Macroeconomic Gentrification

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Introduction

1. Preliminary

View of Hudson Yards from the High Line: Chelsea NYC Sept 2015

Development Plans for Hudson Yards

`http://livehudsonyards.com/`

`http://vanishingnewyork.blogspot.com/2015/02/hudson-yards-effect.html`

As of 2021 – Phase 2 anticipated 2025-2030

It's Friday in New York City, where there's a new breed of private dog clubs offering, among other things:

- triple-filtered dog water
- organic food
- dog trainers
- pottery classes to make your own dog bowl
- DJs on Friday nights
- activities to "foster a deeper connection between you and your dog"
- and other activities to foster connections between you and other affluent dog owners

From: *The Gothamist*, Jan 3, 2025
`https://gothamist.com/arts-entertainment/luxury-new-york-city-clubs-are-catering-to-a-new-clientele-dogs`

2. Question

When the incomes of affluent consumers increase, what happens to:

- less affluent consumers?
- consumption inequality?
- business dynamism and economic growth?

3. Approach

- Build on Agent-Based Macroeconomic Model of Georges (2011, 2018)
  - Growth and Business Cycles Driven by Product Innovation
    - Ongoing Innovation and Adaptation by Firms
    - Lancasterian Product Space and Nested CES Preferences
    - Bounded Rationality in Firm and Consumer Adaptation
    - Perpetual Disequilibrium
- Two Classes of Consumer/Workers
  - Wage Labor and Salaried Employees Consume Different Products
- Income Inequality May Have a Magnified Effect on Consumption Inequality
  - via Pace of Product Innovation
  - via Product Availability

  I label this process *Macroeconomic Gentrification*
- Income Inequality May Influence Growth and Business Dynamism

4. Some Related Literature

- Causes of Income Inequality
  - Automation, Robots, AI:
    - Acemoglu and Restrepo (2018, 2020, 2024)
  - Trade, China
    - Autor, Dorn and Hanson (2013, 2016)
  - Market Power, Concentration, Rents:
    - Piketty, Saez, Stantcheva (2014)
    - Furman and Orszag (2018)
    - Keller and Olney (2018)
    - Autor, Dorn, Katz, Patterson, and Van Reenen (2020)
    - Deb, Eeckhout, Patel, Warren (2024)

- Income and Consumption Inequality are Closely Related
  - Attanasio and Pistaferri (2016)
- Income Distribution Affects Product Innovation and Product Availability
  - Eisenberg (2014), Murphy (2016), Jaravel (2019)
- Product Innovation Can Mitigate or Aggravate Consumption Inequality
  - Shumpeter (1942), Attanasio and Davis (1996), Feenstra and Shapiro (2005), Kaplan and Schulhofer-Wohl (2017), Jaravel (2019, 2024), Becker (2024)
- Product Quality is Central to Firm Performance
  - Hotman, Redding and Weinstein (2016), Foster, Haltiwanger and Syverson (2008)
- Product Churn Depends Heavily on Firm Level R&D
  - Argente, Lee and Moreira (2018, 2024)
- Overall Entrepreneurial Quality May be Driven by a Small Fraction of New Entrants
  - Guzman and Stern (2020)

- ACE Modeling of Product Innovation, Consumer Choice, Income Dynamics, Growth
  - Chen and Chie (2005, 2007, 2013, 2014, 2020)
  - Ciarli, Lorenz, Savona, Valente (2010, 2016)
  - Marengo and Valente (2010)
  - Dawid, Gemkow, Harting, van der Hoog, Neugart (2016)
  - Fagiolo and Roventini (2017)
  - Columbo, Dawid, and Harting (2023)
  - DelliGatti, Gallegati, Palestrini, Tedeschi, Vidal-Tomas (2024)
  - ...

The Model

5. Macroeconomic Environment

- $n_1 + n_2$ **firms** at any time, each produces a unique product.
  - **Type 1 firms** produce for production workers. **Type 2 firms** produce for salaried overhead workers.
- m **product characteristics** valued by all consumers.
- All firms **produce** with both variable and overhead labor to meet forecasted demand.
- 2 **representative consumers** spend all their income (wages and salaries, respectively), and search for better bundles of goods within their market segments.
- Prices are constant **markup** over marginal costs.
- **Product innovation** depends stochastically on **R&D**, which is outcome of discrete choice rule.
- Insolvent firms **exit** and are replaced. Entering firms have some opportunity to switch markets.

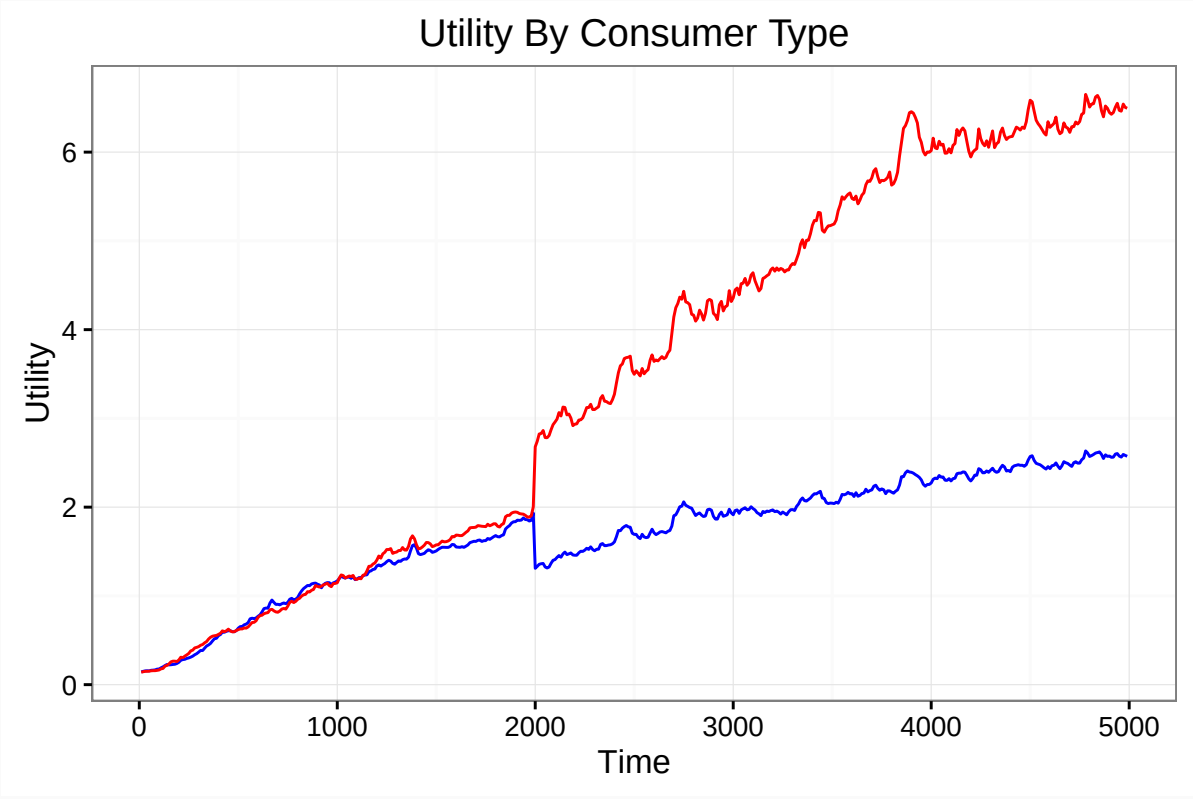
6. Timing of Events

- **R&D:** firms chose their current R&D investment levels (0 or 1).
- **Innovation:** firms experience product innovation with probabilities related to their recent R&D investments.
- **Production:** firms forecast sales, hire production labor, and produce to meet forecasted demand.
- **Incomes:** all firms pay wages to their production workers and salaries to their overhead workers.
- **Consumer Search:** the representative consumers search and update their consumption baskets.
- **Sales:** the consumers spend all of their labor incomes (above) on the consumption basket.
- **Entry and Exit:** firms with insufficient working capital are replaced. The new entrants may migrate across the two markets.

Simulations

7. Consumption Inequality from an Increase in Rents:

Markup is increased from 2 to 3 and salary rate from 1 to 2 in period 2000, shifting income shares from production labor to overhead labor.

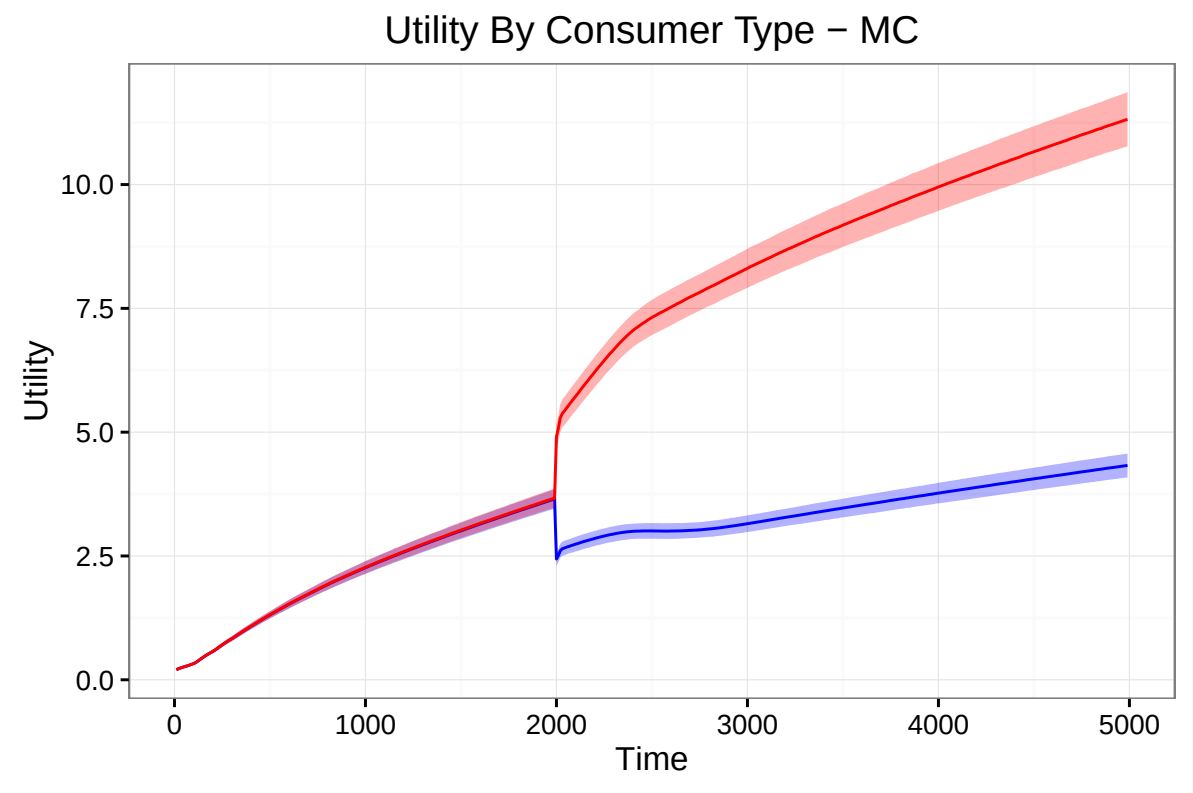


Utility of the two worker/consumer types. Single run.

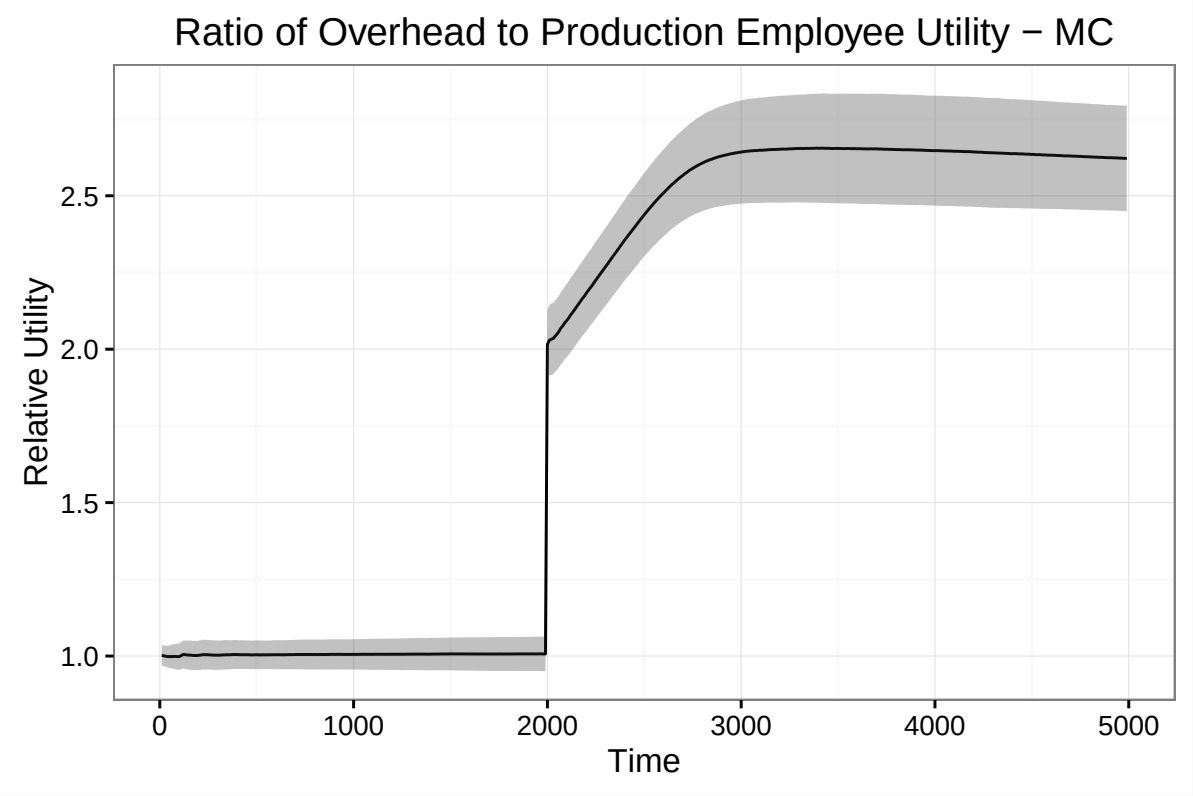
Markup and salary rate are both increased in period 2000:

- shifts income shares from production labor to overhead labor
- aggregate employment neutral for both types of labor
- three effects on relative consumption and utility
  - **income effect**: real income shifts from production labor to overhead labor
  - **variety effect**: firms shift from market 1 to market 2
  - **innovation effect**:
    - profits shift temporarily from market 1 to market 2, spurring R&D and innovation in market 2
    - R&D is more costly, dampening R&D overall
    - increased business failure and new entry generate innovation independently of R&D by incumbent firms

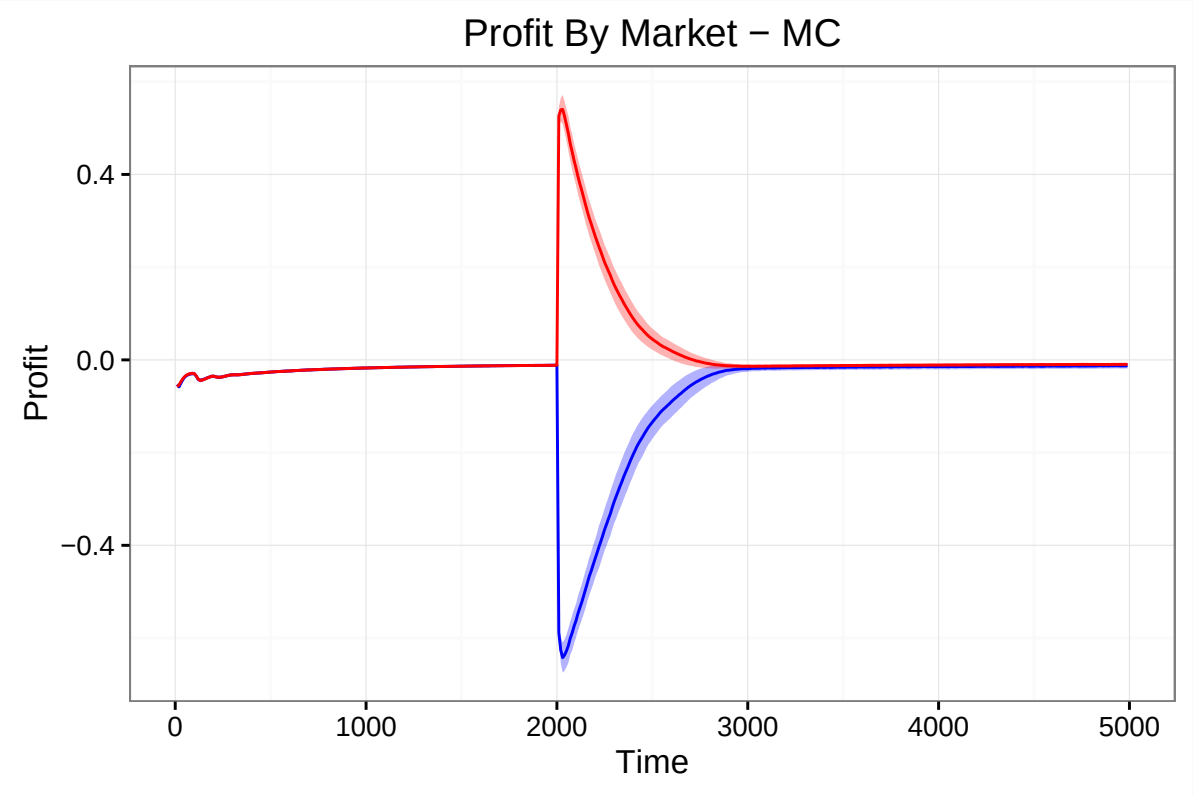
Monte Carlo. Average with 1 SD band over 1000 runs.



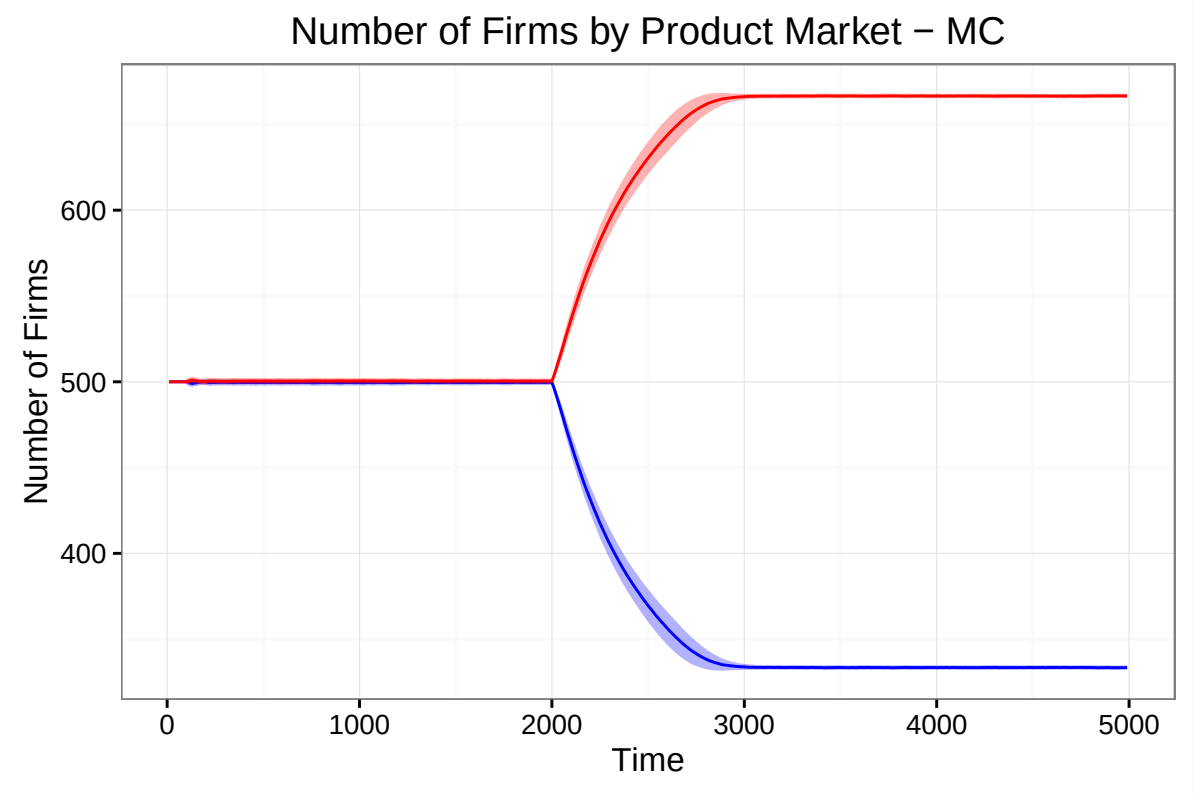
Utility of the two worker/consumer types.



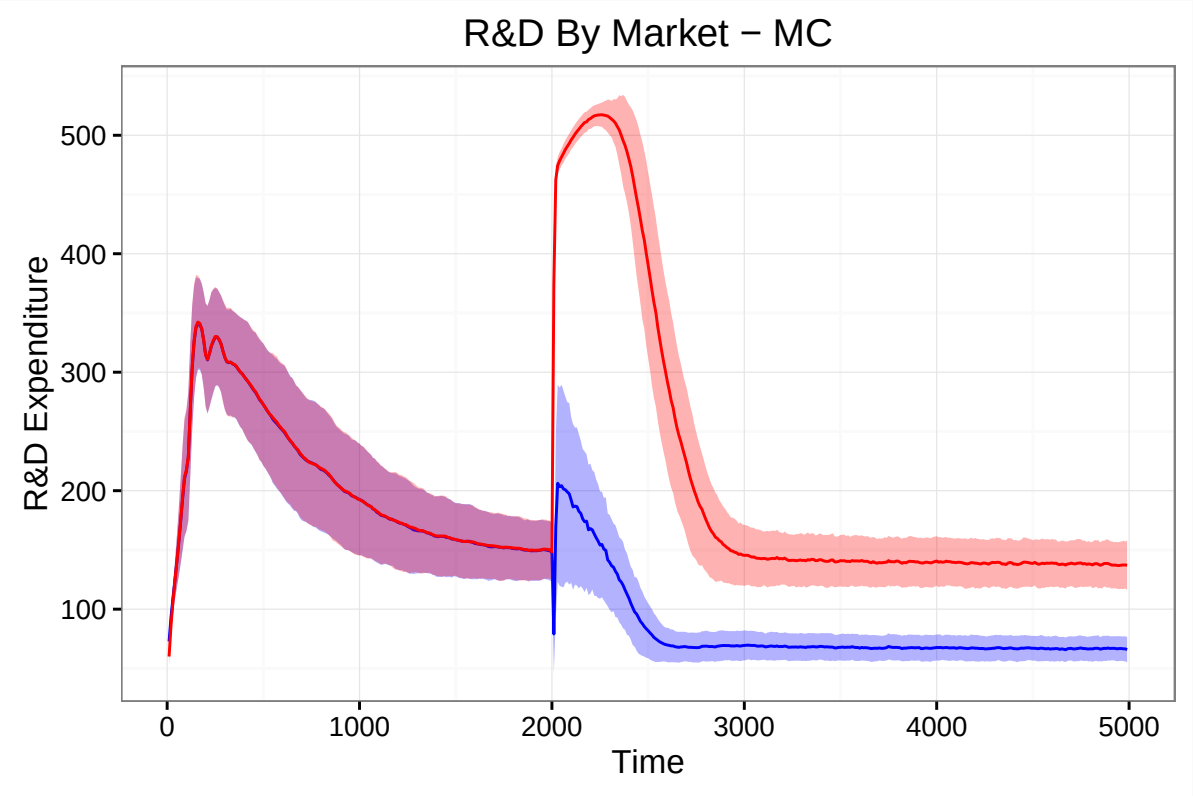
Relative utility $\frac{U_2}{U_1}$ increases by 1. income effect (≈ 1.0), 2. variety effect (≈ 0.35), 3. innovation effect (≈ 0.35).



Profit in each market.

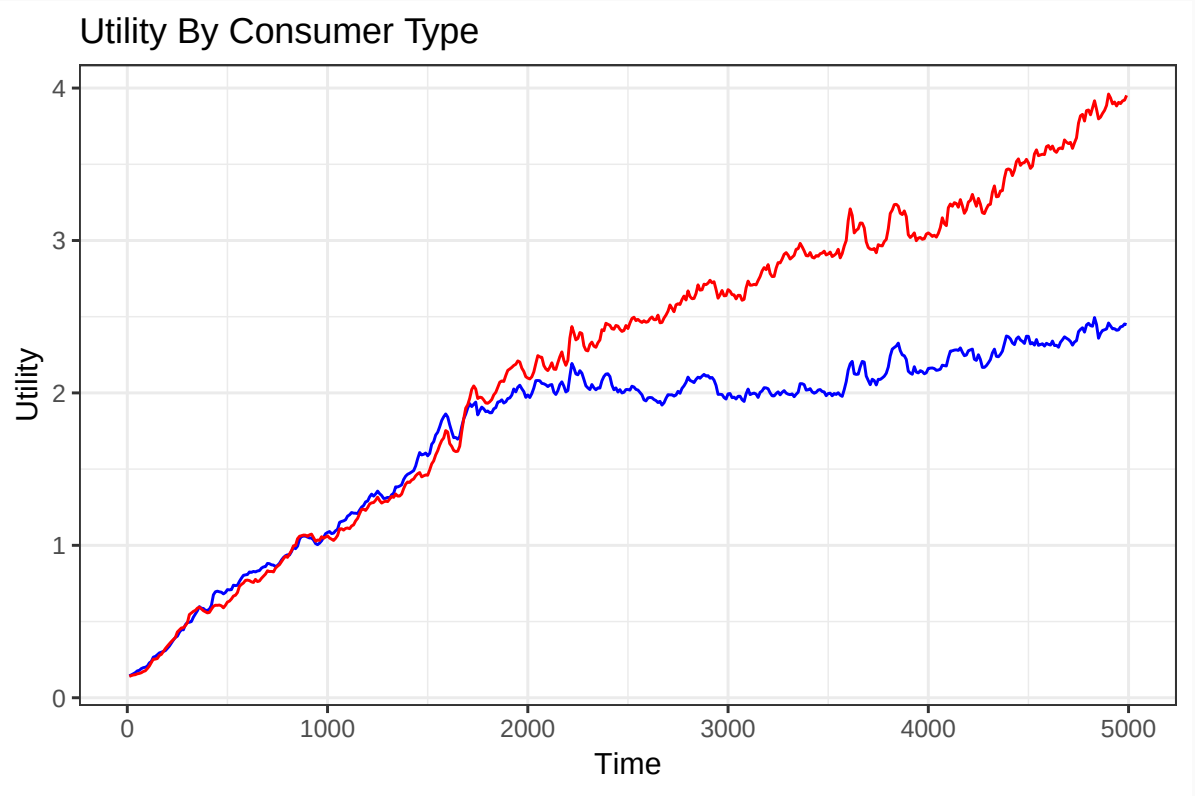


Number of firms in each market.



RandD in each market.

- A gradual increase in markup causes **stagnation** of U_1 and increased consumption inequality.

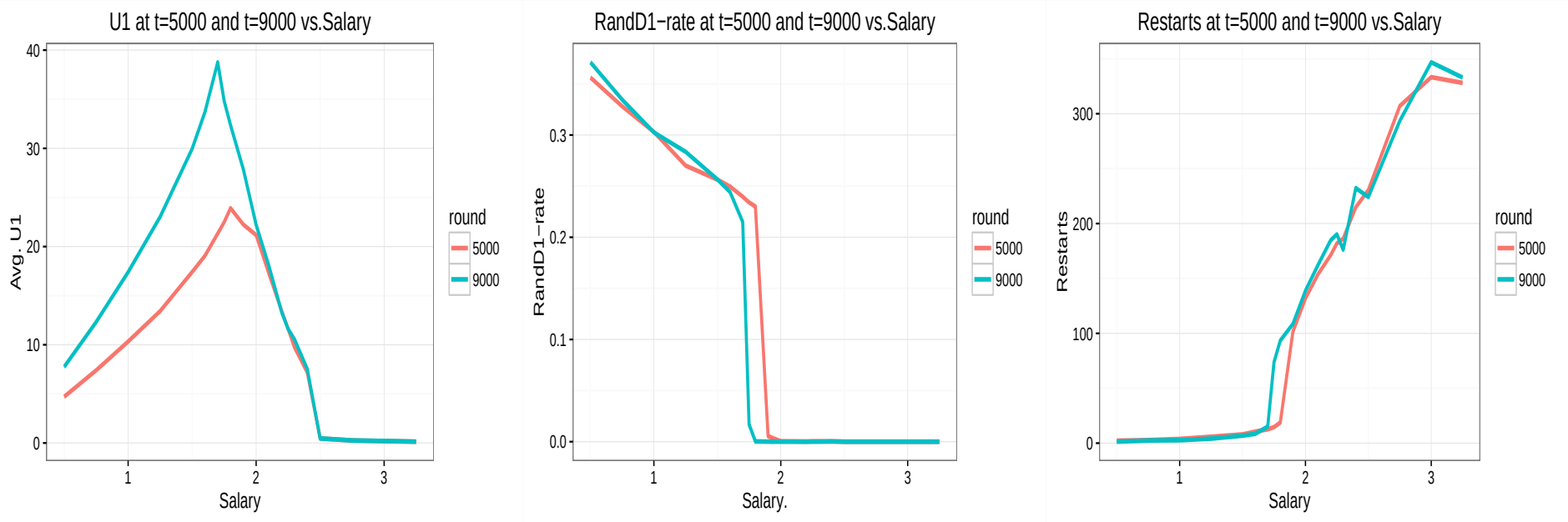


Single run example: μ is increased from 2 to 2.4 gradually during periods 2000-4000. Relative utility u_2/u_1 increases 60%. Decomposition: 1. price effect (40%), 2. variety effect (12%), 3. innovation effect (8%).

9. Impacts of Other Parameter Changes

- Income shares are driven exclusively by the markup: increasing the markup lowers U_1 and U_2 and raises $\frac{U_2}{U_1}$.
- Increasing salary or overhead requirements moderately raises (aggregate) incomes and turnover and lowers R&D spending
- Increasing wages moderately lowers (aggregate) incomes but leaves R&D spending unchanged
- Low R&D spending may (or may not) be offset by higher turnover – creative destruction
- Reducing finance for new entrants moderately increases turnover, lowers R&D, and increases utilities

- Increasing salary or overhead requirements **sufficiently** can kill off R&D and lower utility **dramatically**
  - This effect is *not evident in the representative agent version* of the model, in which e.g., salary increases output and utility.
  - The sustainability of R&D depends on the ecology of agents and the cost of overhead labor. As salary increases, R&D becomes fragile and can collapse.



Effect of increasing salary rate on U1, R&D rate, and turnover rate.

Conclusion

9. Conclusions

- Model of macroeconomic gentrification from increased rents
- Consumption inequality influenced by incomes, product variety, and product innovation
- Growth conditioned by endogenous R&D and exit/entry of firms

Questions?

Additional Slides

A1. Consumer Preferences

For each consumer type:

- $q \in R_n$ is vector of products consumed
- $z \in R_m$ is corresponding vector of characteristics consumed
  - $z = g(q)$: map from products to characteristics (home production function)
  - Specifically, CES aggregator for characteristic j over goods i
    - $z_j = \left[\sum_{i=1}^{n} (q_i \cdot z_{i,j})^{\rho_1}\right]^{1/\rho_1}$
- $u = u(z)$ map from characteristics to utility (utility function)
  - CES aggregator over characteristics j
    - $u(z) = \left[\sum_{j=1}^{m} z_j^{\rho_2}\right]^{1/\rho_2}$
- nested CES utility imposes taste for variety over both characteristics and goods

A2. Product Innovation

- Product Innovation:
  - Product innovation increments z_i by (pos or neg) integers
  - Probability of a product innovation depends on recent R&D investment (distributed lag).
  - Preferential Attachment
- R&D
  - Firms decide whether to turn on/off R&D investment by social learning (discrete choice rule)
  - Two possible reference pairs:
    - Firms with high and low recent *R*&D
    - Firms in own or other market
  - For low profit group, probability of changing R&D status depends on

$$\Phi = \frac{e^{\gamma \pi_1}}{e^{\gamma \pi_1} + e^{\gamma \pi_2}}$$

    π_1 and π_2 are the recent profits of the reference pairs: e.g., high and low R&D firms, $\gamma > 0$.

A3. Consumer Search

- Representative Consumer Search:
  - Consumer establishes budget constraint
  - Searches for optimal bundle of goods by experimentation
  - Experimentation takes form of testing random mutations in which nominal spending shares are shifted between collections of pairs of goods within own market segment
  - Search is subject to election operator. Adopt only changes in spending that increase utility.

A4. Pricing, Production, and Trade

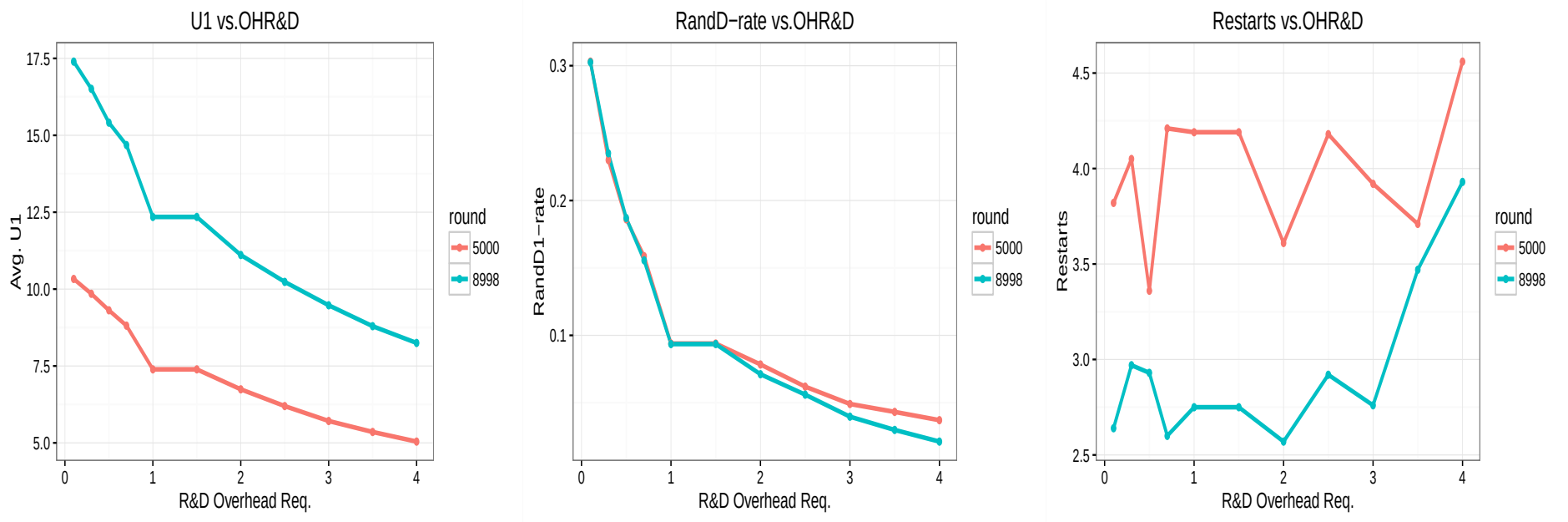
- Firm Pricing and Production:
  - Markup pricing (markup η)
  - Leontief technology: constant marginal production labor requirements.
- Production by Firm i
  - Production Labor requirement is $y_{i,t}/A$
  - Overhead Labor requirement has
    - fixed component $H = s \cdot h$
    - R&D component $R = s \cdot r$ (only when engage in R&D)
  - Firm produces to meet expected demand.
  - Firm forecasts demand by simple extrapolation of past nominal demand.
- Markets:
  - Trade takes place on the short side of the market. Products and residual income are perishable. No saving or inventories.
  - Firm/product is replaced if working capital falls to zero. Entering firms imitate existing firm and may switch markets.

A5. Representative Agent Benchmark

- If firms are homogenous, other than market label, and all engage in $R\&D$, then equilibrium production and sales of consumption good is

$$Y^* = Y_1^* + Y_2^* = \left(\frac{1}{\eta - 1}\right) \cdot \frac{A}{W} \cdot (h + r) \cdot s \cdot (n_1 + n_2)$$

  - Independent of, characteristic magnitudes, and preferences over characteristics.
  - Partials $\frac{\partial Y}{\partial A} > 0$, $\frac{\partial Y}{\partial W} < 0$, $\frac{\partial Y}{\partial s \cdot (h+r)} > 0$, $\frac{\partial Y}{\partial \eta} < 0$ all demand driven.
  - Is a locally stable steady state.
- Utility of PL and OHL each:
  - grows in the LR via product innovation in the own market.
  - depends positively on variety in the own market, and thus n_1/n_2.



Effect of increasing overhead requirement for R&D on U1, R&D rate, and turnover rate.