

# **Labour shares and the personal distribution of income in the OECD**

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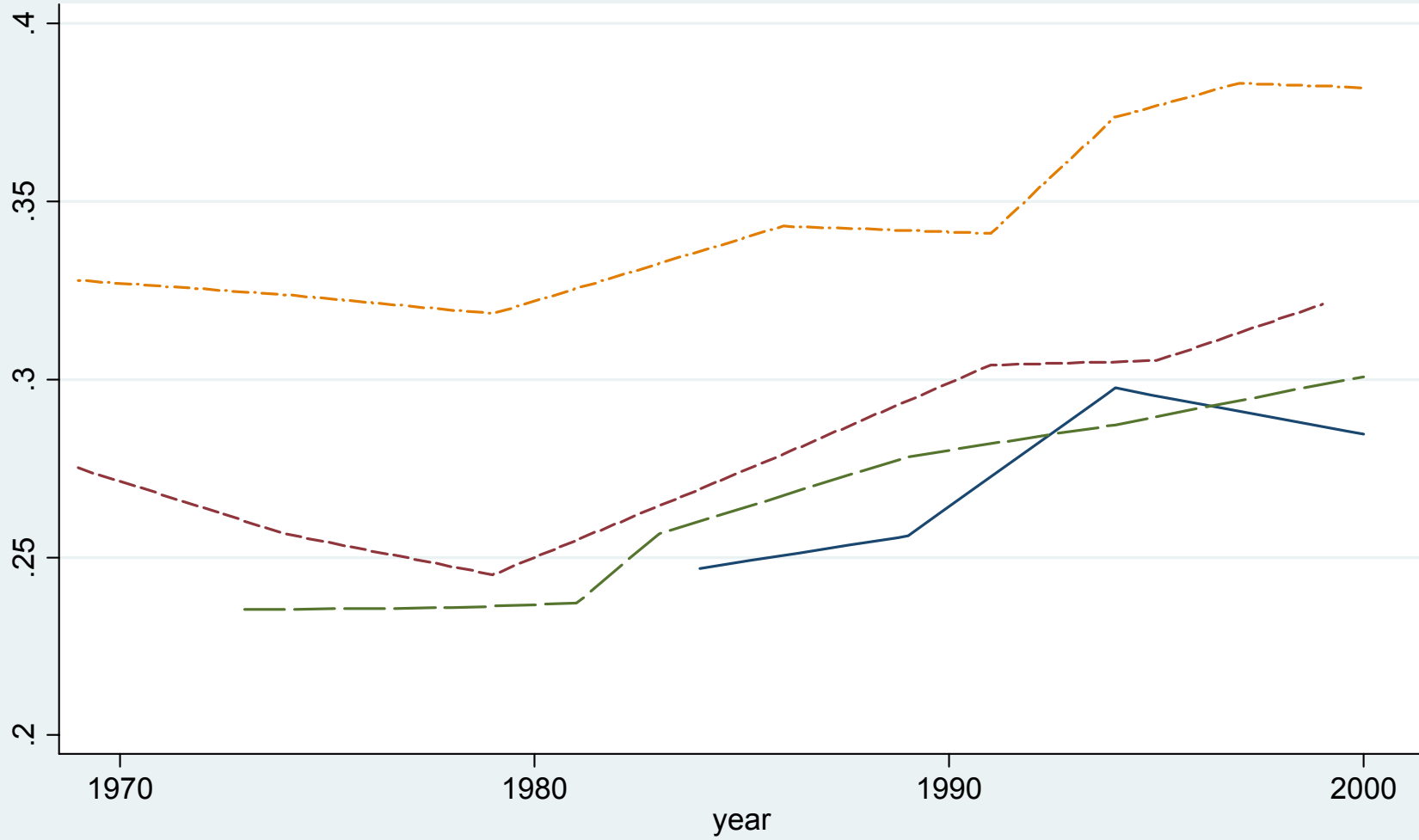
## Introduction

During the past three decades, apparent increase in various measures of inequality

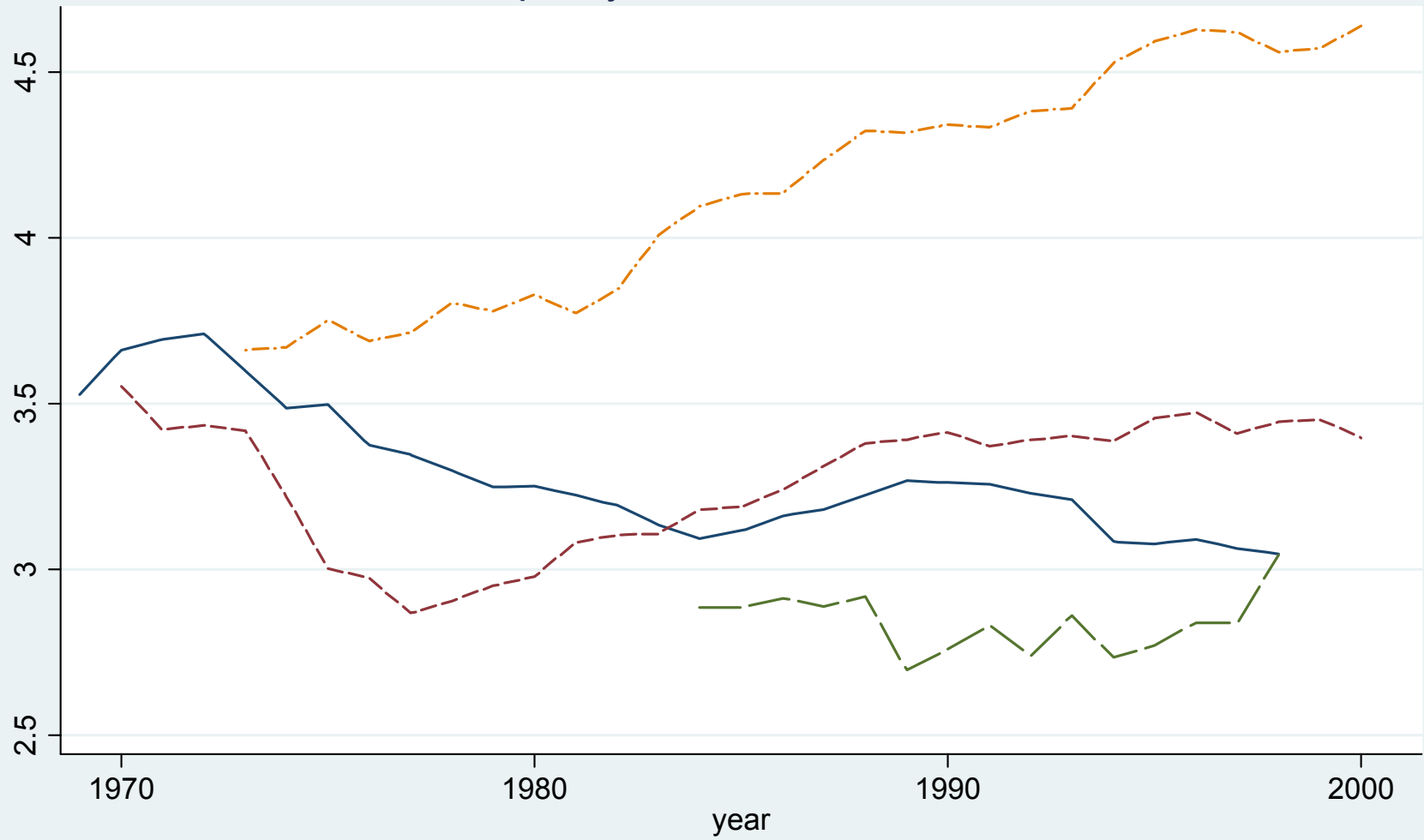
Different approaches:

- ⇒ labour economists focus on how the price of different types of labour changes over time
- ⇒ macroeconomists are concerned with the reward to different factors, i.e. with the shares of labour and capital in aggregate income
- ⇒ policy analysts care about the distribution of household income, which combines capital income, the different labour incomes of household members, and transfers received

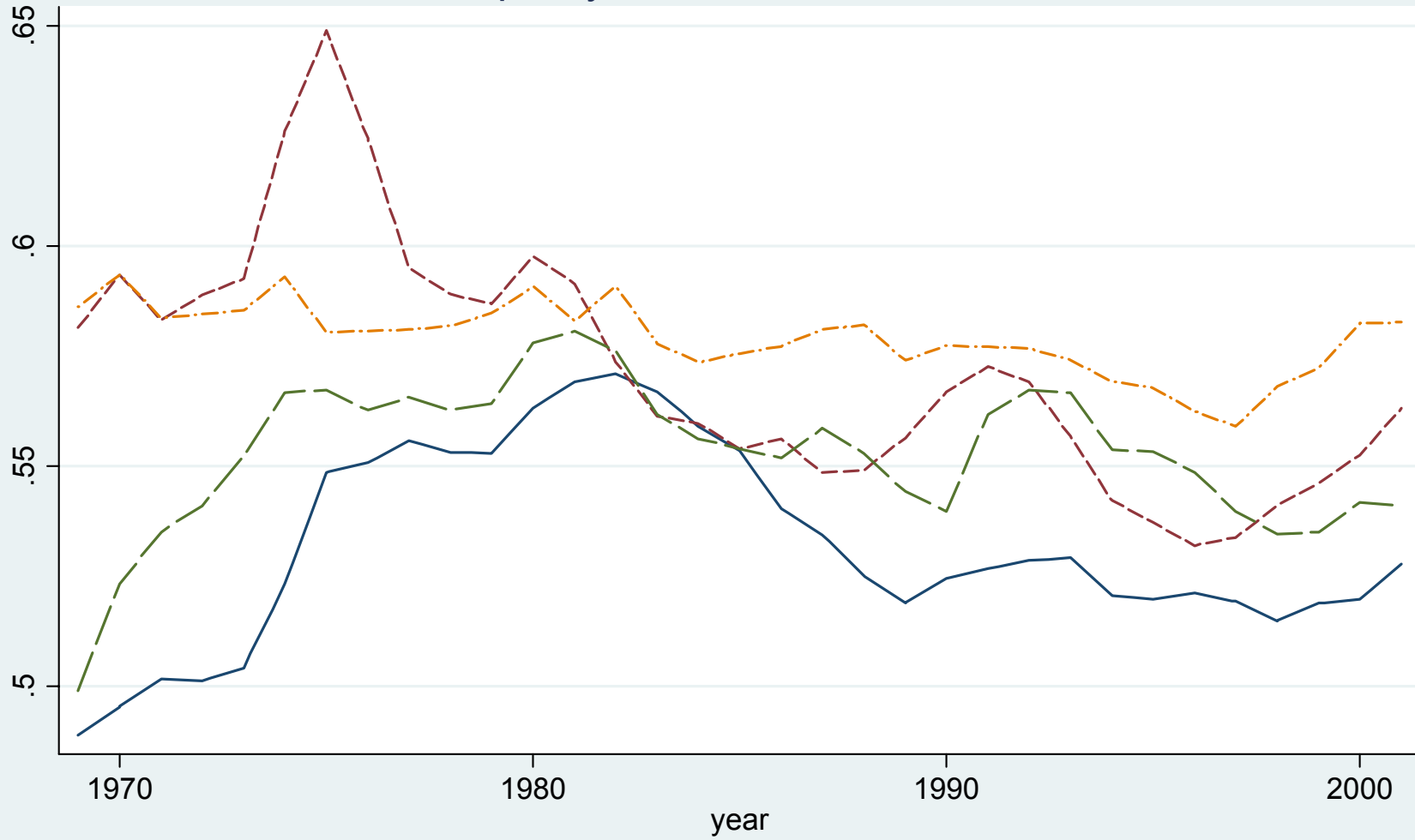
# Inequality - Gini indexes - LIS



### Inequality - Decile ratio - OECD



# Inequality - Labour share - OECD



In this paper we ask the following questions

1. Is the factor distribution of income still a major determinant of the personal distribution of income?
2. What determines differences in labour shares?
3. What is the role of labour market institutions in determining personal income inequality?

In so doing

- ① we develop a theoretical model of the labour market, which allows for understanding the main variables that come into play
- ② propose a framework to combine inequality components in a consistent way in order to understand the observed trends
- ③ we take the theoretical model to the data in an unbalanced panel of countries
- ④ we perform counterfactual analysis to assess the magnitudes of the effects we found.

## **Existing evidence: Effect of LMIs on labour market**

Extensive literature on the impact of LMIs on unemployment and wage dispersion

- Unemployment rates increase with the unemployment benefit and the tax wedge (Nickell, Nunziata and Ochel 2005; Bassanini and Duval 2006)
- Wage dispersion is greater when unions are weaker and less centralised, and the minimum wage lower (Card, Lemieux and Riddell 2004; Koeninger, Leonardi and Nunziata 2007)
- Wage share tends to increase with greater union density and capital per worker (Blanchard 1997, Bentolila and Saint-Paul 2003)

## Wage and employment determination in a unionised economy

Output determined assuming elasticity of substitution between capital and labour equal to  $1/(1 + \sigma)$ , and that between the two types of labour equal to 1.

$$Y = \left[ \alpha K^{-\sigma} + (1 - \alpha) (H^\beta L^{1-\beta})^{-\sigma} \right]^{-1/\sigma}$$

Under profit maximisation

$$\frac{H}{L} = \frac{\beta}{1 - \beta} \frac{w_u}{w_s} \quad \text{and} \quad \theta = \frac{1 - \alpha}{1 - \alpha + \alpha x^\sigma}$$

where  $x \equiv \frac{H^\beta L^{1-\beta}}{K}$  is the ratio of the labour aggregate to capital.



## Two modes of wage determination

- ✓ Skilled workers: efficiency wages
- ✓ Unskilled workers: union bargaining

### Skilled workers

- Shirking

$$U^S = (1 - p)((1 - \tau)w_s)^{\rho} + pB^{\rho}$$

- Not shirking

$$U^N = ((1 - \tau)w_s - e)^{\rho}$$

- Equilibrium

$$(1 - \tau)\bar{w}_s - e)^{\rho} = (1 - p)((1 - \tau)\bar{w}_s)^{\rho} + pB^{\rho}$$

The labour demand for unskilled worker by the firm can be expressed by

$$w_s = \beta(1 - \alpha)\left(\alpha + (1 - \alpha)x^{-\sigma}\right)^{-(1+\sigma)/\sigma} x^{-\sigma} \frac{K}{H}$$

## Unskilled workers

A representative union maximises the expected utility of unskilled union members in a right to manage framework. The bargaining process between firm and union is given by

$$\max_{w_u} \left( \frac{L}{\bar{L}} \left[ ((1 - \tau)w_u)^\rho - B^\rho \right] \right)^\gamma (Y - w_u L - w_s H)^{1-\gamma}$$

First order conditions

$$\rho(1 - \tau)^\rho = \left( \frac{1 - \gamma}{\gamma} \frac{(1 - \beta)\theta}{1 - \theta} + \varepsilon_L \right) \left( (1 - \tau)^\rho - \left( \frac{B}{w_u} \right)^\rho \right)$$

The labour demand for unskilled worker by the firm can be expressed by

$$w_u = (1 - \beta)(1 - \alpha) \left( \alpha + (1 - \alpha)x^{-\sigma} \right)^{-(1+\sigma)/\sigma} x^{-\sigma} \frac{K}{L}$$

① A population composed by four groups:

- (i) A fraction  $u$  of the labour force are unemployed, and receive an unemployment benefit  $B$ ;
- (ii) A fraction  $l$  of the labour force are unskilled workers earning a wage  $\tilde{w}_u = w_u(1 - \tau)$ ;
- (iii) A fraction  $h$  of the labour force are skilled workers. Of those  $h - \kappa$  have an income equal to the skilled wage  $\tilde{w}_s = w_s(1 - \tau)$ ;
- (iv) There are  $\kappa$  worker-capitalists, each of whom earns profits  $\pi$  and the skilled wage  $\tilde{w}_s$ .

Our assumptions imply that  $h + l + u = 1$ . We further assume that  $\tilde{w}_s > \tilde{w}_u > B$  and  $\pi > 0$ .

② The public budget is balanced:  $B = \tau\theta y / u$ .

③ Define the labour share as  $\theta \equiv \frac{w_s H + w_u L}{Y} = \frac{w_s h + w_u l}{y}$  where  $y$  denotes output per capita.

Profits of each worker-capitalist are given by  $\pi = (1 - \theta)y / \kappa$ .

④ Income inequality is measured by the Gini index for population subgroups:

$$Gini = \frac{1}{2y} \sum_{i=1}^N \sum_{j=1}^N |y_i - y_j| \cdot n_i \cdot n_j$$

where  $y_i$  is the income in subgroup  $i$ , which has relative weight  $n_i$ , and  $y$  is the average income.

Given our assumptions about the population and their incomes, the Gini coefficient can be expressed as

$$Gini = (1 - \kappa)(1 - \theta) + lh \frac{\tilde{w}_s - \tilde{w}_u}{y} + u(1 - u) \frac{\tilde{w} - B}{y}$$

where  $\tilde{w}$  is the average wage.

⇒ A higher labour share will reduce inequality by lowering profits and thus reducing the income of the richest individuals.

⇒ A greater wage differential between the skilled and the unskilled will raise the Gini coefficient as it increases inequality within the group of employed individuals.

⇒ a larger unemployment benefit will reduce the Gini coefficient.

## Empirical specification

Our theoretical analysis can be summarised by

$$Gini = G \left( \theta, \frac{w_s - w_u}{y}, b, u \right)$$

where the variable  $b = \frac{B}{y}$  measures the replacement rate in the population, whereas the wage

differential will be proxied by taking the 1<sup>st</sup> and the 9<sup>th</sup> decile in the earnings distribution. We thus estimate the following relationship

$$Gini_{it} = \alpha_0 + \alpha_1 \cdot \theta_{it} + \alpha_2 \cdot \frac{w_{it}^{90}}{w_{it}^{10}} + \alpha_3 \cdot b_{it} + \alpha_4 \cdot u_{it} + \alpha_5 \cdot b_{it} \cdot u_{it} + \delta_i + \lambda_t + def_{it} + \varepsilon_{it}$$

| country        | gini1        | gini2        | p9010       | ls1         | ur          | ben         |
|----------------|--------------|--------------|-------------|-------------|-------------|-------------|
| australia      | 32.83        | 38.08        | 2.83        | 0.49        | 5.32        | 0.22        |
| belgium        | 27.75        | 26.81        | 2.34        | 0.52        | 6.64        | 0.41        |
| canada         | 36.03        | 31.32        | 4.24        | 0.53        | 7.42        | 0.26        |
| denmark        | 32.86        | 32.08        | 2.17        | 0.55        | 5.01        | 0.44        |
| finland        | 21.76        | 29.77        | 2.45        | 0.51        | 5.68        | 0.25        |
| france         | 38.33        | 42.13        | 3.44        | 0.52        | 6.52        | 0.30        |
| germany        | 36.22        | 31.23        | 2.84        | 0.54        | 3.85        | 0.29        |
| italy          | 34.71        | 34.67        | 2.33        | 0.46        | 6.07        | 0.05        |
| japan          | .            | 34.86        | 3.06        | 0.51        | 2.20        | 0.11        |
| korea          | .            | 34.18        | 3.97        | 0.41        | .           | .           |
| netherlands    | 28.55        | 28.54        | 2.61        | 0.55        | 5.11        | 0.45        |
| new zealand    | 27.23        | 34.06        | 3.03        | 0.48        | 2.91        | 0.31        |
| norway         | 22.64        | 34.75        | 2.08        | 0.48        | 2.73        | 0.23        |
| sweden         | 47.12        | 31.69        | 2.10        | 0.58        | 3.17        | 0.19        |
| united kingdom | 27.52        | 25.98        | 3.27        | 0.58        | 6.31        | 0.22        |
| united states  | 37.58        | 35.49        | 4.16        | 0.58        | 5.86        | 0.12        |
| <b>Total</b>   | <b>33.98</b> | <b>32.56</b> | <b>3.03</b> | <b>0.52</b> | <b>5.00</b> | <b>0.26</b> |

Legend:

gini1 = Gini index on personal income distribution, from Brandolini 2003

gini2 = Gini index on personal income distribution, from Deininger and Squire 1996

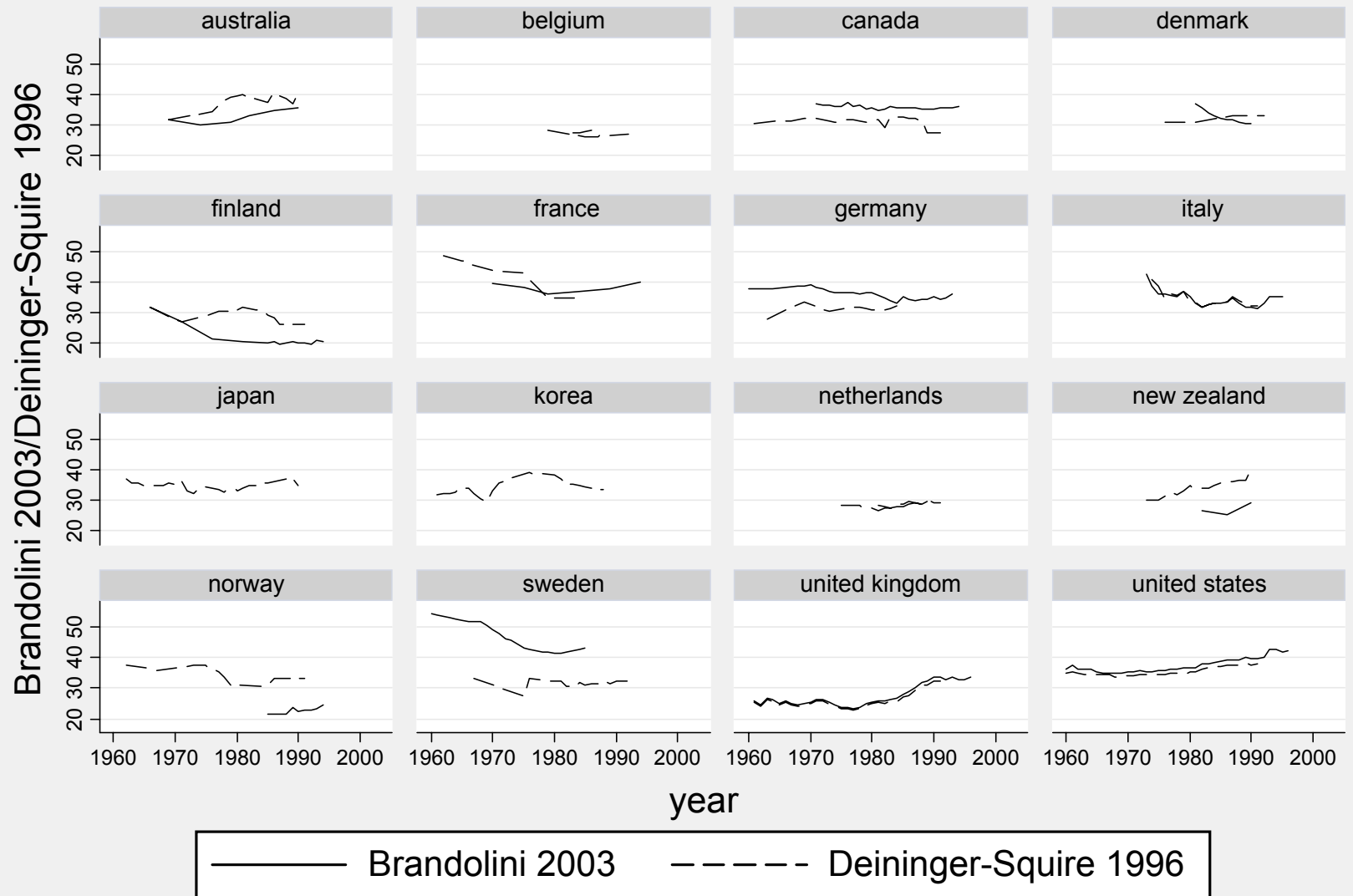
p9010 = ratio between 90<sup>th</sup> and 10<sup>th</sup> percentile in earnings distribution, from OECD

ls1 = labour share on value added at market price, from OECD-Stan database

ur = unemployment rate, from Nickell-Nunziata 2001

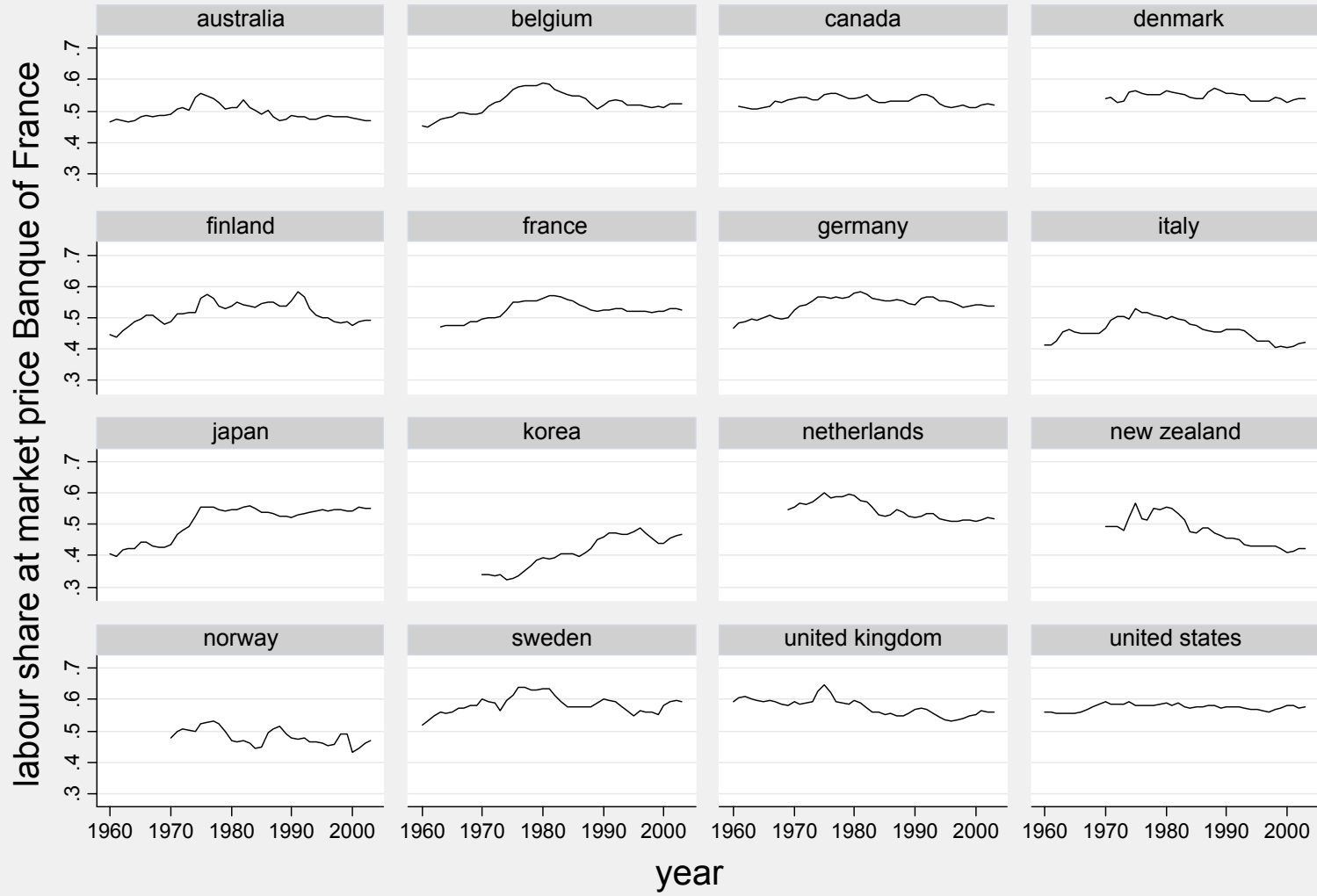
ben = unemployment benefit from OECD 2001

Figure A.1 – Gini indices on income inequality



Graphs by country

Figure A.2 – Labour shares – Total economy



Graphs by country



Table 1 – Determinants of personal income inequality – OLS regressions – robust standard errors - t-statistics in parentheses

| Model :            | 1                  | 2                  | 3                  | 4                  | 5                  | 6                  |
|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| # obs :            | 233                | 142                | 233                | 233                | 142                | 233                |
| Depvar:            | gini1              | gini1              | gini1              | gini1              | gini1              | gini1              |
| labour share       | -43.737<br>(-7.84) | -32.971<br>(-4.19) | -39.004<br>(-6.62) | -48.455<br>(-5.12) | -43.910<br>(-4.68) | -49.112<br>(-5.39) |
| unemploy. benefit  | -36.585<br>(-7.98) | -6.033<br>(-1.05)  | -34.538<br>(-7.38) | -37.130<br>(-7.82) | -4.124<br>(-0.65)  | -34.363<br>(-7.23) |
| unemploy. rate     | -0.916<br>(-4.30)  | 0.101<br>(0.48)    | -0.714<br>(-3.34)  | -1.021<br>(-4.17)  | 0.122<br>(0.50)    | -0.780<br>(-3.24)  |
| benefit× unemploy. | 2.476<br>(3.84)    | -0.277<br>(-0.51)  | 2.236<br>(3.48)    | 2.536<br>(3.56)    | -0.534<br>(-0.81)  | 2.215<br>(3.22)    |
| time               | 0.155<br>(6.90)    | 0.155<br>(5.04)    | 0.107<br>(4.44)    | 0.151<br>(11.70)   | 0.160<br>(6.33)    | 0.090<br>(3.54)    |
| p9010              |                    | 3.564<br>(3.41)    | 3.596<br>(3.68)    |                    | 3.688<br>(2.76)    | 3.995<br>(2.97)    |
| Constant           | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| Definitns          | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| Countries          | Yes                | Yes                | Yes                | Yes                | Yes                | Yes                |
| Years              |                    |                    |                    | Yes                | Yes                | Yes                |
| R <sup>2</sup>     | 0.938              | 0.963              | 0.941              | 0.945              | 0.971              | 0.948              |

Table 2 – Determinants of potentially endogenous variables – OLS regressions robust standard errors - t-statistics in parentheses

| # obs :        | 429      | 429     | 292     | 292     | 541     | 541     |
|----------------|----------|---------|---------|---------|---------|---------|
| Depvar:        | lab.sh.  | lab.sh. | p9010   | p9010   | un.rate | un.rate |
| union          | 0.063    | 0.022   | -0.989  | -0.858  |         |         |
| density        | (3.05)   | (1.33)  | (-4.41) | (-3.91) |         |         |
| minimum        | 0.096    | 0.048   | -3.256  | -2.217  |         |         |
| wage           | (3.54)   | (1.79)  | (-6.38) | (-4.14) |         |         |
| capital        | 0.110    | 0.071   |         |         |         |         |
| xworker        | (17.35)  | (10.43) |         |         |         |         |
| oil            | 0.013    | -0.022  |         |         |         |         |
| price          | (9.40)   | (-4.97) |         |         |         |         |
| yrs of         | -0.045   | -0.008  | -0.343  | -0.292  |         |         |
| educat         | (-16.40) | (-1.18) | (-4.33) | (-3.19) |         |         |
| time           |          |         | 0.031   | 0.022   |         |         |
|                |          |         | (4.01)  | (2.98)  |         |         |
| unempl         |          |         |         |         | 8.994   | 3.745   |
| benefit        |          |         |         |         | (6.58)  | (3.32)  |
| tax            |          |         |         |         | 16.969  | -0.351  |
| wedge          |          |         |         |         | (7.61)  | (-0.17) |
| Constant       | Yes      | Yes     | Yes     | Yes     | Yes     | Yes     |
| Countries      | Yes      | Yes     | Yes     | Yes     | Yes     | Yes     |
| Years          |          | Yes     |         | Yes     |         | Yes     |
| R <sup>2</sup> | 0.813    | 0.886   | 0.962   | 0.971   | 0.494   | 0.742   |

Table 3 – Comparison between OLS and IV estimates - robust standard errors - t-statistics in parentheses

Endogenous: labour share, unemployment rate, p9010

Instruments: (log)capital×worker, union density, tax wedge, years of education, population share with some secondary school attainment.

| Model :         | ols                | ols                | iv                 | iv                 |
|-----------------|--------------------|--------------------|--------------------|--------------------|
| # obs :         | 188                | 188                | 188                | 188                |
| Depvar:         | gini1              | gini1              | gini1              | gini1              |
| labour share    | -23.540<br>(-2.82) | -38.293<br>(-4.00) | -15.729<br>(-1.15) | -57.917<br>(-2.73) |
| p9010           | 4.939<br>(4.66)    | 6.674<br>(4.92)    | 11.421<br>(3.95)   | 15.162<br>(4.73)   |
| unempl benefit  | -21.141<br>(-4.47) | -21.884<br>(-5.36) | -17.736<br>(-4.83) | -17.018<br>(-3.79) |
| unempl rate     | 0.040<br>(0.55)    | 0.050<br>(0.56)    | 0.185<br>(0.73)    | 0.466<br>(1.66)    |
| time            | 0.056<br>(1.75)    | 0.077<br>(1.84)    | -0.026<br>(-0.34)  | -0.139<br>(-1.22)  |
| Constant        | Yes                | Yes                | Yes                | Yes                |
| Definition      | Yes                | Yes                | Yes                | Yes                |
| Countries       | Yes                | Yes                | Yes                | Yes                |
| Years           |                    | Yes                |                    | Yes                |
| R-sq            | 0.933              | 0.947              | 0.915              | 0.924              |
| Sargan (pvalue) |                    |                    | 0.01               | 0.15               |

## **Robustness checks**

- ✓ estimates in subsample with balanced panel (**Canada, Finland, Italy, Sweden, UK, US** make 171 observations)
- ✓ system estimation to account for endogeneity
- ✓ reduced form estimation (to appreciate the magnitude of the overall impact)
- ✓ different data source for Gini (Deininger and Squire)
- ✓ counterfactual exercises

Gini coefficient : Canada, Finland, Italy, Sweden, UK, US

|                | 2       | 4       | 6       | 8       |
|----------------|---------|---------|---------|---------|
| Model :        |         |         |         |         |
| # obs :        | 171     | 171     | 171     | 171     |
| labour         | -47.744 | -42.695 | -51.326 | -56.80  |
| share          | (-7.64) | (-6.40) | (-4.25) | (-5.07) |
| unemploy.      | -40.760 | -38.048 | -44.339 | -41.272 |
| benefit        | (-6.40) | (-5.98) | (-6.68) | (-6.45) |
| unemploy.      | -1.085  | -0.857  | -1.155  | -0.889  |
| rate           | (-3.60) | (-2.89) | (-3.67) | (-2.97) |
| benefitx       | 2.997   | 2.640   | 3.047   | 2.698   |
| unemploy.      | (2.52)  | (2.25)  | (2.54)  | (2.42)  |
| time           | 0.166   | 0.119   | 0.152   | 0.081   |
|                | (7.31)  | (4.54)  | (11.82) | (2.73)  |
| p9010          |         | 3.274   |         | 4.523   |
|                |         | (3.14)  |         | (2.77)  |
| Years          |         |         | Yes     | Yes     |
| R <sup>2</sup> | 0.915   | 0.92    | 0.927   | 0.932   |

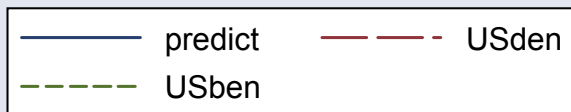
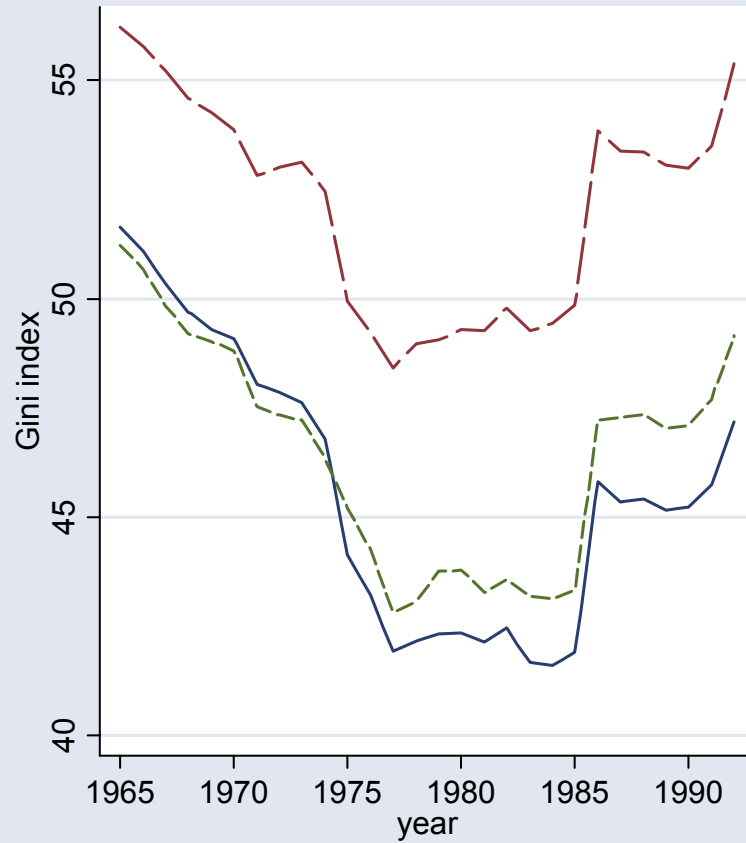
Determinants of personal income inequality – 3SLS regressions

| Observations:  | 129        | 129          | 129     | 129         |
|----------------|------------|--------------|---------|-------------|
| depvar:        | gini index | labour share | p9010   | unempl.rate |
| labour share   | -67.53**   |              |         |             |
| p9010          | 15.27**    |              |         |             |
| unempl.rate    | 1.37**     |              |         |             |
| unempl.benefit | -1.01      | 0.05         | -0.55*  | 1.90        |
| capital×worker |            | 0.21**       | 0.14    | 8.17*       |
| union density  |            | -0.07        | -2.48** | 6.34        |
| minimum wage   |            | 0.01         | -3.62** | 34.88**     |
| years educatio |            | -0.07**      | -0.10   |             |
| log oil price  |            | -0.02*       |         |             |
| tax wedge      |            |              |         | -15.95**    |
| time           | 1.20       |              | 0.04    | -2.36       |
| Constant       | yes        | yes          | yes     | yes         |
| Countries      | yes        | yes          | yes     | yes         |
| Years          | yes        | yes          | yes     | yes         |
| R <sup>2</sup> | 0.8873     | 0.9474       | 0.9887  | 0.8541      |

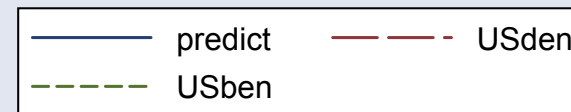
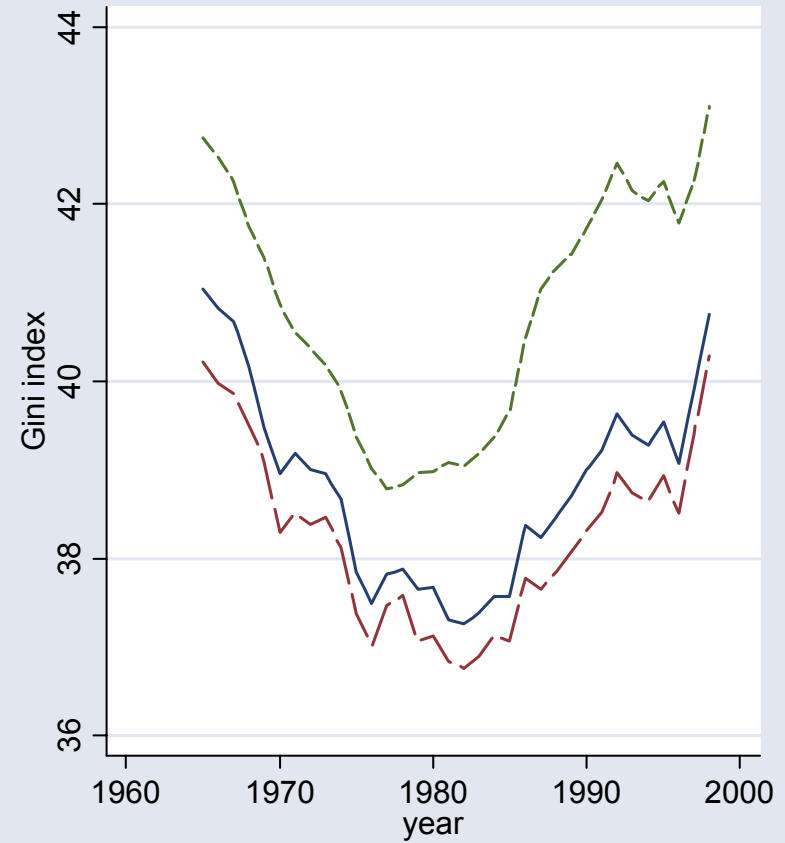
| Model :        | 1       | 2       | 3       | 4       |
|----------------|---------|---------|---------|---------|
| # obs :        | 211     | 211     | 225     | 225     |
| Depvar:        | gini1   | gini1   | gini2   | gini2   |
| union          | -13.202 | -14.314 | -2.157  | -2.745  |
| density        | (-3.18) | (-3.50) | (-0.41) | (-0.46) |
| minimum        | -1.190  | -8.127  | -9.574  | -8.695  |
| wage           | (-0.28) | (-1.64) | (-2.28) | (-1.81) |
| capital        | -8.354  | -19.557 | -2.690  | -3.175  |
| xworker        | (-2.44) | (-4.60) | (-3.24) | (-3.15) |
| years          | -0.90   | 6.471   | -0.565  | -1.150  |
| education      | (-0.68) | (3.13)  | (-0.20) | (-0.34) |
| tax wedge      | -23.812 | -26.533 | -3.314  | -5.188  |
|                | (-4.02) | (-4.14) | (-0.73) | (-1.00) |
| unemploy       | -8.737  | -15.308 | -13.576 | -14.741 |
| benefit        | (-2.22) | (-4.05) | (-3.08) | (-3.22) |
| time           | 0.488   | 0.276   | 0.199   | 0.263   |
|                | (3.15)  | (1.59)  | (0.70)  | (0.75)  |
| Constant       | Yes     | Yes     | Yes     | Yes     |
| Definition     | Yes     | Yes     | Yes     | Yes     |
| Countries      | Yes     | Yes     | Yes     | Yes     |
| Years          |         | Yes     |         | Yes     |
| R <sup>2</sup> | 0.947   | 0.958   | 0.815   | 0.825   |

# Counterfactual with US institutions: union density

## Sweden

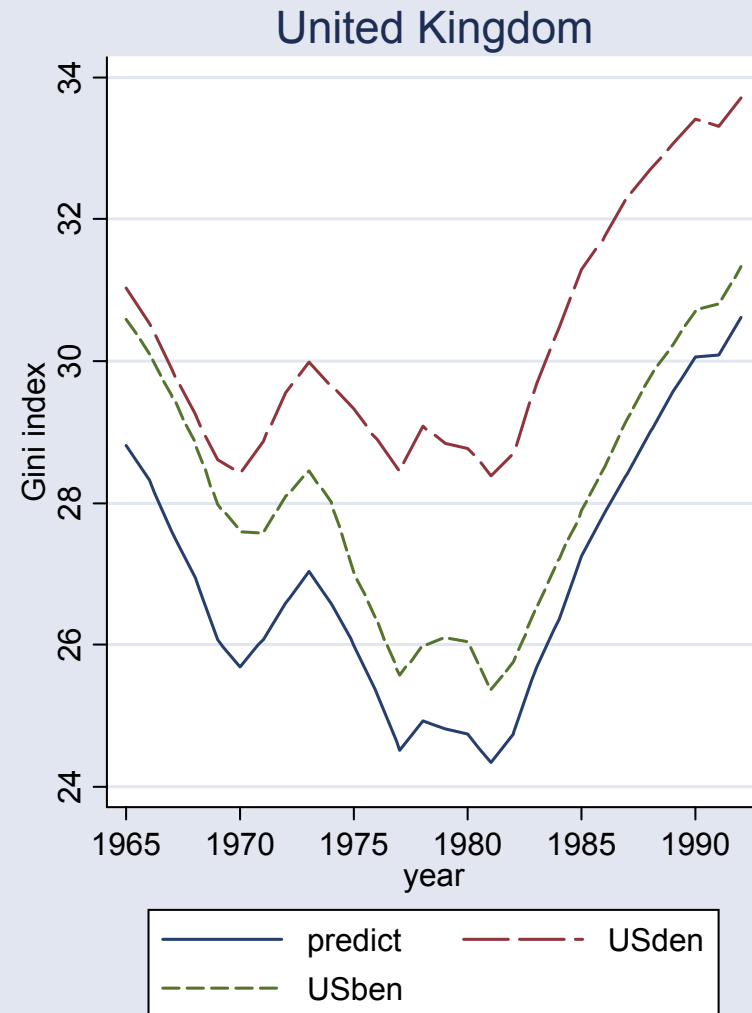
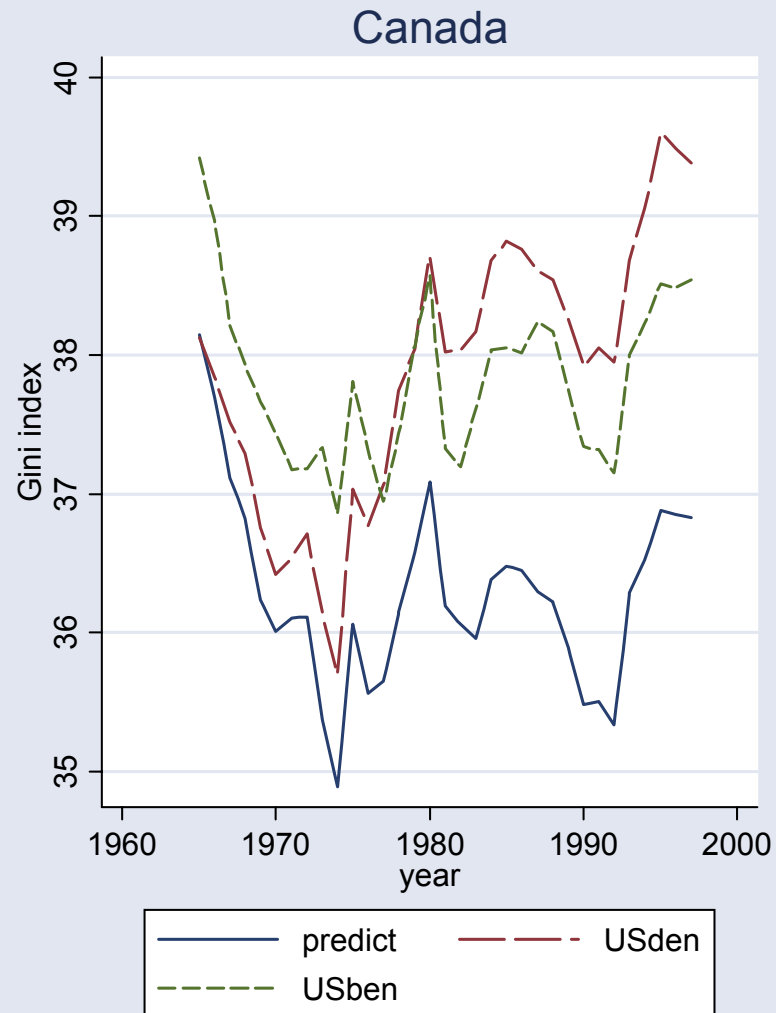


## France



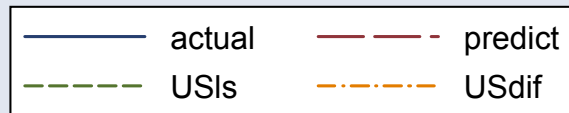
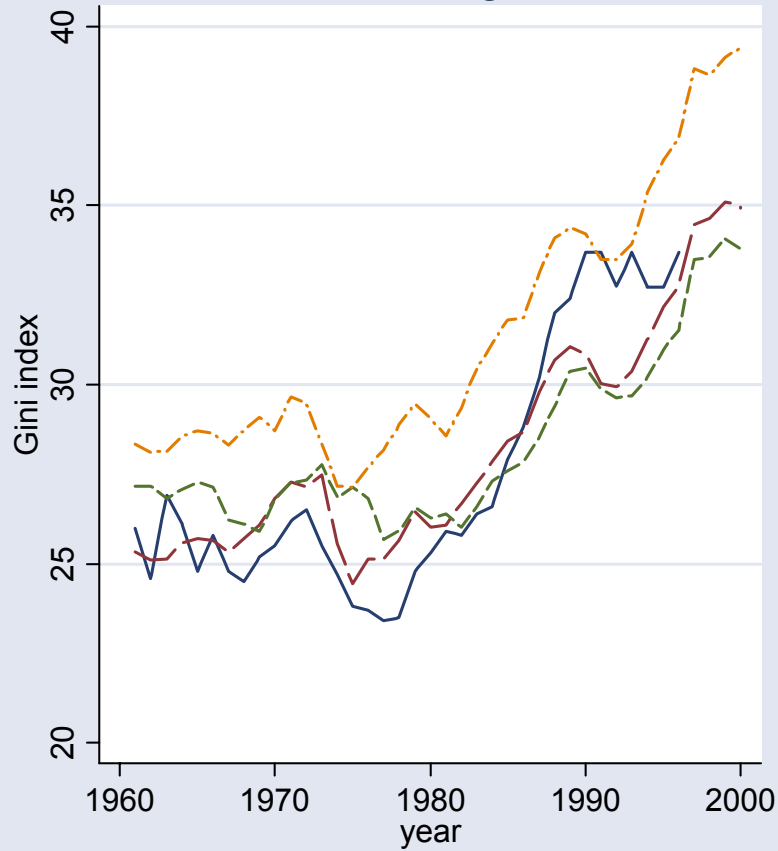


# Counterfactual with US institutions: unemployment benefit

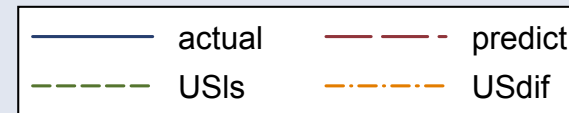
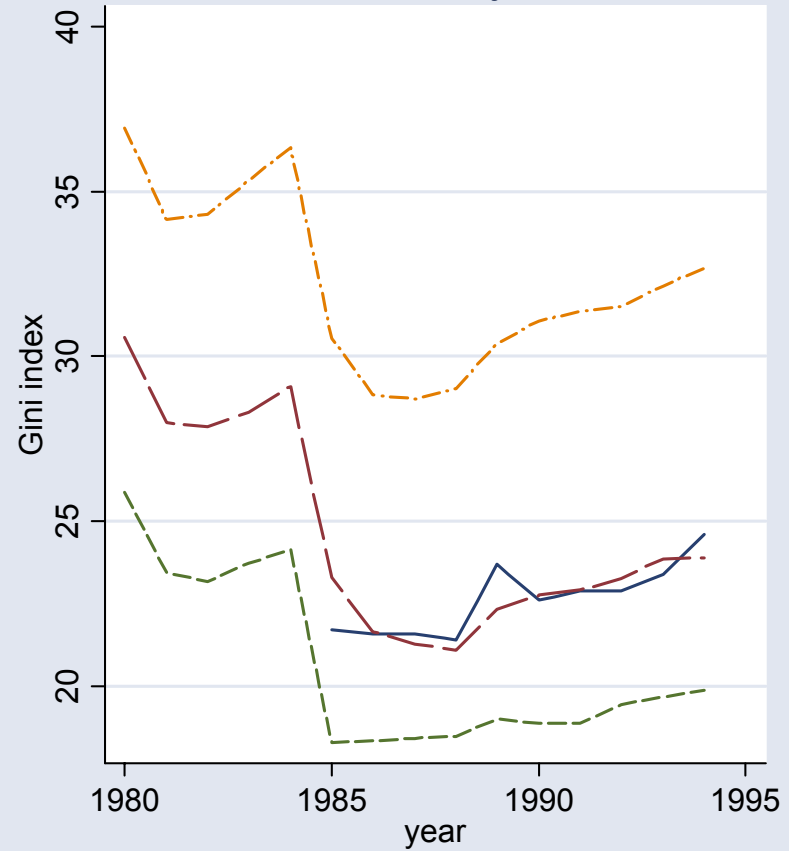


# Counterfactual with US labour share and wage differential

## United Kingdom



## Norway



## Conclusions

- The labour share is still an essential component of personal income inequality
- US more unequal due to wage dispersion
  - offsetting effect of LS (high  $K/L$ )
- Crucial role of unions in reducing personal income inequality
  - at the cost of higher unemployment
- But are there dynamic effects?