The impact of structural reforms on the functional income distribution
A model-based assessment

Werner Röger, János Varga, Jan in 't Veld and Lukas Vogel
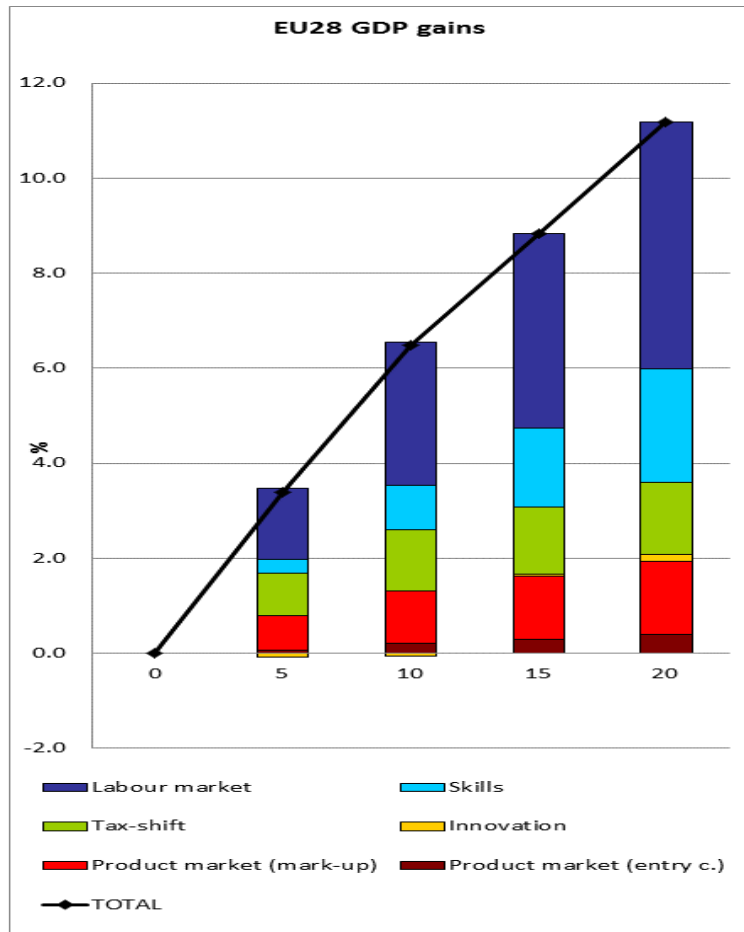
ECFIN Structural Reforms Workshop

Brussels, 19 June 2017

Structural reforms can boost GDP

**EU GDP effects of closing half the gap
with best practice**

EU28 GDP gains

- ➢ **Potentially large GDP effects if each MS closes half the gap vis-à-vis best performers:**

  - EU GDP after 10 years: + 6½ %

  < SE +2% ; …… ; EL +10% >

  - After 20 years: GDP >10%

- ➢ **But how do structural reforms affect income distribution ?**
- ➢ **Is there a trade-off between efficiency and equity ?**

Source: Varga and in 't Veld (2014)

Potential distributional impact of structural reforms

- Existing literature focusses mostly on income distribution for **income deciles**

- E.g. Causa et al. (2015,2016):
    - trade-offs between growth and equity for social protection and labour market reforms
    - complementarity between growth and equity for competition-promoting PMR and higher government spending on education

Contribution of this paper:

- Show impact on **functional income distribution** using a structural macroeconomic model
    - Wage income (per skill group)
    - Capital income
    - Transfer-benefit income

Potential distributional impact of structural reforms

- Objective is to assess EU-wide distributional impact of jointly implemented structural reforms

- This assessment focuses on *potential* reforms in product and labour markets (not actual past reforms):

- *Comparable* structural reforms in terms of 'degree of ambition': closing half the gap with best performers for different structural indicators (Varga and in 't Veld, 2014)

Our main findings

- There can be generally a trade-off between increase in employment of a group (e.g. low-skilled) vs income of the average group member relative to income per capita

- Trade-off for labour market reforms between growth and equity

- Complementarity for product markets reforms and human capital investment

$\Rightarrow$ Labour market reforms combined with existing product market rigidities may be suboptimal

$\Rightarrow$ Requires simultaneous product market reforms

QUEST III R&D model

Global DGSE model (28 member states plus RoW):

microfounded, forward-looking dynamic stochastic general equilibrium

- Households
- Final goods producing firms
- Intermediate goods producing firms
- R&D sector
- Monetary and fiscal authorities
- Disaggregation of labour force: low-, medium, high skilled (employment rate, skill efficiencies)
- Technological change: increasing product variety (Jones, Dixit&Stiglitz)

Overview I
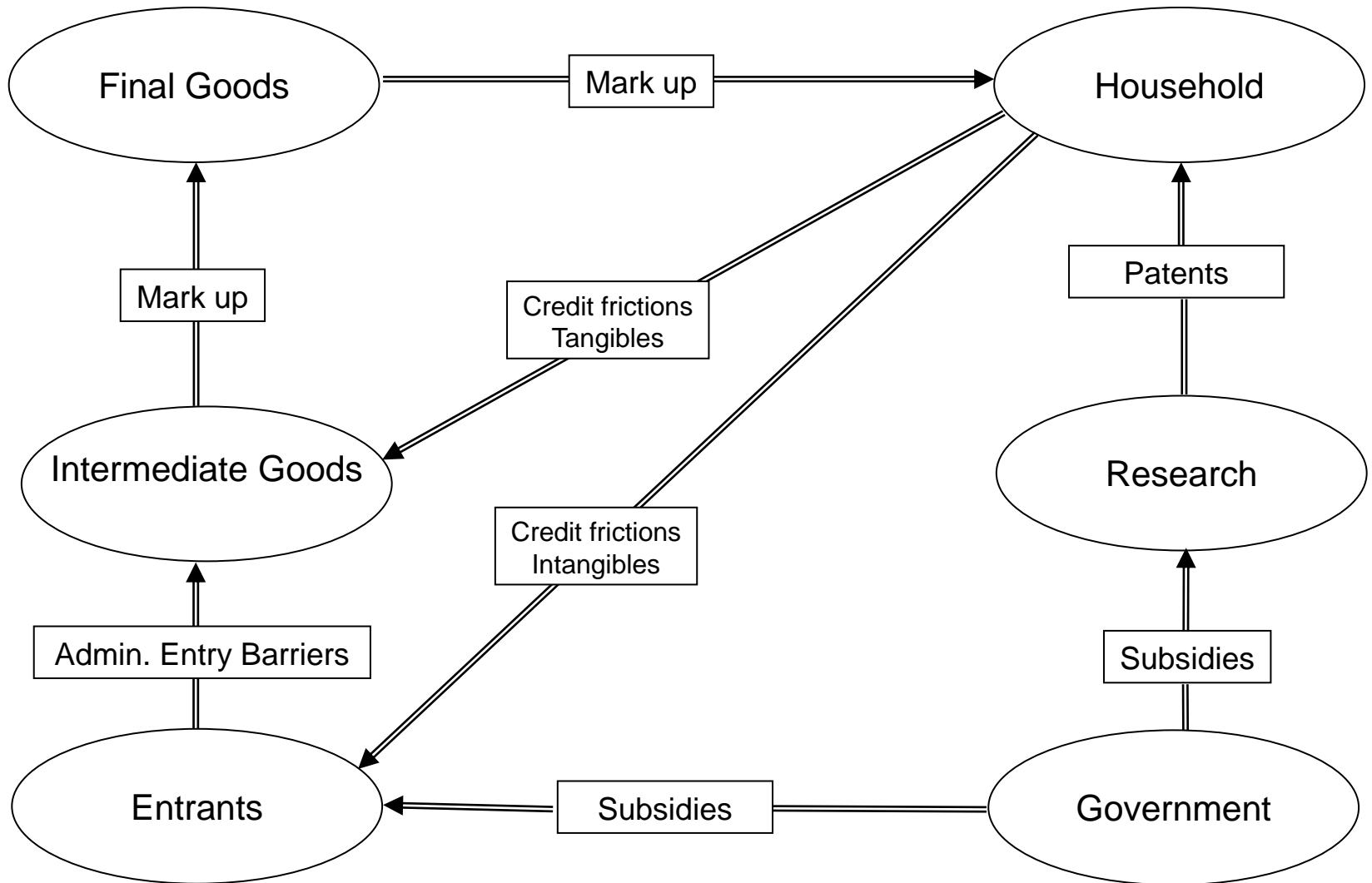
Functional income components

- Net wages :
  - low skilled
  - medium skilled
  - high-skilled
- Unemployment benefits
- Transfers (pensions)
- Profit income
  - Profits tangible capital
  - Profits intangible capital
  - Profits monopoly rents
- Financial income from
  - domestic bonds
  - foreign bonds

Structural Reforms - Benchmarking approach

Structural reforms in

1. Labour markets: labour market participation & unemployment benefit generosity, tax reforms shifting tax burden from labour to consumption

2. Product markets: market competition and regulation,

3. Human capital (Reforms "2.0") : skill structure and R&D expenditure

Quantifies the reforms by assuming a gradual closure of the gap with the 3 best EU performers by 50%

- avoiding unrealistic/unattainable targets
- not actual reform measures
- implementation lags may be longer than assumed

Structural indicators

		AT	BE	BG	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	RO	SE	SI	SK	UK	Average 3 best EU performers
Market competition	Services sector markups (%)	15.3	15.9	11.9	13.4	17.0	15.0	12.7	16.4	19.7	14.9	17.3	15.7	n.a.	15.2	13.8	14.1	17.6	18.2	19.1	10.6	13.9	15.4	15.1	20.8	13.3	15.2	17.2	12.2	11.6
Market regulation	Entry costs (%)	11.7	6.3	5.9	14.3	12.6	9.1	1.8	3.3	23.8	12.3	4.9	2.7	9.2	9.5	2.6	18.0	6.2	4.8	6.5	20.3	6.4	22.1	3.2	5.3	5.0	1.6	5.4	3.9	2.0
Tax reform	Labour to consumption tax revenue ratio	2.4	3.0	0.7	1.1	1.7	2.5	1.9	1.3	1.7	2.6	2.0	2.8	1.0	1.4	1.6	3.0	1.4	1.9	1.4	1.2	2.6	1.5	1.3	1.0	1.9	1.7	1.7	1.5	0.9
Labour market reforms 1.0	Female non-participation (%, 25-55ys):																													
	- low-skilled	30.1	44.4	47.1	28.8	34.1	38.2	32.0	34.3	39.9	27.8	38.4	33.2	47.3	43.6	54.4	50.2	36.5	27.1	36.3	59.1	34.7	46.9	22.4	46.5	31.8	29.2	39.8	40.5	25.8
	- medium-skilled	12.9	19.6	18.1	20.4	17.2	16.2	13.9	17.4	27.8	17.8	17.6	15.3	22.9	20.6	31.2	27.7	14.9	22.5	17.3	21.7	15.4	24.8	8.7	27.6	11.6	11.4	18.9	19.8	10.8
	- high-skilled	8.8	9.0	10.0	11.2	19.1	11.1	7.3	13.6	10.9	10.3	11.7	8.7	8.0	17.2	15.8	17.3	4.5	13.3	9.1	10.8	7.3	9.3	4.8	8.5	6.6	4.9	17.1	11.8	4.8
	Low-skilled male non-participation (%, 25-55ys)	17.1	19.6	33.2	12.3	20.2	16.5	20.2	19.2	7.9	10.4	21.1	13.6	25.4	27.8	20.6	15.0	28.4	8.0	17.6	7.7	14.9	28.0	10.6	22.1	13.9	18.7	24.7	18.0	7.9
	Elderly non-participation (%, 55-64ys):																													
	- low-skilled	22.9	25.0	19.9	19.5	29.5	13.2	16.0	14.4	20.5	15.0	23.6	22.4	28.7	25.6	17.9	20.0	18.3	19.5	16.4	22.6	17.6	32.1	14.5	19.6	12.6	31.4	28.2	14.5	13.4
	- medium-skilled	10.5	10.6	11.2	7.0	11.2	8.3	8.1	9.3	9.9	6.1	9.7	11.9	12.9	14.0	6.7	7.6	11.4	13.9	10.3	6.8	6.9	15.6	4.2	12.3	4.8	15.9	11.4	7.1	5.0
	- high-skilled	5.5	6.5	6.7	4.6	3.5	4.6	4.4	4.5	7.5	3.5	5.4	5.6	8.0	7.0	4.1	4.4	4.0	4.6	4.3	4.4	4.2	4.6	5.0	5.0	2.6	7.3	5.2	5.5	3.2
	Benefit replacement rate* (%)	68.8	65.1	38.5	n.a.	57.4	60.9	73.1	42.8	10.8	46.9	71.7	57.8	n.a.	30.1	74.1	9.2	52.5	72.5	56.6	52.8	71.7	45.6	48.8	25.6	64.3	61.0	39.0	62.2	52.3
Labour market reforms 2.0	Share of high-skilled (%)	6.4	7.9	6.4	9.1	6.0	9.2	7.5	11.4	7.3	9.8	12.2	8.5	4.5	4.9	9.3	4.2	9.9	8.2	7.2	3.5	6.3	6.0	4.1	4.9	9.0	6.7	5.2	9.4	11.2
	Expenditure on high-skilled education (% GDP)	0.4	0.2	0.2	0.4	0.3	0.4	0.5	0.3	0.4	0.3	0.7	0.3	0.2	0.2	0.4	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.5	0.4	0.2	0.3	0.5
	Share of low-skilled (%)	16.9	27.2	18.2	21.5	7.2	13.7	21.7	9.4	32.8	44.5	14.1	24.9	18.7	17.5	23.3	41.8	6.6	19.5	10.6	59.4	24.2	9.9	60.2	23.7	16.8	14.6	8.1	21.6	7.3
	Expenditure on medium-skilled education (% GDP)	3.8	4.0	2.1	4.8	2.8	3.3	4.8	3.1	3.2	2.6	4.3	3.5	1.6	2.8	3.5	2.6	3.4	2.6	2.5	6.2	3.9	2.6	3.0	1.7	3.9	3.1	2.5	3.4	2.9
	R&D tax-credit rates	0.12	0.15	n.a.	n.a.	0.18	-0.02	-0.01	n.a.	0.01	0.34	0.25	0.38	n.a.	0.25	0.26	0.12	n.a.	-0.01	n.a.	n.a.	0.23	0.00	0.49	n.a.	-0.01	0.16	-0.01	0.17	0.41

Note: darker shades correspond to larger gap vis-à-vis the benchmark.
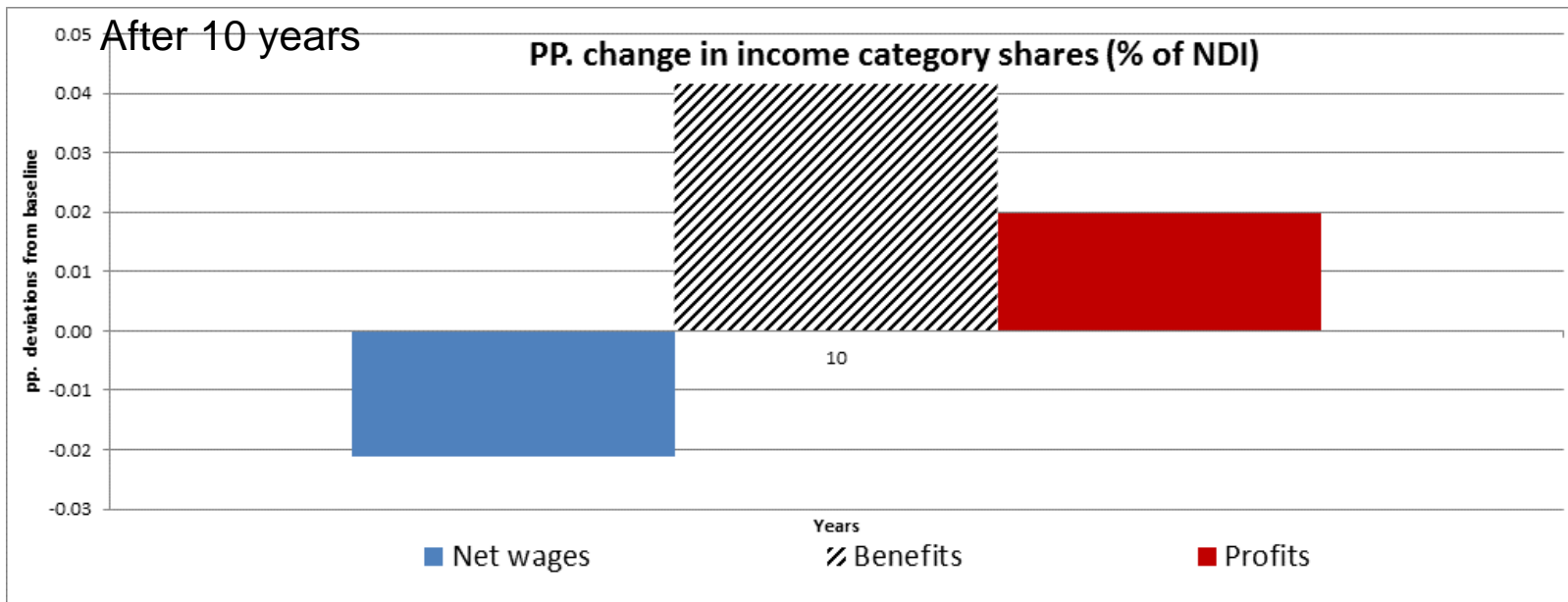
1. Labour market policies

- **Increase participation rates**
  - females

  - low-skilled

  - elderly 55-64yrs

  - budgetary costs and savings:

    → increased child-care expenditure
    → increased benefits
    → reduction in pension payments

- **Reduction in benefit replacement rate** to EU average

  - reduction in benefit payments
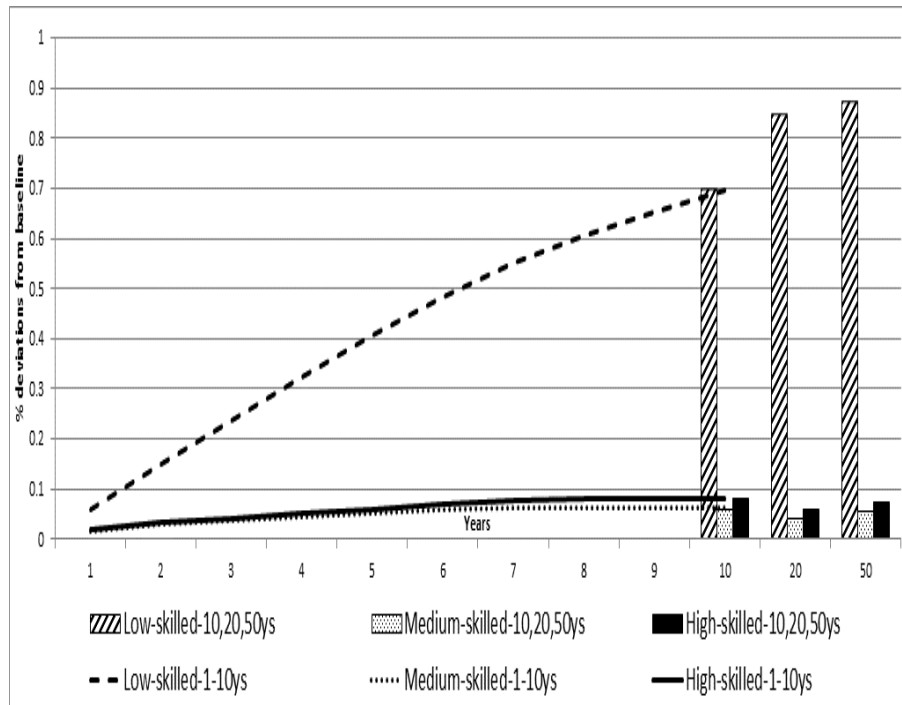
1.1 Low-skilled participation

## Increase in participation rate (~ +4.5 pp at EU level)

After 10 years

PP. change in income category shares (% of NDI)

(chart: "pp. deviations from baseline" vs. "Years"; Net wages bar ≈ -0.02, Benefits (hatched) bar ≈ +0.04, Profits (red) bar ≈ +0.02; marker at 10)

Legend: ■ Net wages ⧄ Benefits ■ Profits

- Wage income as a share of total income is reduced, while other income categories increase.

- Share of benefit income jumps, since an increase in low skilled employment increases entitlements to benefits because of a higher risk of unemployment.

1.1 Low-skilled participation

Total wage income

Net real wages
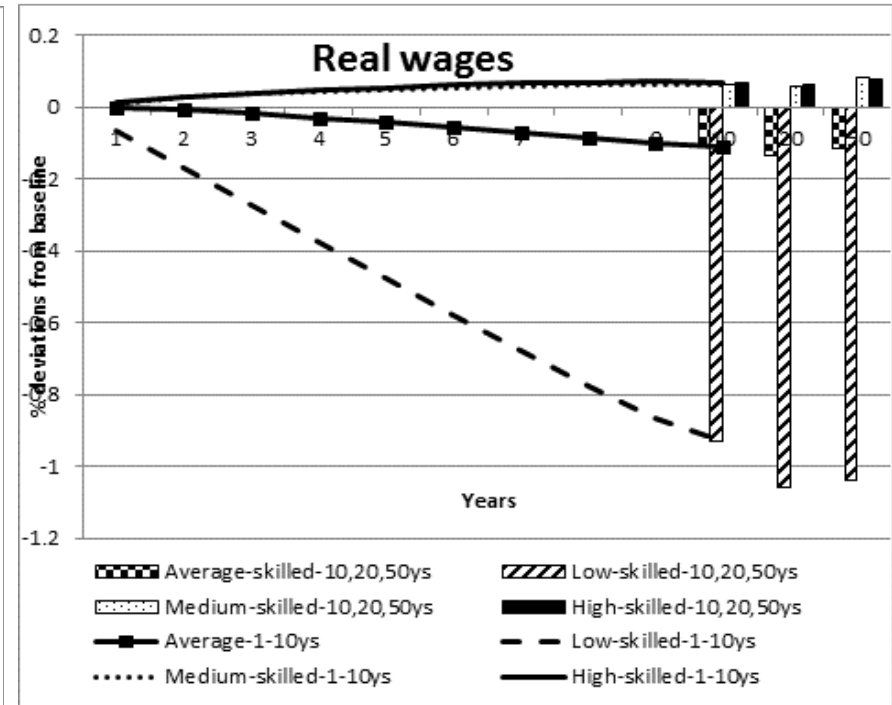
- **Trade-off for low skilled between higher employment and lower absolute and relative wages – but total wage income increases**

- **The income of medium and high skilled workers is not affected much by this participation change.**

Total wage income effect depends crucially on elasticity of substitution

$\sigma > 1$

L^L

LD

L^L_2

L^L_1

LS

w_2 w_1

w

$\sigma < 1$

L^L

LD

LS

w_2 w_1

w
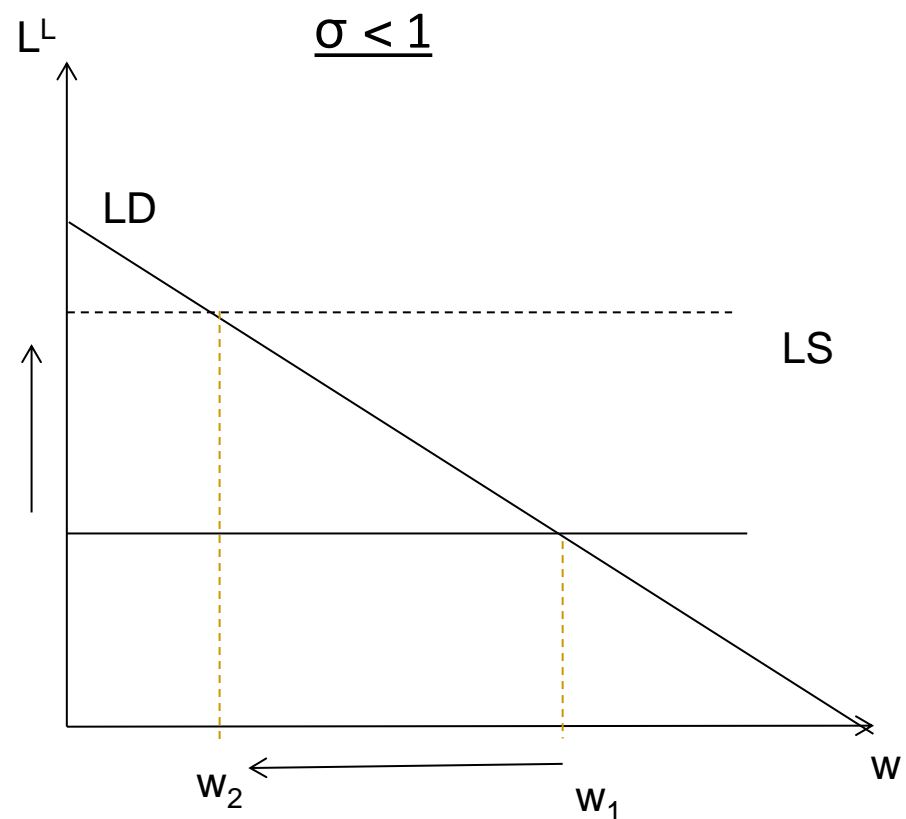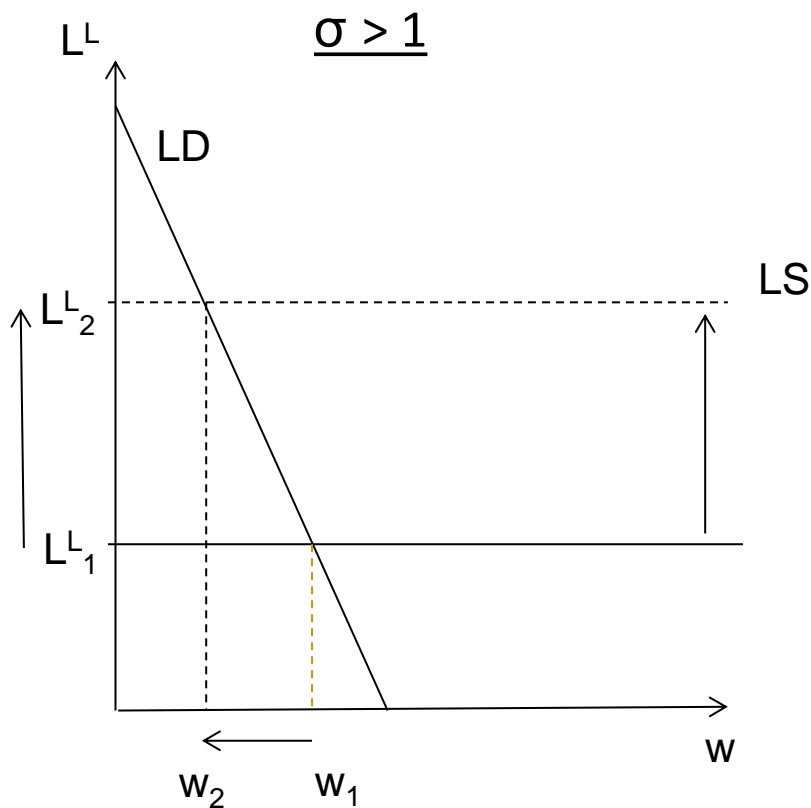
1.2 Unemployment benefit reforms (~-3.5 pp. EU)

Income shares (Year 10)
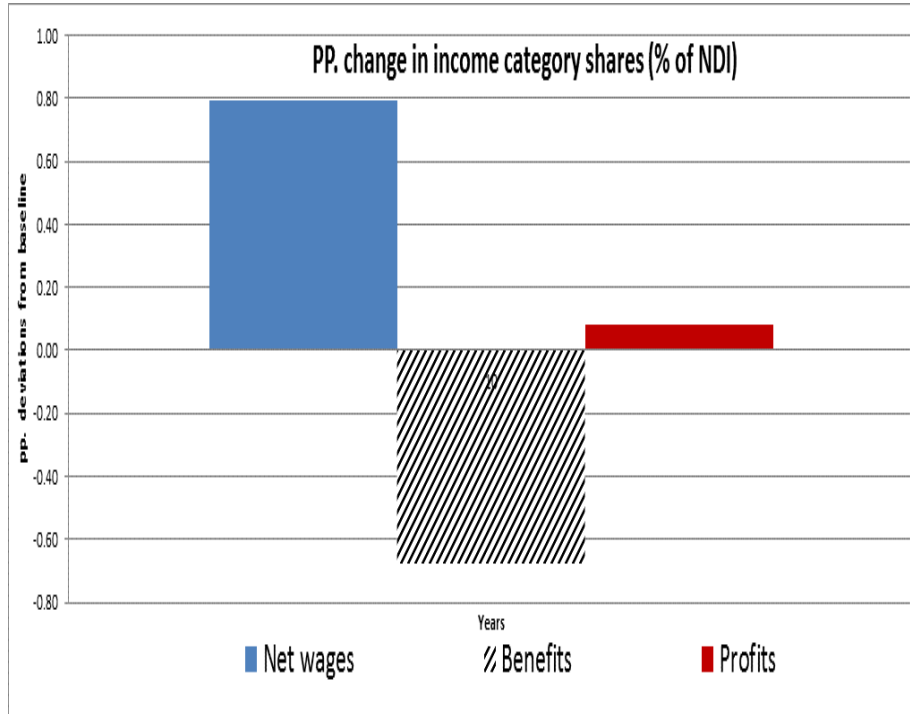
Net wages relative to NDI
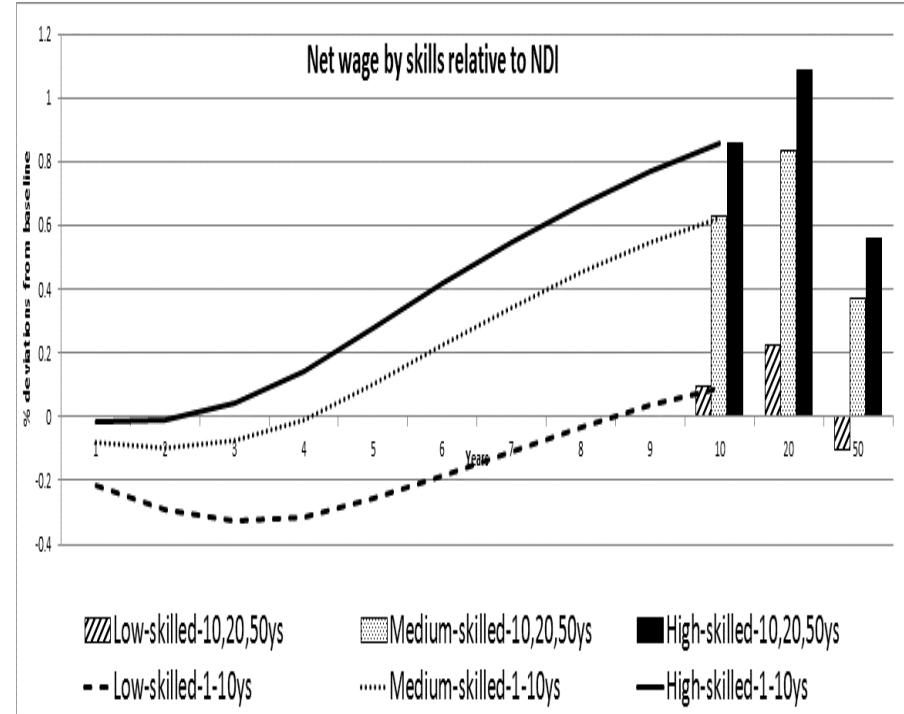
- Downward pressure on wages (lower reservation wage)
- Boost to labour demand and positive output gains
- The share of wage income is increasing because of a decline in benefit income (less so for low-skilled)

2. Product market reforms - competition

Negative mark-up shocks (~ -1.5 pp at EU level)

- Increases the demand for all factors of production: (tangible capital, intangible capital and labour)

  - Increases wage income (sum) due to higher employment and real wages

  - Share of profit income shrinks

- But if combined with exit of less productive firms:

=> lay-offs , i.e. less favourable wage income development

2. Product market reforms - competition

Income shares (% of all income) -

Standard scenario

With cut in overhead labour
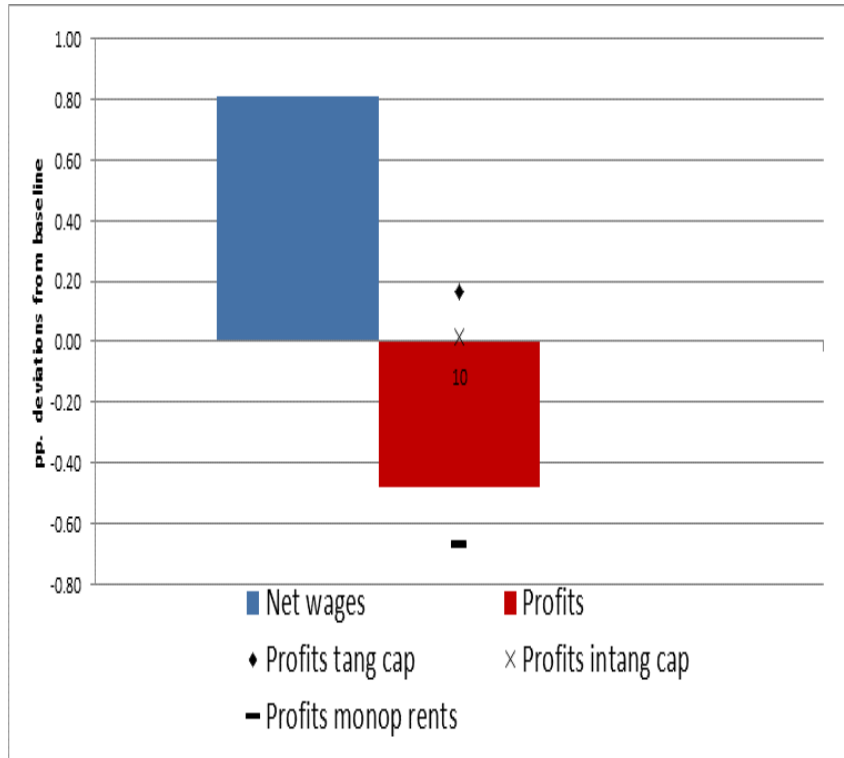
- Higher wages and employment
- share of profit income shrinks

But assumes no job destruction
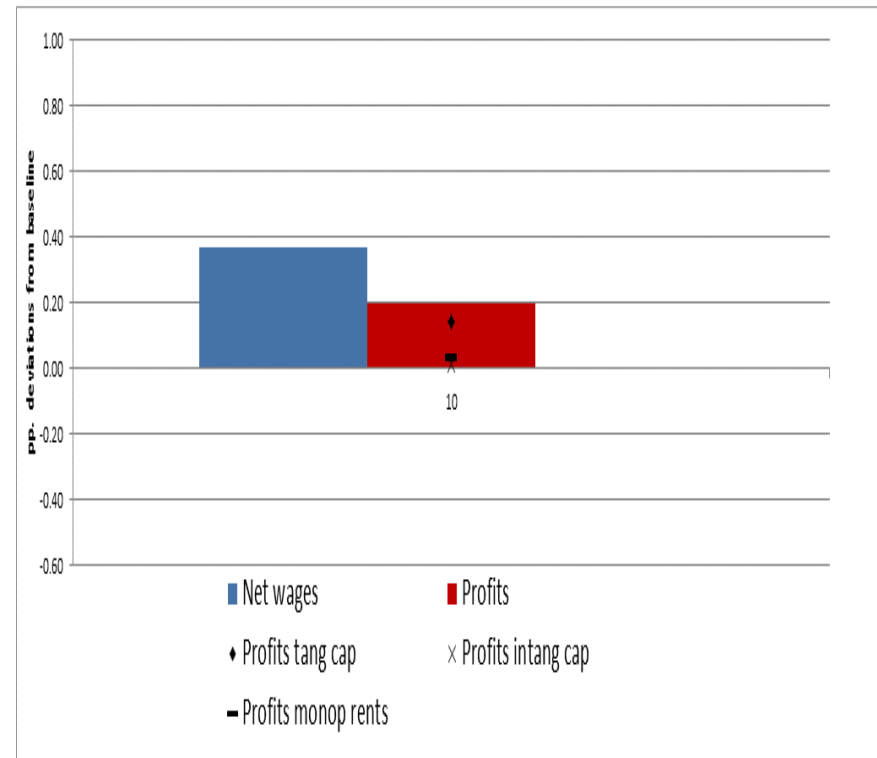
If less productive firms exit (job lay-offs): less favourable wage share development

3. Human capital investments ("reforms 2.0")

- **Increase the share of medium skilled** (without accounting for education quality standards)

- Reform costs modelled as increase educational spending

- The effect of schooling takes time to build up due to the cohort effects and the gains are only becoming apparent in the medium term.

- Therefore the later the skill supply problems are addressed, the later MS can reap the long-run benefits and in the meantime the more they will fall behind the innovation frontiers.

3. Skills upgrade from low to medium (~12pp. EU)

Total wage income
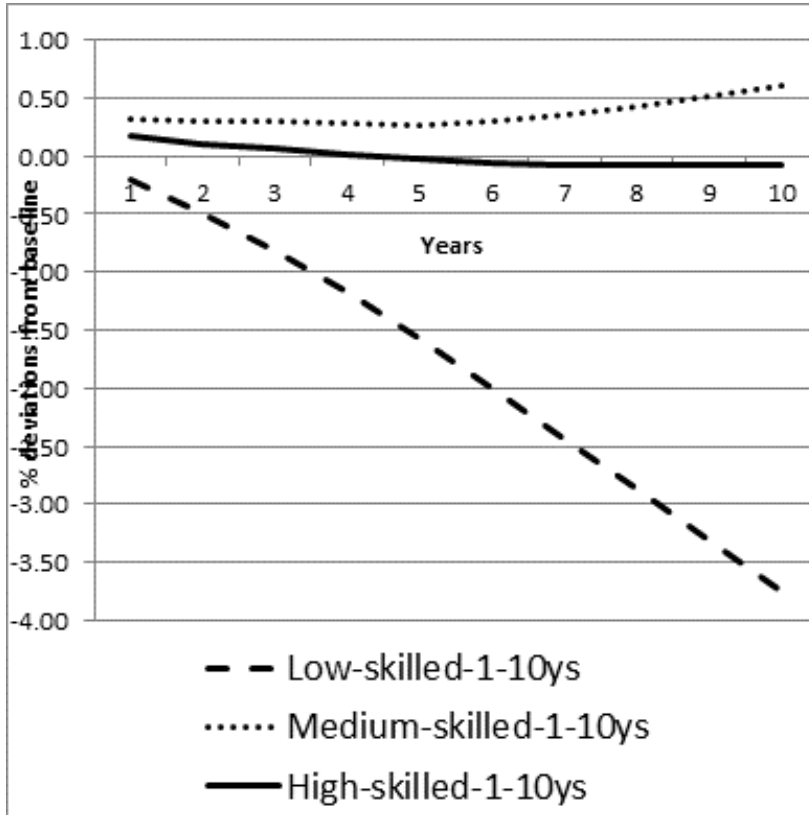
Net wages
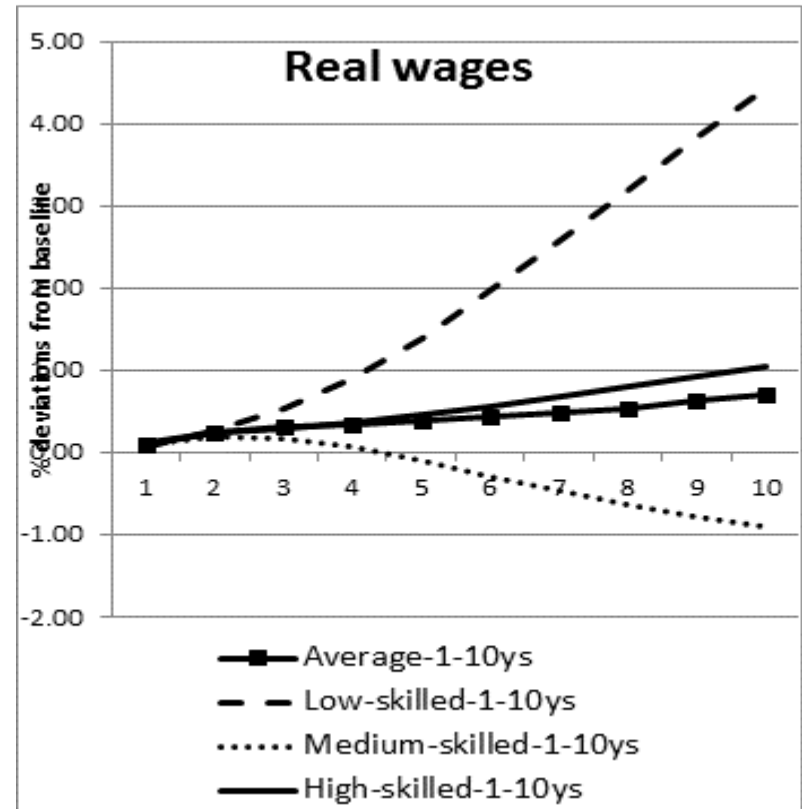
Trade-off between an increase in employment of a particular group and the income of the average group member compared to income per capita.

3. Skills upgrade from low to medium
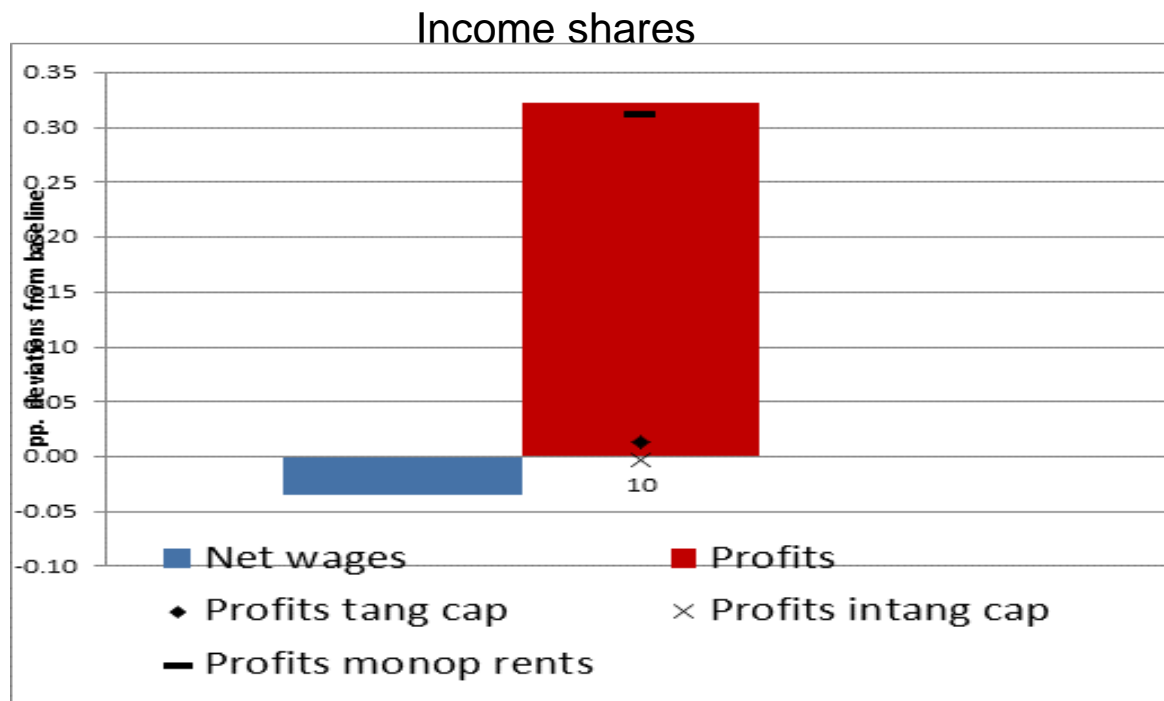
Income shares

- **Profit income increases mostly because of the monopoly rents component of the profit income (increase in output reduces share of fixed cost in production) – assumes entry in goods market remains restricted**

$$Y_t = A^{\frac{1-\alpha}{\theta}} K^{\alpha} CES\left(L_{Y,t}\right)^{1-\alpha} - FC(overhead)$$

- **If combined with increased entry: lower profit income, higher wage share**

1-3 Changes in income shares by type of reform
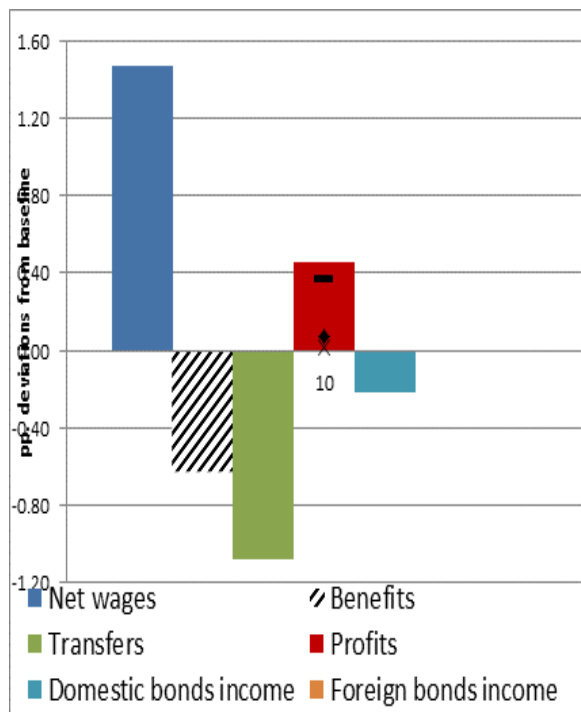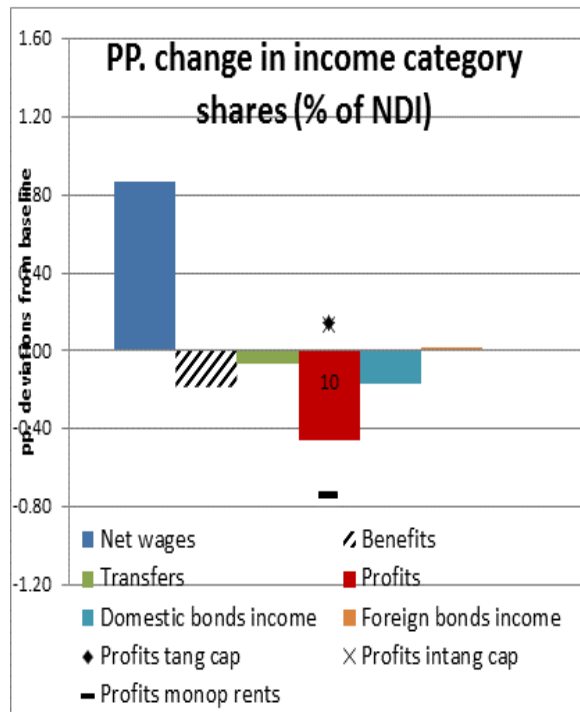
Labour participation reforms   **Product market reforms**   **Human capital reforms**
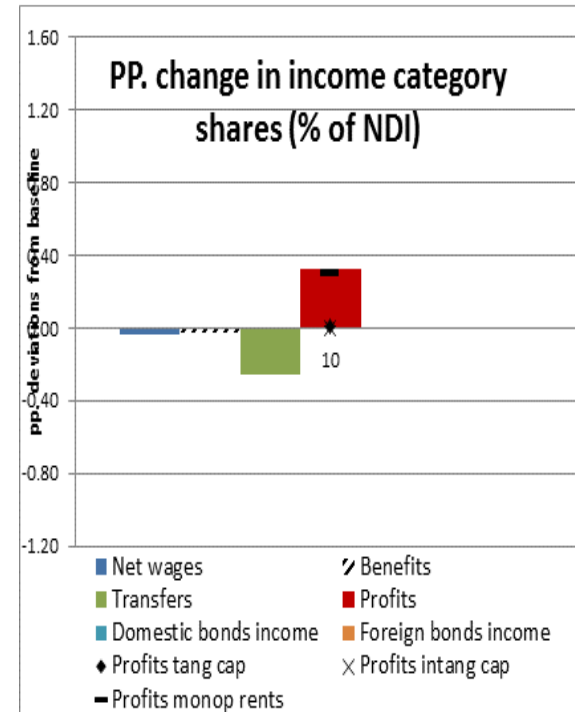
- Labour participation reforms: wage share ↑, profit share ↑
- Product market reforms: wage share ↑, profit share ↓ (but less pronounced with exit of firms)
- Human capital reforms: wage share (↓), profit share ↑
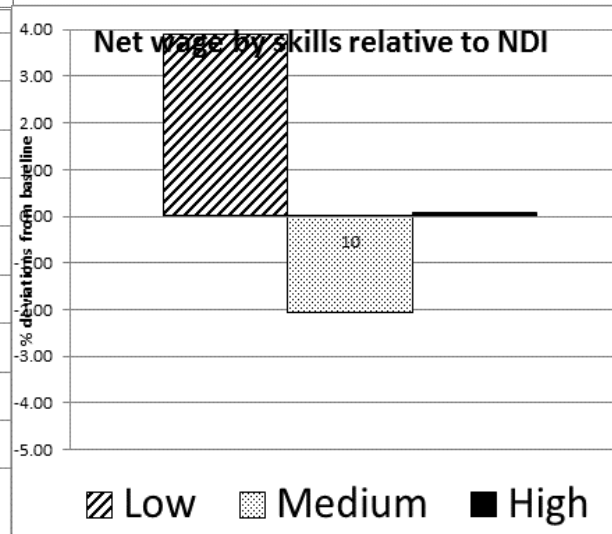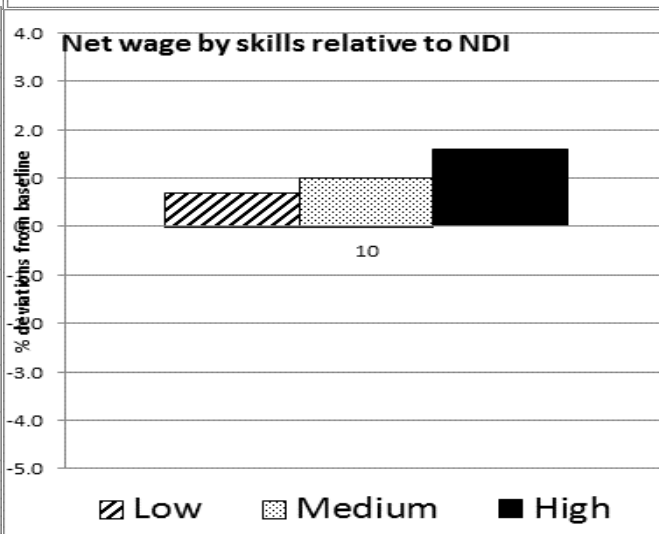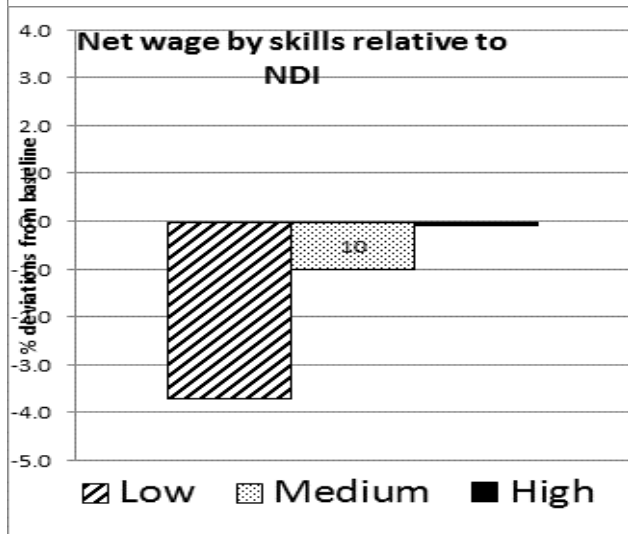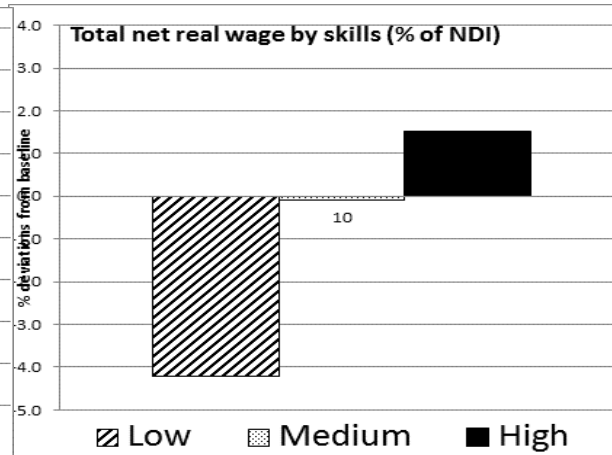   - Profit income increases mostly because of the monopoly rents component of the profit income.
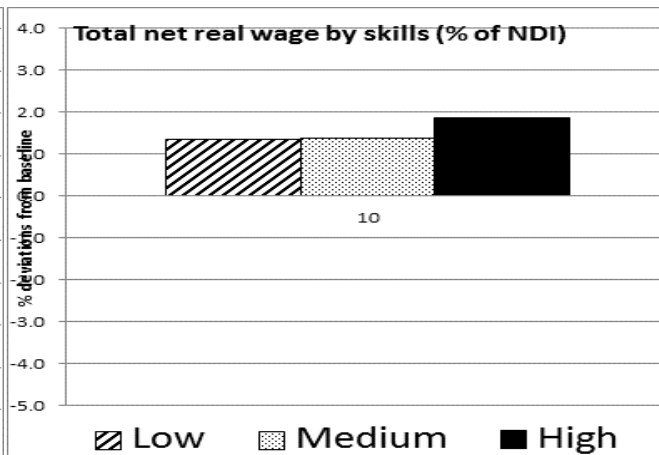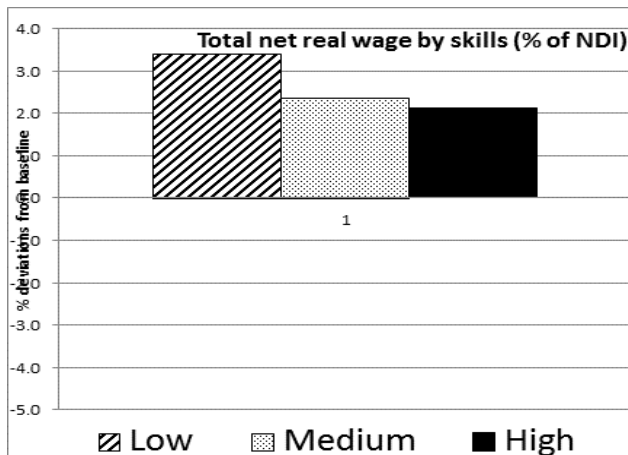
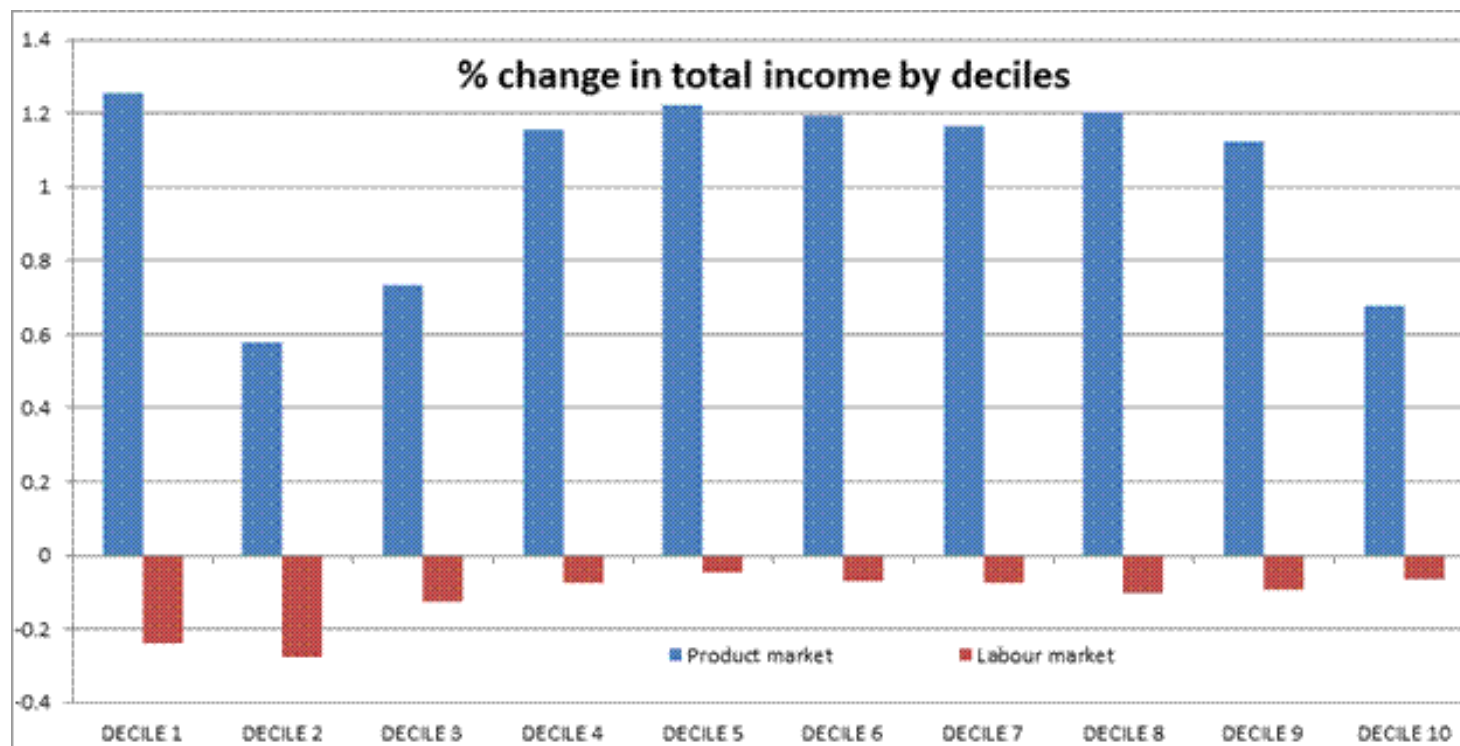# 1-3. Total wage income vs relative wages

Labour participation reforms **Product market reforms** **Human capital reforms**

From functional income distribution to deciles: combine model output with EU SILC data - France

% change in total income by deciles

Conclusions

- Labour participation reforms: Trade-off between growth and equity

    - Widening of wage dispersion, but income enhancing through higher employment

    - Trade-off between an increase in employment of a particular group and the income of the average group member compared to income per capita.

- Product market reforms: total wage income increases => Complementarity between growth and equity

- Human capital reforms: also complementarity

=> Labour market reforms to be combined with product market reforms and human capital reforms

Thank you

# Extra slides

Literature review - Motivation

- Distributional impact of structural reforms little researched

- Empirical works: OECD, Causa et al (2015, 2016)
  → trade-offs between growth and equity for social protection and labour market reforms
  → complementarity between growth and equity for competition-promoting PMR and higher government spending on education

- Simulation works mostly on taxation:
  – microsimulation studies (Decoster et al. 2010)
  – GE macro studies (Burgert and Roeger, 2014)

Overview II
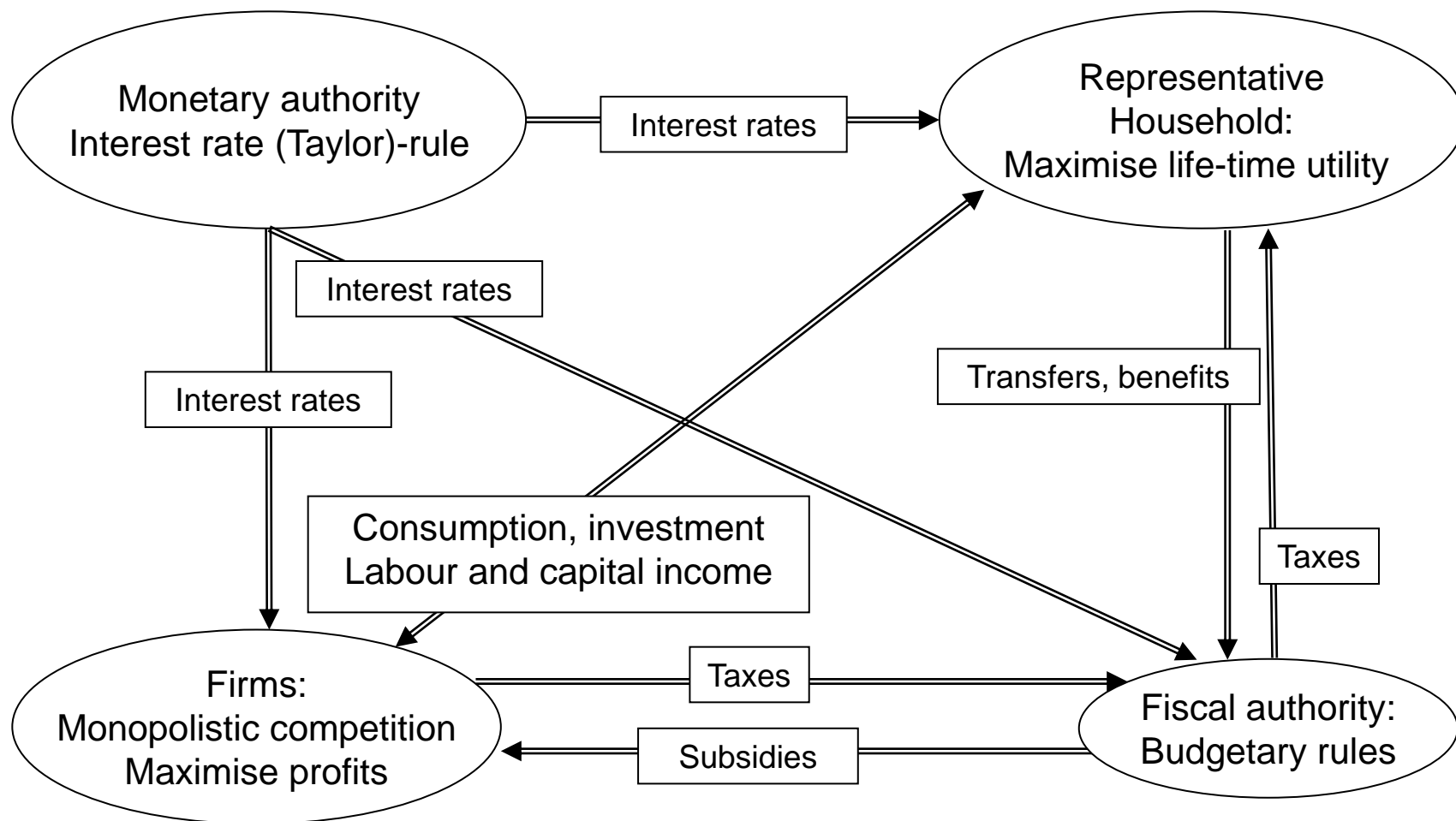
Impact of jointly implemented reforms

GDP

Employment
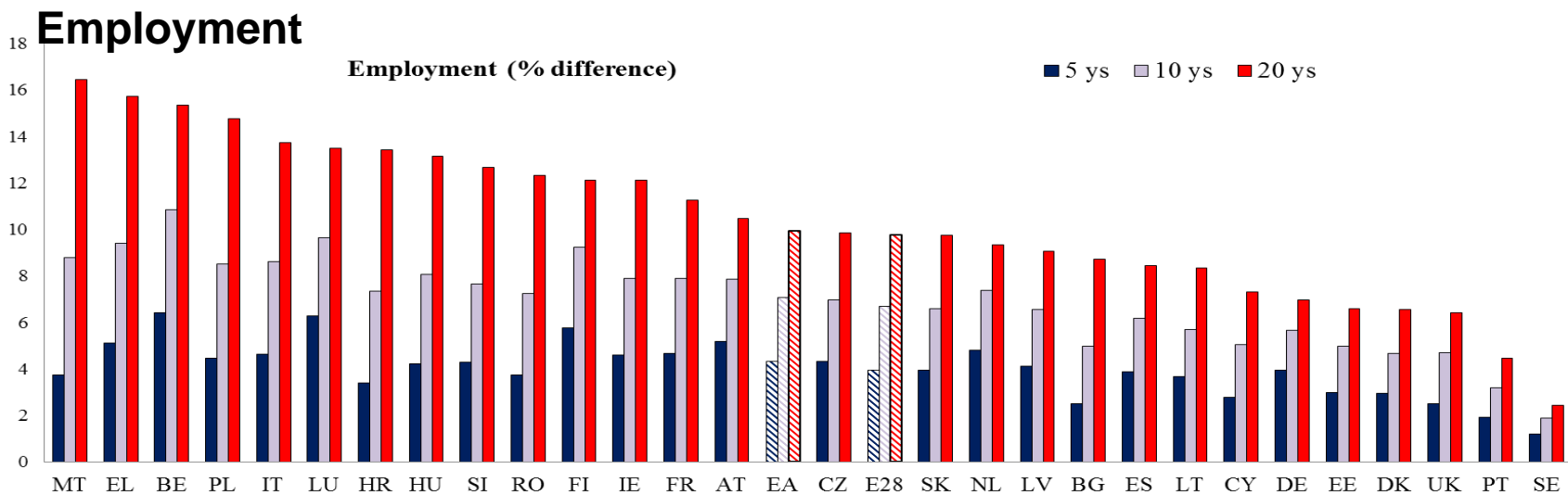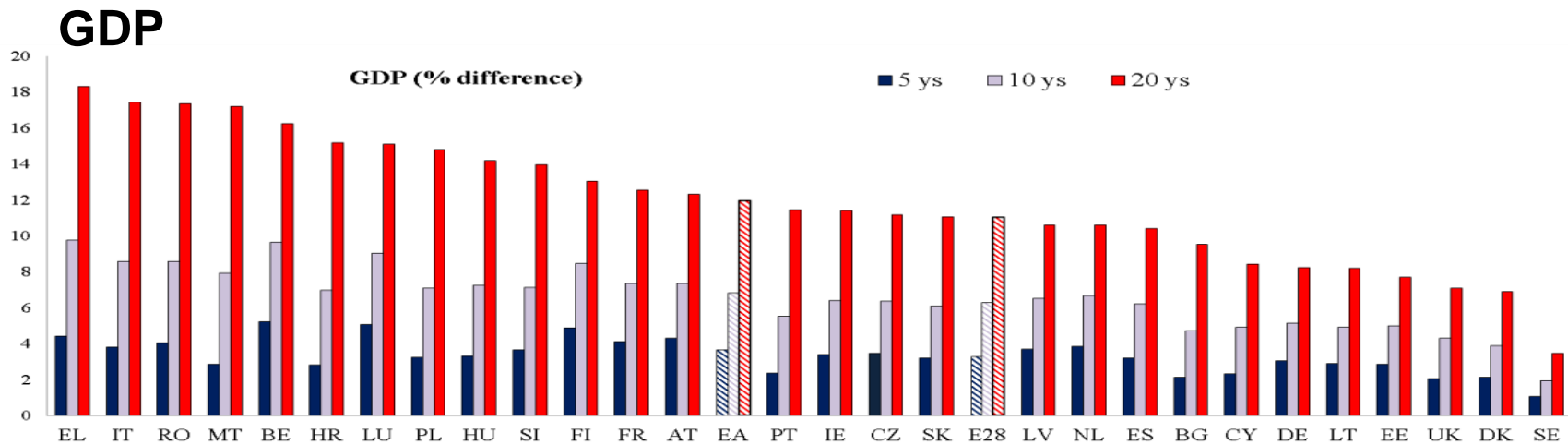
Source: QUEST simulations

Income categories

Households – budget constraint

- supply labour (L_t),

- hold tangible, intangible capital and financial assets (K_t, A_t, B_t).

- receive
  - → net wage income (W_t^N),
  - → rental incomes (i_t^K) and (i_t^A) and interest income (i_t)
  - → profits
  - → unempl. benefits (BEN_t), transfers (TR, pensions)

$$(1 + t_t^C)C_t + \Delta B_t + P_t^K J_t^K + (1 - \tau^A)P_t^A \Delta A_t = i_{t-1}B_{t-1} + W_t^N L_t + i_{t-1}^K P_t^K K_{t-1} + i_{t-1}^A P_t^A A_{t-1} + PR_t^Y + A_t PR_t^x + BEN_t + TR_t$$

Income categories

Households – budget constraint

$$\underbrace{(1 + t^C)C_t}_{consumption} + \underbrace{\Delta B_t + P_t^K J_t^K + (1 - \tau^A)P_t^A \Delta A_t}_{financial, tangible, intangible\ assets\ p.} =$$

$$\underbrace{i_{t-1}B_{t-1}}_{\substack{financial \\ wealth\ inc}} + \underbrace{W_t^L L_t}_{wages} + \underbrace{i_{t-1}^K P_t^K K_{t-1} + i_{t-1}^A P_t^A A_{t-1}}_{tangible, intangible\ c.income}$$

$$+ \underbrace{PR_t^Y + A_t PR_t^x}_{profits} + \underbrace{BEN_t}_{\substack{unempl. \\ benefits}} + \underbrace{TR_t}_{transfers}$$

Employment and wage income divided up into skill groups

$$W_t^N L_t = \underbrace{(1 - t_t^{W_L})W_t^L L_{Lt}}_{low} + \underbrace{(1 - t_t^{W_M})W_t^M L_{M,t}}_{medium} + \underbrace{(1 - t_t^{W_H})W_t^H (L_{H,t} + L_{A,t})}_{high}$$

Production

Intermediate production

$$x_t^i = K_t^i$$

$$PR_{t,i}^x = P_t^{x_i} x_t^i - i_t^K P_t^K K_t^i - i_t^A P_t^A = 0 \text{ (free entry)}$$

Final goods production

$$Y_t = \left(L_{Y,t} - FC_L\right)^\alpha \left(\int^{A_t} \left(x_t^i\right)^\theta di\right)^{(1-\alpha)/\theta} - FC_Y$$

Labour CES aggregate of skill types

$$L_{Y,t} = \left(\sum_{s \in \{L,M,HY\}} \Lambda_s^{1/\mu} \left(\chi_L L_{L,t}\right)^{(1-\mu)/\mu}\right)^{\mu/(1-\mu)}, \mu > 1$$

$$PR_t^Y = (1 - t_t^P)(Y_t - (1 + scc_t)W_t N_t) - A_t x_t P_t^x$$

Income categories

Profits

Divide net profit income into three categories

Rental income, tangibles $= (i_{t-1}^{K} - \delta^{K})P_t^{K}\,K_{t-1}$

Rental income, intangibles $= (i_{t-1}^{A} - \delta^{A})P_t^{A}A_{t-1} + \underbrace{\tau^{A}P_t^{A}\Delta A_t}_{tax-credits}$

Monopoly rents

$$= (1 - t_t^{P})(P_t^{Y}Y_t - (1 + scc_t)W_t\,L_t) - \underbrace{A_t x_t P_t^{x}}_{\substack{intermediate \\ goods\ purchase}}$$