ibs institute for structural research

# Firms and wage inequality in Central and Eastern Europe

Iga Magda, Jan Gromadzki, Simone Moriconi

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?
  - How do they differ across CEE? How do they compare to Western Europe or CEE?

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?
  - How do they differ across CEE? How do they compare to Western Europe or CEE?
  - How did they evolve since 2000s?

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?
  - How do they differ across CEE? How do they compare to Western Europe or CEE?
  - How did they evolve since 2000s?
- What is the role of firms?

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?
  - How do they differ across CEE? How do they compare to Western Europe or CEE?
  - How did they evolve since 2000s?
- What is the role of firms?
  - Are wage differentials higher between or within firms?

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?
  - How do they differ across CEE? How do they compare to Western Europe or CEE?
  - How did they evolve since 2000s?
- What is the role of firms?
  - Are wage differentials higher between or within firms?
  - How do these patterns change?

# Introduction

- We analyse trends in wage inequality in Central and Eastern Europe
  - How high are the wage inequalities?
  - How do they differ across CEE? How do they compare to Western Europe or CEE?
  - How did they evolve since 2000s?
- What is the role of firms?
  - Are wage differentials higher between or within firms?
  - How do these patterns change?
- What are the micro determinants of wage inequalities?

# Main results

- The levels of wage inequality have converged among the CEE countries

# Main results

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)

# Main results

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)

# Main results

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)
- Most of the inequality changes are explained by the between-firm component (but not in each country)

# Main results

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)
- Most of the inequality changes are explained by the between-firm component (but not in each country)
- At micro level, variances associated with workers and co-workers education, age, occupations and market services

# Main results

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)
- Most of the inequality changes are explained by the between-firm component (but not in each country)
- At micro level, variances associated with workers and co-workers education, age, occupations and market services
- Changes in the size of variance of wages can be attributed mostly to shifts in the intercept - institutional factors?

# Literature

- Growing evidence on the role firms play in determining wage inequalities (Lazear and Shaw 2009, Card, Heining and Kline 2013; Barth, Bryson, Davis and Freeman, 2016; Blau and Kahn 2016; Card, Cardoso, Heining and Kline 2013)

# Literature

- Growing evidence on the role firms play in determining wage inequalities (Lazear and Shaw 2009, Card, Heining and Kline 2013; Barth, Bryson, Davis and Freeman, 2016; Blau and Kahn 2016; Card, Cardoso, Heining and Kline 2013)
- Within-firm component higher, but high growth in the between-firm component in the U.S. 1992-2007: Barth et al. 2016

# Literature

- Growing evidence on the role firms play in determining wage inequalities (Lazear and Shaw 2009, Card, Heining and Kline 2013; Barth, Bryson, Davis and Freeman, 2016; Blau and Kahn 2016; Card, Cardoso, Heining and Kline 2013)
- Within-firm component higher, but high growth in the between-firm component in the U.S. 1992-2007: Barth et al. 2016
- Low between-firm component contribution in Sweden, compared to Brazil, and growth mainly in the within component (Akerman et al., 2013)

# Data

- European Structure of Earnings Survey, a large linked employer-employee dataset

# Data

- European Structure of Earnings Survey, a large linked employer-employee dataset
- 4 waves of repeated cross-sections

# Data

- European Structure of Earnings Survey, a large linked employer-employee dataset
- 4 waves of repeated cross-sections
- Harmonized data available for 25 EU countries

# Data

- European Structure of Earnings Survey, a large linked employer-employee dataset
- 4 waves of repeated cross-sections
- Harmonized data available for 25 EU countries
- We analyse BG, CZ, EE, HU, LT, LV, PL, RO, SK

# Data

- European Structure of Earnings Survey, a large linked employer-employee dataset
- 4 waves of repeated cross-sections
- Harmonized data available for 25 EU countries
- We analyse BG, CZ, EE, HU, LT, LV, PL, RO, SK
- We do not have data from 2002 for all countries, so we focus on 2006, 2010 and 2014 waves

# Data

- European Structure of Earnings Survey, a large linked employer-employee dataset
- 4 waves of repeated cross-sections
- Harmonized data available for 25 EU countries
- We analyse BG, CZ, EE, HU, LT, LV, PL, RO, SK
- We do not have data from 2002 for all countries, so we focus on 2006, 2010 and 2014 waves
- We use gross hourly wages

# Measure of wage inequality

- We normalize log wage such that for each country $\hat{w_{it}} = 100 * \frac{w_{it}}{\bar{w}_t}$

# Measure of wage inequality

- We normalize log wage such that for each country $\hat{w_{it}} = 100 * \frac{w_{it}}{\bar{w_t}}$
- Our measure of wage inequality is the variance of normalized log wages ($\hat{w_{it}}$)

# Measure of wage inequality

- We normalize log wage such that for each country $\hat{w_{it}} = 100 * \frac{w_{it}}{\bar{w}_t}$
- Our measure of wage inequality is the variance of normalized log wages ($\hat{w_{it}}$)
- We decompose the overall variance into the within- and between-firm component:

$$Var(\hat{w_{it}}) = \frac{1}{N_t}\sum_i(\hat{w_{it}} - \hat{\bar{w}_t})^2 = \frac{1}{N_t}\sum_j\sum_{i\in j}(\hat{w_{it}} - \hat{\bar{w}_{jt}})^2 + \frac{1}{N_t}\sum_j N_{jt}(\hat{\bar{w}_{jt}} - \hat{\bar{w}_t}) \quad (1)$$

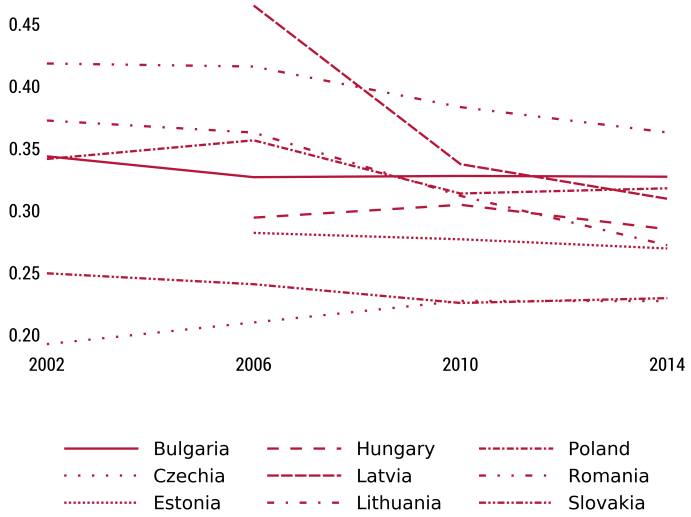
# Measure of wage inequality

- We normalize log wage such that for each country $\hat{w}_{it} = 100 * \frac{w_{it}}{\bar{w}_t}$
- Our measure of wage inequality is the variance of normalized log wages ($\hat{w}_{it}$)
- We decompose the overall variance into the within- and between-firm component:

$$Var(\hat{w}_{it}) = \frac{1}{N_t}\sum_i (\hat{w}_{it} - \hat{\bar{w}}_t)^2 = \frac{1}{N_t}\sum_j \sum_{i \in j} (\hat{w}_{it} - \hat{\bar{w}}_{jt})^2 + \frac{1}{N_t}\sum_j N_{jt}(\hat{\bar{w}}_{jt} - \hat{\bar{w}}_t) \quad (1)$$

- where $\hat{\bar{w}}_t$ is the average normalized log wage in year $t$ in a given country, $\hat{\bar{w}}_{jt}$ denotes average normalized log wage for workers in firm $j$ in year $t$, $N_t$ is the number of all workers in year $t$ and $N_{jt}$ is the number of workers in firm $j$.

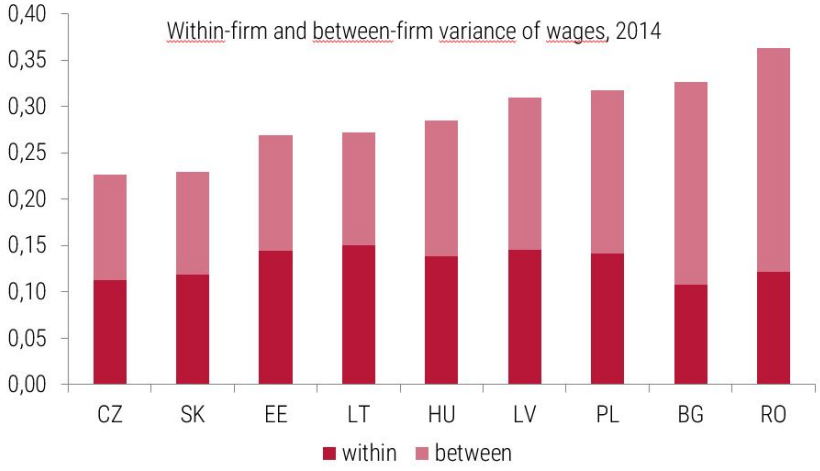
# Variance of normalized log wages (2002-2014)



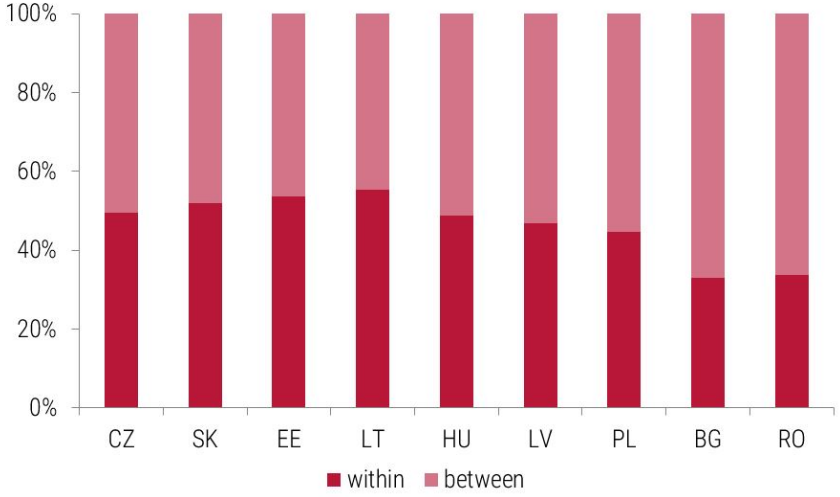

Source: Own calculations based on European Structure of Earnings Survey

# How do CEE compare to WE/ SE?

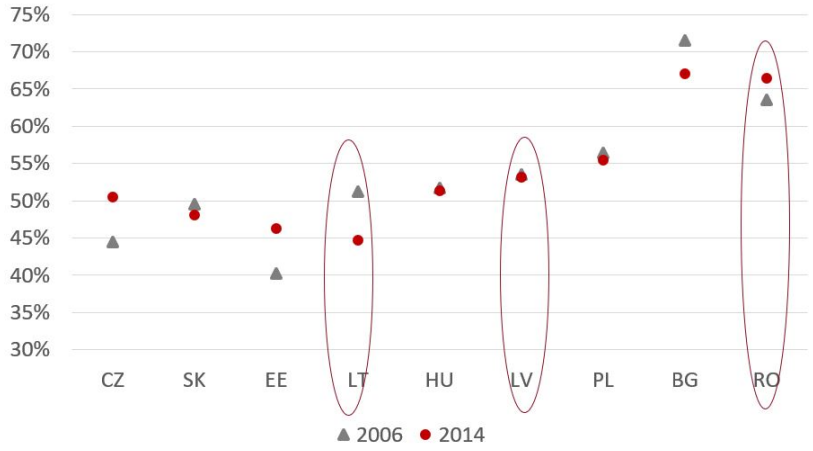
# Between firm differentials drive wage inequality gaps



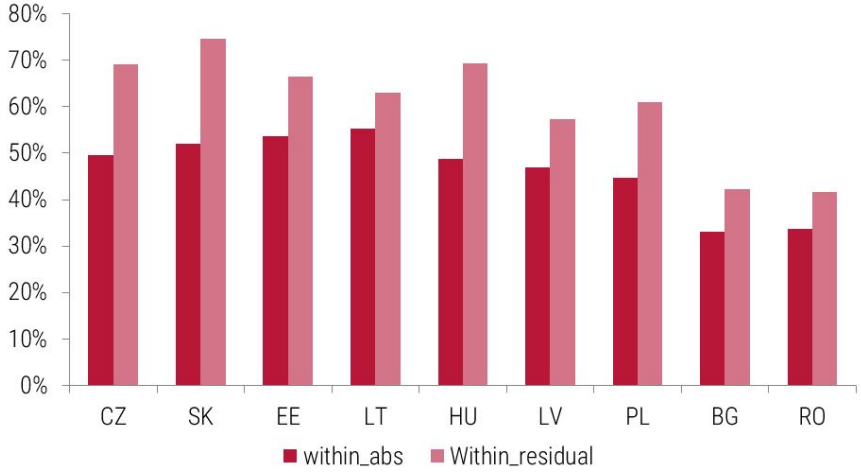
# BG, RO : high between-firm shares of inequality



# Changes over time? Share of between-firm inequality



# Residual wage inequality - between component is lower.



# Micro determinants: RIF regression

- Method introduced by Firpo, Fortin, and Lemieux (2018)
- We calculate the recentered influence function value for each observation:

$$\mathrm{RIF}(\hat{w}_{it}) = (\hat{w}_{it} - \hat{\bar{w}}_t)^2 \tag{2}$$

# Micro determinants: RIF regression

- Method introduced by Firpo, Fortin, and Lemieux (2018)
- We calculate the recentered influence function value for each observation:

$$\mathrm{RIF}(\hat{w_{it}}) = (\hat{w_{it}} - \hat{\bar{w}_t})^2 \tag{2}$$

- Next, we estimate the following model by OLS (for each year and country separately):

$$\mathrm{RIF}(\hat{w_{it}}) = \beta_0 + \beta_1 X_{it} + \beta_2 X_{jt} + \epsilon_{it} \tag{3}$$

# Micro determinants: RIF regression

- Method introduced by Firpo, Fortin, and Lemieux (2018)
- We calculate the recentered influence function value for each observation:

$$\mathrm{RIF}(\hat{w_{it}}) = (\hat{w_{it}} - \hat{\bar{w}_t})^2 \tag{2}$$

- Next, we estimate the following model by OLS (for each year and country separately):

$$\mathrm{RIF}(\hat{w_{it}}) = \beta_0 + \beta_1 X_{it} + \beta_2 X_{jt} + \epsilon_{it} \tag{3}$$

- where $X_{it}$ is a set of individual characteristics (age, gender, education, occupation, type of contract), and $X_{jt}$ is a set of firm characteristics (sector, public/private firm, share of female workers, share of workers with tertiary education, share of workers aged 50 years or more and share of workers with tenure of less than two years)

# Micro determinants: RIF regression

- Method introduced by Firpo, Fortin, and Lemieux (2018)
- We calculate the recentered influence function value for each observation:

$$\mathrm{RIF}(\hat{w_{it}}) = (\hat{w_{it}} - \hat{\bar{w}_t})^2 \tag{2}$$

- Next, we estimate the following model by OLS (for each year and country separately):

$$\mathrm{RIF}(\hat{w_{it}}) = \beta_0 + \beta_1 X_{it} + \beta_2 X_{jt} + \epsilon_{it} \tag{3}$$

- where $X_{it}$ is a set of individual characteristics (age, gender, education, occupation, type of contract), and $X_{jt}$ is a set of firm characteristics (sector, public/private firm, share of female workers, share of workers with tertiary education, share of workers aged 50 years or more and share of workers with tenure of less than two years)
- Interpretation: the partial effect of a small change in the distribution of a covariate on the distributional statistic of interest (in our case variance of normalized log wages)

# What contributes to wage variance? (RIF regs)

| | Bulgaria | Romania |
|---|---|---|
| female | -0.096*** | -0.074*** |
| tertiary edu | 0.014** | 0.151*** |
| secondary edu | -0.050*** | -0.038*** |
| old age | 0.117*** | 0.145*** |
| prime age | 0.110*** | 0.113*** |
| Fixed term contract | 0.062*** | -0.039*** |
| public sector | -0.057*** | -0.020*** |
| NACE: manuf. & constr. | 0.196*** | 0.182*** |
| NACE: market services | 0.206*** | 0.208*** |
| High skilled | 0.189*** | 0.084*** |
| Medium-high skilled | -0.060*** | -0.007* |
| Medium-low skilled | -0.089*** | -0.080*** |
| **Firm level variables:** | | |
| Share of workers 50+ | -0.417*** | -0.260*** |
| Share of short-tenured workes | 0.073*** | 0.104*** |
| Share of tertiary edu workers | 0.284*** | 0.429*** |
| Share of women | -0.093*** | -0.049*** |

# What contributes to wage variance? (RIF regs)

| | Czech Rep. | Slovakia |
|---|---|---|
| female | -0.090*** | -0.080*** |
| tertiary edu | 0.133*** | 0.043*** |
| secondary edu | -0.070*** | -0.103*** |
| old age | 0.127*** | 0.130*** |
| prime age | 0.113*** | 0.115*** |
| Fixed term contract | -0.027*** | -0.004*** |
| public sector | -0.087*** | -0.100*** |
| NACE: manuf. and construction | 0.074*** | 0.049*** |
| NACE: market services | 0.135*** | 0.087*** |
| High skilled | -0.093*** | -0.063*** |
| Medium-high skilled | -0.135*** | -0.118*** |
| Medium-low skilled | -0.237*** | -0.178*** |
| **Firm level variables:** | | |
| Share of workers 50+ | -0.127*** | -0.168*** |
| Share of short-tenured workes | 0.062*** | 0.025*** |
| Share of tertiary edu | 0.072*** | 0.105*** |
| Share of women | 0.040*** | 0.019*** |

# What contributes to wage variance? (RIF regs)

| | Czech Rep. | Slovakia |
|---|---|---|
| female | -0.090*** | -0.080*** |
| tertiary edu | 0.133*** | 0.043*** |
| secondary edu | -0.070*** | -0.103*** |
| old age | 0.127*** | 0.130*** |
| prime age | 0.113*** | 0.115*** |
| Fixed term contract | -0.027*** | -0.004*** |
| public sector | -0.087*** | -0.100*** |
| NACE: manuf. and construction | 0.074*** | 0.049*** |
| NACE: market services | 0.135*** | 0.087*** |
| High skilled | -0.093*** | -0.063*** |
| Medium-high skilled | -0.135*** | -0.118*** |
| Medium-low skilled | -0.237*** | -0.178*** |
| **Firm level variables:** | | |
| Share of workers 50+ | -0.127*** | -0.168*** |
| Share of short-tenured workes | 0.062*** | 0.025*** |
| Share of tertiary edu | 0.072*** | 0.105*** |
| Share of women | 0.040*** | 0.019*** |

# What contributes to higher variance of wages

- tertiary education at individual level, reinforced by tertiary-educated co-workers

# What contributes to higher variance of wages

- tertiary education at individual level, reinforced by tertiary-educated co-workers
- age matters as well - older workers associated with higher wage inequality (compared to young ones), but not at firm-level, higher share of older coworkers decreases wage inequality

# What contributes to higher variance of wages

- tertiary education at individual level, reinforced by tertiary-educated co-workers
- age matters as well - older workers associated with higher wage inequality (compared to young ones), but not at firm-level, higher share of older coworkers decreases wage inequality
- higher skilled occupations lower wage inequality, but not in BG and RO - where employees in high skilled occupations increase the overall wage inequality

# What contributes to higher variance of wages

- tertiary education at individual level, reinforced by tertiary-educated co-workers
- age matters as well - older workers associated with higher wage inequality (compared to young ones), but not at firm-level, higher share of older coworkers decreases wage inequality
- higher skilled occupations lower wage inequality, but not in BG and RO - where employees in high skilled occupations increase the overall wage inequality
- sectoral affiliation matters: market services contribute the most to variance of wages, coefficients particularly high in BG and RO

# Micro determinants: Blinder-Oaxaca decomposition

- We use a standard Blinder-Oaxaca decomposition to distinguish the contribution of changes in endowments, coefficients and interaction to the change in the overall variance
- We decompose the change in the overall variance between 2006 and 2014 for each country, according to the formula:

$$\begin{aligned} \mathrm{Var}(\mathrm{w_{i,\hat{2}014}}) - \mathrm{Var}(\mathrm{w_{i,\hat{2}006}}) = \beta_{2006}(\bar{\mathrm{X}}_{2014} - \bar{\mathrm{X}}_{2006}) \\ +(\beta_{2014} - \beta_{2006})\bar{\mathrm{X}}_{2006} \\ +(\bar{\mathrm{X}}_{2014}) - \bar{\mathrm{X}}_{2006}) * (\beta_{2014} - \beta_{2006}) \end{aligned} \tag{4}$$

# Micro determinants: results

- The positive effect of tertiary education on the variance of log wages has decreased in most countries (stable in other)

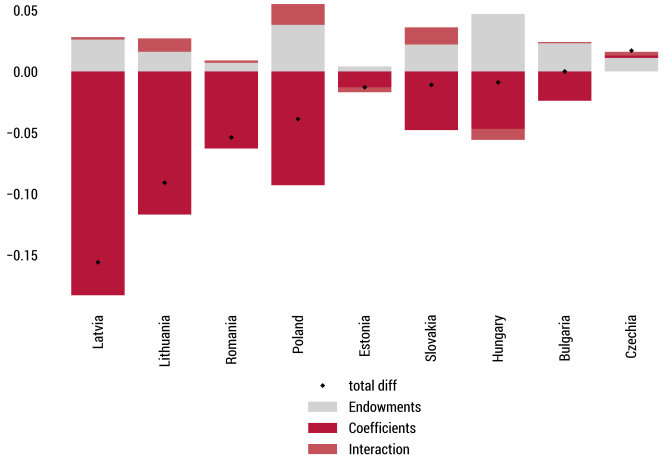
# Micro determinants: results

- The positive effect of tertiary education on the variance of log wages has decreased in most countries (stable in other)
- The effect of age of a worker has increased in most countries

# Micro determinants: results

- The positive effect of tertiary education on the variance of log wages has decreased in most countries (stable in other)
- The effect of age of a worker has increased in most countries
- There has been no universal patterns in changes in occupational and sectoral effects in CEE

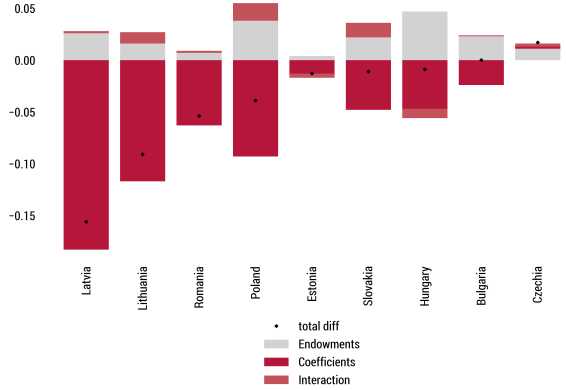
# Blinder-Oaxaca: results




Source: Own calculations based on European Structure of Earnings Survey

# Blinder-Oaxaca: results

- The biggest part of the change in overall variance was explained by changes in coefficients, but most of this contribution is due to the changes in intercepts (pointing to the likely role of institutional changes)




Source: Own calculations based on European Structure of Earnings Survey

# Conclusions

- The levels of wage inequality have converged among the CEE countries

# Conclusions

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)

# Conclusions

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)

# Conclusions

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)
- Most of the inequality changes are explained by the between-firm component (but not in each country)

# Conclusions

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)
- Most of the inequality changes are explained by the between-firm component (but not in each country)
- At micro level, variances associated with workers and co-workers education, age, occupations and market services

# Conclusions

- The levels of wage inequality have converged among the CEE countries
- The largest changes occurred between 2006-2014 (Great Recession)
- Most of the inequality levels are explained by the between-firm component (but not in each country)
- Most of the inequality changes are explained by the between-firm component (but not in each country)
- At micro level, variances associated with workers and co-workers education, age, occupations and market services
- Changes in the size of variance of wages can be attributed mostly to shifts in the intercept - institutional factors?

# References


- Akerman, Anders, Elhanan Helpman, Oleg Itskhoki, Muendler Marc-Andreas, and Stephen Redding (2013). “Sources of wage inequality”. In: American Economic Review 103.3, pp. 214–219.
- Autor, David H., Lawrence F. Katz, and Melissa S. Kearney (May 2008). “Trends in U.S. Wage Inequality: Revising the Revisionists”. In: Review of Economics and Statistics 90.2, pp. 300–323.
- Barth, Erling, Alex Bryson, James C. Davis, and Richard Freeman (2016). “It is Where You Work: Increases in the Dispersion of Earnings across Establishments and Individuals in the United States”. In: Journal of Labor Economics 34.2, pp. 244–263.
- Firpo, Sergio P., Nicole M. Fortin, and Thomas Lemieux (2018). “Decomposing Wage Distributions Using Recentered Influence Function Regressions”. In: Econometrics 6.
- Helpman, Elhanan, Oleg Itskhoki, and Stephen Redding (2017). “Trade and inequality: From theory to estimation”. In: Review of Economic Studies 84.1, pp. 357–405.

ibs instytut badań strukturalnych

# THANK YOU

WWW.IBS.ORG.PL