

# Wealth Distribution and Political Conflict in the Model of Transition from Stagnation to Growth

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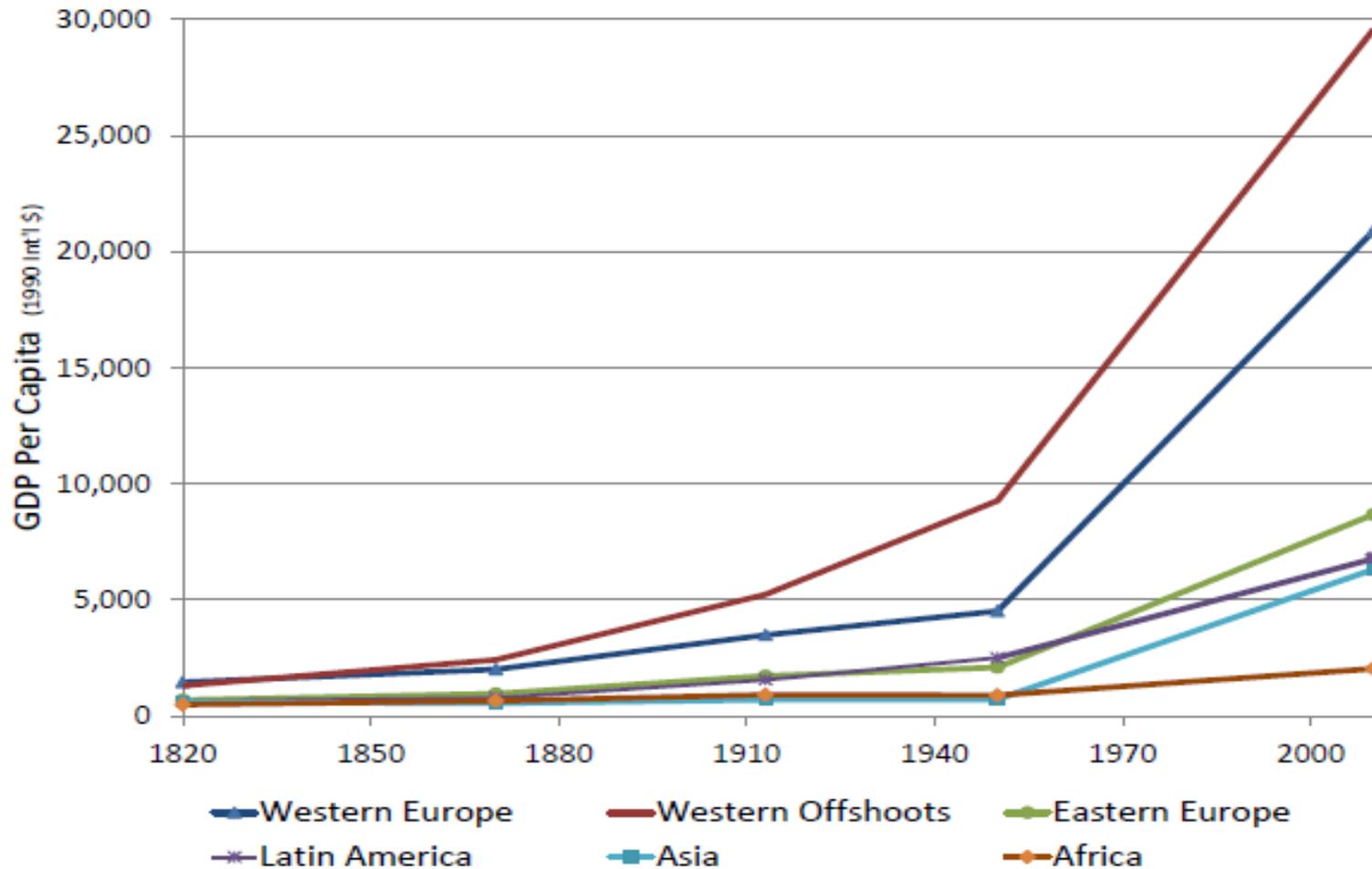
October 3, 2016

## Motivation-1

Rich-to-poor countries ratio in terms of GDP per capita is now around 20:1, while it was 3:1 before the Industrial Revolution. What can explain these huge and increasing differences in cross-country living standards?

- The variation in moments of take-off from stagnation to growth, and the pace of this process: Pritchett (1997), Hansen and Prescott (2002), Galor (2005, 2011) – **the Great Divergence phenomenon**

# The Great Divergence



Source: O. Galor, “Unified Growth Theory”

## Motivation-2

The transition to modern growth regime was accompanied by:

- The political conflict between the supporters and opponents of modern sector development
  
- The endogenous change in institutional set-up as the outcome of this political conflict
  - adoption of new technologies
  - education reforms
  - property rights protection

## Motivation-3

But why countries differ in the outcomes and intensity of this this conflict?

What determines whether the pro-growth policies accumulate sufficient support or not?

We study the impact of **inequality in wealth distribution** on the outcomes and intensity of political conflict during the stage of transition from stagnation to growth

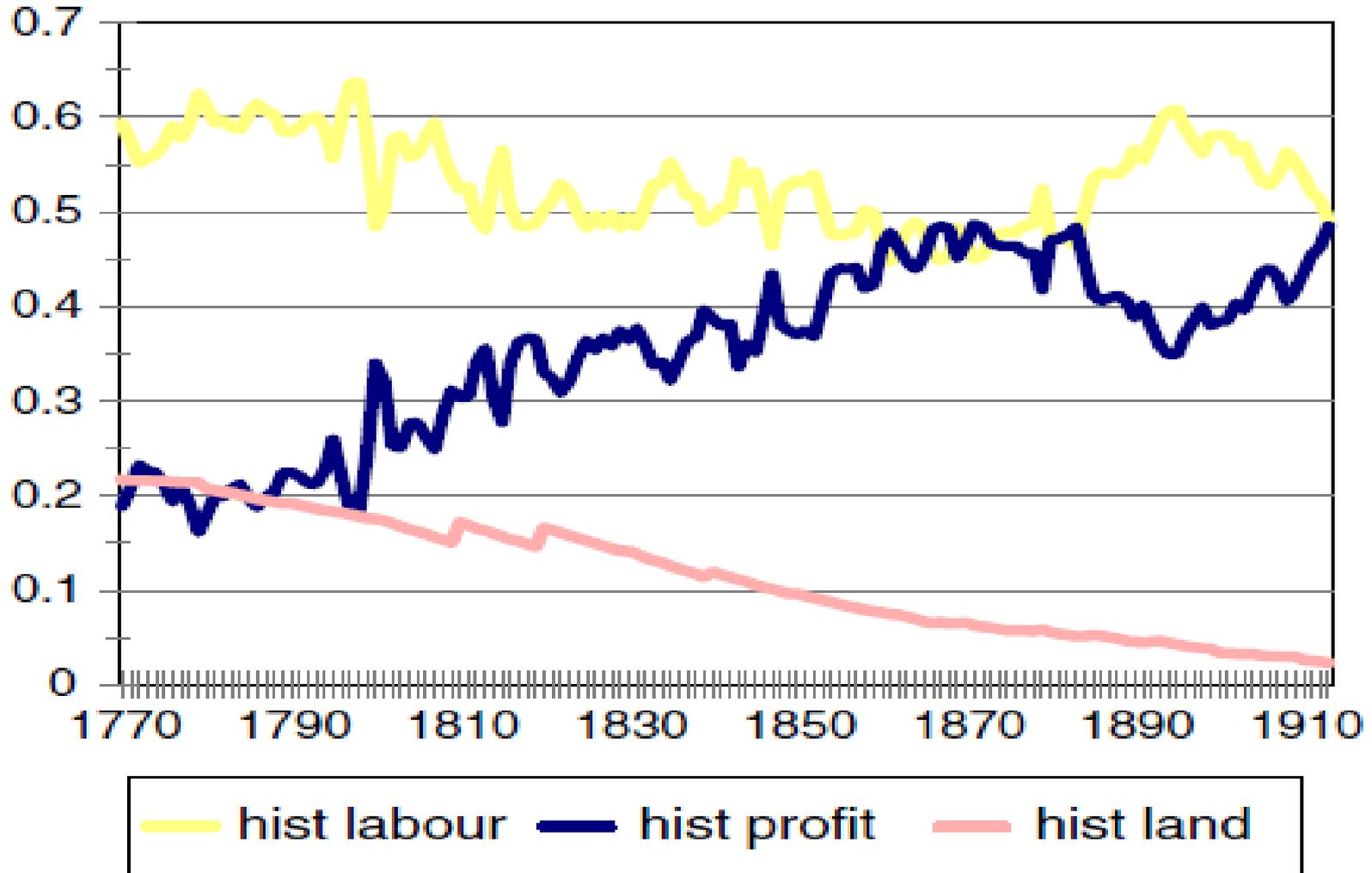
## Motivation-4

Why the shape of wealth distribution is important?

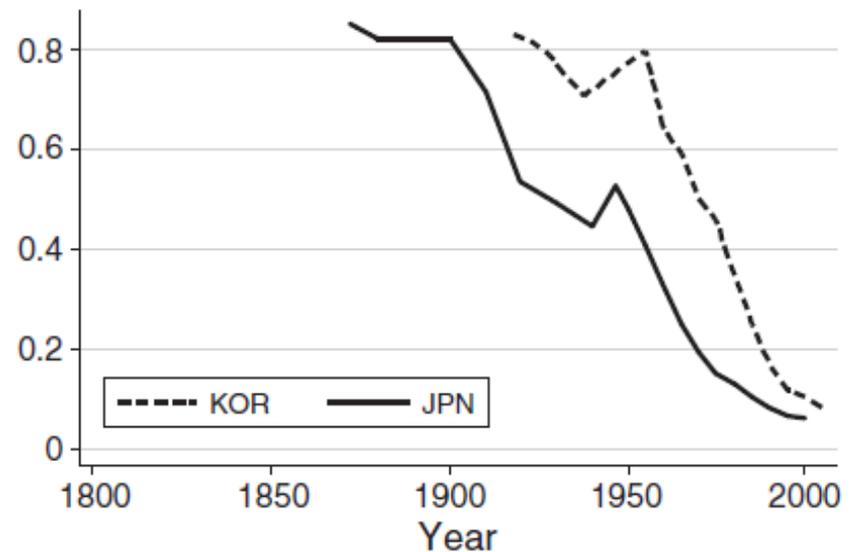
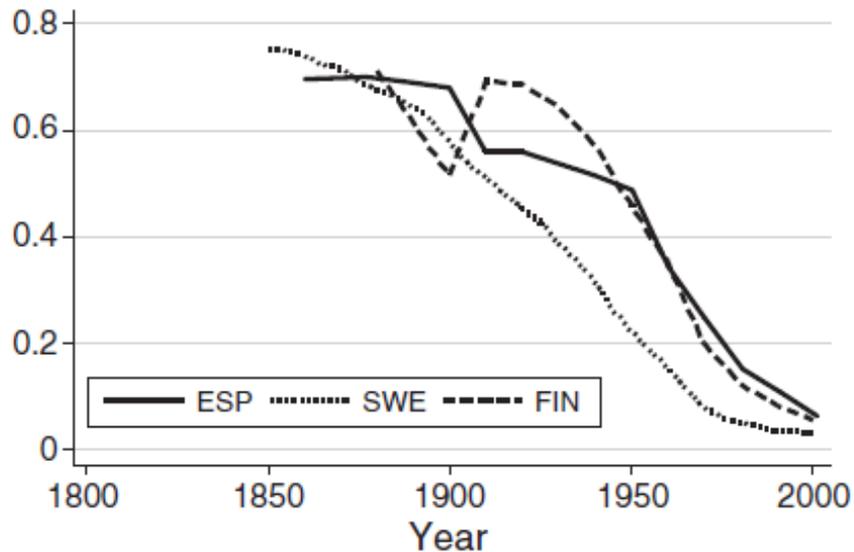
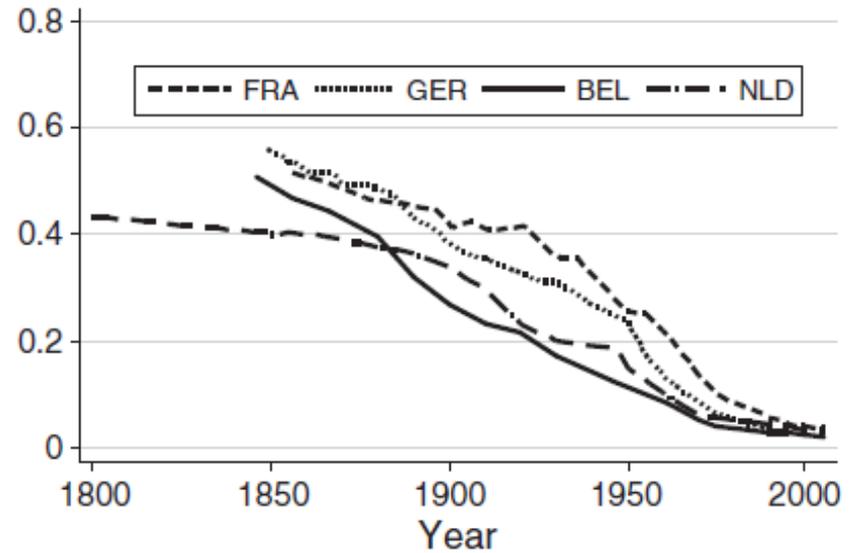
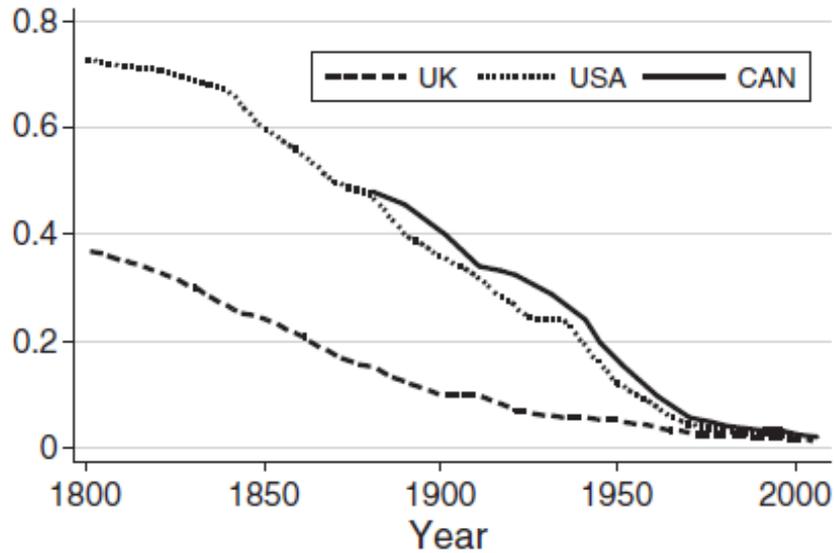
- It affects the preferred level of institutional strength of each agent
- It shapes the incentives and abilities of agents to participate in political conflict
- It determines the degree of collective action problem inside competing groups

“Stylized facts” on the key macroeconomic variables during the industrialization and the distribution of assets

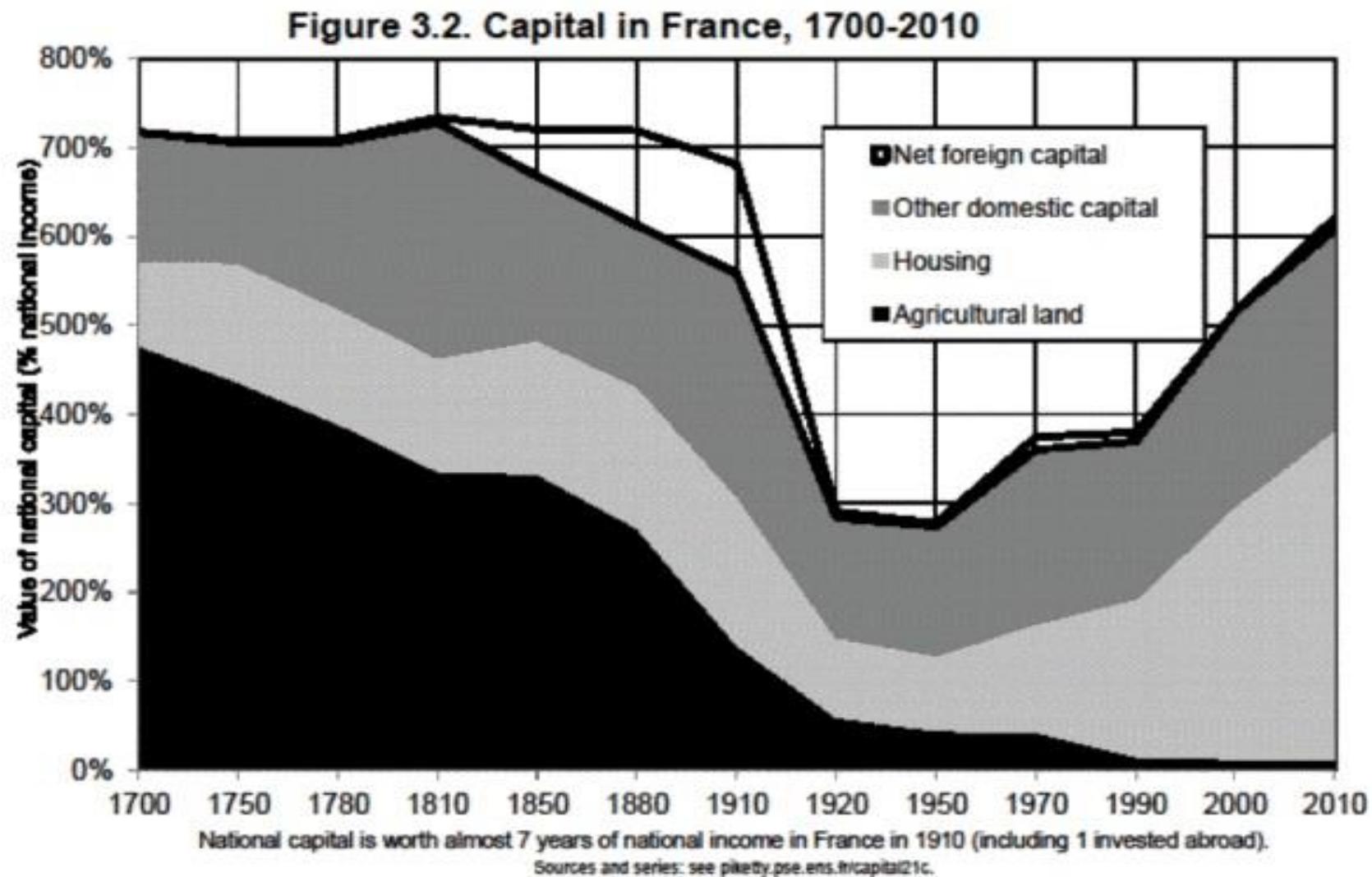
Changes in the structure of wealth (Source: Allen, 2009, “Engel’s pause, technical change...”)



# Reallocation of labor (Alvarez-Cuadrado and Poschke, 2011, “Structural change out of agriculture...”)



# Changes in the structure of wealth



Source: Piketty, 2014, Capital in the 21<sup>st</sup> century

# The distribution of firm sizes across countries (source: Kinghorn and Nye, 1996)

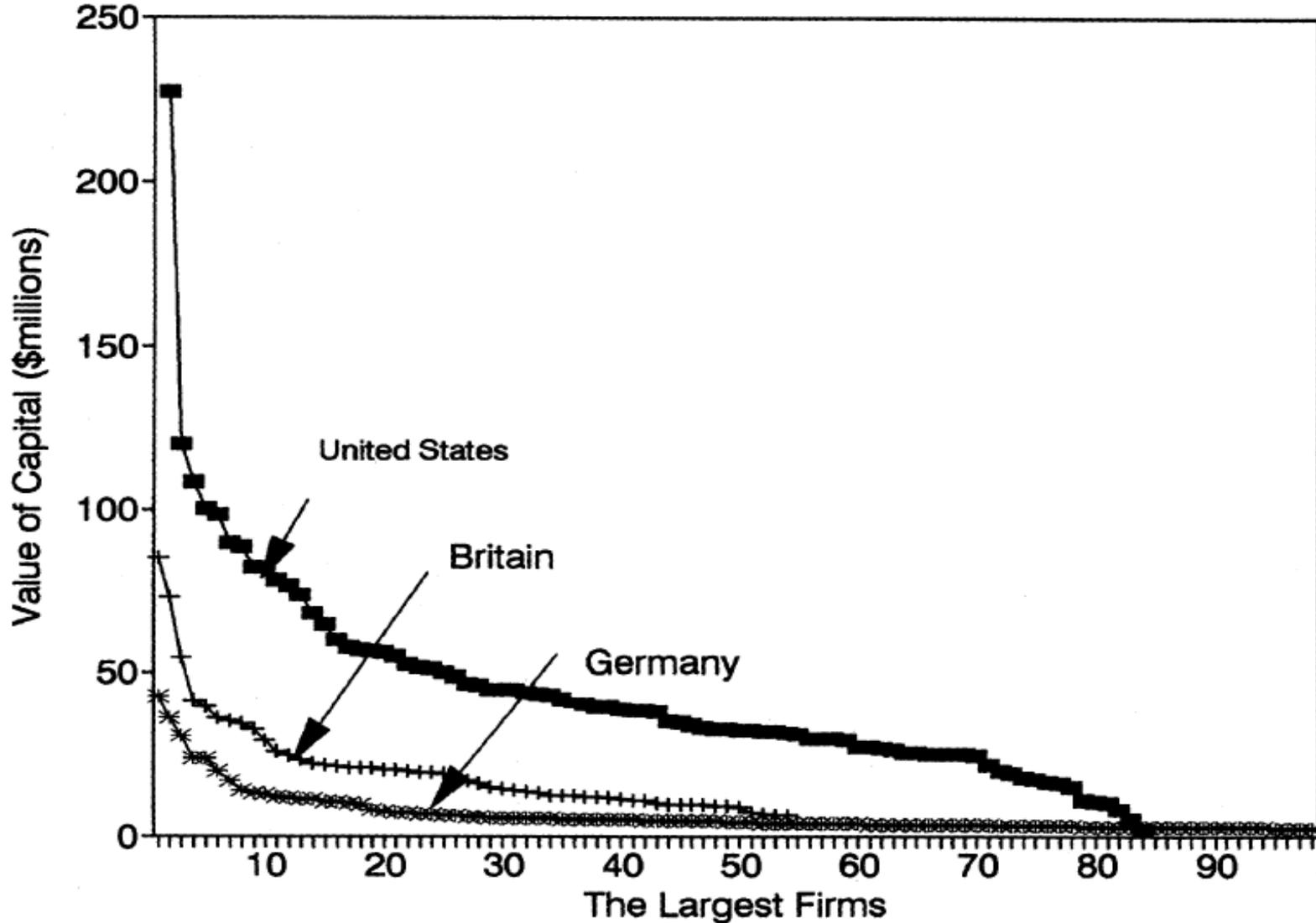


FIGURE 2

DISTRIBUTION OF THE LARGEST FIRMS AS MEASURED BY CAPITAL VALUE

## England: Corn Laws and the “Anti-Corn Law League” (source: Jordan, 1927)

**Corn Laws (1815-1846)** – restrictions and tariffs on imported grain, which led to higher grain prices, favorable for domestic traditional sector, and harming the modern sector and labor.

**Anti-Corn Law League (est. 1838)** – led by Richard Cobden, financed and supported by the biggest manufacturers (mainly those

Only after the sufficient concentration of funds emerged in the industrial sector, the League was created and started to influence the situation through public opinion and the Parliament

## Our contribution-1

1. We build a two-sector unified growth model of the transition from stagnation to growth with asymmetric public policy contest
2. The outcome of public policy contests between heterogeneous agents determines the pace of industrialization and growth.
3. The model captures several key features of the industrialization period:
  - Gradual structural change (reallocation of labor from traditional to the modern sector)
  - Rising share of capital gains and declining share of land rents in the overall incomes
  - The political conflict between the old elite and the new emerging capitalist elite; an “inverted-U” dynamics of conflict intensity

## Our contribution-2

The shape of wealth distribution within and between the opposing groups affects the agents' incentives and abilities to invest in political conflict. Hence, it affects the pace of development

- We show that higher concentration of landownership hampers institutional development and growth during industrialization period
- The impact of inequality in capital distribution is class-specific and stage-specific

## Our contribution-3

- Higher concentration of capital inside the landless agents is growth-enhancing; the effect is stronger for later stages of industrialization
- The effect of between-group inequality in capital ownership
  - May lead to an adverse effect of capital concentration (if the biggest capital owners are also big landowners)
  - Depends on the stage of industrialization (in the early stages higher share of traditional elite in the modern sector hampers development, and vice versa)

## Related Literature

- The models of transition from stagnation to growth: Galor, Weil (2000), Hansen, Prescott (2002), Jones (2002), Strulik, Weisdorf (2008)
- The political economy of industrialization: Llavador and Oxoby (2005), Bertocchi (2006), Boschini (2006), Galor et al. (2009), Desmet and Parente (2014)
- Public policy asymmetric contests: Epstein and Nitzan (2006), Baik (2008), Nitzan and Ueda (2014)
- Inequality, institutions and growth: Engerman and Sokoloff (2000), Sonin (2003), Gradstein (2007), Mokyr and Nye (2007), Galor et al. (2009), Amendola et al. (2013)

# The Model

# Timing

1. The generation is born and it receives capital and land bequests, which are used in production processes and generate incomes next period
2. Agents may invest part of their income in conflict in order to increase the probability of the desired institutional outcome
3. After the institutional set-up is determined, agents receive their post-conflict incomes, where factor prices are affected by the conflict outcome
4. Finally, agents optimally allocate their post-conflict income between consumption and bequest to their offspring, and the game repeats

# Production

## Two-sector growth model

- Traditional sector (land and labor):  $Y_T = A_T T^\alpha L_T^{1-\alpha}$
- Modern sector (capital and labor):  $Y_M = A_M K^\alpha L_M^{1-\alpha}$

- Technological progress is stochastic in the M-sector:

$$A_{M,t+1} = \begin{cases} \gamma A_{M,t}, & \text{if } R \\ A_{M,t}, & \text{if } S \end{cases}, \gamma > 1$$

- Lagged spillover to the traditional sector:  $A_{T,t+1} = A_{M,t}$
- Goods are perfect substitutes in consumption
- Labor is absolutely mobile between the two sectors.

# Population

OLG model with bequests where each generation lives for two periods

- Total population is constant
- Three initial classes: landowning elite (E), share  $\lambda_E$  of population, landless capitalists (C), share  $\lambda_C$  (who own capital but not land), and workers (W), share  $1 - \lambda_E - \lambda_C$

Both within- and between-group inequality:

- $K_0$  is distributed according to  $G(K)$  among capitalists and the elite
- $T$  is distributed among the elite according to  $H(T)$ .
- Land is fixed and non-tradable, hence  $T_t = T = \text{const}$  and  $T_t^i = T^i = \text{const}$

# Incomes

- All agents receive capital and (if in an agent is a landowner) land bequests in the first period, and invest these bequests in production process
- The second period is divided into two parts, pre-conflict and post-conflict; agents get their incomes before conflict and after the conflict
- All agents work (inelastic labor supply) and receive wage income

Therefore, income of agent  $i$  is the following:

$$I_t^i = w_t^i + k_t^i R_t + T^i \rho_t$$

## Factor Prices

Wages and land income are non-competitive in traditional sector:

$$w_{T,t} = (1 - \tau)(1 - \alpha)A_{T,t} \left( \frac{T}{L_{T,t}} \right)^\alpha$$
$$\rho_t = \left( 1 + \frac{\tau(1 - \alpha)}{\alpha} \right) \alpha A_{T,t} \left( \frac{L_{T,t}}{T} \right)^{1-\alpha}$$

while factor prices are competitive in the modern sector:

$$w_{M,t} = (1 - \alpha)A_{M,t} \left( \frac{K_t}{L_{M,t}} \right)^\alpha$$
$$R_t = \alpha A_{M,t} \left( \frac{L_{M,t}}{K_t} \right)$$

# Preferences and optimization

Individual preferences over consumption and bequests are given by

$$U^i = (1 - \beta) \ln(c_{t+1,1}^i) + \beta \mathbb{E}(\ln(c_{t+1,2}^i) + \ln(b_{t+1}^i))$$

Two budget constraints:

$$c_{t+1,1}^i + e_{t+1}^i \leq I_{t+1,1}^i - \text{pre-conflict income allocation}$$

$$c_{t+1,2}^i + b_{t+1}^i \leq I_{t+1,2}^i - \text{post-conflict incomes allocation}$$

## Second stage optimization

$$U_2^i = \ln(c_{t+1,2}^i) + \ln(b_{t+1}^i)$$

$c_{t+1,2}^i + b_{t+1}^i \leq I_{t+1,2}^i$  - post-conflict income allocation

Solution:

$$(c_{t+1,2}^i)^* = \frac{1}{2} \cdot I_{t+1,2}^i, \quad (b_{t+1}^i)^* = \frac{1}{2} \cdot I_{t+1,2}^i$$

$$V^i = \ln(I_{t+1}^i)$$

# First stage optimization

Pre-conflict utility:

$$V^i = (1 - \beta) \ln(c_{t+1,1}^i) + \beta \mathbb{E}(\ln(I_{t+1,2}^i))$$

$$c_{t+1,1}^i + e_{t+1}^i \leq I_{t+1,1}^i$$

where  $e_{t+1}^i$  is the money-input in conflict.

- Therefore, political preferences are driven by post-conflict incomes
- Post-conflict incomes depend on the outcome of political conflict, since conflict outcome affects relative productivity of sectors, labor reallocation, and hence, factor prices

# Political Conflict

We model conflict as asymmetric public policy contest game (see e.g. Epstein and Nitzan, 2007; Baik, 2008; Nitzan and Ueda, 2014)

- The outcome of a contest is a realization of a certain policy, Reform (R, increase in  $A_{M,t}$ ) or Status-quo (S, no increase in  $A_{M,t}$ )
- The benefit from winning a contest is a utility gain due to higher income:

$$\Delta_R^i = V_R^i(R) - V_R^i(S), \text{ and } \Delta_S^j = V_S^j(S) - V_S^j(R)$$

- The probability of reform policy is given by the following Tullock-type CSF:

$$p_R = \frac{\sum e_R^i}{\sum e_R^i + \sum e_S^j} = \frac{E_R}{E}$$

# Political preferences

## Proposition 1. (Political preferences)

- **Landowners' capital and land holdings.** For a given  $K_t, T, g,$  and  $\tau,$  there exists a (possibly empty) subset  $\mathcal{L}_R$  of landowners, who have sufficiently high  $k^i$  and low  $T^i,$  such that they support reform policy (industrialization)
- **Strength of support.** For a given  $K_t, T, g,$  and  $\tau,$  the larger  $k^i$  is; the stronger the support for industrialization is, i.e.  $(\Delta_R^i)'_{k^i} > 0,$  and the larger  $T^i$  is; the weaker the support for industrialization is, i.e.  $(\Delta_R^i)'_{T^i} < 0.$
- **The end of conflict.** There exists a threshold level of aggregate capital  $\bar{K},$  such that for all  $K_t \geq \bar{K}$  even the most eager supporter of status-quo policy switches his preferences towards industrialization; therefore, there is no conflict, and  $p_R = 1$  when  $K_t \geq \bar{K}.$

# Individual Contributions to the Conflict

Expected gains from participation in conflict for the supporter of reform policy:

$$\max_{e_R^i, c^i} p_R \cdot \ln \beta \left( \frac{I_R}{I_S} \right) + (1 - \beta) \cdot \ln(c^i)$$
$$\text{s.t. } c^i + e^i \leq I^i$$

$$\text{Solution (best response): } (e_R^i)^* = I^i - \frac{1 - \beta}{\frac{E - E_R}{E} \Delta_R^i}$$

- expenditures increase with own income and stake in conflict
- decrease with other group members aggregate expenditures (free-riding) and overall expenditures (lower individual ability to influence the process)

# Public policy contest equilibrium

**Share functions approach** (Cornes and Hartley, 2000, 2005; Nitzan and Ueda, 2014)

$$E_R^* = \sum (e_R^i)^* = \sum \left( I_{t+1,1}^i - \frac{1-\beta}{E-E_R} \Delta_R^i \right)_+ \rightarrow \text{unique equilibrium}$$

group effort (applying monotonicity and continuity arguments)

$$E: \frac{E_R}{E} + \frac{E_S}{E} = 1 \rightarrow \text{unique aggregate effort equilibrium}$$

# Within-group inequality in capital distribution

## Proposition 2 (within-group distribution of capital)

- If  $E > \bar{E}$ , then any strict Lorenz-worsening redistribution of capital within the landless group of agents increases the probability of reform policy. The effect is larger for the larger values of the aggregate capital.
- The opposite holds for land distribution inside the landowners

### Reasoning:

- Conflict vs Consumption channel
- Gains from winning in a conflict channel
- Free-riding channel (contributors and non-contributors)

# Between-group inequality in capital distribution

Denote by  $\eta$  a share of  $K_t$  that belongs to capitalists, while  $(1 - \eta)K_t$  belongs to landowners.

## **Proposition 3 (between-group distribution of capital)**

- If  $\frac{T}{K_t} \geq \kappa$  then a lower  $\eta$  results in lower  $p_R$ , i.e. lower pace of industrialization
- if  $\frac{T}{K_t} < \kappa$  then a lower  $\eta$  leads to higher  $p_R$  and faster industrialization.

# Model Dynamics

# Dynamic equations

## ➤ Capital accumulation

$$K_{t+1} = \beta Y_t = \beta (A_{T,t} T^\alpha L_{T,t}^{1-\alpha} + A_{M,t} K_t^\alpha L_{M,t}^{1-\alpha}),$$

## ➤ Employment in the traditional sector

$$L_{T,t} = 1 - L_{M,t}$$

## ➤ The expected rate of productivity growth in the modern sector

$$\mathbb{E} \left( \frac{A_{M,t}}{A_{M,t-1}} \right) = p_{R,t} (\gamma - 1),$$

## ➤ Technological progress in the traditional sector

$$A_{T,t} = A_{M,t-1}$$

# Conditional steady-state

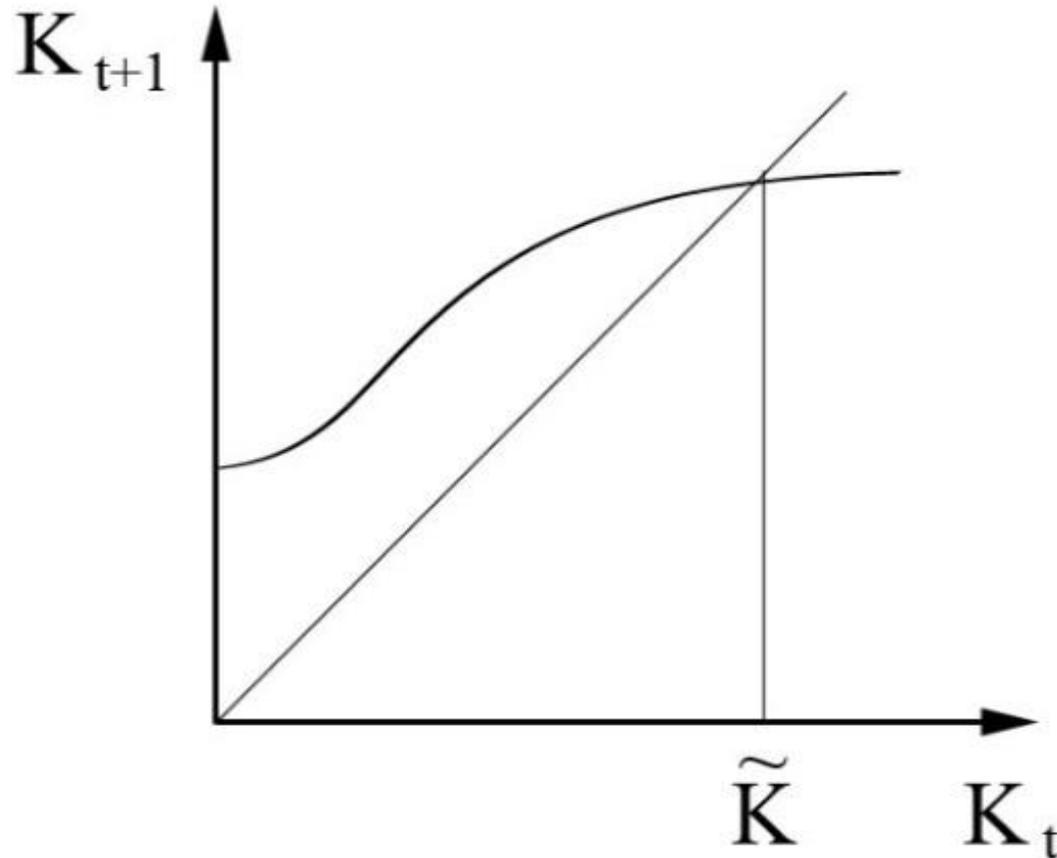
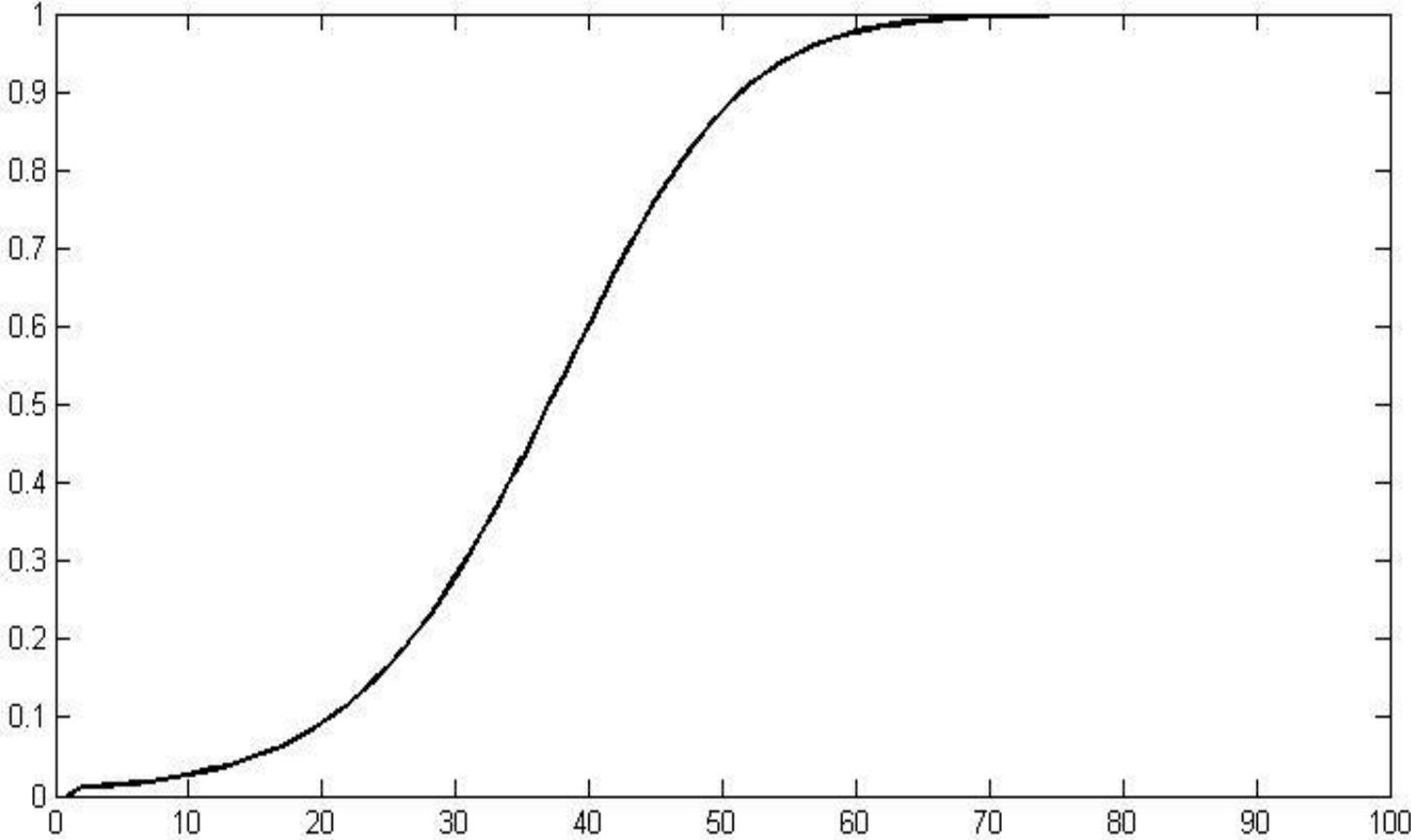


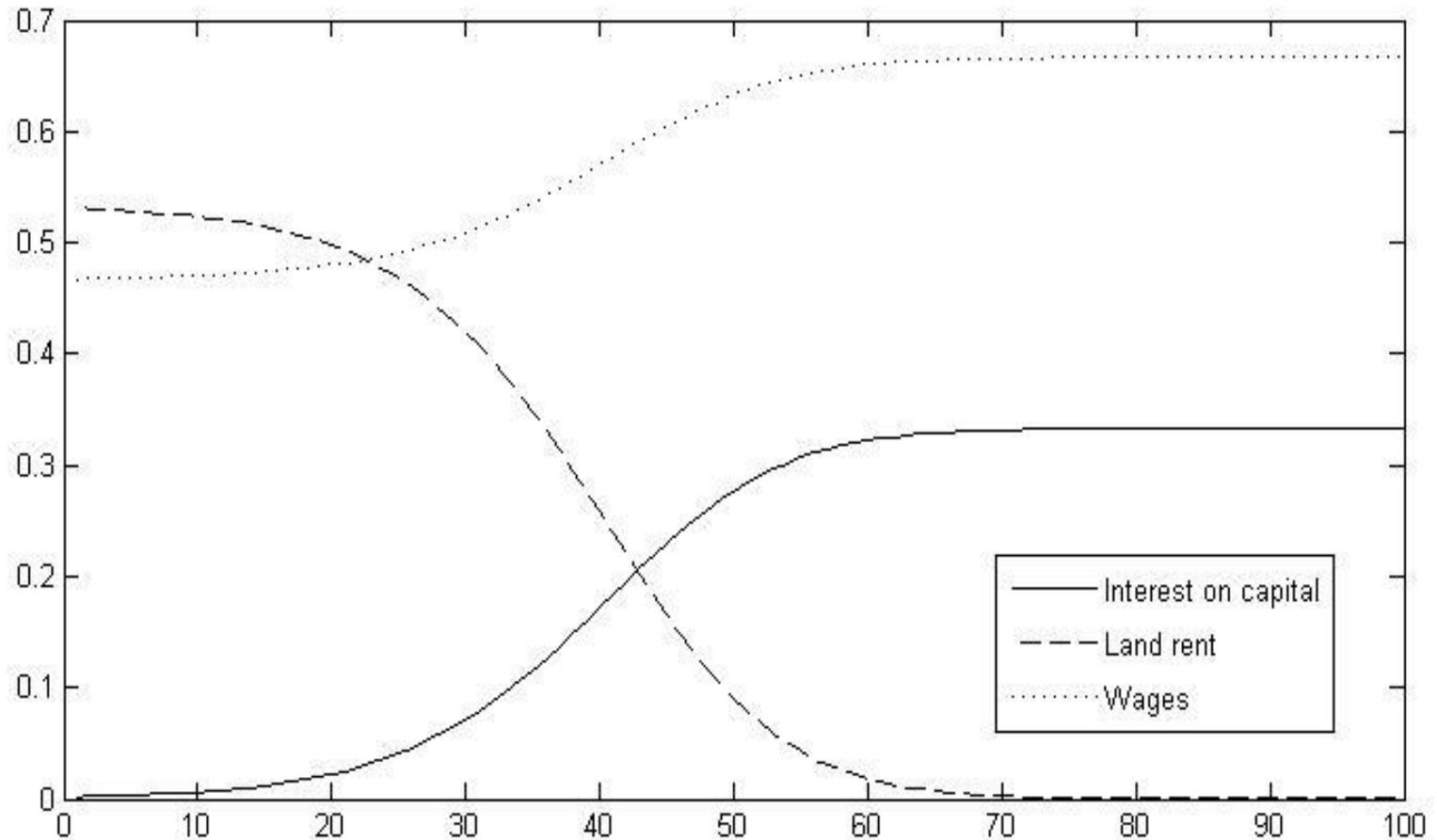
Figure 1. The dynamics of aggregate capital for a given level of  $A_M, A_T$

# The share of employment in the modern sector



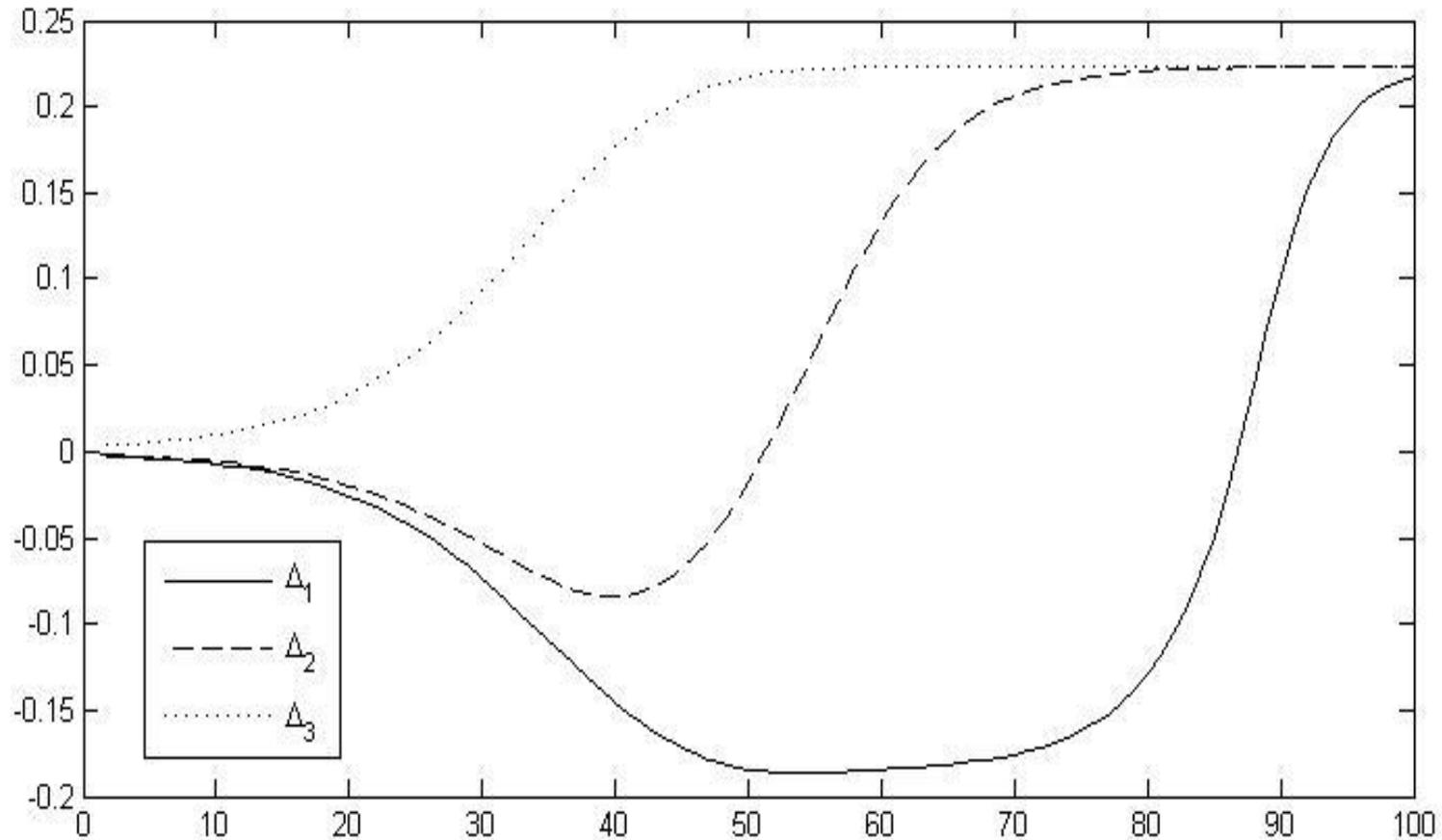
**Figure 3. The dynamics of employment in the modern sector**

# The shares of factor incomes in GDP



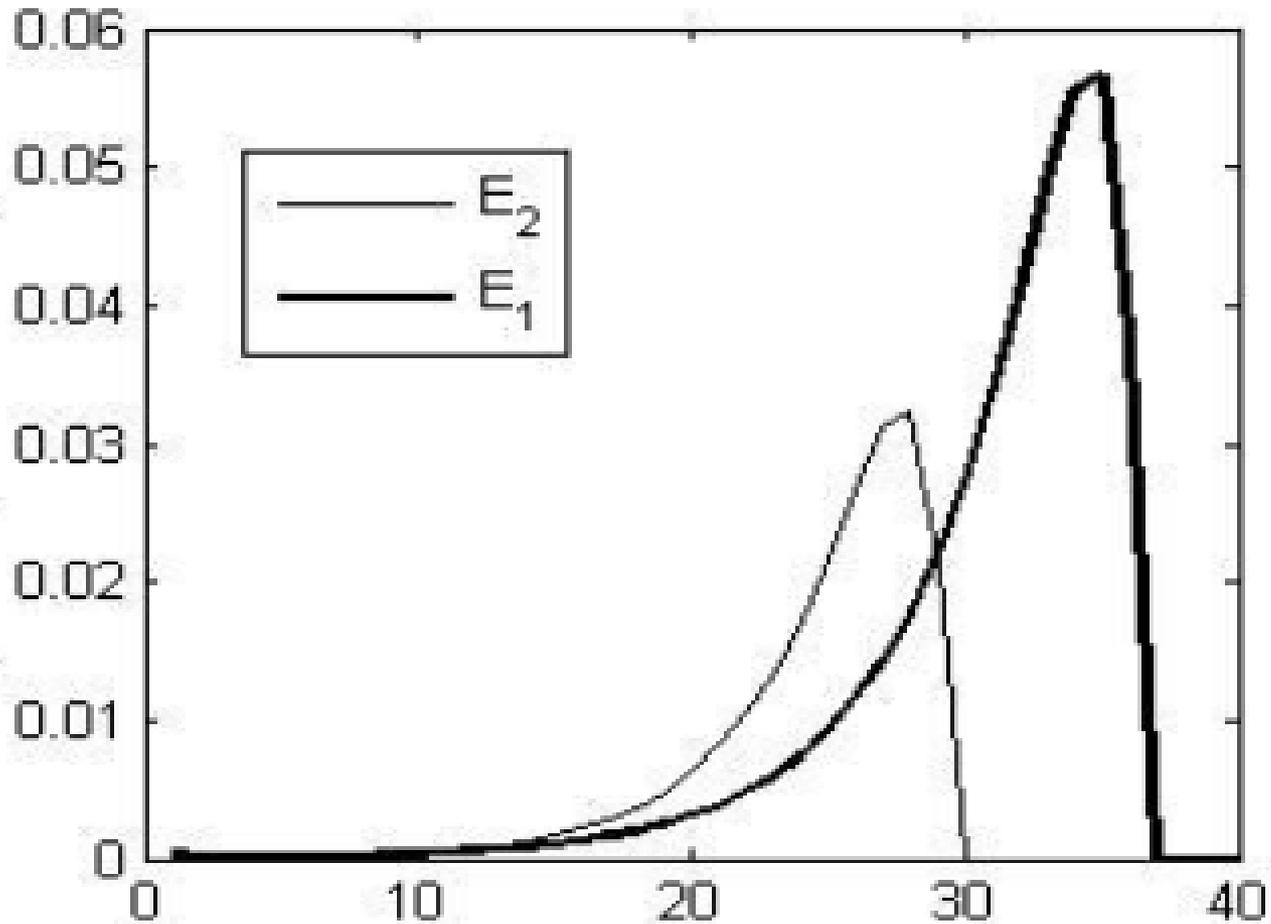
**Figure 4. The dynamics of factor incomes shares in total value added**

# Gains from the reform policy



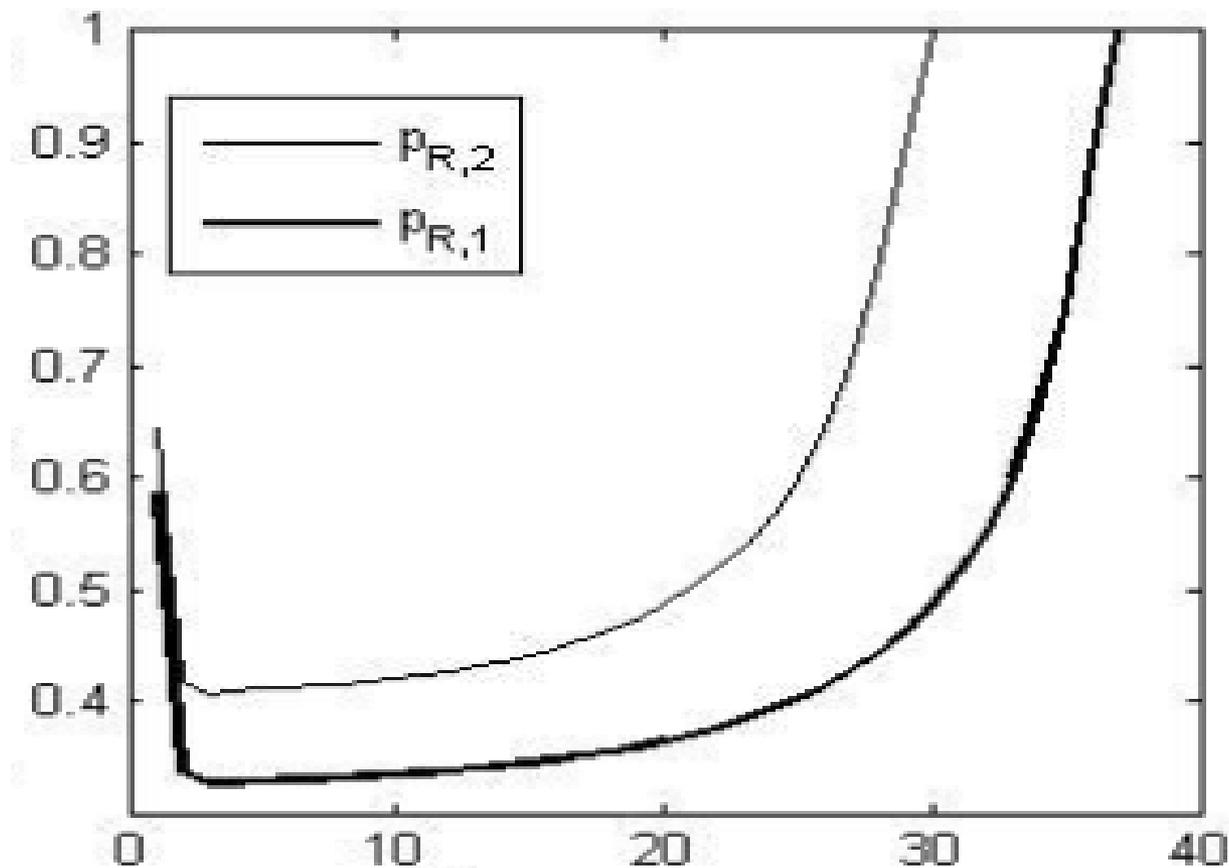
**Figure 2. The dynamics of gains from the reform policy  $\Delta^i$**

# The intensity of political conflict (different land distributions)



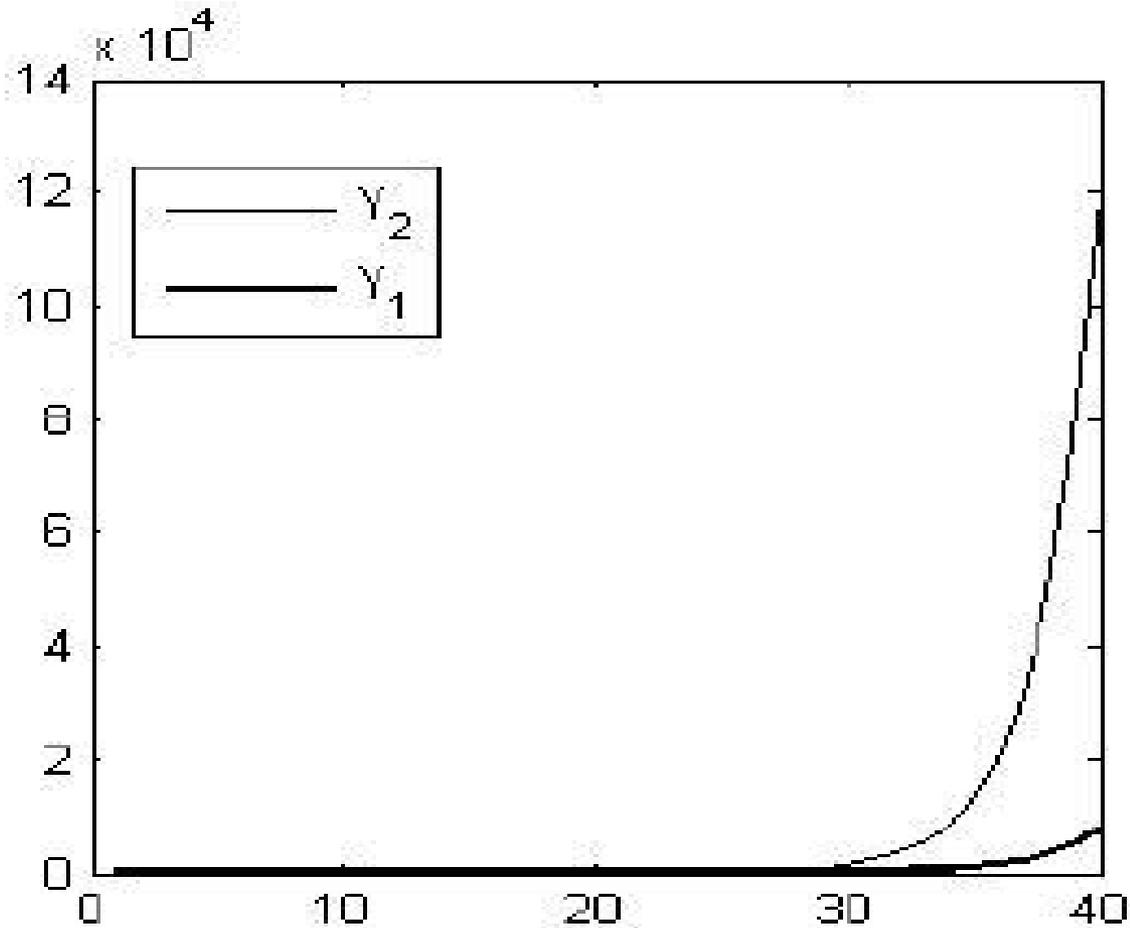
**Figure 5. The dynamics of political conflict for concentrated ( $E_1$ ) and dispersed ( $E_2$ ) land ownership**

# Institutional change (different land distributions)



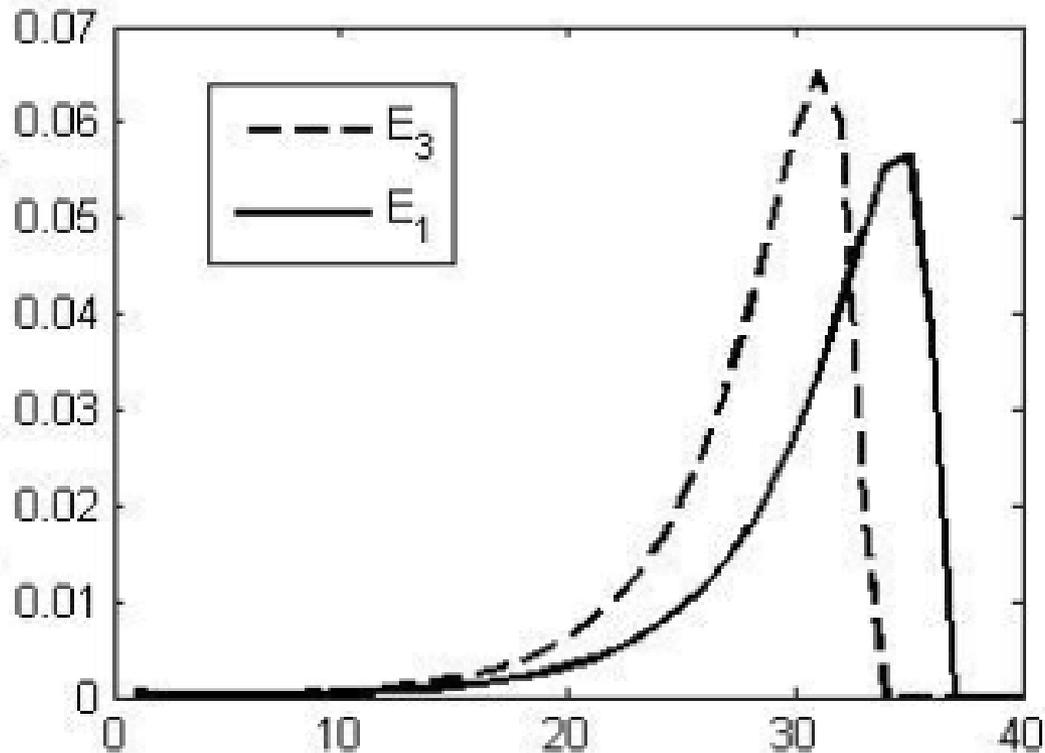
**Figure 6. The probability of reform policies for concentrated ( $P_{R,1}$ ) and dispersed ( $P_{R,2}$ ) land ownership**

# Divergence (different land distributions)



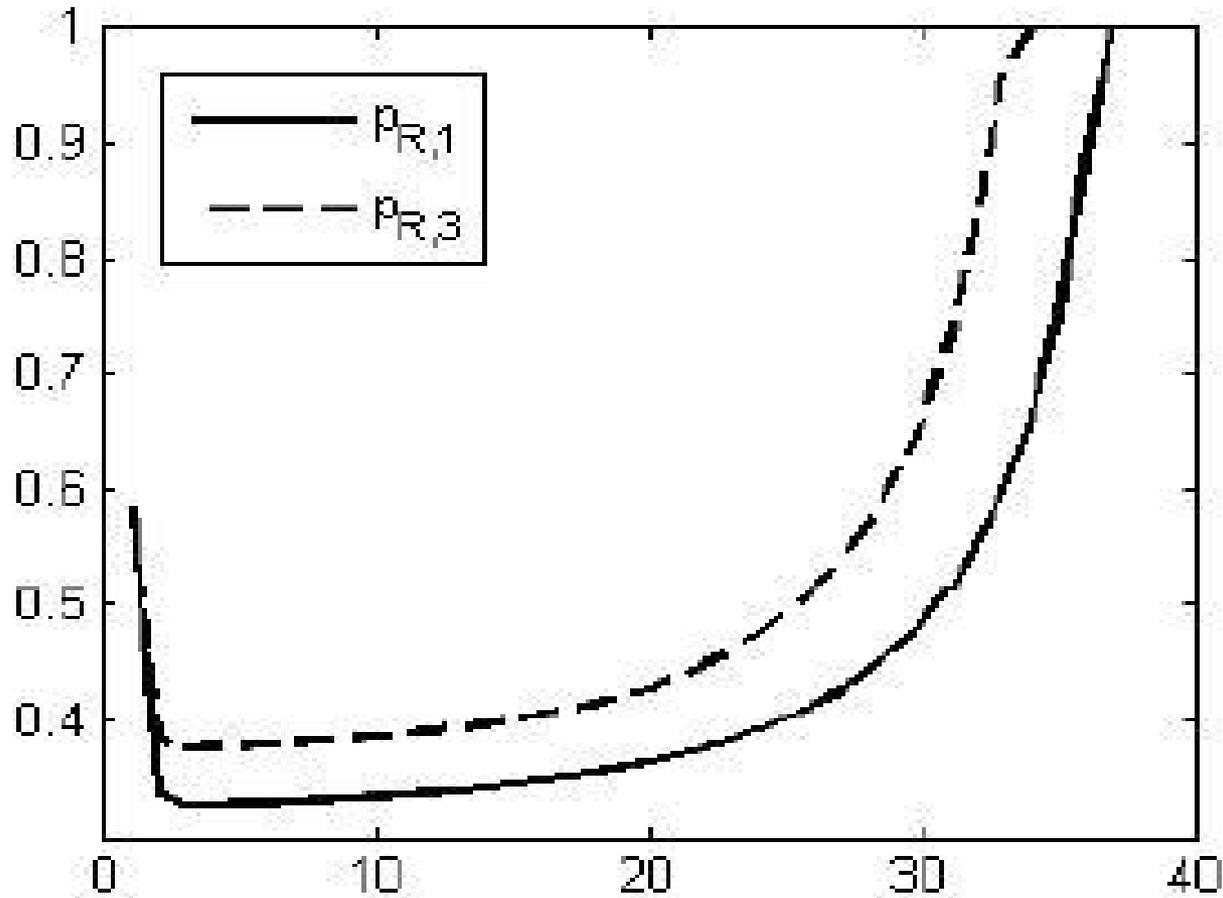
**Figure 7. Incomes per capita for concentrated ( $Y_1$ ) and dispersed ( $Y_2$ ) land ownership**

# The intensity of political conflict (different capital distributions)



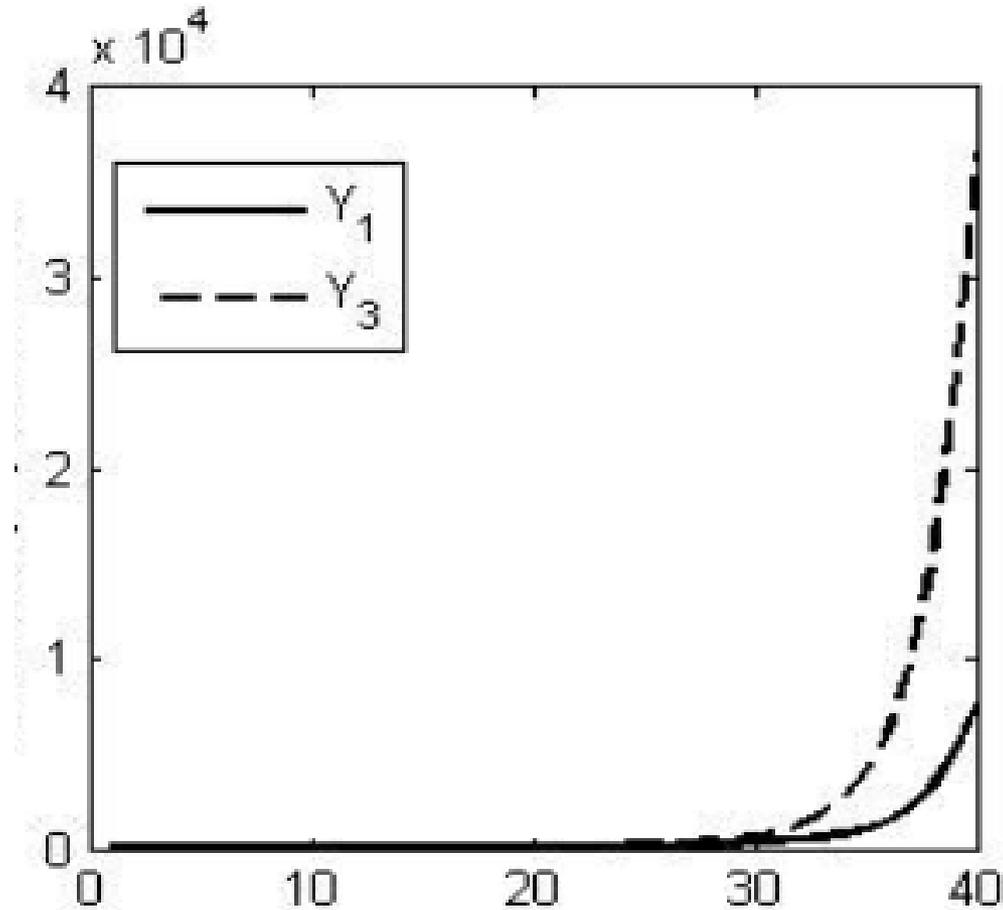
**Figure 8. The dynamics of political conflict for concentrated ( $E_3$ ) and dispersed ( $E_1$ ) capital ownership**

# Institutional change (different capital distributions)



**Figure 9. The probability of reform policies for concentrated ( $P_{R,3}$ ) and dispersed ( $P_{R,1}$ ) capital ownership**

# Divergence (different capital distributions)



**Figure 7. Incomes per capita for concentrated ( $Y_3$ ) and dispersed ( $Y_1$ ) capital ownership**

Thanks for your attention!