

# Changes in income inequality in Lithuania: the role of policy, labour market structure, returns and demographics

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IARIW 2019

September 17-18 2019, Moscow, Russia

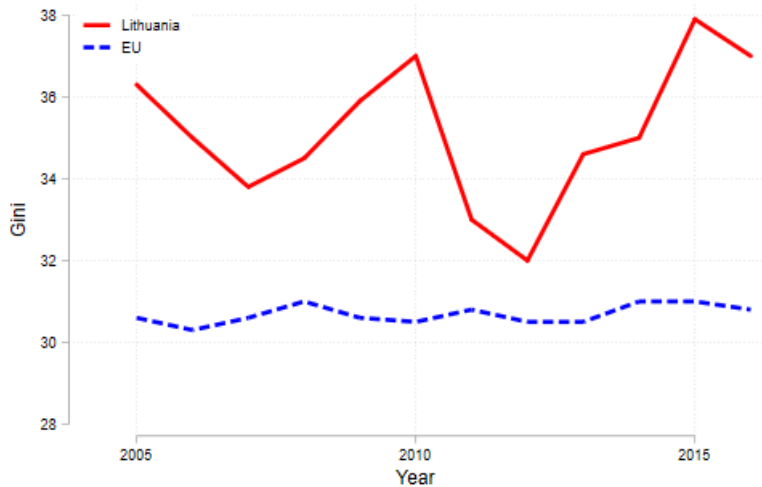
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Vilnius  
University



## Motivation: what's the Gini up to?



## Motivation: first country from the region

- ▶ First east European country to decompose household disposable income by demographics, labour market structure, returns structure and tax-benefit system.
- ▶ Several possible explanations of the Gini dynamics in 2007-2015 in Lithuania: financial crisis, policy reforms, migration and ageing.
- ▶ We use micro-simulation micro-econometric decomposition approach developed by Sologon et al. (2018, 2019).

# Methods#1

In a nutshell...

- ▶ factors:
  - ▶ demographics
  - ▶ labour market structure
  - ▶ returns structure
  - ▶ tax-benefit systems
- ▶ the contribution of each factor is assessed using a sequence of simulated counterfactual distributions of household disposable incomes that would prevail in each period, if these factors were swapped between periods
- ▶ the logic of the Generalized Oaxaca-Blinder decompositions - extended to the entire distribution take care "partially" of path dependency

## Household income generation process

- ▶ describe the overall household income distribution & *create counterfactual distributions*

### Components:

- ▶ hierarchically structured, multiple equation specifications for detailed sources of income
  - ▶ a set of basic observable characteristics (individual and household level)
  - ▶ vector of 'parameters' describing how the receipt and level of income sources vary with household and individual characteristics
  - ▶ a vector of household-specific 'residuals' linking predictions from model parameters to observed income sources
- ▶ public transfers, taxes and social security contributions

## Methods#3

### Household income generation process

- ▶ Household disposable income components

$$y_h = y_h^L + y_h^K + y_h^O + y_h^B - t_h.$$

$$y_h^L = \sum_{i=1}^{n_h} I_{hi}^{lab} (I_{hi}^{emp} y_{hi}^{emp} + I_{hi}^{se} y_{hi}^{se})$$

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

$$y_h^O = \sum_{i=1}^{n_h} (I_{hi}^{pripen} y_{hi}^{pripen} + I_{hi}^{other} y_{hi}^{other})$$

$$y_h^B = y_h^{pens} + y_h^{mtb} + y_h^{nmtb}$$

$$t_h = tax_h + \sum_{i=1}^{n_h} SSC_{hi}.$$

# Methods#4

## Household income generation process

- ▶ Parametric specifications - parametric relationships between income components and observed household/individual characteristics
  - ▶ Labour incomes: model the probability to be at work, to earn income from salaried employment or self-employment, self-employment income, the occupational, sector and industry choices, wages, hours
  - ▶ Other market incomes: model the probability of receiving each income source and the level
  - ▶ Public transfers (non-simulated/partially simulated): model the probability of receiving the benefit and the level
- ▶ Tax-benefit calculator - EUROMOD
  - ▶ public transfers
  - ▶ taxes and social security contributions

## Household income generation process

- ▶ Estimation of parameters
  - ▶ market structure & presence of income sources - logistic & multinomial logistic model
  - ▶ wage rate - Singh-Maddala distribution regression (without and with endogenous selection)(Van Kerm, 2013)
  - ▶ income sources - log-linear model
  - ▶ residual distribution: Juhn et al. (1993) extended to a more complex multivariate model



## Methods#6

### Household income generation process

The generic representation of the income generation process:

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

$Y$  is income,  $X$  a vector of 'exogenous' characteristics,  $\Upsilon$  a vector of unobserved characteristics (residual) terms,  $m^{\xi}$  the specific parametric structure and  $\xi$  the vector of parameter values.

- ▶ Generating counterfactual distribution - transformations of the income generation process 'swapping coefficients':
  - ▶ labour market structure transformation
  - ▶ price and return transformation
  - ▶ tax-benefit transformation
  - ▶ demographic transformation

# Methods#7

## Household income generation process

- ▶ **Price and returns transformation:**  $F^r = m^\xi(X, \Upsilon; \tilde{r}(\xi))$ 
  - ▶ import the parameters of the equations characterizing the level of earnings and all other pre-tax incomes
  - ▶ impact on  $\theta$  is  $\Delta_\theta^r(F) = \theta(F) - \theta(F^r)$ .

## Household income generation process

### ▶ Labour market structure transformation:

$$F^l = m^\xi(X, \Upsilon; \tilde{l}(\xi))$$

- ▶ import the parameters of the equations characterising the labour market structure: employment probabilities, occupational, industrial structure, the presence of non-labour incomes, etc....
- ▶ impact of the labour market structure transformation,  $m^\xi(X, \Upsilon; \xi) - m^\xi(X, \Upsilon; \tilde{l}(\xi))$ , on distribution functionals of interest  $\theta$  is  
$$\Delta'_\theta(F) = \theta(F) - \theta(F^l).$$

## Household income generation process

- ▶ **Tax-benefit transformation:**  $m^\xi(X, \Upsilon; \tilde{tb}(\xi))$ 
  - ▶ import the regression parameters determining the level/eligibility of public transfers
  - ▶ import the parameters if the EUROMOD tax-benefit calculator
  - ▶ impact on  $\theta$  is  $\Delta_\theta^{tb}(F) = \theta(F^{tb}) - \theta(F)$ .

## Household income generation process

- ▶ **Demographic transformation:**  $F^d = m(\tilde{X}(X), \Upsilon; \xi)$ 
  - ▶ re-weighting techniques in the tradition of DiNardo et al. (1996): age, gender, migrant status, marital status, education, number of children
  - ▶ impact of a demographic transformation,  $m^\xi(X, \Upsilon; \xi) - m^\xi(\tilde{X}(X), \Upsilon; \xi)$ , on distribution functionals of interest  $\theta$  is  $\Delta_\theta^d(F) = \theta(F) - \theta(F^d)$ .

## Methods#8

'Direct effects' (Biewen and Juhasz, 2012; Biewen, 2014) - to reduce issues of path-dependence:

- ▶ assess the impact of each factor from the same initial benchmark distribution:
- ▶  $D_{\theta}^k(F^A, F^B) = \theta(F^A) - \theta(F_A^k)$
- ▶  $F_A^k$  = counterfactual distribution obtained by applying one particular transformation k (e.g. tax-benefit systems swap)

- ▶  $\Delta_{\theta}(F^A, F^B) =$

$$D_{\theta}^l(F^A, F^B) + D_{\theta}^r(F^A, F^B) + D_{\theta}^{tb}(F^A, F^B) + \\ D_{\theta}^d(F^A, F^B) + R_{\theta}(F^A, F^B) + \Delta_{\theta}^{\gamma}(F^A, F^B)$$

- ▶  $R_{\theta}(F^A, F^B) = \theta(F^A) - \theta(F_A^{pop^d})$

- ▶ Unexplained effect

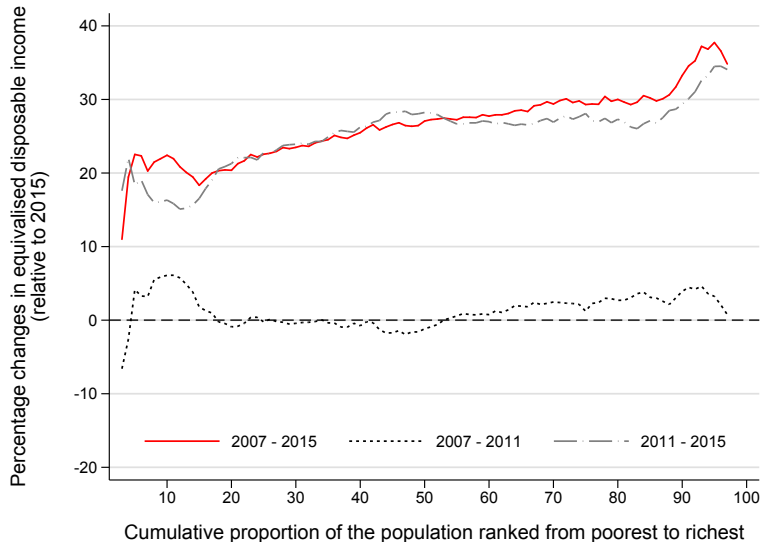
$$\theta(F^A) - \theta(F^B) - \left( \sum_{k \in \{l, r, tb, d\}} D_{\theta}^k(F^A, F^B) \right)$$

# Data

- ▶ EUROMOD standardized datasets based on European Union Statistics of Income and Living Conditions (EU-SILC) database
- ▶ 2007, 2011, 2015
- ▶ Outcome income measure : equivalized household disposable income (LIS equivalence scale - square root of the household size)

# Results#1: Accounting for changes in income inequality

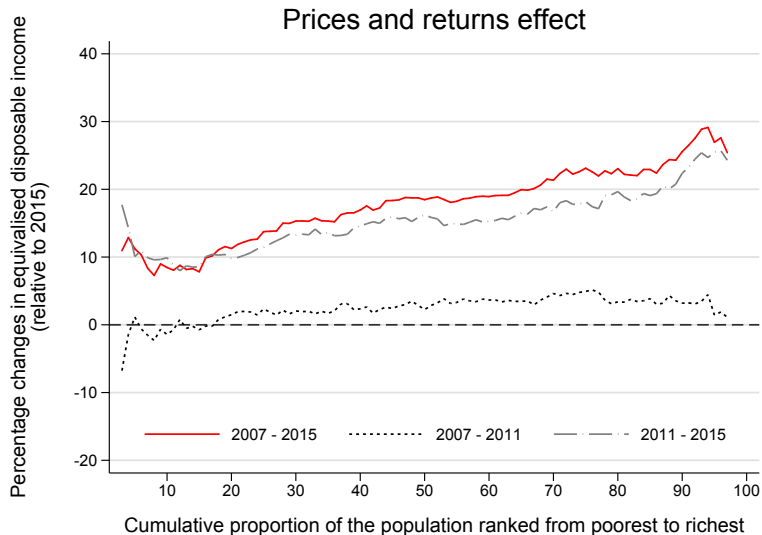
Total change





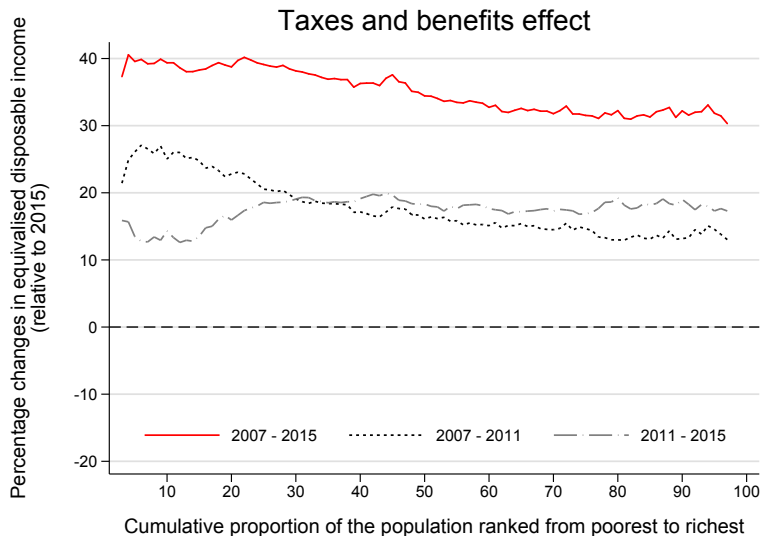
# Results#2: Accounting for differences in income inequality

Counterfactual distribution Price and Returns



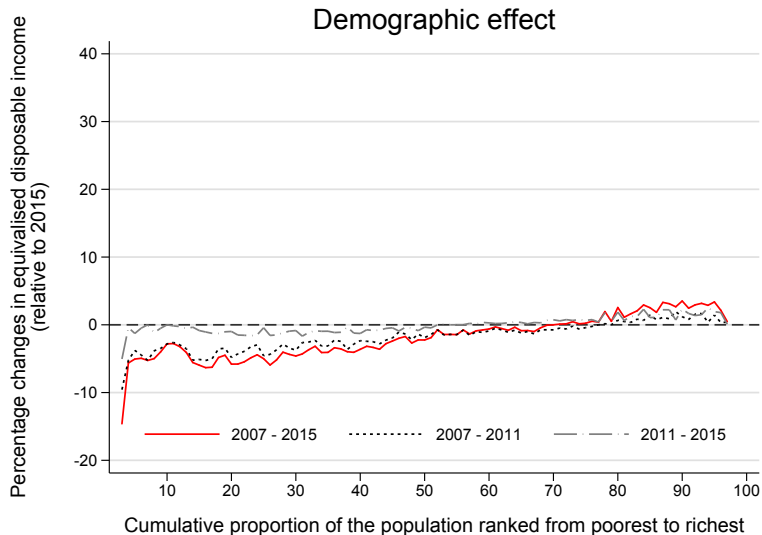
# Results#3: Accounting for differences in income inequality

Counterfactual distribution Taxes and Benefits



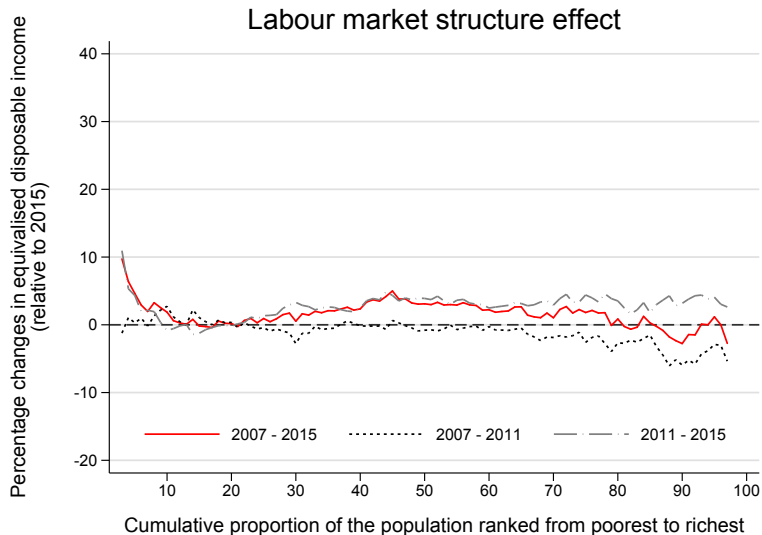
# Results#4: Accounting for differences in income inequality

Counterfactual distribution Demographics



# Results#5: Accounting for differences in income inequality

Counterfactual distribution Labour Market Structure



# Results#6

	2007-2015	2007-2011	2011-2015
<b>Gini Market Income</b>			
Total change	0.042	0.040	0.002
Labour Market Structure	-0.015	-0.015	-0.001
Returns	0.006	-0.007	0.013
Tax-benefit system	0.002	0.004	-0.001
Demographics	0.020	0.017	0.003
Interactions	0.003	0.009	-0.006
Unexplained	0.026	0.033	-0.007
<b>Gini Disposable Income</b>			
Total change	0.021	-0.008	0.029
Labour Market Structure	-0.012	-0.017	0.005
Returns	0.030	-0.002	0.032
Tax-benefit system	-0.020	-0.021	0.000
Demographics	0.013	0.008	0.006
Interactions	0.017	0.002	0.016
Unexplained	-0.008	0.022	-0.030
<b>Net Redistribution</b>			
Total change	0.021	0.048	-0.026
Labour Market Structure	-0.003	0.003	-0.006
Returns	-0.024	-0.005	-0.019
Tax-benefit system	0.023	0.024	-0.001
Demographics	0.006	0.009	-0.003
Interactions	-0.014	0.007	-0.021
Unexplained	0.034	0.010	0.023

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

## Main conclusions

- ▶ Changes in the tax and benefit system successfully accommodated a rapid rise in market income inequality due to the crisis during the 2007-2011...
- ▶ but did less during the subsequent years when the rising returns in the labour market significantly increased the disposable income inequality
- ▶ Demographic effects contribute significantly to the rising inequalities in Lithuania

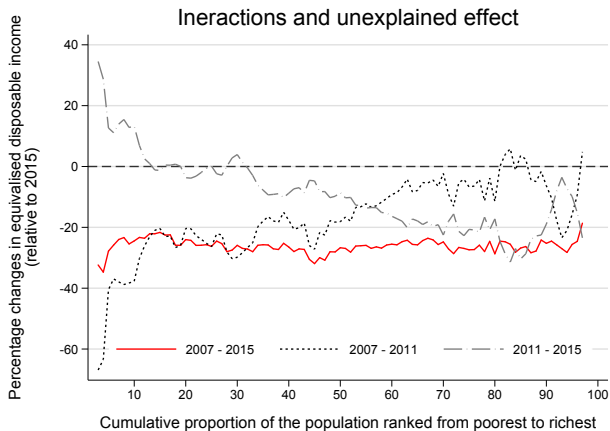
# Thank you

This work is part of the project 'Tax-benefit systems, employment structures and cross-country differences in income inequality in Europe: a micro-simulation approach–SIMDECO' supported by the Luxembourg National Research Fund (contract C13/SC/5937475).

The research leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 730998, InGRID-2 - Integrating Research Infrastructure for European expertise on Inclusive Growth from data to policy.

# Results: Accounting for differences in income inequality

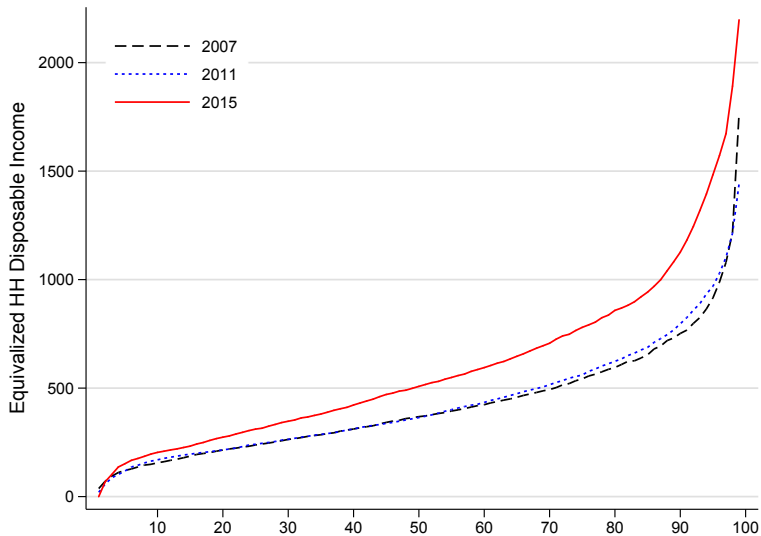
Counterfactual distribution (f) Unexplained and interactions





# Results

Incomes barely changed from 2007-2011, but rose rapidly thereafter.



## Methods#8

The decomposition procedure aims to decompose the total difference between the income distributions in two periods, described by some summary index measure  $\theta(F)$ :

$$\blacktriangleright \Delta_{\theta}(F^A, F^B) = \theta(F^B) - \theta(F^A)$$

into a number of factors that capture the contribution of different components of the model to the gap:

$$\blacktriangleright \Delta_{\theta}(F^A, F^B) = \sum_{k=1}^K D_{\theta}^k(F^A, F^B).$$

$\blacktriangleright k =$  TB system, market composition, returns, demographics.