect of the system as a whole, as well as the partial effects of taxes and transfers. The effectiveness of the system as a whole is measured by net redistribution, which is defined as the difference between the Gini of market income and the Gini of disposable income. Next, the effectiveness of each component of redistribution, i.e. transfers and taxes, is evaluated separately. Specifically, we present measures of (i) redistribution, given by the Reynolds-Smolensky index; (ii) average tax (transfer) rates, defined as the ratio between the total amount of taxes (transfers) paid (received) and the total pre-tax (transfer) income; and (iii) progressivity/regressivity effect, measured by the Kakwani index[9].

[Table 4 about here.]

The analysis of these indicators suggests several findings. First, in terms of overall redistribution, the tax and transfer system as a whole was a crucial determinant of the level of disposable income inequality in Lithuania. In each of the three years considered, the net redistributive effect was around 15 Gini points, or about 30% of the Gini of market income. However, the system was not equally redistributive throughout the whole period. The tax and benefit system became more redistributive in 2011 as compared to 2007, as the net redistributive effect increased by 35%, from 0.134 to 0.182. The effect was large enough to dominate the increase in market income inequality by more than 13%: the resulting disposable income inequality was smaller than in 2007. The system, however, became less redistributive in 2015 as compared to 2011: disposable income inequality increased, even though market income inequality did not change during this period.

The increase in net redistribution in 2011 was determined by an increase in benefit redistribution (more generous transfer rates and more regressive benefits), whereas the drop in 2015 compared

[9] Note that in the case of transfers, higher regressivity means more transfers being *received* by lower income households, while in the case of taxes, higher regressivity means more taxes being *paid* by lower-income households. Therefore, an increase in transfer regressivity increases redistribution while an increase in tax progressivity (and therefore a decrease in tax regressivity) increases redistribution.

to 2011 was determined by a decrease in both benefit (smaller transfer rates and less regressive transfers) and tax redistribution (drop in tax progressivity).

5 Drivers of changes in the income distribution between 2007 and 2015

This section decomposes the changes of total income inequality presented in Subsection 4 into the contributions of the main factors considered in our model, as described in Subsection 3.3. This helps us understand why income inequality changed.

Decomposing changes in incomes

Figure 7 shows the contribution of each factor to the total changes in income distributions (i.e., the decomposition of the total changes in income distribution that were depicted in Figure 6b). Analogously to the results presented in Figure 6, for each percentile in each graph, the change in the period 2007-2015 is equal to the sum of the changes in the periods 2007-2011 and 2011-2015. Furthermore, for each percentile, and each period, the total change in the income distribution given in Figure 6 is equal to the sum of the four factor contributions as portrayed in Figure 7 as well as the the interaction effects and the residuals. The joint effect of the latter two can be found in Figure 8 in the Appendix.

All four factors contributed to changing household disposable income distribution in Lithuania. The biggest effect was due to the price and returns effect, as well as changes in the generosity of the tax and benefit system. Changes in price and returns increased disposable income of the median household by about20% during the whole period, whereas changes in the tax and benefit system generosity contributed another 12%. Changes in labour market structure increased income by 5% and the demographic effect generated a negative change in the disposable income of the median household.

Changes in the transfer system, the prices and returns as well as the demographics, appear to have affected the income inequality: the size (and the sign in some cases) of the effects vary, depending on the position on the income distribution. As expected, changes in the tax and benefits increased the income of the bottom deciles more than the top of the income distribution. The effect generated a decrease in income inequality. Nonetheless, the top of the income distribution has benefited significantly more from the changes to the price and returns of the markets, which has contributed to the rise of the income inequality. Although the demographic effect had a smaller impact on the level of disposable income, its effect on inequality appears to be very significant over the analysed period. This is because changes in the demographics of the population affect the bottom and the top of the income distribution unequally: due to the demographic effect, the income of the bottom 30% of the population was 5% lower in 2015, whereas the income of the top has increased by 5%. The size of the contribution of the demographic effect to increasing income inequality is comparable to the size of the tax and benefit effect acting in the opposite direction.

Looking at the two sub-periods, neither changes in the tax and benefit system nor the prices and returns had the same effect throughout the whole period. The largest gains for the bottom of the income distribution was due to the changes in tax and benefits over the crisis period. This was partly because benefits were substantially raised in this period, as well as because market incomes have dropped. In contrast, the tax and benefit became much less generous during the upturn, because benefits increased less or not at all, while market incomes rose rapidly. Furthermore, benefits that target the bottom of the income distribution, such as social assistance, actually decreased during the 2011-2015 period and as a result the bottom 20% benefited less than the rest of the distribution. In contrast, the price and returns played a modest role in 2007-2011; most of the effect came during the years of economic expansion. This speaks to the nature of the prices and returns effect and is consistent with a procyclical nature of that effect. Overall, the emerging picture implies that the measures adapted by the tax and benefit system could not deliver sufficient redistribution at a time when incomes were rising rapidly, i.e. during the upturn of the business cycle. In contrast, the demographic effect appears to be less sensitive to the business cycle conditions. It slowly but gradually increased inequality in both sub-periods, likely due to the secular nature of the demographic shifts.

Finally, the effect of changes in the labour market structure appear to be mostly concentrated at the bottom of the income distribution. There is a positive effect on the bottom 5% of households: their income increased by almost 10% during the whole period, with most change happening in second period. The income of households in the middle of the income distribution also increased slightly. Interestingly, the top of the income distribution either did not gain or lost income because of changes in the labour market structure.

[Figure 5 about here.]

Further decomposing of the demographic effect

To further decompose the demographic effect, we calculated the contribution of each observable that we use to calculate the demographic effect. The results are presented in Table 9 in the Appendix. For the sake of brevity, we only report the contributions of the most important demographic factors: age, education, and marital status. Table 9 discloses that declining (legal) marriage rates contributed the most while increasing rates of education, defined as tertiary level education versus all lower education levels, rates had an important role as well. The marriage effect generated a very unequal and negative effect across almost the whole of the income distribution. The rising education rates, by contrast, resulted in a positive and significantly more equal effect across the distribution. The combination of these two effects, displayed in Figure 9d, explains the totality of the demographic effect. Interestingly, the ageing of society does not appear to have played a significant role in explaining the recent increase in income inequality.

The reason why marriage had a large effect on income inequality seems to stem from the fact that inequality among married households is smaller than among households with a single adult. This means that as a smaller share of population becomes married, income inequality increases. This finding is consistent with Burtless (1999), who found a similar result for the United States in the late 20th century. There are several factors that might generate this effect. The low earnings of one partner can be offset by the higher earnings of the second partner — an insurance mechanism that non-married households (which are largely also single-person households) do not have. Alternatively, marriage can be a "luxury" into which higher income earners self-select. Additionally, our results show that fewer married households are linked to lower household disposable income. While our decompositions are not causal, other studies do tend to suggest that this link may be causal: as summarized by Lundberg *et al.* (2016), married men tend to work longer hours and get higher earnings. This is related to changing behaviour (reducing risky activities such as drug use or drinking and increasing preferences for work). As such, falling marriage rates among the poorest households maybe especially problematic, as this pushes them into even deeper poverty.

Education has an overall positive effect for incomes, although the effect is slightly stronger in the upper tail of the income distribution. This means that the rise in the number of people with tertiary education is associated with higher income overall, even though the richest individuals benefit more. This result is in line with Magda *et al.* (2021), who show that education contributed to wage inequality in Lithuania in the similar period due to the composition effect (more educated people).

Importantly, the demographic effect only captures a part of the overall education effect. This is because the demographic effect only considers the share of people with tertiary education, but does not consider the returns to education. Magda *et al.* (2021) finds that returns to education in terms of wages indeed declined in Lithuania in a similar period, and that this decline was strong enough to offset the composition effect (more people getting tertiary education). As a result, more education also means more equal wages and subsequently more equal incomes. Additionally, those with higher education tend to receive more equal incomes than those who do not have it (Černiauskas and Čiginas, 2020). Because of this, even if between-group inequality increases (that is, the income gap between those with a tertiary degree and those without rises), the higher share of educated results in lower the within-group inequality in Lithuania. This finding contrasts Lemieux (2006) results obtained for the US, where the more educated (albeit defined at a more disaggregated level) tended to be more unequal than those who were educated, in which case more education means less equality. One possible explanation for different levels of within inequality could relate to more homogeneous universities in Lithuania than in the US, resulting in more equal outcomes. For example, all but one university in Lithuania are public, and the government (now and in soviet times) provides heavy subsidies to enter. However, this should be explored further. Similarly, the stronger effect for the top of income distribution could be examined further. This would be problematic if higher income families have certain privileges of obtaining education. Contemporary reports do not suggest unequal access to higher education per se, but there are signs that supply of early education is unequal, which could allow wealthier families to access it, and then subsequently find it easier to enroll into higher education (OECD, 2017).

Decomposing changes in inequality and redistribution

Here we quantify the contributions of the four factors as well as their interactions to the changes in income inequality and net redistribution. That is, we decompose Table 4, found in section 4.2. Table 5 shows the contributions to the changes in Gini of disposable income and the Gini of market income. The contributions to the changes of the net redistribution, which is the difference between Gini of market income and the Gini of disposable income, is found in Table 6. All decompositions are based on direct effects, as shown in Section 3.3. As a robustness check, the decompositions based on the Shapley value can be found in Table 9 in the Appendix.

Starting with the contributions to the changes in disposable income inequality, we can see that the effects of the four factors were heterogeneous. In terms of the size of the effect, the contribution of the prices and returns factor was the most important, and the totality of the effect is concentrated in the second period. Over the period of economic recovery, the Gini of disposable income rose by 3.2 pp due to higher prices and returns. This number is consistent with Figure 7c, which shows that the upper tail of the disposable income distribution benefited significantly more than the lower tail. Demographic changes were another important contributor to the growing income inequality in Lithuania. Unlike the effect of prices and returns, trends in the Lithuanian demographic situation appear to be secular and independent from the business cycle conditions: the impact in both periods is similar quantitatively, amounting to a total contribution of 1.3 pp to the Gini index.

The remaining two factors acted in the opposite direction and were responsible for taming the growing income inequality due to the returns and the demographic effects. Specifically, changes in the tax and benefit system managed to counter half of the increase in market income inequality. Its contribution to *reducing* the Gini of disposable income amounted to 2.0 pp, and the effect is concentrated in the period of financial crisis. As discussed in Section 2, no additional measures were implemented during the years of economic expansion, as most of the transfers, such as pensions, were frozen. This means that the amount of redistribution remained the same, and the tax and benefit system was not able to accommodate rising disposable income inequality during the economic upturn. Finally, the labour market structure is shown to make a smaller but also significant contribution to lowering income inequality, which occurred during the first sub-period.

Moving to market income inequality, one can observe that it has grown significantly over the whole period, but most of it occurred during the financial crisis of 2008: the Gini grew by 4.2 pp, with 95% of the growth concentrated in the first sub-period.[10] Interestingly, demographics was the most important factor, contributing to about half of this increase. Going back to Table 2, this was a period when the share of married households decreased while the number of those with tertiary education increased, suggesting that household and education composition was behind this rise in inequality. Not surprisingly, the effect of prices and returns in the labour and capital markets on income inequality portrays procyclicality. The effect of prices and returns was negative during the crisis years (-0.7 pp) but positive and significant in size during the years of economic expansion (1.3 pp). Looking at the whole period, the two phases cancel each other out, and the total effect is only 0.6 pp. Changes in labour market structure appear to be the only factor that has reduced market

[10] The small effect of the tax-benefit transformation on market income inequality is due to adjustments to minimum wages, which are included in the taxes and benefit transformation. Regarding the compliance rules implemented in EUROMOD, we are not bringing in second-order non-compliance and we are not assuming differential compliance. We assume, thus, no tax-evasion, compliance in benefit take-up, and compliance with minimum wage regulations.

income inequality substantially, and the effect is mainly concentrated in the first sub-period. It is important to note that the component unexplained by our methodology amounts to a significant share of the total change, especially so during the first sub-period. This implies that factors not modelled by our methodology (e.g., regional composition of workers and jobs) also played a role.

[Table 5 about here.]

Next, we examine net redistribution to assess whether the changes in the income distribution were due to changes in policy design or changes in the distribution of market incomes. Here, market incomes refer to all factors (except the tax and benefit factor) plus interactions and the unexplained residual. We decompose the changes in the redistributive indices marking the transition from market to disposable income. Specifically, we decompose redistributive indexes into total a) net redistribution, b) benefit redistribution (benefit regressivity, average benefit rate), and c) tax redistribution (tax progressivity, average tax rate). Our infrastructure allows us to assess to what extent the observed changes in these indices are due to changes in policy design over time, as captured by the tax-benefit effect in Table 6. Controlling for changes in market income distributions between 2007 and 2015, we find that net redistribution increased. The increase was driven by an increase in benefit redistribution, as seen in Table 6a, where all the increase took place in the period 2007-2011. In contrast, changes to the tax system reduced income redistribution. Again, the policy changes predominantly took place in 2007-2011.

We then split the benefit and tax redistribution further into average tax/benefit rate effect and a progressivity effect with the help of the STATA package compiled by Peichl and van Kerm (2007). The results are found in Table 6b. From this, we see that the benefit redistribution increased due to higher benefit generosity. Higher benefits were paid out, particularly in the period of 2007-2011. Had market incomes not risen in that period also, inequality would have been even lower. Although benefits became less regressive, benefit redistribution increased. As shown in Černiauskas and Čiginas (2020), this is because it is more effective to change benefit level than benefit regressivity, as benefits are already regressive. Although tax rates did become more progressive (partly due to rising tax-exempt amount of income), the level of taxes decreased substantially due to lower tax rates. As a result, taxes became less redistributive.

[Table 6 about here.]

The tax-benefit system during the period from 2011 to 2015 did not generate sufficient redistribution for prevention of income inequality, which resulted from rapid increases in market incomes.

Comparatively low levels of benefits and reluctance to introduce an increasingly progressive income tax were the main factors of rising income inequality.

6 Concluding remarks

This paper studies the drivers of changes in the income distribution in Lithuania from 2007 to 2015 by adapting a methodology developed by Sologon *et al.* (2021). We assess the role played by changes in the labour market structure, the economic returns in labour and capital markets, the demographics, and the economic policy related to tax and benefit rules. The case of Lithuania is esoecially interesting, given the country's recent transition from a planned economy to a market one, its ongoing convergence to the EU-15, and large fluctuations in disposable income over the business cycle. During the period under discussion, the Lithuanian economy experienced a global financial crisis which significantly affected household disposable income, a series of tax and benefit reforms, and a changing demographic structure. Income inequality reached unprecedented levels as a result. To address this challenge, one must first understand the factors that contribute to income inequality and determine whether the tax and benefit system in place is able to reduce it.

Our results suggest that the growing returns in the labour and capital markets, as well as large structural changes in the demographics of the population, played the main role in explaining the observed increase in income inequality. Changes in the tax and benefit system reduced income inequality overall, but only during the period 2007-2011. In particular, the benefit system became more redistributive because of larger benefit pay-outs that were increased in this period. By the year 2011, those who lost work had access to relatively high unemployment benefits, parental benefits, sick leaves, old age pension, and other benefits, as compared to 2007. However, benefits only slightly increased thereafter, while in some cases (e.g., due to increasing pension age) fewer benefits have been handed out altogether. Tax rates have been lowered in 2007-2011 and were not raised in the later period. As a consequence, disposable income inequality increased sharply over the next period. Although the returns effect was the main contributor to increasing income inequality, especially during 2011-2015 period, other important factors played a significant role as well. Our results show that the demographic effect persistently increased income inequality over the analysed period. Specifically, we found that declining marriage rates were mostly responsible for the increase.

Several lessons can be drawn from the analysis of the Lithuanian economy during 2007-2015.

First, implementing fiscal consolidation by reducing the generosity of the benefits system can have important negative distributional consequences. Falling regressivity of benefits during the economic expansion in the aftermath of the financial crisis was one of the main contributors to increasing disposable income inequality in Lithuania. Second, the Lithuanian tax system is designed in such a way that its progressivity declines in response to unequal growth in income distribution. As the economy continues to converge towards EU-15, we can expect this mechanism to continue unless the tax system is reconsidered. Third, changing demographic composition of the population can have important consequences on the income inequality as well. As marriage rates continue to decline (most likely due to a change in the preferences with respect to the size of the household), we can expect to see rising income inequality in the future.

Bibliography

Alvaredo, F., L. Chancel, T. Piketty, E. Saez, and G. Zucman, *World inequality report 2018*, Harvard University Press, 2018.

Atkinson, A. B., T. Piketty, and E. Saez, "Top incomes in the long run of history," *Journal of Economic Literature*, 49(1), 3–71, 2011.

Bargain, O., "Back to the future: decomposition analysis of distributive policies using behavioural simulations," *International Tax and Public Finance*, 19(5), 708–731, 2012.

Bargain, O. and T. Callan, "Analysing the effects of tax-benefit reforms on income distribution: a decomposition approach," *Journal of Economic Inequality*, 8(1), 1–21, 2010.

Barsky, R., J. Bound, C. Kerwin, and J. Lupton, "Accounting for the black-white wealth gap: a nonparametric approach," *Journal of the American Statistical Association*, 97(459), 2002.

Biewen, M., "A general decomposition formula with interaction effects," *Applied Economics Letters*, 21(9), 636–642, 2014.

Biewen, M. and S. P. Jenkins, "A framework for the decomposition of poverty differences with an application to poverty differences between countries," *Empirical Economics*, 30(2), 331–358, 2005.

Biewen, M. and A. Juhasz, "Understanding rising income inequality in germany, 1999/2000–2005/2006," *Review of Income and Wealth*, 58(4), 622–647, 2012.

Bourguignon, F., F. H. Ferreira, and P. G. Leite, "Beyond oaxaca–blinder: Accounting for differences in household income distributions," *The Journal of Economic Inequality*, 6(2), 117–148, 2008.

Burtless, G., "Effects of growing wage disparities and changing family composition on the us income distribution," *European Economic Review*, 43(4-6), 853–865, 1999.

Černiauskas, N. and A. Čiginas, "Measurement and decomposition of lithuania's income inequality," *Baltic Journal of Economics*, 20(2), 139–169, 2020.

Daly, M. C. and R. G. Valletta, "Inequality and poverty in United States: The effects of rising dispersion of men's earnings and changing family behaviour," *Economica*, 73(289), 75–98, 2006.

Dardanoni, V. and P. J. Lambert, “Progressivity comparisons,” *Journal of Public Economics*, 86(1), 99–122, 2002.

Deutsch, J., M. N. P. Alperin, and J. Silber, “Using the shapley decomposition to disentangle the impact of circumstances and efforts on health inequality,” *Social Indicators Research*, 138(2), 523–543, 2018.

DiNardo, J., N. M. Fortin, and T. Lemieux, “Labor market institutions and the distribution of wages, 1973-1992: A semiparametric approach,” *Econometrica*, 64(5), 1001–1044, 1996.

Firpo, S., N. M. Fortin, and T. Lemieux, “Unconditional quantile regressions,” *Econometrica*, 77(3), 953–973, 2009.

Herault, N. and F. Azpitarte, “Understanding changes in the distribution and redistribution of income: a unifying decomposition framework,” *Review of Income and Wealth*, 62(2), 2016.

Immervoll, H. and L. Richardson, “Redistribution policy and inequality reduction in oecd countries: What has changed in two decades?” *OECD Social, Employment, and Migration Working Papers*, (122), 2011.

Juhn, C., K. M. Murphy, and B. Pierce, “Wage inequality and the rise in returns to skill,” *Journal of Political Economy*, 101(3), 410–442, 1993.

Lemieux, T., “Increasing residual wage inequality: Composition effects, noisy data, or rising demand for skill?” *American Economic Review*, 96(3), 461–498, 2006.

Lerman, R. I. and S. Yitzhaki, “Income inequality effects by income source: A new approach and applications to the united states,” *The Review of Economics and Statistics*, 67(1), 151–156, 1985.

Levy, H., C. Lietz, and H. Sutherland, “Swapping policies: Alternative tax-benefit strategies to support children in Austria, Spain and the UK,” *Journal of Social Policy*, 36(4), 625–647, 2007.

Li, J., H. A. La, and D. M. Sologon, “Policy, demography, and market income volatility: What shaped income distribution and inequality in australia between 2002 and 2016?” *Review of Income and Wealth*, 67(1), 196–221, 2021.

Lundberg, S., R. A. Pollak, and J. Stearns, “Family inequality: Diverging patterns in marriage, cohabitation, and childbearing,” *Journal of Economic Perspectives*, 30(2), 79–102, 2016.

Magda, I., J. Gromadzki, and S. Moriconi, “Firms and wage inequality in central and eastern europe,” *Journal of Comparative Economics*, 49(2), 499–552, 2021.

Navickė, J., “Factors behind the changes in income distribution in the baltics: income, policy, demography,” *Journal of Baltic Studies*, 51(2), 137–157, 2020.

Nolan, B., W. Salverda, D. Checchi, I. Marx, A. McKnight, I. G. Tóth, and H. G. van de Werfhorst, eds., *Changing Inequalities and Societal Impacts in Rich Countries: Thirty Countries' Experiences*, Oxford University Press, 2014.

O'Donoghue, C., D. M. Sologon, I. Kyzyma, and J. McHale, “Modelling the distributional impact of the covid-19 crisis*,” *Fiscal Studies*, 41(2), 321–336, 2020.

OECD, *Divided We Stand: Why Inequality Keeps Rising*, OECD, Paris, 2011.

OECD, *Education in Lithuania*, 2017.

Paulus, A. and I. V. Tasseva, “Europe through the crisis: Discretionary policy changes and automatic stabilizers,” *Oxford Bulletin of Economics and Statistics*, 82(4), 864–888, 2020.

Peichl, A. and P. van Kerm, “PROGRES: Stata module to measure distributive effects of an income tax,” Statistical Software Components, Boston College Department of Economics, 2007.

Reynolds, M. and E. Smolensky, “Public expenditures, taxes and the distribution of income: the United States, 1950, 1961, 1970,” *Academic Press, New York*, 1977.

Rothe, C., “Partial distributional policy effects,” *Econometrica*, 80(5), 2269–2301, 2012.

Sastre, M. and A. Trannoy, “Shapley inequality decomposition by factor components: Some methodological issues,” *Journal of Economics*, 77(1), 51–89, 2002.

Shorrocks, A. F., “The class of additively decomposable inequality measures,” *Econometrica*, 48(3), 613–625, 1980.

Shorrocks, A. F., “Inequality decomposition by factor components,” *Econometrica*, 50(1), 193–211, 1982.

Shorrocks, A. F., “Inequality decomposition by population subgroups,” *Econometrica*, 52(6), 1369–85, 1984.

Shorrocks, A. F., "Decomposition procedures for distributional analysis: A unified framework based on the Shapley value," *Journal of Economic Inequality*, 1–28, 2013.

Smeeding, T., R. Erikson, and M. Jäntti, *Persistence, privilege, and parenting: The comparative study of intergenerational mobility*, Russell Sage Foundation, 2011.

Sologon, D. M., V. Almeida, and P. V. Kerm, "Accounting for the distributional effects of the 2007-2008 crisis and the economic adjustment program in Portugal," *LISER Working Papers no. 2019-05, 52 p.*, 2019.

Sologon, D. M., P. Van Kerm, J. Li, and C. O'Donoghue, "Accounting for differences in income inequality across countries: tax-benefit policy, labour market structure, returns and demographics," *The Journal of Economic Inequality*, 19(1), 13–43, 2021.

Sutherland, H. and F. Figari, "EUROMOD: the European Union tax-benefit microsimulation model," *International Journal of Microsimulation*, 6(1), 2013.

Tasseva, I. V., "The changing education distribution and income inequality in great britain," *Review of Income and Wealth*, 2020.

Van Kerm, P., "Generalized measures of wage differentials," *Empirical Economics*, 45(1), 465–482, 2013.

Van Kerm, P., S. Yu, and C. Choe, "Decomposing quantile wage gaps: a conditional likelihood approach," *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, 65(4), 507–527, 2016.

Appendix

A Additional tables and figures

Tables 7 and 8 list income generation process components. Table 7 contains the examined income sources and states whether the variable was aggregated or modelled. In case the variable is modelled, it contains the conditioning variables. The corresponding model transformation is also included. The same is done for demographic and labour market variables in Table 8.

[Table 7 about here.]

[Table 8 about here.]

[Figure 6 about here.]

[Figure 7 about here.]

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List of Figures

Figure 1: Gini index, European Union, 2015

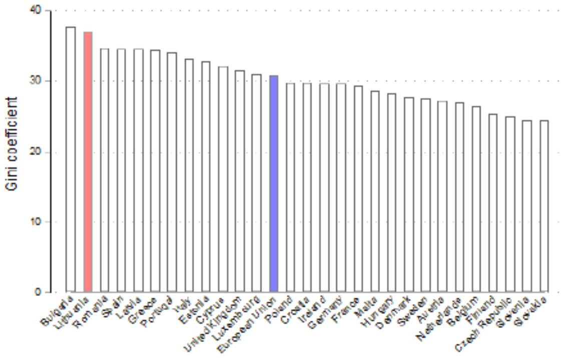
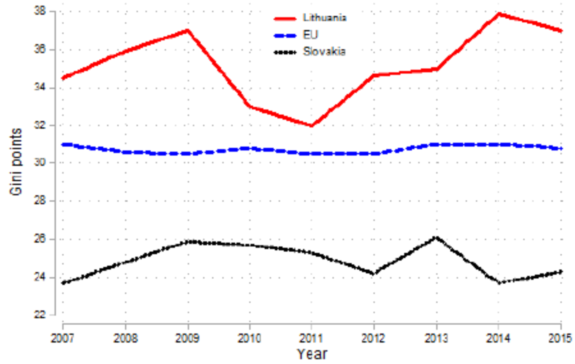
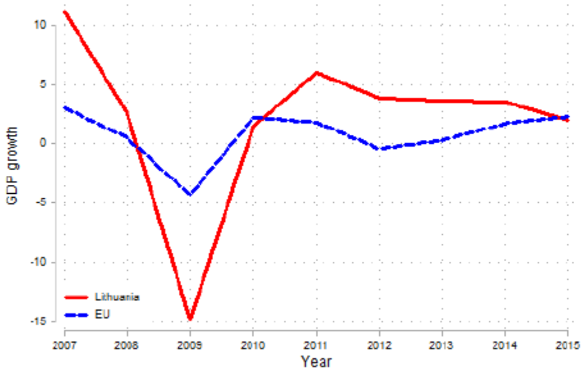


Figure 2: Gini index, Lithuania, 2007-2015



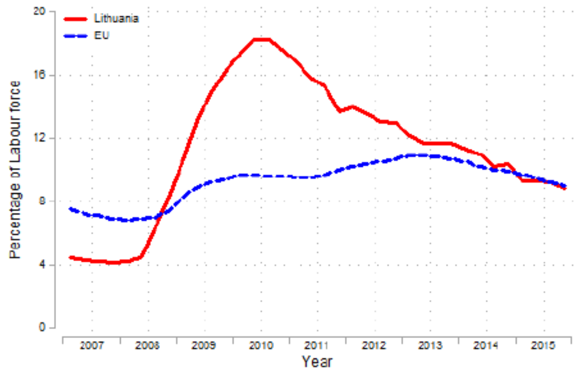
Note: Gini index refers to equivalized disposable income. Source: Eurostat.

Figure 3: GDP growth



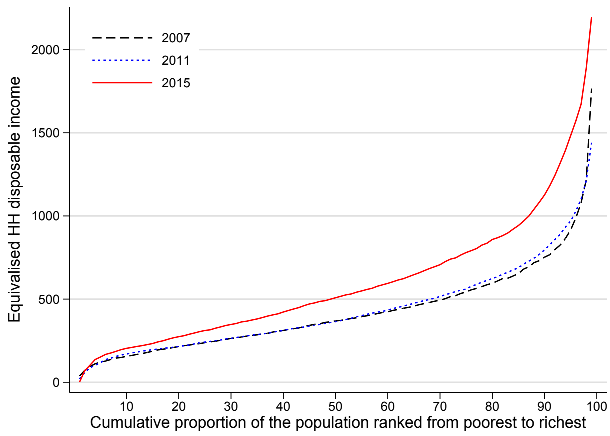
Source: Eurostat.

Figure 4: Unemployment rate



Source: Eurostat.

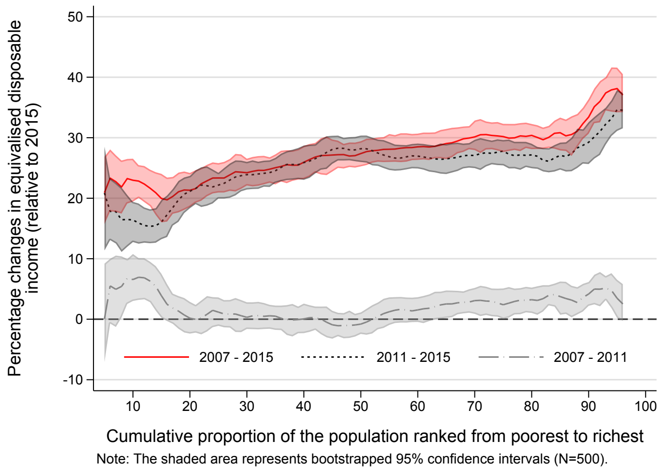
Figure 5: Distribution of equivalised household disposable income (nominal values)



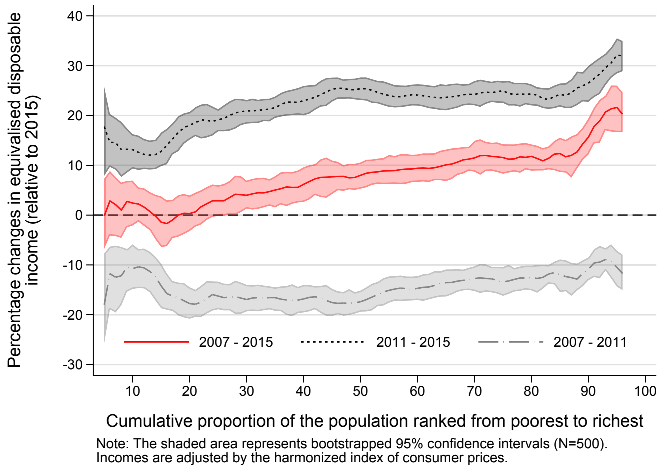
Source: Authors' calculation based on EU-SILC EUROMOD input data.

Figure 6: Relative changes in the distribution of equivalised household disposable income

(a) Nominal values



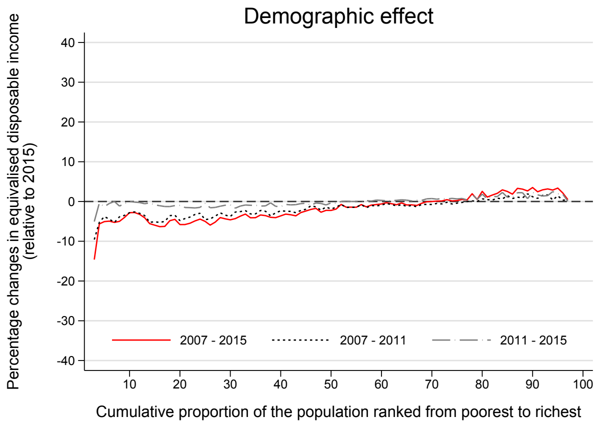
(b) HICP adjusted to 2015 prices



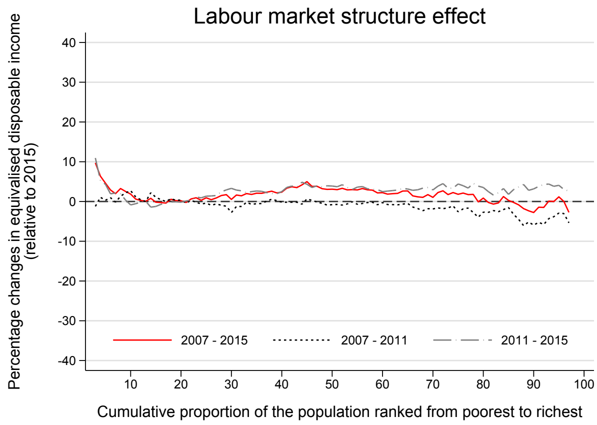
Source: Authors' calculation based on EU-SILC EUROMOD input data.

Figure 7: Decomposition of changes in the distribution of equivalised household disposable income

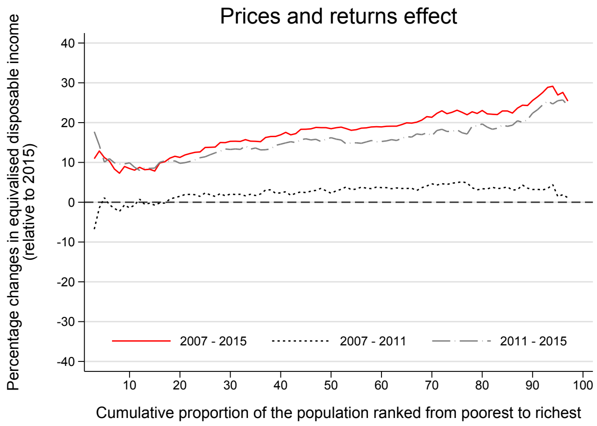
(a) Demographic effect



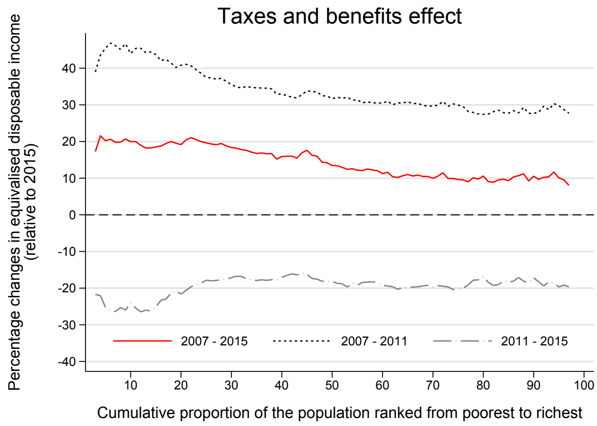
(b) labour market structure effect



(c) Prices and returns effect

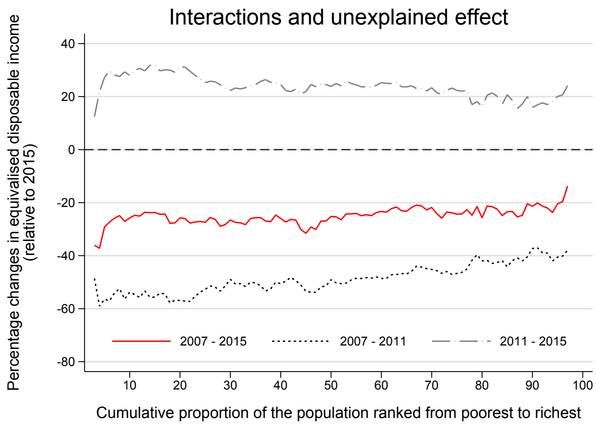


(d) Taxes and benefits effect



Source: Authors' calculation based on EU-SILC EUROMOD input data.

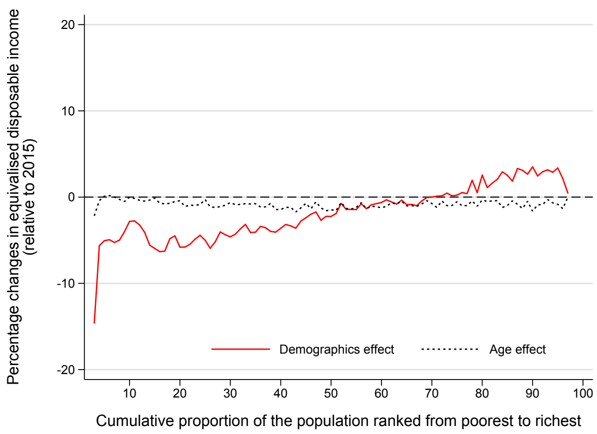
Figure 8: Interactions and unexplained effect



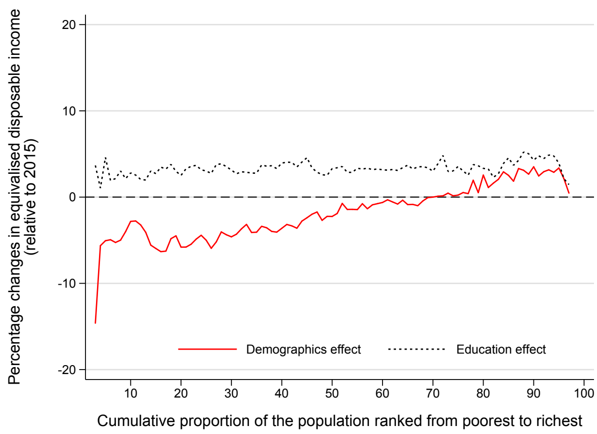
Source: Authors' calculation based on EU-SILC EUROMOD input data.

Figure 9: Decomposition of the demographic effect

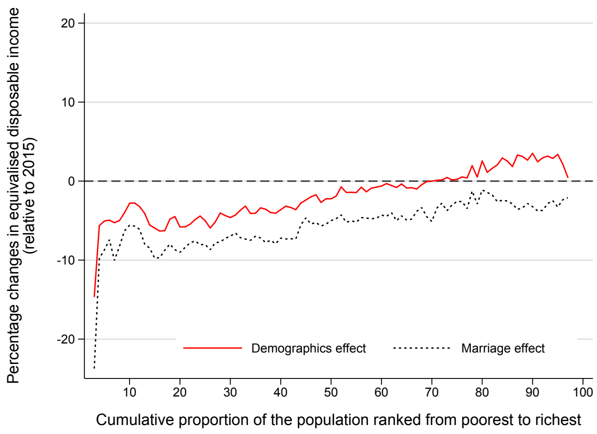
(a) Age effect



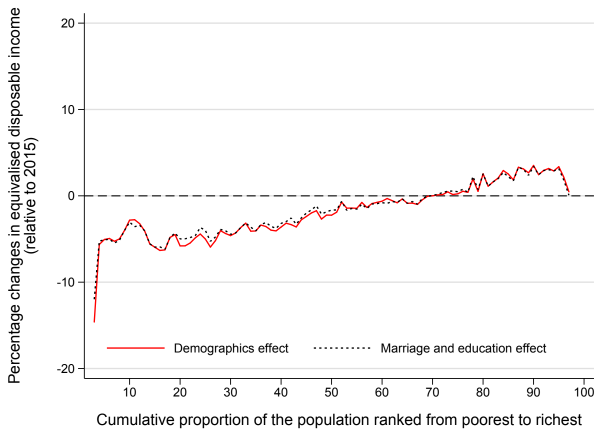
(b) Education effect



(c) Marriage effect



(d) Marriage and education effect



Source: Authors' calculation based on EU-SILC EUROMOD input data.

List of Tables

Table 1: Nominal growth of average benefit levels

	2007-2011	2011-2015
Old-age pension	26%	13%
Work incapacity and invalidity pensions	27%	4%
Maternity and paternity benefits	83%	-29%
Sickness benefit	1%	31%
Social assistance	95%	-13%
Benefits for bringing up children	49%	1%

Notes: the figures represent percent changes over the period 2007-2011 and 2011-2015 for average social protection expenditures in current prices by selected benefit types. Old-age pension refers to average old-age state social insurance pension payout per person per month. Sickness benefits refer to average expenditure on state social insurance sickness benefit per sick day. Other calculations are available on request.

Source: author calculation based on administrative data on social protection from Statistics Lithuania.

Table 2: Population socio-economic characteristics (shares of total population)

	2007	2011	2015	2007-2011	2011-2015
Demographic					
Tertiary Education	0.287	0.332	0.358	0.045 (0.014)	0.026 (0.015)
People 16-65	0.684	0.670	0.665	-0.014 (0.008)	-0.005 (0.008)
People >65	0.148	0.173	0.179	0.024 (0.007)	0.006 (0.008)
Child 0-3	0.038	0.037	0.039	-0.001 (0.005)	0.002 (0.005)
Child 4-11	0.080	0.073	0.081	-0.007 (0.006)	0.008 (0.006)
Child 12-15	0.049	0.047	0.036	-0.002 (0.004)	-0.011 (0.004)
Married	0.578	0.530	0.469	-0.048 (0.011)	-0.061 (0.012)
Citizen	0.995	0.995	0.992	0.000 (0.002)	-0.002 (0.002)
Male	0.444	0.450	0.451	0.006 (0.007)	0.000 (0.007)
Household size	3.316	3.091	2.991	-0.225 (0.074)	-0.101 (0.068)
Labour market structure					
Months worked	6.629	5.903	6.479	-0.726 (0.121)	0.576 (0.124)
Employee/Self-Employed	0.897	0.942	0.910	0.045 (0.007)	-0.032 (0.007)
Occupation					
Managers	0.139	0.115	0.115	-0.024 (0.009)	0.000 (0.009)
Professionals	0.168	0.233	0.229	0.064 (0.012)	-0.003 (0.013)
Associate Prof.	0.104	0.084	0.071	-0.021 (0.008)	-0.013 (0.007)
Clerks	0.041	0.038	0.043	-0.003 (0.005)	0.005 (0.005)
Service	0.118	0.125	0.122	0.007 (0.010)	-0.003 (0.009)
Craft	0.204	0.193	0.189	-0.011 (0.011)	-0.003 (0.011)
Plant	0.112	0.103	0.103	-0.009 (0.008)	-0.001 (0.008)
Unskilled	0.113	0.110	0.129	-0.003 (0.008)	0.018 (0.009)
Industry					
Agriculture	0.078	0.058	0.052	-0.020 (0.007)	-0.006 (0.006)
Industry	0.246	0.155	0.151	-0.091 (0.012)	-0.003 (0.010)
Services	0.676	0.788	0.797	0.111 (0.013)	0.009 (0.012)
Business certificate	0.262	0.191	0.215	-0.071 (0.040)	0.024 (0.038)
Price and returns					
With wage income	0.615	0.606	0.653	-0.009 (0.011)	0.047 (0.011)
Wages	4.263	3.750	4.624	-0.513 (0.097)	0.874 (0.105)
With capital income	0.085	0.075	0.164	-0.010 (0.007)	0.089 (0.008)
Capital income	9.004	4.883	9.174	-4.122 (2.620)	4.291 (2.035)
Nr. of observations	12130	12659	10895		

Notes: The estimates are weighted. The shares for education refer to age-group 25-64; for married, sex to age >= 16; for months worked to ages 16 to 80; for employees, occupation, industry and sector to those in work aged 16 to 80; for citizen to the entire sample; for buisness sertificates to self-employed. The shares for capital refer to age>= 16. Wages and capital income deflated by the harmonized index of consumer prices. Standard errors in parenthesis.
Source: author calculation based on EU-SILC EUROMOD input data.

Table 3: Summary statistics of monthly household disposable income (in EUR)

	Nominal		HICP adjusted		
	Mean	Median	Mean	Median	Gini
2007	433 (4.34)	369 (3.84)	549 (5.50)	467 (4.87)	0.339 (0.0041)
2011	438 (3.59)	364 (3.89)	455 (3.73)	378 (5.63)	0.331 (0.003)
2015	611 (6.66)	508 (5.82)	611 (6.66)	508 (5.82)	0.360 (0.0039)

Note: HICP adjusted values are given in 2015 prices. Standard errors in parenthesis.
Source: author calculation based on EU-SILC EUROMOD input data.

Table 4: The redistributive effect of the tax and transfer system

	2007	2011	2015	2007-2011	2011-2015	2007-2015
Gini Market Income (1)	0.473 [0.463 - 0.483]	0.513 [0.505 - 0.521]	0.515 [0.505 - 0.525]	0.040 [0.028 - 0.053]	0.002 [-0.011 - 0.015]	0.042 [0.028 - 0.056]
Gini Disposable Income (2)	0.339 [0.33 - 0.349]	0.331 [0.325 - 0.338]	0.360 [0.352 - 0.368]	-0.008 [-0.020 - 0.002]]	0.029 [0.017 - 0.038]	0.021 [0.008 - 0.032]
Net Redistribution (1)-(2)	0.134 [0.128 - 0.139]	0.182 [0.175 - 0.188]	0.155 [0.149 - 0.161]	0.048 [0.039 - 0.057]	-0.026 [-0.036 - -0.018]	0.021 [0.012 - 0.029]
Gini Market Income (+ Transfers) (3)	0.369 [0.36 - 0.379]	0.364 [0.358 - 0.371]	0.391 [0.383 - 0.399]	-0.005 [-0.017 - 0.005]	0.026 [0.015 - 0.037]	0.021 [0.009 - 0.034]
Average Transfer Rate	0.186 [0.178 - 0.195]	0.252 [0.241 - 0.263]	0.223 [0.213 - 0.233]	0.066 [0.053 - 0.081]	-0.029 [0.016 - 0.046]	0.037 [-0.052 - -0.024]
Transfer Regressivity	0.768 [0.745 - 0.791]	0.845 [0.832 - 0.860]	0.801 [0.782 - 0.820]	0.078 [0.05 - 0.104]	-0.044 [-0.066 - 0.021]	0.034 [0.003 - 0.062]
Transfer Redistribution (RS) (1)-(3)	0.104 [0.099 - 0.108]	0.148 [0.142 - 0.154]	0.124 [0.119 - 0.129]	0.045 [0.037 - 0.053]	-0.024 [-0.032 - -0.016]	0.021 [0.013 - 0.028]
Gini Market Income (+ Transfers - Taxes) (4)	0.341 [0.332 - 0.350]	0.343 [0.337 - 0.349]	0.372 [0.364 - 0.381]	0.002 [-0.01 - 0.012]	0.030 [0.018 - 0.040]	0.032 [0.02 - 0.043]
Average Tax Rate	0.177 [0.175 - 0.179]	0.100 [0.099 - 0.101]	0.107 [0.105 - 0.108]	-0.077 [-0.08 - -0.075]	0.007 [0.005 - 0.008]	-0.070 [-0.073 - -0.068]
Tax Progressivity (K)	0.144 [0.139 - 0.149]	0.199 [0.193 - 0.205]	0.161 [0.154 - 0.165]	0.055 [0.047 - 0.063]	-0.038 [-0.047 - -0.032]	0.017 [0.009 - 0.024]
Tax Redistribution (RS) (3)-(4)	0.029 [0.028 - 0.03]	0.022 [0.021 - 0.022]	0.019 [0.018 - 0.019]	-0.007 [-0.009 - -0.006]	-0.003 [-0.004 - -0.002]	-0.010 [-0.012 - -0.009]

Notes: K = Kakwani; RS = Reynolds-Smolensky. Bootstrapped 95% confidence intervals (N=500) are reported in squared brackets.

Source: author calculation based on EU-SILC EUROMOD input data.

Table 5: Decomposition of changes in equivalised income inequality

	Gini Disposable Income			Gini Market Income		
	2007-2015	2007-2011	2011-2015	2007-2015	2007-2011	2011-2015
Total change	**0.021**	**-0.008**	**0.029**	**0.042**	**0.04**	**0.002**
Demographics	0.013	0.008	0.006	0.020	0.017	0.003
Labour Market Structure	-0.012	-0.017	0.005	-0.015	-0.015	-0.001
Prices and Returns	0.030	-0.002	0.032	0.006	-0.007	0.013
Taxes and Benefits	-0.020	-0.021	0.000	0.002	0.004	-0.001
Interactions	0.017	0.002	0.016	0.003	0.009	-0.006
Unexplained	-0.008	0.022	-0.030	0.026	0.033	-0.007

Notes: Columns indicate the time period over which statistics where calculated (e.g. 2007-2011 refers to the change from 2007 to 2011).

Source: author calculation based on EU-SILC EUROMOD input data.

Table 6: Decomposition of the changes in redistribution

(a) Net redistribution, benefit redistribution and tax redistribution

	Net redistribution			Benefit redistribution			Tax redistribution		
	2007-2015	2007-2011	2011-2015	2007-2015	2007-2011	2011-2015	2007-2015	2007-2011	2011-2015
Total	**0.021**	**0.048**	**-0.026**	**0.021**	**0.045**	**-0.024**	**-0.010**	**-0.007**	**-0.003**
Taxes and Benefits	0.023	0.024	-0.001	0.027	0.028	-0.002	-0.008	-0.008	0.000
Market incomes	-0.001	0.024	-0.025	-0.006	0.017	-0.022	-0.002	0.001	-0.003

Notes: Columns indicate the time period over which statistics where calculated (e.g. 2007-2011 refers to the change from 2007 to 2011).

Source: author calculation based on EU-SILC EUROMOD input data.

(b) Detailed tax and benefit redistribution

	Benefit regressivity			Average benefit rate			Tax progressivity			Average tax rate		
	2007-2015	2007-2011	2011-2015	2007-2015	2007-2011	2011-2015	2007-2015	2007-2011	2011-2015	2007-2015	2007-2011	2011-2015
Total	**0.034**	**0.078**	**-0.044**	**0.037**	**0.066**	**-0.029**	**0.017**	**0.055**	**-0.038**	**-0.070**	**-0.077**	**0.007**
Taxes and Benefits	-0.017	0.015	-0.032	0.070	0.060	0.010	0.029	0.033	-0.004	-0.071	-0.071	0.000
Market incomes	0.051	0.062	-0.012	-0.033	0.006	-0.039	-0.012	0.022	-0.035	0.000	-0.006	0.006

Notes: Columns indicate the time period over which statistics where calculated (e.g. 2007-2011 refers to the change from 2007 to 2011).

Source: author calculation based on EU-SILC EUROMOD input data.

Table 7: Definition of income components and summary modelling information

Variable	Definition	Level	Treatment	Factor	Model	Conditioning variables
y_h	total household disposable income	household	aggregate		–	–
y_h^L	gross labour income	household	aggregate		–	–
I_{hi}^{emp}, y_{hi}^{emp}	employee income (wage*hours)	individual	aggregate	Returns (wage rates) and /LM structure (hours)	–	–
I_{hi}^{se}, y_{hi}^{se}	self-employment income (receipt, amount)	individual	modelled	Returns	logit,log-linear	x_{hi}, $firm-size_{hi}$, occ_{hi}, ind_{hi}, $work-history_{hi}$, lse_{hi}, $lsepf_{hi}$
y_h^K	capital income (investment, property)	household	aggregate	Returns	–	
I_h^{inv}, y_h^{inv}	investment income (receipt, amount)	individual	modelled	Returns	logit,log-linear	x_{hi}
I_h^{prop}, y_h^{prop}	property income (receipt, amount)	individual	modelled	Returns	logit,log-linear	x_{hi}
y_{hi}^O	other incomes (receipt, amount)	individual	aggregate, modelled	Returns	logit, log-linear	x_{hi}
y_h^B	public transfers	household	aggregate	TB	–	–
$I_{hi}^{sickness}$, $y_{hi}^{sickness}$	sickness (receipt, amount)	individual	modelled	TB	logit, log-linear	x_{hi}
$I_h^{housing}$, $y_h^{housing}$	housing benefits (receipt, amount)	household	modelled	TB	logit, log-linear	x_h
I_h^{sa}, y_h^{sa}	social assistance (receipt, amount)	household	modelled	TB	logit, log-linear	x_h
I_{hi}^{ed}, y_{hi}^{ed}	education benefit (receipt, amount)	individual	modelled	TB	logit, log-linear	x_h
y_h^{mb}	maternity and paternity benefits	individual	modelled	TB	EUROMOD	x_{hi},y_{hi}^L,y_{hi}^K, $work-history_{hi}$
y_h^{pcb}	pregnancy and childcare benefit	individual	modelled	TB	EUROMOD	x_{hi},y_{hi}^L,y_{hi}^K, $work-history_{hi}$
I_{hi}^{unemp}, y_{hi}^{unemp}	unemployment benefits (receipt, amount)	individual	aggregate, modelled	TB	logit, log-linear, EUROMOD	x_{hi}, $unemployed_{hi}$ (for receipt)

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Table 7 – continued from previous page

Variable	Definition	Level	Treatment	Factor	Model	Conditioning variables
I_{hi}^{pens}, y_{hi}^{pens}	state old age benefits (receipt, amount)	individual	aggregate, modelled	TB	logit, log-linear, EUROMOD	x_{hi}, $work-history_{hi}$, $retired_{hi}$ (for receipt)
$I_{hi}^{disability}$, $y_{hi}^{disability}$	disability (receipt and amount)	individual	aggregate, modelled	TB	logit, log-linear, EUROMOD	x_{hi}, $disabled_{hi}$
I_{hi}^{surv}, y_{hi}^{surv}	survivor benefits (receipt, amount)	individual	aggregate, modelled	TB	logit, log-linear, EUROMOD	x_{hi}
t_h	taxes and social security contributions	individual and household	aggregate, modelled	TB	EUROMOD	y_{hi}^{L}, y_{hi}^{K}, y_{hi}^{O},y_{hi}^{B},x_{hi}, $expenditure_h$,lbl_{hi}
y_h^{ca}	child allowance	family	modelled	TB	EUROMOD	x_h,y_h^L,y_h^K, y_h^B,$work-history_{hi}$
y_h^{bg}	birth grant	Individual	modelled	TB	EUROMOD	x_{hi},y_{hi}^L,y_{hi}^K, $work-history_{hi}$
y_{hi}^{sb}	social benefit	individual	modelled	TB	EUROMOD	x_{hi},y_{hi}^L,y_h^K, y_{hi}^B,$asset_h$,$work-history_{hi}$

Table 8: Demographic and labour market variables

Variable	Definition	Level	Treatment	Factor	Model	Conditioning variables
x_h	household-level demographic characteristics (number of children aged 0–3, 4–11 and 12–15) and individual characteristics of the household head (marital status, gender, age and age squared, university education), assets	household	observed	Demo	–	–
x_{hi}	individual-level characteristics: gender, age and age squared, university education, marital status, number of children in the household (aged 0–3, 4–11 and 12–15), citizenship, age*university, age squared*university, sex, sex*university, age*sex, work-history	individual	observed	Demo	–	–
occ_{hi}	occupation (1-digit ISCO); for working individuals only	individual	modelled	LM Struct	multinomial logit	x_{hi}
ind_{hi}	industry sector (primary, secondary or tertiary); for working individuals only	individual	modelled	LM Struct	multinomial logit	x_{hi}
s_{hi}	number of hours worked	individual	modelled	LM Struct	linear	x_{hi}
w_{hi}	average wage rate; for employees only	individual	modelled	Returns	Singh-Maddala	x_{hi} occ_{hi} ind_{hi}
$retired_{hi}$	retired	individual	modelled	LM Struct	logit	x_{hi}
$uenemployed_{hi}$	unemployed	individual	modelled	LM Struct	logit	x_{hi}
$occpension_{hi}$	pays voluntary pension	individual	modelled	LM Struct	logit	x_{hi}
lse_{hi}	owner of enterprise with employees (sub-group of self-employed)	individual	modelled	LM Struct	logit	x_{hi}
lbl_{hi}	has business certificate (sub-group of self-employed)	individual	modelled	LM Struct	logit	x_{hi}
$lsepf_{hi}$	engaged in individual activities (sub-group of self-employed)	individual	modelled	LM Struct	logit	x_{hi}

Table 9: Comparison of direct effects and Shapley value effects

	Direct effect	Shapley
Demographics	0.013	0.014
Labour Market Structure	-0.012	-0.006
Prices and Returns	0.030	0.037
Taxes and Benefits	-0.020	-0.021
Unexplained and interactions	0.010	-0.004

Notes: Columns indicate the time period over which statistics where calculated (e.g. 2007-2011 refers to the change from 2007 to 2011).

Source: author calculation based on EU-SILC EUROMOD input data.

Table 10: Employment

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	-0.183	3.133	1.168	2.550	2.454	2.197	5.899*	2.702	4.547	2.858	-1.032	2.136
nch03	0.435	0.427	-0.723	0.500	-0.377	0.302	0.344	0.357	-0.004	0.42	-0.263	0.418
nch411	-0.246	0.229	-0.092	0.330	-0.424	0.240	-0.282	0.168	-0.374	0.258	-0.199	0.173
nch1215	-0.308	0.224	-1.007***	0.256	0.393	0.350	-0.318	0.199	-0.302	0.444	0.142	0.265
marr	0.173	0.225	-0.018	0.233	-0.347	0.188	-0.564	0.36	0.420	0.315	0.022	0.255
age	0.038	0.058	0.068	0.044	0.132**	0.042	0.161**	0.058	0.003	0.053	0.049	0.046
age2	-0.001	0.001	-0.002***	0.000	-0.002***	0.000	-0.002***	0.001	-0.001	0.001	-0.001*	0
ageuniv	0.023	0.154	-0.017	0.109	-0.056	0.092	-0.279*	0.121	-0.157	0.123	0.053	0.092
age2univ	0.000	0.002	0.000	0.001	0.001	0.001	0.003*	0.001	0.002	0.001	-0.000	0.001
constant	2.618*	1.238	3.537***	1.036	1.117	1.030	0.298	1.23	4.104***	1.142	2.180*	0.953
N	2834		3166		2856		2844		2945		2630	
chi2	101.809		245.04		153.779		144.341		81.85		51.297	
p	0		0		0		0		0		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 11: Average wage rate- females

	2007		2011		2015	
	coef	se	coef	se	coef	se
a						
age: (.,.)	-0.016	0.031	0.057***	0.010	0.049	0.044
age: (30,.)	0.010	0.040	-0.098***	0.019	-0.065	0.067
age: (40,.)	0.009	0.020	0.085***	0.017	0.058	0.046
age: (50,.)	-0.021	0.011	-0.087***	0.013	-0.081**	0.031
univ	-0.145	0.078	-0.280***	0.074	-0.242***	0.067
marr	0.224***	0.056	0.079	0.064	-0.027	0.125
nch03	0.413	0.231	-0.115	0.116	-0.641***	0.162
nch411	0.056	0.092	0.048	0.088	0.132	0.086
nch1215	-0.062	0.069	0.145	0.107	0.142	0.113
firm_size1	-0.253***	0.075	-0.352***	0.068	-0.154	0.130
Constant	1.730	0.913	0.128	0.246	0.187	0.989
b						
age: (.,.)	0.056	0.030	0.015	0.016	-0.004	0.043
age: (30,.)	-0.056	0.041	0.000	0.023	-0.013	0.058
age: (40,.)	-0.018	0.027	-0.062***	0.019	-0.016	0.025
age: (50,.)	-0.006	0.024	0.056**	0.018	0.032	0.019
univ	0.615***	0.076	0.414***	0.085	0.445***	0.088
marr	-0.134*	0.068	-0.171**	0.056	-0.053	0.070
nch03	-0.431***	0.079	-0.236**	0.089	0.227	0.162
nch411	-0.067	0.081	-0.077	0.064	-0.191***	0.055
nch1215	0.026	0.100	-0.141	0.073	-0.053	0.084
firm_size1	0.070	0.120	-0.043	0.066	-0.070	0.102
occ_eur== 1.0000	0.129*	0.054	0.397***	0.084	0.461***	0.048
occ_eur== 2.0000	0.095*	0.047	0.289***	0.051	0.308***	0.063
occ_eur== 3.0000	0.033	0.045	0.157**	0.051	0.210***	0.049
occ_eur== 5.0000	-0.240***	0.047	-0.115*	0.054	-0.105	0.057
occ_eur== 6.0000	-0.157	0.111	-0.109	0.062	0.027	0.045
occ_eur== 7.0000	-0.177*	0.087	0.085	0.074	-0.082	0.052
occ_eur== 8.0000	-0.315***	0.055	-0.243***	0.049	-0.133***	0.040
ind_saps== 1.0000	-0.337***	0.085	-0.085	0.101	-0.077	0.059
ind_saps== 3.0000	-0.075	0.055	0.057	0.041	0.004	0.038
Work history (length of time in months)	0.001	0.000	0.001*	0.000	0.001***	0.000
Constant	-0.796	0.804	0.258	0.452	1.227	1.171
citizen			0.095	0.136	0.015	0.169
q						
age: (.,.)	0.053	0.064	-0.033	0.029	-0.060	0.097
age: (30,.)	-0.054	0.086	0.074	0.049	0.037	0.137
age: (40,.)	-0.040	0.052	-0.139**	0.045	-0.062	0.073
age: (50,.)	0.027	0.036	0.145***	0.036	0.120*	0.055
univ	0.373*	0.160	0.427*	0.182	0.518**	0.161
marr	-0.265*	0.124	-0.370**	0.141	-0.042	0.189
nch03	-0.894***	0.270	-0.248	0.242	0.506**	0.164
nch411	-0.113	0.185	-0.119	0.153	-0.363**	0.139
nch1215	0.029	0.223	-0.202	0.226	-0.227	0.206
firm_size1	0.360	0.251	0.290	0.151	0.078	0.284
Work history (length of time in months)	0.001	0.001	0.001	0.001	0.001**	0.001
Constant	-1.443	1.799	0.657	0.721	1.722	2.267
m						
age: (.,.)	-0.163***	0.023	-0.132***	0.024	-0.118***	0.011
age: (30,.)	0.160***	0.045	0.134**	0.049	0.152***	0.024
age: (40,.)	0.015	0.042	-0.018	0.031	-0.099***	0.025
age: (50,.)	0.102**	0.034	0.144***	0.013	0.194***	0.015
univ	-0.748***	0.083	-0.645***	0.078	-0.742***	0.059
nch03	0.269*	0.109	0.692***	0.109	0.557***	0.121
nch411	0.173**	0.066	0.039	0.078	0.195***	0.058
nch1215	0.043	0.074	0.204**	0.068	0.108	0.076
citizen	-0.329	0.443	-0.649**	0.226	-0.281	0.206
no_partner	-0.184	0.130	-0.262**	0.080	-0.159	0.089
spuniv	-0.141	0.125	-0.143	0.130	-0.053	0.102
spinwork	-0.309**	0.119	-0.288**	0.105	-0.271**	0.101
Constant	4.490***	0.757	3.903***	0.561	3.035***	0.312
theta						
Constant	0.536	0.321	-8.847***	0.515	-9.105***	0.571
N	5365		5864		5039	
p	.		.		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 12: Average wage rate - male

	2007		2011		2015	
	coef	se	coef	se	coef	se
a						
age: (.,.)	-0.012	0.020	0.022	0.016	0.061***	0.018
age: (30,.)	-0.001	0.025	-0.016	0.024	-0.113***	0.030
age: (40,.)	0.017	0.022	-0.026	0.021	0.096**	0.029
age: (50,.)	-0.001	0.020	-0.005	0.015	-0.075***	0.023
univ	0.210**	0.080	-0.138*	0.064	-0.061	0.091
marr	0.191	0.144	0.198**	0.063	0.015	0.097
No of children	-0.008	0.044	-0.097*	0.040	-0.006	0.049
firm_size1	-0.071	0.068	-0.280***	0.058	-0.142	0.086
Constant	1.645**	0.503	0.864*	0.406	0.122	0.440
b						
age: (.,.)	0.025	0.025	0.001	0.020	-0.008	0.014
age: (30,.)	-0.051	0.030	-0.020	0.029	0.032	0.021
age: (40,.)	-0.000	0.022	0.012	0.019	-0.066**	0.020
age: (50,.)	-0.000	0.019	0.006	0.016	0.030	0.016
univ	0.020	0.065	0.266***	0.071	0.143*	0.057
marr	-0.002	0.155	-0.113	0.069	0.113	0.059
No of children	0.006	0.043	0.022	0.040	-0.081**	0.030
citizen	-0.011	0.099	0.135	0.109	0.048	0.108
firm_size1	-0.184**	0.068	-0.185**	0.058	-0.176***	0.051
occ_eur== 1.0000	0.339***	0.063	0.213***	0.058	0.213**	0.068
occ_eur== 2.0000	0.155*	0.063	0.189***	0.056	0.226***	0.066
occ_eur== 3.0000	0.095	0.065	0.018	0.058	0.172*	0.068
occ_eur== 5.0000	-0.191**	0.066	-0.127*	0.061	-0.038	0.069
occ_eur== 6.0000	0.041	0.058	-0.149**	0.053	0.027	0.063
occ_eur== 7.0000	0.021	0.060	-0.161**	0.053	-0.027	0.063
occ_eur== 8.0000	-0.182**	0.063	-0.219***	0.057	-0.132*	0.066
ind_saps== 1.0000	-0.285***	0.042	-0.232***	0.045	-0.273***	0.044
ind_saps== 3.0000	0.013	0.020	-0.066**	0.023	-0.062**	0.024
Work history (length of time in months)	0.001***	0.000	0.001***	0.000	0.001**	0.000
Constant	0.553	0.641	1.048	0.538	1.284***	0.386
q						
age: (.,.)	0.024	0.058	-0.047	0.041	-0.119***	0.034
age: (30,.)	-0.076	0.072	0.010	0.062	0.203***	0.054
age: (40,.)	0.046	0.053	0.045	0.047	-0.171**	0.055
age: (50,.)	-0.013	0.046	0.013	0.035	0.111*	0.043
univ	-0.798***	0.169	0.180	0.154	-0.108	0.157
marr	-0.191	0.353	-0.343*	0.150	0.081	0.174
No of children	0.081	0.108	0.004	0.087	-0.180*	0.087
firm_size1	-0.101	0.168	0.067	0.141	0.108	0.152
Work history (length of time in months)	0.001	0.001	0.002**	0.001	0.001	0.001
Constant	-0.202	1.473	1.291	1.060	2.404**	0.873
N	2514		2784		2383	
p	0.039		0		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 13: Number of hours worked

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	17.884	14.378	6.467	7.498	18.910**	7.090	5.319	8.247	32.844***	7.1	16.718*	8.219
nch03	-4.652***	1.156	-4.896***	1.293	-5.998***	1.364	-0.492	1.347	1.430	1.083	-0.520	1.124
nch411	-0.898	0.728	-1.091	0.686	-1.219	0.692	-0.039	0.6	-0.576	0.707	-0.046	0.743
nch1215	0.083	0.959	-1.162	0.905	-2.189*	0.902	-1.272	0.664	0.223	0.813	-2.001	1.109
marr	1.231	0.786	2.273**	0.788	-0.389	0.658	3.775***	0.934	2.804*	1.207	4.106***	0.962
age	1.103**	0.344	1.750***	0.206	1.929***	0.185	0.639**	0.214	1.715***	0.206	1.265***	0.226
age2	-0.014***	0.004	-0.019***	0.002	-0.020***	0.002	-0.007**	0.002	-0.018***	0.002	-0.014***	0.003
ageuniv	-1.014	0.732	0.118	0.354	-0.435	0.325	-0.153	0.385	-1.175***	0.326	-0.529	0.375
age2univ	0.014	0.009	-0.003	0.004	0.003	0.004	0.001	0.004	0.011**	0.004	0.005	0.004
Constant	15.120	7.749	-8.673*	4.278	-12.369**	3.977	22.461***	4.155	-7.899	4.041	4.687	4.754
N	2834		3166		2856		2844		2945		2630	
r2	0.076		0.153		0.172		0.04		0.133		0.109	
p	0		0		0		0		0		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 14: Self-employment income (receipt, amount)

For receipt, see 23,24 and 25.

(a) Amount

Source:

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	4.248*	2.019	-1.988	2.960	-6.305	3.663	0.881	1.241	-1.989	6.384	-1.474	1.712
nch03	-0.033	0.256	-0.178	0.317	0.003	0.271	0.109	0.194	0.088	0.334	0.326	0.284
nch411	-0.146	0.209	-0.215	0.185	0.002	0.210	-0.101	0.11	0.185	0.208	0.049	0.179
nch1215	0.063	0.153	0.104	0.167	0.309	0.473	-0.194	0.135	0.103	0.095	0.247	0.208
marr	0.108	0.166	0.389*	0.167	-0.115	0.204	0.807***	0.224	0.282	0.225	0.164	0.241
age	0.039	0.029	0.033	0.052	0.108*	0.045	-0.023	0.025	0.071	0.084	0.063	0.045
age2	-0.000	0.000	-0.001	0.000	-0.002***	0.000	-0.000	0	-0.001	0.001	-0.001*	0
citizen	2.181***	0.645	0.291	0.648	-0.132	0.369	-0.484	0.303	0.000	0	-1.035	0.603
firm_size1	0.633	0.541	-0.768	0.807	-0.585	0.437	-0.467	0.263	0.000	0	-0.017	0.359
occ_eur== 1.0000	0.136	0.593	0.210	0.339	-0.154	0.389	1.386	0.907	-0.364	0.956	0.951	0.515
occ_eur== 2.0000	0.345	0.652	0.269	0.580	0.166	0.364	1.474	0.926	1.301	0.988	0.590	0.403
occ_eur== 3.0000	-0.851	0.612	-0.133	0.780	-1.034	0.614	1.539	0.923	0.125	1.034	-0.410	0.55
occ_eur== 5.0000	0.247	0.576	0.797*	0.389	0.253	0.334	0.849	0.931	0.399	0.986	1.045*	0.448
occ_eur== 6.0000	0.431	0.639	-0.091	0.418	-0.121	0.405	1.500	0.906	-0.422	0.943	-0.360	0.425
occ_eur== 7.0000	-0.201	0.597	-5.543***	0.355	-0.823	0.574	1.611	0.951	-0.176	0.941	-0.774	0.485
occ_eur== 8.0000	-0.048	0.593	0.070	0.359	-0.095	0.460	0.479	0.932	-0.577	0.948	0.598	0.476
ind_saps== 1.0000	1.333***	0.359	-0.235	0.491	0.039	0.550	0.238	0.181	0.215	0.602	-0.623	0.495
ind_saps== 3.0000	1.186***	0.282	-0.759	0.469	-0.361	0.437	0.200	0.144	-0.268	0.36	-0.688*	0.305
Work history (length of time in months)	-0.000	0.001	0.002*	0.001	0.005***	0.001	-0.000	0.001	0.001	0.001	0.002	0.002
Owner of individual enterprise with employees: 1 yes, 0 no employees	0.763***	0.180					0.615***	0.176				
People engaged in individual activities: 1 yes, 0 no	0.250	0.263	-0.470	0.867	-0.064	0.276	0.293	0.183	0.015	0.384	-0.287	0.369
ageuniv	-0.195*	0.092	0.057	0.128	0.255	0.137	-0.036	0.052	0.010	0.226	0.114	0.073
age2univ	0.002*	0.001	-0.000	0.001	-0.002*	0.001	0.000	0.001	0.000	0.002	-0.002*	0.001
Constant	0.390	1.156	4.994**	1.669	4.149**	1.435	5.446***	1.18	4.050	2.266	5.970***	1.231
Owner of inidvidual enterprise with employees: 1 yes, 0 no employees			0.264	0.480	1.557***	0.322			1.347**	0.489	-0.032	0.282
N	290		245		307		330		161		247	
r2	0.619		0.341		0.414		0.413		0.329		0.441	
p	0		.		.		0		0		.	

Authors' calculation based on EU-SILC EUROMOD input data.

Table 15: Investment income (receipt, amount)

(a) Receipt

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	0.899	2.498	1.891	3.161	0.259	1.768	3.395	2.66	5.302*	2.142	2.795	1.858
nch03	-0.371	0.521	0.466	0.357	0.037	0.246	-0.346	0.54	0.319	0.346	-0.182	0.269
nch411	-0.180	0.232	0.121	0.203	0.163	0.154	-0.155	0.257	0.182	0.201	0.067	0.169
nch1215	0.010	0.252	0.193	0.236	0.038	0.196	-0.004	0.262	0.165	0.242	0.050	0.223
marr	1.059***	0.238	0.638***	0.188	0.811***	0.137	1.270**	0.4	0.742*	0.336	1.106***	0.21
age	0.086	0.049	0.259**	0.082	0.216***	0.045	0.107	0.067	0.306***	0.066	0.244***	0.045
age2	-0.001	0.000	-0.002**	0.001	-0.002***	0.000	-0.001	0.001	-0.002***	0.001	-0.002***	0
ageuniv	-0.010	0.095	0.010	0.108	0.043	0.065	-0.105	0.098	-0.130	0.081	-0.074	0.07
age2univ	0.000	0.001	-0.000	0.001	-0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001
constant	-6.217***	1.258	-11.904***	2.424	-8.186***	1.255	-6.984***	1.668	-12.951***	1.665	-8.752***	1.209
N	5659		6109		5346		4814		5115		4268	
chi2	74.507		132.948		245.965		119.573		105.83		195.298	
p	0		0		0		0		0		0	

(b) Amount

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	1.022	2.884	-0.619	3.660	-2.083	4.129	-0.493	3.306	5.49	5.7	-4.793	4.664
nch03	-0.877	0.529	-0.476	0.449	-0.561	0.662	-0.684	0.469	-0.29	0.38	-0.178	0.602
nch411	-0.178	0.413	-0.165	0.373	-0.076	0.446	-0.110	0.444	0.00	0.417	0.093	0.435
nch1215	-0.650	0.572	-0.731	0.398	-0.291	0.436	-0.927	0.548	-0.17	0.386	0.058	0.563
marr	-0.494	0.302	0.347	0.264	0.418	0.333	-0.930	0.621	-0.78	0.585	-1.355**	0.488
age	0.094	0.076	-0.237	0.125	0.182	0.108	0.194**	0.073	0.10	0.176	0.321*	0.127
age2	-0.001	0.001	0.002*	0.001	-0.001	0.001	-0.002**	0.001	0.00	0.001	-0.002*	0.001
citizen	-1.452***	0.405	-2.421***	0.458	-4.101***	0.655	-1.744***	0.343	0.00	0	0.819	1.84
ageuniv	-0.027	0.117	0.033	0.135	0.140	0.149	0.084	0.129	-0.21	0.201	0.294	0.177
age2univ	0.000	0.001	-0.000	0.001	-0.001	0.001	-0.001	0.001	0.00	0.002	-0.003	0.002
Constant	1.194	1.764	10.142**	3.634	-3.552	3.311	-0.950	2.177	-0.04	5.125	-10.499*	4.119
N	359		328		739		314		275.00		597	
r2	0.097		0.082		0.133		0.219		0.08		0.189	
p	.		.		0		0		0.09		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 16: Property income (receipt, amount)

(a) Receipt

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	1.411	2.847	3.541	2.332	-4.055	2.536	-2.652	3.21	2.830	2.93	-0.827	2.491
nch03	-0.262	0.362	0.248	0.367	0.629	0.338	-0.016	0.386	0.265	0.427	0.384	0.403
nch411	0.427*	0.199	-0.150	0.280	0.307	0.241	0.410*	0.207	-0.217	0.312	0.387	0.272
nch1215	0.482*	0.244	0.402	0.262	0.266	0.345	0.419	0.269	0.565	0.292	0.104	0.365
marr	0.732**	0.240	0.386	0.215	0.524*	0.226	1.113**	0.378	0.253	0.291	0.564	0.327
age	0.132*	0.058	0.211***	0.054	0.140*	0.064	0.117*	0.052	0.239***	0.054	0.201***	0.054
age2	-0.001	0.001	-0.002**	0.000	-0.001*	0.001	-0.001	0	-0.002***	0	-0.002**	0.001
ageuniv	-0.051	0.106	-0.112	0.085	0.171	0.091	0.123	0.12	-0.044	0.108	0.059	0.097
age2univ	0.001	0.001	0.001	0.001	-0.002	0.001	-0.001	0.001	0.000	0.001	-0.001	0.001
constant	-8.452***	1.550	-10.282***	1.455	-7.511***	1.942	-8.685***	1.391	-11.374***	1.559	-9.819***	1.372
N	5659		6109		5346		4814		5115		4268	
chi2	64.267		66.376		40.714		87.378		58.955		68.519	
p	0		0		0		0		0		0	

(b) Amount

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	-2.481	2.736	-0.023	5.118	12.321***	3.624	-7.30	5.019	-10.844*	4.546	2.980	5.276
nch03	0.795*	0.387	0.744	0.663	-0.843*	0.332	0.85	0.465	2.104**	0.669	-1.230**	0.469
nch411	-0.194	0.182	0.107	0.310	-0.117	0.243	-0.16	0.211	0.090	0.365	-0.655*	0.266
nch1215	-0.302	0.240	0.318	0.291	0.018	0.220	-0.25	0.331	0.687**	0.26	-0.476	0.558
marr	-0.936***	0.241	-0.713***	0.184	-0.222	0.375	-0.21	0.333	-0.566	0.298	0.754	0.696
age	-0.010	0.062	0.053	0.072	-0.123	0.082	-0.06	0.088	0.066	0.074	-0.514**	0.193
age2	0.000	0.001	-0.001	0.001	0.001	0.001	0.00	0.001	-0.000	0.001	0.004**	0.002
citizen	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0	0.000	0	-1.357*	0.606
ageuniv	0.106	0.108	0.002	0.182	-0.388**	0.141	0.32	0.184	0.407*	0.162	-0.005	0.195
age2univ	-0.001	0.001	0.000	0.002	0.003*	0.001	0.00	0.002	-0.003*	0.001	-0.000	0.002
Constant	3.811*	1.857	1.751	2.152	5.510**	1.811	3.91	2.538	0.529	2.049	17.523**	5.294
N	234		226		213		183.00		169		166	
r2	0.122		0.122		0.272		0.15		0.218		0.319	
p	0.006		0		0		0.05		0.001		.	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 17: Other incomes (receipt, amount)

(a) Receipt

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	2.272	2.064	1.273	1.992	-5.307*	2.295	2.087	4.146	5.874	5.172	0.784	4.337
nch03	-0.825	0.582	0.046	0.353	0.675	0.502	0.906	0.476	0.727*	0.332	-0.524	0.637
nch411	-0.080	0.235	0.557*	0.267	-0.357	0.325	-0.254	0.401	-0.111	0.348	0.416	0.288
nch1215	0.005	0.293	0.063	0.294	-0.650	0.469	0.127	0.342	-0.790	0.731	-0.184	0.423
marr	-1.389***	0.243	-2.680***	0.332	-2.355***	0.349	0.603	0.601	-0.427	0.482	-0.711	0.456
age	0.069*	0.031	0.173***	0.031	0.016	0.031	0.099	0.069	0.131	0.069	0.040	0.042
age2	-0.001*	0.000	-0.002***	0.000	-0.000	0.000	-0.002	0.001	-0.002	0.001	-0.000	0
ageuniv	-0.120	0.087	-0.079	0.081	0.210*	0.094	-0.115	0.172	-0.233	0.261	0.020	0.197
age2univ	0.001	0.001	0.001	0.001	-0.002*	0.001	0.001	0.002	0.002	0.003	-0.000	0.002
constant	-4.719***	0.820	-3.565*	1.570	-3.142*	1.380	-5.790***	1.261	-4.931**	1.807	-3.541*	1.8
citizen			-3.037**	1.100	-0.150	1.063			-1.054	1.107	-1.408	1.222
N	6044		6434		5606		5275		5451		4533	
chi2	44.681		105.278		66.101		35.459		57.426		22.011	
p	0		0		0		0		0		0.015	

(b) Amount

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	0.233	2.553	-2.211	2.556	-4.937**	1.664	3.311	2.43	1.622	3.216	-1.955	2.22
nch03	-0.101	0.377	0.267	0.576	0.533	0.345	-0.030	0.255	0.010	0.367	-0.702	0.689
nch411	-0.667**	0.224	0.043	0.299	0.371	0.256	-0.219	0.206	0.008	0.268	-0.667	0.401
nch1215	-1.620***	0.466	-0.504*	0.214	0.898**	0.310	-0.200	0.297	-0.283	0.692	-1.884**	0.533
marr	-0.432	0.302	0.051	0.200	-0.127	0.285	0.683*	0.323	0.472	0.303	0.852	0.448
age	0.005	0.043	-0.018	0.063	-0.052	0.038	0.077	0.045	-0.084	0.043	-0.072	0.073
age2	-0.000	0.000	0.000	0.001	0.000	0.000	-0.001*	0.001	0.001	0	0.000	0.001
ageuniv	-0.042	0.100	0.106	0.102	0.188**	0.068	-0.206	0.118	-0.099	0.152	0.128	0.106
age2univ	0.001	0.001	-0.001	0.001	-0.002*	0.001	0.003*	0.001	0.001	0.002	-0.002	0.001
Constant	4.907***	1.304	4.847**	1.760	6.136***	0.799	2.322*	0.992	5.751***	0.881	6.270***	1.523
N	151		162		123		68		73		46	
r2	0.434		0.143		0.41		0.247		0.148		0.508	
p	0		0.007		0		0.016		0.482		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 18: State old age benefits (receipt and amount)

(a) Receipt

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	63.687	171.574	3086.470*	1562.159	-97.252	164.432	1265.274*	523.081	-62.800	47.803	336.982	631.387
marr	-0.110	0.317	-0.231	0.269	-0.039	0.270	0.204	0.383	0.066	0.353	0.372	0.41
age	12.328***	2.421	5.512***	0.732	8.940***	1.567	2.753	6.968	4.458***	0.763	1.584	4.351
age2	-0.086***	0.017	-0.038***	0.005	-0.061***	0.011	-0.016	0.055	-0.030***	0.005	-0.007	0.035
Work history (length of time in months)	-0.001	0.001	0.001	0.001	0.004***	0.001	0.002	0.001	0.000	0.001	0.001	0.002
retired	0.329	0.315	0.894**	0.347	0.249	0.352	0.406	0.309	0.481	0.251	1.310**	0.4
ageuniv	-1.855	4.987	-105.619*	53.440	2.844	4.747	-42.209*	17.274	1.805	1.381	-11.394	20.692
age2univ	0.013	0.036	0.903*	0.457	-0.020	0.034	0.351*	0.142	-0.013	0.01	0.096	0.169
constant	-429.473***	83.277	-192.893***	24.765	-318.412***	54.046	-112.334	221.588	-160.557***	26.357	-73.696	136.532
N	2354		2681		2551		1668		1971		1682	
chi2	111.231		234.056		305.054		188.982		156.366		136.932	
p	0		0		0		0		0		0	

(b) Amount

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	-4.470	4.726	-14.793*	7.286	-1.947	6.108	11.415	9.545	19.228**	6.818	5.814	12.849
marr	-0.085***	0.023	-0.004	0.022	0.003	0.025	-0.064	0.04	0.031	0.036	0.161***	0.048
age	0.107*	0.054	0.326***	0.055	0.289***	0.080	0.366**	0.117	0.987***	0.144	0.486*	0.203
age2	-0.001	0.000	-0.002***	0.000	-0.002***	0.001	-0.002**	0.001	-0.007***	0.001	-0.003*	0.001
citizen	0.079	0.083	-0.287	0.210	0.244	0.238	0.213	0.129	-0.145	0.223	-0.397*	0.186
Work history (length of time in months)	0.001***	0.000	0.000***	0.000	0.001***	0.000	0.000*	0	0.000**	0	0.000*	0
ageuniv	0.131	0.133	0.416*	0.204	0.068	0.169	-0.315	0.266	-0.534**	0.19	-0.155	0.355
age2univ	-0.001	0.001	-0.003*	0.001	-0.001	0.001	0.002	0.002	0.004**	0.001	0.001	0.002
Constant	0.894	1.941	-6.704***	1.975	-6.096*	2.897	-8.375*	4.196	-31.076***	5.206	-12.546	7.353
N	1947		2339		2074		1168		1466		1166	
r2	0.128		0.22		0.196		0.138		0.389		0.236	
p	0		0		0		0		0		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 19: Occupation (1-digit ISCO); for working individuals only

(a) 2-3

	2						3					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	1.557	1.789	2.706	1.785	6.263**	2.018	0.960	1.903	1.134	1.843	7.850***	2.187
nch03	-0.385	0.245	-0.227	0.243	-0.145	0.241	-0.093	0.252	-0.156	0.275	-0.059	0.295
nch411	-0.626***	0.16	-0.250	0.144	0.008	0.146	-0.155	0.159	-0.360	0.195	-0.108	0.182
nch1215	-0.362	0.186	-0.380*	0.175	-0.111	0.211	-0.453*	0.219	-0.638**	0.221	0.351	0.234
marr	-0.075	0.189	-0.053	0.164	0.208	0.171	-0.291	0.218	0.039	0.197	-0.232	0.212
age	-0.091	0.05	-0.085	0.055	-0.035	0.054	-0.072	0.051	-0.109*	0.053	-0.000	0.058
age2	0.000	0.001	0.000	0.001	-0.000	0.001	0.000	0	0.001	0.001	0.000	0.001
ageuniv	0.001	0.081	-0.046	0.076	-0.172*	0.084	-0.055	0.087	-0.044	0.084	-0.329***	0.094
age2univ	0.000	0.001	0.001	0.001	0.002*	0.001	0.000	0.001	0.000	0.001	0.003**	0.001
sex	1.197	0.632	0.789	0.628	1.060	0.741	0.428	0.691	1.447*	0.673	1.431	0.828
sexuniv	-0.455	0.325	-0.371	0.308	-0.747*	0.32	0.241	0.356	-0.102	0.337	-0.203	0.374
agesex	0.010	0.013	0.017	0.012	0.017	0.014	0.009	0.014	-0.016	0.013	-0.014	0.016
constant	0.200	1.259	0.883	1.479	-1.425	1.519	1.347	1.446	1.461	1.398	-1.768	1.622
N	5674		6091		5475		5674		6091		5475	
chi2	1405.208		1628.927		1470.587		1405.208		1628.927		1470.587	
p	0		0		0		0		0		0	

(b) 4-5

	4						5					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	0.461	2.772	-1.916	2.727	6.014*	2.655	-2.189	2.896	-0.604	2.017	5.934**	2.169
nch03	-0.053	0.359	-0.156	0.327	0.043	0.329	0.568*	0.273	-0.298	0.281	0.216	0.271
nch411	-0.235	0.236	-0.010	0.211	0.116	0.196	-0.154	0.155	-0.063	0.162	-0.105	0.163
nch1215	-0.713*	0.295	-1.047**	0.321	-0.596	0.352	-0.086	0.197	-0.527**	0.188	-0.277	0.243
marr	-0.462	0.294	-0.086	0.244	0.146	0.254	-0.317	0.218	-0.054	0.185	0.167	0.198
age	-0.086	0.063	-0.054	0.074	-0.057	0.066	-0.086	0.047	-0.026	0.051	-0.022	0.049
age2	0.001	0.001	0.000	0.001	0	0.001	0.000	0	0.000	0.001	0.000	0
ageuniv	-0.009	0.139	0.054	0.127	-0.238	0.123	0.090	0.145	-0.041	0.088	-0.295**	0.095
age2univ	-0.000	0.002	-0.001	0.001	0.002	0.001	-0.001	0.002	0.001	0.001	0.003**	0.001
sex	2.211**	0.824	1.388	0.825	1.241	1.045	1.810**	0.67	3.711***	0.663	3.065***	0.754
sexuniv	-0.277	0.533	0.455	0.507	-0.742	0.576	-0.785	0.469	-0.524	0.366	-1.068**	0.401
agesex	-0.017	0.017	-0.002	0.017	0.022	0.02	-0.003	0.014	-0.046***	0.013	-0.026	0.015
constant	-0.853	1.637	-0.641	1.859	-1.586	2.191	0.520	1.343	-1.565	1.41	-1.667	1.417
N	5674		6091		5475		5674		6091		5475	
chi2	1405.208		1628.927		1470.587		1405.208		1628.927		1470.587	
p	0		0		0		0		0		0	

(c) 6-7

	6						7					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	-1.156	1.982	-2.661	1.915	3.019	2.365	1.413	3.424	1.868	3.156	2.228	2.769
nch03	0.158	0.27	-0.072	0.281	-0.072	0.272	0.474	0.316	0.018	0.333	0.061	0.298
nch411	-0.200	0.141	-0.250	0.151	0.111	0.147	-0.040	0.166	-0.280	0.188	0.157	0.169
nch1215	-0.309	0.179	-0.552**	0.176	-0.091	0.209	-0.148	0.203	-0.450*	0.207	-0.262	0.254
marr	0.088	0.223	-0.193	0.182	-0.251	0.187	-0.189	0.235	0.220	0.252	0.022	0.21
age	-0.058	0.042	-0.151**	0.047	-0.092*	0.045	0.121*	0.05	0.033	0.057	0.091	0.055
age2	0.000	0	0.002***	0	0.001*	0	-0.001*	0	-0.000	0.001	-0.000	0.001
ageuniv	-0.061	0.088	0.024	0.083	-0.191*	0.097	-0.173	0.14	-0.106	0.133	-0.125	0.126
age2univ	0.001	0.001	-0.000	0.001	0.002*	0.001	0.002	0.002	0.001	0.001	0.001	0.001
sex	0.260	0.609	1.778**	0.586	1.768**	0.685	-0.567	0.861	0.516	0.93	1.626	0.938
sexuniv	0.183	0.425	-0.234	0.375	-0.990*	0.446	0.431	0.779	-1.071	0.826	-0.794	0.588
agesex	-0.024	0.013	-0.048***	0.012	-0.040**	0.013	-0.024	0.017	-0.046*	0.018	-0.060***	0.018
constant	3.466**	1.193	4.637***	1.255	3.023*	1.243	-0.661	1.466	0.987	1.582	-1.319	1.607
N	5674		6091		5475		5674		6091		5475	
chi2	1405.208		1628.927		1470.587		1405.208		1628.927		1470.587	
p	0		0		0		0		0		0	

(d) 8

	8					
	2007		2011		2015	
	2007		2011		2015	
	coef	se	coef	se	coef	se
univ	-1.385	2.388	-2.964	2.346	3.082	2.704
nch03	0.028	0.282	-0.182	0.299	0.331	0.279
nch411	-0.014	0.154	-0.115	0.172	0.374*	0.163
nch1215	-0.132	0.209	-0.543**	0.202	-0.201	0.225
marr	-0.470*	0.208	-0.454*	0.186	-0.630***	0.191
age	-0.092*	0.043	-0.121**	0.047	-0.036	0.045
age2	0.001	0.000	0.001*	0.000	-0.000	0.000
ageuniv	-0.071	0.106	-0.044	0.107	-0.231*	0.113
age2univ	0.001	0.001	0.001	0.001	0.003*	0.001
sex	-0.104	0.609	0.081	0.632	0.520	0.745
sexuniv	0.099	0.478	0.171	0.456	-0.693	0.461
agesex	0.014	0.012	0.005	0.012	0.009	0.014
constant	2.374*	1.205	3.749**	1.290	1.379	1.279
N	5674		6091		5475	
chi2	1405.208		1628.927		1470.587	
p	0		0		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 20: Industry sector (primary - control, secondary or tertiary); for working individuals only

	Secondary						Tertiary					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	-2.685	3.066	-3.740	3.304	1.553	3.52	-2.589	2.901	-3.487	3.063	-0.682	3.243
nch03	0.144	0.291	-0.052	0.277	-0.627*	0.316	0.016	0.278	-0.042	0.230	-0.499	0.284
nch411	-0.204	0.148	-0.031	0.212	0.018	0.227	-0.311*	0.142	0.069	0.193	0.184	0.217
nch1215	-0.533**	0.185	-0.493*	0.205	-0.187	0.261	-0.406*	0.161	-0.357*	0.177	-0.121	0.229
marr	0.231	0.224	0.081	0.24	0.413	0.221	0.354	0.207	0.024	0.207	0.472*	0.204
age	-0.076	0.06	0.043	0.058	0.079	0.059	-0.127*	0.054	-0.195***	0.048	-0.134**	0.050
age2	0.001	0.001	-0.000	0.001	-0.001*	0.001	0.001*	0.001	0.002***	0.000	0.002***	0.000
ageuniv	0.041	0.13	0.174	0.144	-0.039	0.146	0.080	0.121	0.178	0.132	0.066	0.131
age2univ	0.000	0.001	-0.002	0.002	0.000	0.002	-0.000	0.001	-0.002	0.001	-0.001	0.001
sex	0.734	0.723	1.939**	0.721	1.203	0.78	0.850	0.670	1.564*	0.612	2.088**	0.668
sexuniv	1.099	0.662	0.688	0.48	0.230	0.505	1.025	0.638	1.039*	0.434	0.565	0.462
agesex	-0.019	0.015	-0.037*	0.015	-0.011	0.016	-0.008	0.014	-0.018	0.013	-0.022	0.013
constant	3.204*	1.545	-1.077	1.483	-1.325	1.605	4.307**	1.427	4.976***	1.205	2.975*	1.366
N	5008		6111		5486							
chi2	184.93		252.821		224.973							
p	0		0		0							

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 21: Retired

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	211.092	210.749	138.328	81.220	347.443*	143.265	-303.337**	108.961	-39.94	76.364	-27.926	68.644
nch015	-0.223	0.225	-0.354	0.259	1.613	1.938	-0.172	0.33	0.79	0.478	0.009	1.081
marr	-0.196	0.462	-0.130	0.337	-0.943*	0.397	1.351**	0.497	-0.35	0.331	0.342	0.409
age	4.937*	2.027	4.216***	0.602	5.856***	0.998	-8.925*	3.63	0.03	2.255	-3.727*	1.501
age2	-0.032*	0.016	-0.029***	0.004	-0.040***	0.007	0.082**	0.032	0.00	0.018	0.036**	0.013
ageuniv	-7.094	7.418	-4.417	2.758	-11.404*	4.959	10.644**	3.759	1.63	2.449	1.100	2.346
age2univ	0.060	0.065	0.035	0.023	0.094*	0.043	-0.093**	0.032	-0.02	0.02	-0.010	0.02
constant	-178.829**	63.060	-148.812***	20.693	-208.951***	33.906	238.498*	103.493	-19.59	68.944	94.473*	43.407
N	2001		2212		1927		1241		1490.00		1183	
chi2	116.48		120.981		176.091		50.27		122.91		76.962	
p	0		0		0		0		0.00		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 22: Unemployed

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	4.546	4.870	11.144***	3.361	1.164	4.122	7.699	5.214	8.645*	4.178	3.084	6.556
nch03	-0.421	0.533	-0.179	0.339	-0.446	0.375	1.034*	0.5	-0.973	0.769	0.400	0.542
nch411	-0.599	0.327	-0.021	0.255	0.069	0.228	0.209	0.246	-0.241	0.417	0.188	0.35
nch1215	0.162	0.432	-0.262	0.238	-0.336	0.330	-0.190	0.624	-0.005	0.264	-0.022	0.389
marr	-0.151	0.395	-0.369	0.334	-0.315	0.288	-0.247	0.392	0.549	0.331	-0.369	0.369
age	0.376***	0.099	0.414***	0.071	0.400***	0.074	0.379***	0.068	0.607***	0.058	0.254***	0.055
age2	-0.004**	0.001	-0.005***	0.001	-0.005***	0.001	-0.004***	0.001	-0.008***	0.001	-0.003***	0.001
ageuniv	-0.227	0.265	-0.620***	0.183	-0.151	0.199	-0.368	0.286	-0.474*	0.226	-0.019	0.367
age2univ	0.003	0.003	0.008***	0.002	0.003	0.002	0.004	0.003	0.006*	0.003	-0.001	0.005
constant	-10.341***	1.797	-8.787***	1.156	-9.030***	1.240	-8.927***	1.239	-10.982***	0.925	-6.000***	0.941
N	1067		985		773		932		980		694	
chi2	43.774		72.056		49.107		51.5		139.529		44.03	
p	0		0		0		0		0		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 23: Owner of enterprise with employees (sub-group of self-employed)

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	15.539	10.995	-17.43	17.263	1.27	6.464	0.20	4.674	-38.14	39.628	-5.63	10.429
nch015	0.181	0.420	0.68	0.535	-1.49	0.826	0.22	0.226	0.25	0.576	0.64	0.43
marr	-0.596	0.429	0.28	0.957	-0.12	0.701	-0.33	0.384	-0.34	0.998	0.46	0.719
age	-0.251**	0.090	0.08	0.355	0.25	0.171	0.04	0.073	1.16	0.71	0.15	0.335
age2	0.003***	0.001	0.00	0.004	0.00	0.002	0.00	0.001	-0.01	0.006	0.00	0.003
ageuniv	-0.517	0.454	0.96	0.857	-0.21	0.300	0.08	0.184	1.70	1.424	0.28	0.386
age2univ	0.005	0.004	-0.01	0.010	0.00	0.003	0.00	0.002	-0.02	0.013	0.00	0.003
constant	3.307	2.133	-3.63	9.115	-4.34	2.858	-3.34	1.934	-37.74	21.163	-7.59	9.437
N	290		245.00		307.00		330.00		161.00		247.00	
chi2	50.482		36.75		5.64		31.35		21.41		20.40	
p	0		0.00		0.58		0.00		0.00		0.00	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 24: Has business certificate (sub-group of self-employed)

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	6.36	7.000	-1.31	7.416	1.573	6.919	-13.879	14.549	2.772	18.96	10.720	11.692
nch03	-0.38	0.898	-1.16	0.767	0.458	0.701	-0.703	0.709	0.656	0.971	0.087	0.65
nch411	0.28	0.459	-1.74	1.093	-0.518	0.504	-0.115	0.396	0.116	0.622	0.163	0.371
nch1215	-0.30	0.461	0.72	0.537	-2.086	1.123	-0.547	0.424	-0.546	0.475	1.092	0.595
marr	0.61	0.521	0.41	0.532	-0.867	0.480	1.386	0.865	0.894	0.716	0.786	0.615
age	0.02	0.100	0.11	0.213	0.315**	0.099	-0.228*	0.103	0.348	0.182	0.258*	0.122
age2	0.00	0.001	0.00	0.002	-0.004***	0.001	0.001	0.001	-0.004*	0.002	-0.003*	0.001
ageuniv	-0.31	0.292	0.03	0.309	-0.060	0.298	0.623	0.819	-0.088	0.763	-0.398	0.616
age2univ	0.00	0.003	0.00	0.003	0.000	0.003	-0.008	0.011	0.000	0.007	0.003	0.008
constant	0.07	2.245	-1.92	5.130	-5.688*	2.430	5.510*	2.434	-8.504*	3.847	-7.150*	2.868
N	290.00		245.00		307		330		161		247	
chi2	25.62		20.49		32.656		32.517		18.124		21.8	
p	0.00		0.02		0		0		0.034		0.01	

Source: Authors' calculation based on EU-SILC EUROMOD input data.

Table 25: Engaged in individual activities (sub-group of self-employed)

	Females						Males					
	2007		2011		2015		2007		2011		2015	
	coef	se	coef	se	coef	se	coef	se	coef	se	coef	se
univ	-2.406	7.419	10.951	8.554	9.164*	4.025	7.820	8.176	5.224	5.038	-0.671	5.077
nch411	-1.419	0.814	0.263	0.341	-0.103	0.317	0.248	0.276	0.248	0.478	-0.004	0.325
nch1215	1.194***	0.356	-1.142	0.768	0.162	0.544	0.362	0.334	-0.450	0.721	0.765*	0.37
marr	-0.718	0.571	2.254*	1.072	-0.076	0.456	-0.464	0.469	-0.083	1.003	0.755	0.829
age	0.221	0.240	0.592*	0.249	0.185	0.102	0.644*	0.27	0.057	0.109	0.022	0.175
age2	-0.002	0.002	-0.006*	0.003	-0.002	0.001	-0.007*	0.003	-0.000	0.001	-0.001	0.002
ageuniv	0.090	0.334	-0.504	0.399	-0.361*	0.160	-0.263	0.382	-0.096	0.229	0.054	0.227
age2univ	-0.000	0.004	0.006	0.004	0.004*	0.002	0.002	0.004	0.000	0.002	0.000	0.002
constant	-9.380	5.372	-20.512***	5.816	-8.548**	2.606	-18.596**	6.149	-7.474**	2.321	-4.614	3.533
nch03			0.184	0.484	-0.458	0.809			0.537	0.34	-0.381	0.713
N	2834		3166		2856		2844		2945		2630	
chi2	19.052		41.257		15.598		15.866		21.89		57.401	
p	0.015		0		0.076		0.044		0.009		0	

Source: Authors' calculation based on EU-SILC EUROMOD input data.