

Competition and Inequality ¹

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¹The views expressed herein are the authors' and do not reflect those of De Nederlandsche Bank

Motivation: 6 macroeconomic trends

In the last few decades 6 macroeconomic trends characterized US data:

- 1 Decrease in number of listed firms;
- 2 Increase in Estimated Price Markups;
- 3 Increase in the ratio between Stock Market capitalization and GDP;
- 4 Increase in the profit share of income;
- 5 Decrease in the labor share of Income;
- 6 Increase in Income Inequality.

Concentration and Inequality

- These facts suggest that the United States is no longer the dynamic and competitive economy it was thirty years ago, and led to a renewed interest in the macroeconomic effects of market power.
- Stiglitz (2012) and Baker and Salop (2015) argue that an increase in rents could be one of the reasons behind the increase in income and wealth inequality documented in the United States over the last forty years.

Aim of the Paper

- 1 Explain the 6 trends using a quantitative general equilibrium model;
- 2 Assess the Macroeconomics, Distributional and Welfare Effects of a decrease the extent of competition in the goods market.

Trends I and II: Markups and Number of Competitors

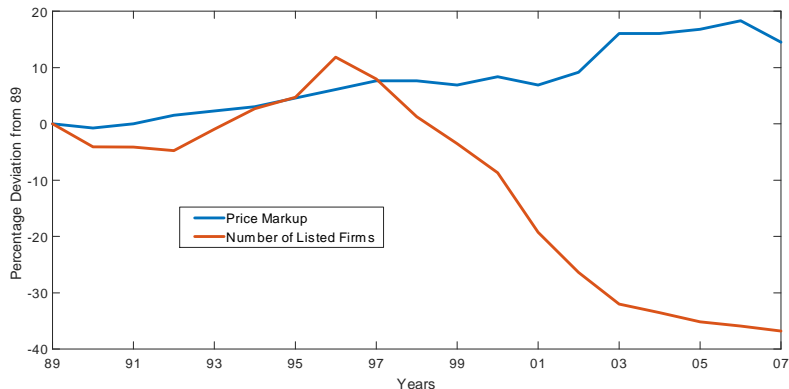


Figure: Markup and number of firms in the period 1989-2007 (% deviation from 1989). Source: FRED

Trends III and IV: Profit Share and Market capitalization over GDP

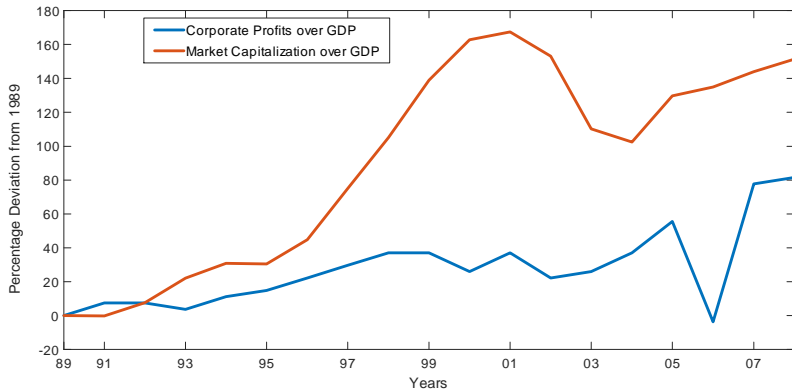


Figure: Profits over GDP and Capitalization over GDP in the period 1989-2007 (in % deviations from 1989). Source: FRED

Trend V: Labor share of Income

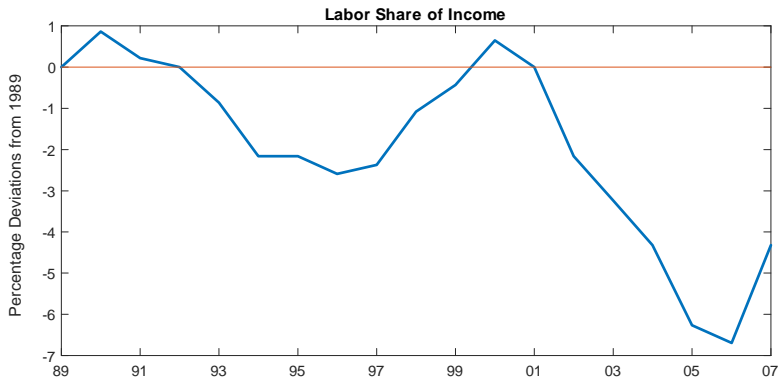
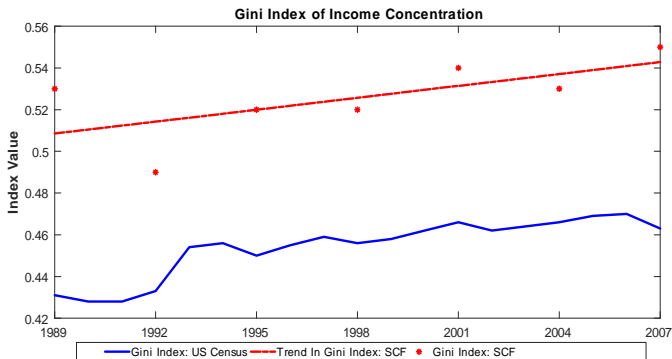


Figure: Percentage deviation in the labor share of income. The plotted value in each year represents the deviation from the baseline value, which is that in 1989. Source: FRED.

Trend VI: Income Concentration



What is Behind the Surge in Concentration, Profits and Market Values?

Leading explanations in the literature:

- 1 **Superstar Firms** (Author et al. 2017). Top firms have become increasingly more efficient than other firms in their respective industries. This might explain why their market shares and their profits have grown. According to this view, **concentration is good news**, and high profits reflect high efficiency
- 2 **Entry costs** (Gutierrez and Philippon (2019), CEA (2016), Grullon et al. (2019)). Increase in entry costs created barriers to entry. Such barriers allowed dominant firms to limit entry by actual and potential rivals. According to this view, **concentration is bad news**, and high profits reflect high Market Power.

Increase in Entry Costs

- In our framework the increase in concentration is triggered by an increase in entry costs which creates barriers to entry.
 - Increase in Entry Costs could be due to either:
 - ① increase in regulation, as suggested by Gutierrez and Philippon (2019);
 - ② decrease in productivity of R&D, as suggested by Bloom et al. (2017)
- Our modelling framework is consistent with both explanations.

Benchmark Incomplete Markets Model: Bewley-Aiyagari

- **Households:** have uncertain income and can only partially insure against this uncertainty;
- **Saving Behaviour:** driven by *precautionary motive*, agents accumulate wealth in order to smooth away the effects of bad shocks on consumption;
- **Wealth Distribution:** different income histories lead to different asset positions;
- **Firms:** Perfect competition.

This paper with respect to baseline Bewley-Aiyagari

1 Endogenous Variety with Oligopolistic competition:

- ▶ Homogenous firms compete in quantities à la Cournot or in prices à la Bertrand \Rightarrow price markups are endogenous (Colciago and Etro (2010), Edmond, Midrigan and Xu (2015),)
- ▶ Technological sunk entry costs determine entry of firms/varieties \Rightarrow number of competitors/goods and their stock market values are endogenous (Bilbiie, Ghironi and Melitz (2012)).

2 Stock Market: The investment in new productive units is financed by households through the accumulation of shares in the portfolio of firms.

Investment: Physical Capital Vs Varieties

- the number of firms/varieties can be interpreted as the capital stock of the economy;
- the decision of households to finance entry of new firms is akin to the decision to accumulate physical capital in the standard incomplete markets model;
- the stock-market price of firms changes endogenously in response to changes in competition, together with profits this determine the return to investment;
- this contrasts with the standard incomplete markets model, where the price of physical capital is constant absent capital adjustment costs, and the return to investment equals the marginal product of physical capital.

What we do in the paper

- 1 Evaluate how imperfect competition with endogenous variety affects the distributions of income and wealth;
- 2 Simulate an increase in entry costs and evaluate resulting:
 - ▶ *Macroeconomic trends*;
 - ▶ *Distributional and Welfare* effects.

Result 1: Effect of Entry+oligopoly on Income and Wealth Distributions

- **Entry+oligopoly**: strongly improves performance of the benchmark model when it comes to address the *concentration* of the wealth and income distributions;
- **Price of investment and Profits** change endogenously in response to changes in competition and it is at the core of our mechanism: they determine the return to investment, which in turn affects household saving decisions and the distributions of wealth and income, producers' entry, and the intensity of competition.

Result 2: Macroeconomic Trends spreading from Increase in Entry Costs

Higher Entry Costs



Fewer firms (Trend I)



Higher markups (Trend II)



Stock Market Value/GDP (Trend III)



Higher Profit Share of Income (Trend IV)



Lower labor share of income (Trend V)



Given High Wealth Concentration \implies Higher Income Concentration (Trend VI)

Result 3: Welfare. Who loses from higher Market Concentration?

- Higher market power leads to a shifts in the distribution of income: from labor to financial income.
⇒ Agents for whom labor income represents the majority of total income loose.
- 97% of population suffer a welfare loss, average welfare loss is about 6% of initial consumption;
- 3% gain: either very wealthy agents, or agents with a low initial productivity relative to asset holdings.

The Model

Two key building Blocks:

- 1 Endogenous variety+Oligopoly: Endogenous Number of homogeneous firms as in Bilbiie, Ghironi and Melitz (2012), which compete oligopolistically as in Colciago and Etro (2010)
- 2 Households with idiosyncratic income shocks who face incomplete markets as in Aiyagari (1994).

Entry and Exit of Firms

- Continuum of symmetric sectors, each with N_t firms (varieties);
- η_t units of labor to build a new firm;
- Time to Build: new entrants at time t , N_t^e , will be able to produce just at time $t + 1$;
- Exogenous death probability δ

$$N_{t+1} = (1 - \delta) (N_t + N_t^e)$$

⇒ the number of firms is an endogenous state variable, similar to K in baseline Aiyagari.

- Entry Condition that pins down N_t

$$\underbrace{V_t}_{\text{firm market value}} = \underbrace{\eta_t w_t}_{\text{sunk entry cost}}$$

Markup Function

Firms maximize profits, d_t , in each period. Under different forms of competition we obtain symmetric equilibrium prices satisfying:

$$\underbrace{\rho_t}_{\text{relative price}} = \underbrace{\mu(\varepsilon, N_t)}_{\text{markup function}} \underbrace{\frac{w_t}{A_t}}_{\text{MC}}$$

where ε is the elasticity of substitution between goods belonging to the same sector. Under both Cournot and Bertrand:

$$\frac{\partial \mu(\varepsilon, N_t)}{\partial N_t} < 0 \quad \frac{\partial \mu(\varepsilon, N_t)}{\partial \varepsilon} < 0$$

$$\lim_{N \rightarrow \infty} \mu(\varepsilon, N_t) = \frac{\varepsilon}{\varepsilon - 1} \rightarrow \text{Markup under Monopolistic Competition}$$

Households

$$\max E_0 \sum_{t=0}^{\infty} \beta^t \frac{C_t(i)^{1-\gamma}}{1-\gamma} \quad (1)$$

$$V_t (N_t + N_t^e) s_{t+1}(i) + C_t(i) = (d_t + V_t) N_t s_t(i) + \theta_t(i) w_t \quad (2)$$

$$s_{t+1}(i) \geq 0 \quad (3)$$

$\theta_t(i)$: exogenous labor productivity;

w_t : real wage rate per efficiency unit;

$V_t (N_t + N_t^e) s_{t+1}(i)$: total value of stock market purchases in t ;

$V_t N_t s_t(i)$: value of the household's portfolio;

$d_t N_t s_t(i)$: dividend income.

Wealth distribution in 1989

Wealth	Quintiles					Top		Concentration	
	Q1	Q2	Q3	Q4	Q5	95-99%	1%	Gini 99	Gini All
SCF 89	-0.2	1.2	5.2	13	80.7	24.3	29.9	0.72	0.79
Model 89	0	0.4	3.7	15.9	80.0	26.7	13.2	0.75	0.77

Table: Wealth distribution in 1989. Cournot and U.S. data. The empirical distribution is based on the SCF in 1989.

Income distribution in 1989

Income	Quintiles					Top		Concentration	
	Q1	Q2	Q3	Q4	Q5	95-99%	1%	Gini 99	Gini All
SCF 89	2.6	7	12.5	20	57.8	15	17.1	0.46	0.53
Model 89	4.5	9.6	13.9	22.5	49.5	14	5.8	0.46	0.48

Table: Income distribution in 1989. Cournot and U.S. data. The empirical distribution is based on the SCF in 1989.

Increase in Entry Costs

- We simulate an increase in entry costs;
- entry costs are set in order to replicate the (linear trend in) the average markup estimated by De Loecker and Eeckhout (2017) between 1989 and 2007;
- we selected 2007 as final year since this is not a business cycle model and does not aim at addressing effects of the great recession;
- further, 1989-2007 covers the period in which the literature identifies the increase in market concentration;
- focus on Cournot, Bertrand essentially identical.

Number of firms and Markups (Trends I and II)

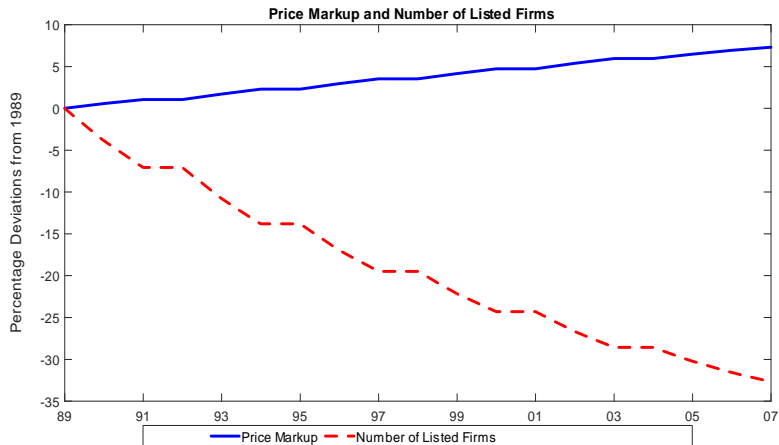


Figure: Number of listed firms and the price markup between 1989 and 2007. Percentage deviations from 1989. Gradual increase in entry costs.

Capitalization/GDP and Profit Share (Trends III and IV)

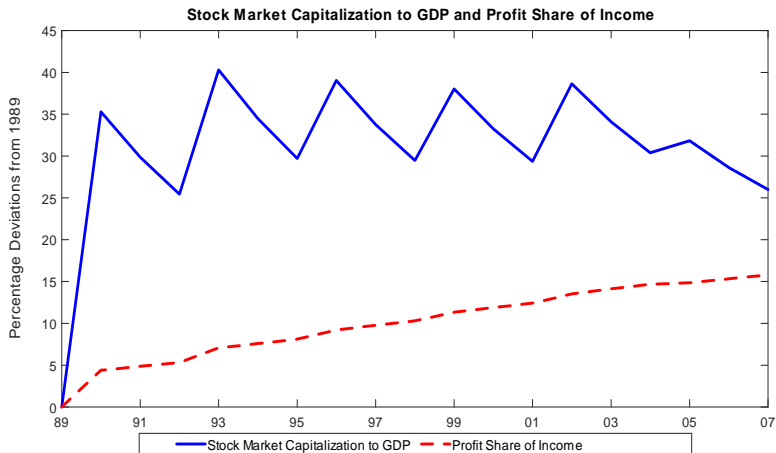


Figure: Stock market capitalization to GDP and profits share of income between 1989 and 2007. Percentage deviations from 1989. Gradual increase in

Labor Share (Trend V)



Figure: Labor share of income between 1989 and 2007. Percentage deviations from 1989. Gradual increase in entry costs.

Gini Wealth

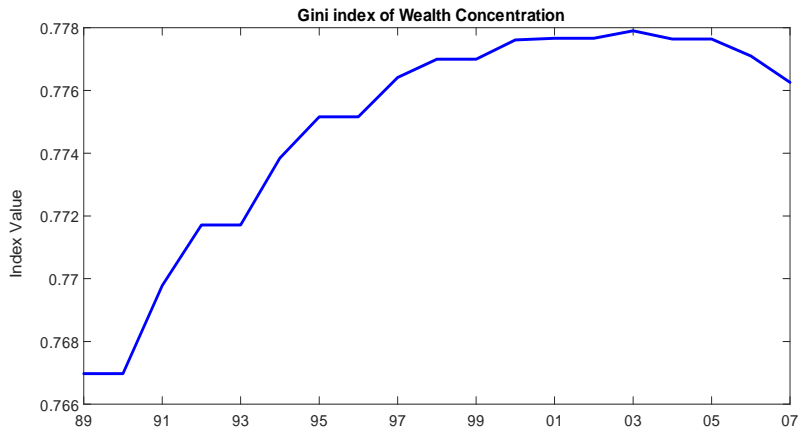


Figure: Gini Index of wealth Concentration. Index value between 1989 and 2007. Gradual increase in entry costs.

Gini Income

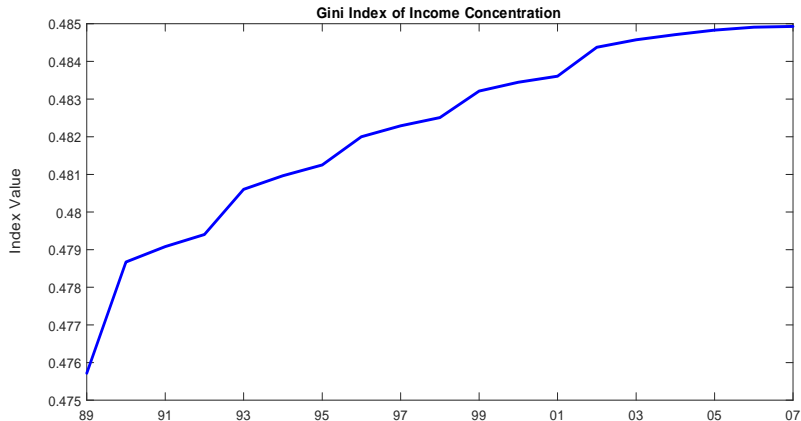


Figure: Gini Index of Income Concentration. Index value between 1989 and 2007.

Increase in Entry Costs: Welfare Effects

- We evaluate the welfare effects of higher market concentration spreading from higher barriers to entry;
- Metric: **Consumption Equivalent Variation**. By how much consumption in the initial SS should increase (decrease) to make one as well off as during the transition to the final steady state?
- Only about **3%** of agents experience a welfare gain

Distribution of Welfare Losses

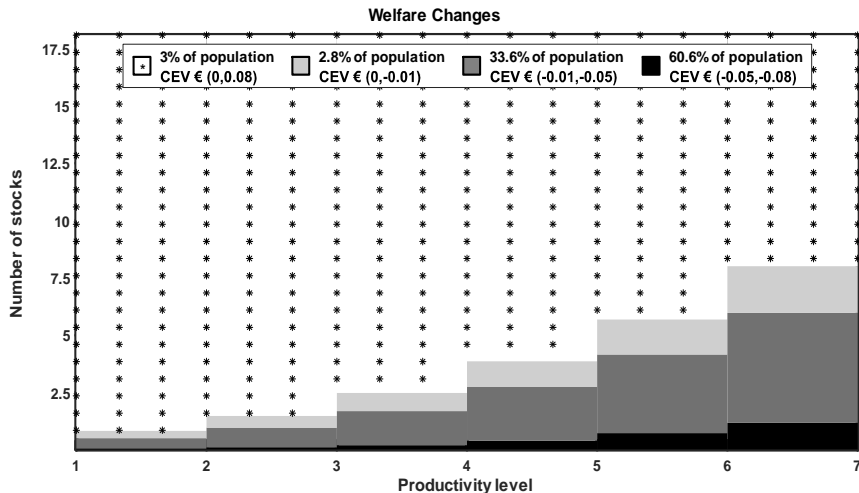


Figure: Distribution of CEVs. Productivity levels on the horizontal axis, stock holdings on the vertical one

Aggregate Welfare Effect

Utilitarian social welfare gain ω^u : the average welfare gain in the economy, but it can also be interpreted as the welfare gain of a newborn who does not yet know her type, hence her position in the asset-productivity space. This can be decomposed as

$$1 + \omega^u = (1 + \omega_{level})(1 + \omega_{uncertainty})(1 + \omega_{inequality})$$

<i>Decomposition of Average Welfare Gain</i>			
ω^u	<i>Level</i> ω_{lev}	<i>Inequality</i> ω_{inc}	<i>Uncertainty</i> ω_{unc}
-0.058	-0.083	-0.018	0.045

Table: Decomposition of the utilitarian social welfare change. Each component is expressed in percentage of consumption

Conclusions

- This paper links the debate concerning the decrease in competitiveness and business dynamism in the United States with that on raising inequality.
- It makes 4 contributions:
 - 1 it builds a model with endogenous markups and incomplete markets that matches the concentration of the US empirical income and wealth distributions;
 - 2 it explains the trends in business dynamism, profits and markups observed in the last few decades through an increase in entry costs for new firms;
 - 3 it shows that those trends explain a large fraction of the increase in the Gini index of income concentration over the same period;
 - 4 it quantifies the welfare costs due to the decrease in competition, and finds that they are large and unevenly distributed across households.