

Rethinking inflation in an ABM model

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Inflation: this time is different

- Over the last couple of years, the world has experienced the highest levels of inflation in more than four decades.
- Determining the causes of inflation - whether it's a result of excessive aggregate demand or largely supply-driven - is important to tailor the appropriate policy response
- There is evidence that corporate profits and mark-ups have increased with prices, leaving real wages behind (Andler et al., 2022; Konczal, 2022)
- Meanwhile, personal consumption and total real aggregate demand have been consistently below trend since the beginning of 2020 (Stiglitz, Regmi, 2022)
- We build an Agent Based Macroeconomic model which tries to shed light on the relationship between market power, profits and inflation

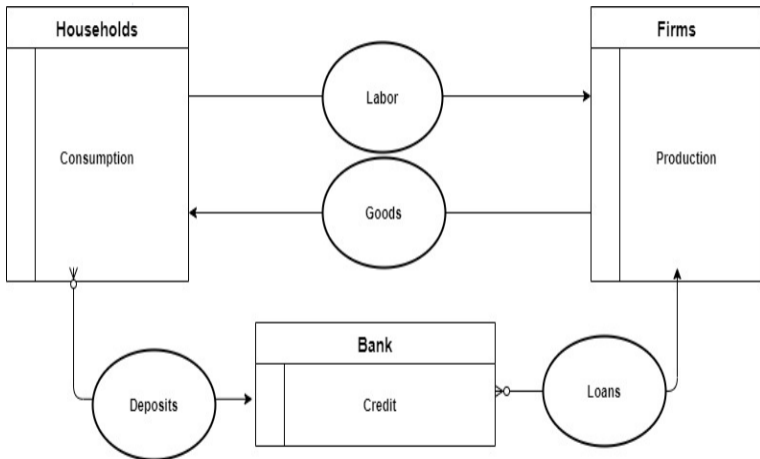


An algorithmic approach to modeling economic phenomena

- Agent Based Modeling: "the computational study of economic processes modelled as dynamic systems of interacting agents" (Tetsfatsion, 2006). The economy is an evolving complex system.
- In the real world agents are heterogeneous in beliefs, strategies, endowments etc. They interact locally via complex networks, and through sequential out-of-equilibrium states
- There is no isomorphism between the micro- and macroeconomic levels of aggregation: macroeconomic phenomena are explained as emergent properties of disequilibrium interactions at the micro level



Building Blocks (builds on Guerini et al. 2018)



Imperfect matching in the product market

- customers will sort firms according to their current size on the market and will decide whether to queue-up or not in a firm according to a Binomial trial with probability $p_{f,t}^{GM}$.

$$\Phi_{h,t}^{LM} = \begin{cases} 0 & \text{with probability } 1 - p_{f,t}^{GM} & \text{not queue up} \\ 1 & \text{with probability } p_{f,t}^{GM} & \text{queue up} \end{cases}$$

- The probability of queuing is proportional to the price posted by the firm relative to the market average

$$p_{f,t}^{GM} = \frac{1}{\varrho^{GM}} \left[1 - \gamma^{GM} \left(\frac{P_{f,t} - \bar{P}_t}{\bar{P}_t} \right) \right]$$

- lower values of ϱ^{GM} imply higher probability of matching for any given price, capturing higher incumbent advantage
- higher values of γ^{GM} imply higher (lower) probability of matching for lower (higher) prices, capturing the degree of "price selection" in the model

Market structure and inflation

- We analyze two alternative scenarios with respect to market characteristics:
- Scenario 1 (baseline): a strongly competitive market with low incumbent advantage and strong price selection ($\rho^{GM} = 20, \gamma^{GM} = 20$)
- Scenario 2 (concentration): a less competitive market with high incumbent advantage and low price selection ($\rho^{GM} = 1, \gamma^{GM} = 1$)
- While in Scenario 1 concentration stays close to the initial level throughout the simulation, In Scenario 2 market structure departs from the initial symmetric one and gradually transitions towards more concentration.
- Note that in these simulations labor productivity is homogeneous: the market protocol itself gives rise to a concentrated market structure merely by rewarding random success with more visibility on the market



Market structure and inflation 2

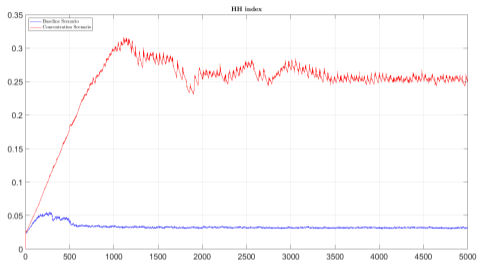


Figure 1: Scenario 2 gives rise to higher and more volatile market concentration, while in Scenario 1 concentration remains close to initial levels.

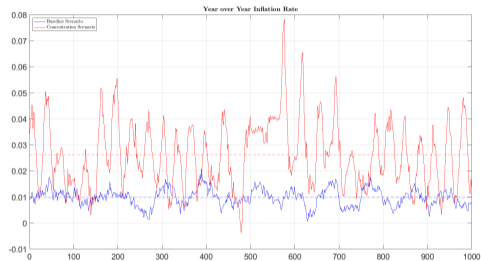


Figure 2: Year-over-year inflation is positive on average and much larger in the concentration scenario



Market structure and inflation: Main aggregate variables

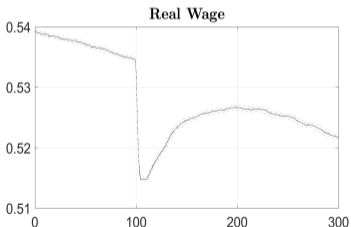
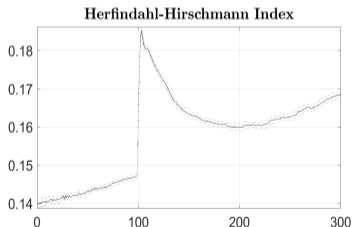
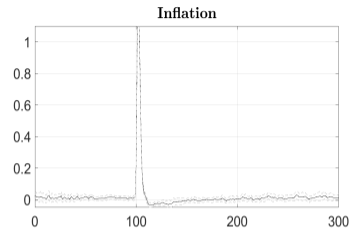
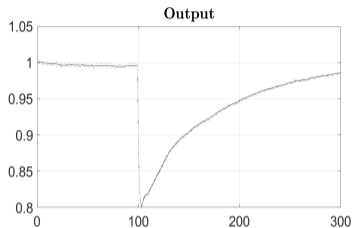
Table 1: Main variables of interest between the two scenarios. Simulation for the last 1000 weeks. Absolute value of the simulation t-statistic of H0: “no difference between the two scenarios” in parentheses.

Output is standardized with respect to Baseline

Scenario	Output	Inflation	Unemployment	Wage share	Markup	HHI
Baseline	1.000	0.89%	0.83%	85.3%	17.1%	3.1%
Concentration	0.883	2.7%	6.16%	60.1%	66.6%	27.8%
Rel. Variation	- 11.7%	+ 203%	+ 642 %	- 29 %	+ 289 %	+ 796 %
(ttest)	(41.102)	(38.644)	(85.566)	(85.971)	(62.116)	(60.359)
pvalue	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001



How does the system react to aggregate shocks?



Summing up

- We have built an Agent Based Macroeconomic Model with a decentralized interaction protocol and relatively simple behavioural rules.
- We characterize two scenarios: In Scenario 1 consumers consistently buy from the cheapest supplier, while in Scenario 2 the market leader has a "visibility advantage"
- This leads to radically different economic environments: while market structure in Scenario 1 stays dispersed, in Scenario 2 two or three firms end up dominating the market
- This in turn has implications for the aggregate level of markup, aggregate demand and wage and price dynamics

