Firm Dynamics, Monopsony and Aggregate Productivity Differences

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Background & Motivation

- Imperfect competition in labor markets leads to aggregate efficiency losses (Manning, 2011; Card, 2022).
    - main channel: static labor misallocation.
- Large output losses from dynamic misallocation (Guner et al. 2016; Bento and Restuccia 2017)
    - endogenous amplification from selection and investment

Q: How does labor market power affect firm dynamics and aggregate productivity?

What We Do

- We document higher firm age, life-cycle firm growth, firm investment and lower markdowns in richer countries.
- We build a dynamic neoclassical monopsony model (Card et al. 2018; Dustmann et al. 2022), nested into an occupational-choice model as in Lucas (1978).
  - **Innovations:**
    1. Endogenous selection into entrepreneurship
    2. Dynamic investment into productivity growth.
- Perform counterfactuals to quantify:
  - Differences in firm dynamics explained by labor market power.
  - Income losses attributable to the two novel channels.

What We Find

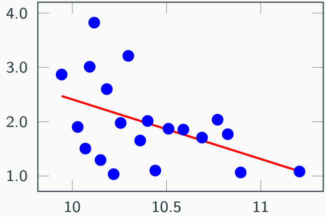
- Labor market power accounts for 42% of cross country income differences.
- Selection into entrepreneurship and dynamic investment in productivity jointly account for approximately 35% of the gains from eliminating labor market power.
  - Labor market power distorts the allocation of labor and profits, which results in distorted entry and investment policies.

Data

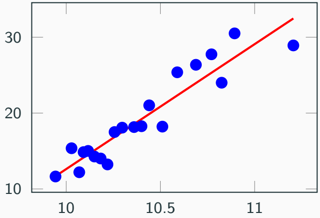
- We use the World Bank Enterprise Surveys (WBES).
- Establishment level surveys, representative of non-agricultural and non-financial private firms with 5+ employees.
- Over 140 countries, we restrict analysis to the 31 countries with GDP per capita of over $25,000.
- We compare the median local labor market across countries.
  - We define local labor markets as location-industry pairs.

Four Facts

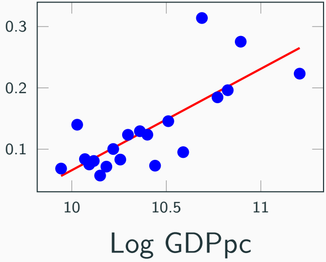
Markdowns



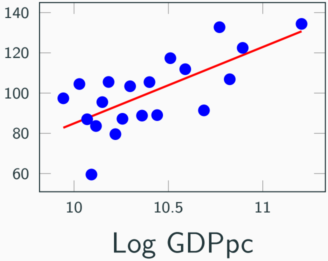
Firm Age



Firm Investment



Firm Growth



Markdown Estimation | Alternative Investment | Alternative Growth

Model: Setup

- Measure N of risk-averse hand-to-mouth agents differing in:
  - entrepreneurial productivity, z;
  - entrepreneurial amenities, a.
- Every period, agents choose to be either a worker or an entrepreneur
  - workers value wages and amenities of their employer;
  - entrepreneurs value profits and own amenities.
- Productivity z follows a Poisson process.
- Entrepreneurs can invest to improve their chances of productivity growth.
- Stochastic probability of exit, δ.
- Frictionless labor market clears every period.

Model: Problem of the Workers

- Per-period utility of worker i employed by entrepreneur j:

$$u(z_i, a_i, z_j, a_j) = \epsilon^L \ln(w_j) + a_j + \nu_{ij}$$

where ν_{ij} are Type-I EV shock with location 0 and scale σ_ν.

- Value of worker i employed by entrepreneur j:

$$U(z_i, a_i, z_j, a_j) = u(z_i, a_i, z_j, a_j) + \beta(1-\delta)\mathbb{E}_{z_i} \max\{\tilde{U}(z_i, a_i), V(z_i, a_i)\}$$

where

$$\tilde{U}(z_i, a_i) = \sigma_\nu \ln\left(E \int_{\mathcal{Z}\times\mathcal{A}} \exp\left(\frac{U(z_i, a_i, z_k, a_k)}{\sigma_\nu}\right) \mu(z_k, a_k) dz_k da_k\right)$$

Model: Problem of the Workers II

- Probability that worker i chooses to work at firm j:

$$p_{ij} = \frac{\exp\left(\frac{U(z_i, a_i, z_j, a_j)}{\sigma_\nu}\right)}{E \int_{\mathcal{Z}\times\mathcal{A}} \exp\left(\frac{U(z_i, a_i, z_k, a_k)}{\sigma_\nu}\right) \mu(z_k, a_k) dz_k da_k}$$

- Labor supply to firm j:

$$L_j = L \int_{\mathcal{Z}\times\mathcal{A}} p_{ij}\phi(z_i, a_i) dz_i da_i = L\Theta \exp\left(\epsilon^L \ln(w_j) + a_j\right)$$

Model: Problem of the Entrepreneurs

- Entrepreneurs operate the following technology:

$$Y_j = z_j \ln(L_j)$$

- Static wage posting:

$$\max_{w_j} \pi_j(z_j, a_j) = z_j \ln(L_j) - w_j L_j - c_f$$

$$\textit{subject to} \quad L_j = L\Theta \exp\left(\epsilon^L \ln(w_j) + a_j\right)$$

- Solution is an optimal wage schedule $W(z, a)$.

Model: Problem of the Entrepreneurs II

- Dynamic investment decision:

$$V(z_i, a_i) = \max\{V^I(z_i, a_i), V^N(z_i, a_i)\}$$

where:

$$\begin{aligned} V^I(z_i, a_i) = \epsilon^L \ln(\pi_j(z_i, a_i) - c_z) + a_i \\ + \beta(1-\delta)\Big(p_i \max\{V(z_{i+}, a_i), \tilde{U}(z_{i+}, a_i)\} + \\ (1-p_i)\max\{V(z_{i-}, a_i), \tilde{U}(z_{i-}, a_i)\}\Big) \end{aligned}$$

and

$$\begin{aligned} V^N(z_i, a_i) = \epsilon^L \ln(\pi_j(z_i, a_i)) + a_i \\ + \beta(1-\delta)\Big(p_n \max\{V(z_{i+}, a_i), \tilde{U}(z_{i+}, a_i)\} + \\ (1-p_n)\max\{V(z_{i-}, a_i), \tilde{U}(z_{i-}, a_i)\}\Big) \end{aligned}$$

Model Discussion

- For insights, let labor supply L be constant. The firms' static problem yields the following equilibrium condition

$$\ln(L_j) = \frac{\epsilon^L}{1+\epsilon^L}\ln(z_j) + \frac{1}{1+\epsilon^L}a_j + C$$

- Then

$$\frac{L(\bar{z},a)}{L(\underline{z},a)} = \left(\frac{\bar{z}}{\underline{z}}\right)^{\frac{\epsilon^L}{1+\epsilon^L}} \text{ and } \frac{L(z,\bar{a})}{L(z,\underline{a})} = \left(\frac{\bar{a}}{\underline{a}}\right)^{\frac{1}{1+\epsilon^L}}$$

- Higher elasticities $\Rightarrow$ reallocation of labor away from high amenity and toward high productivity firms.

Model Discussion

- Equilibrium profits are

$$\pi_j(z_j, a_j) = z_j \left[\ln(L_j) - \frac{\epsilon^L}{1+\epsilon^L} \right] - c_f$$

- We show

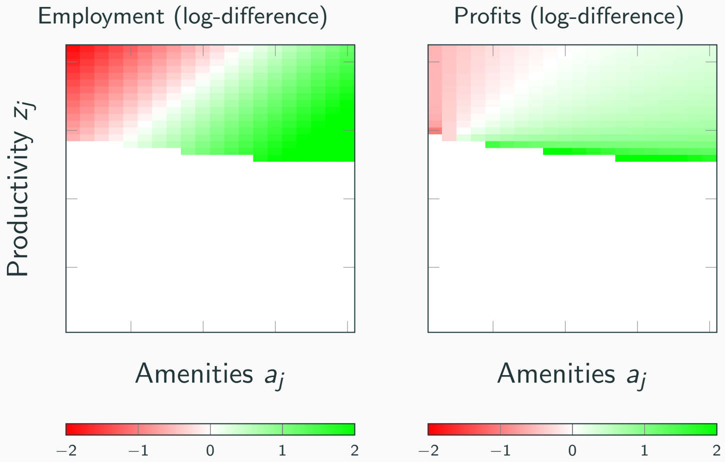
$$\frac{\partial[\pi_j(z, \bar{a}) - \pi_j(z, \underline{a})]}{\partial \epsilon^L} \leq 0 \text{ and } \frac{\partial[\pi_j(\bar{z}, a) - \pi_j(\underline{z}, a)]}{\partial \epsilon^L} \geq 0$$

- Higher elasticities $\Rightarrow$ reallocation of profit away from high amenity and toward high productivity firms.

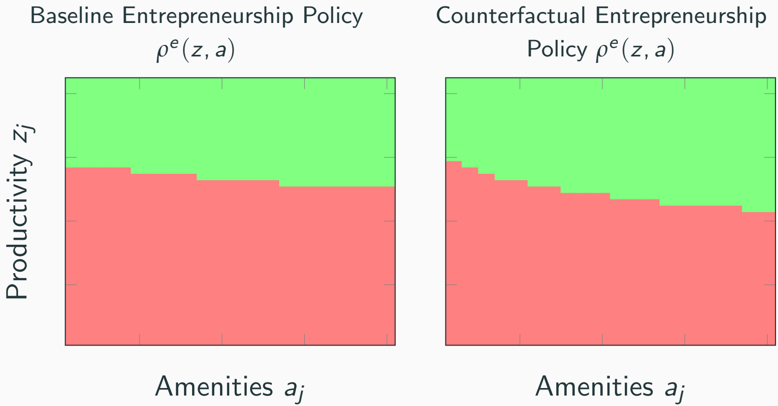
Model Discussion

- Through reallocation of employment and profits across types there is a reallocation of entrepreneurship and investment:
    - Away from high amenity and toward high productivity agents.
- In the model, competition operates as a skill-biased force.
    - LMP as a correlated distortion.

Mechanisms - Employment and Profits



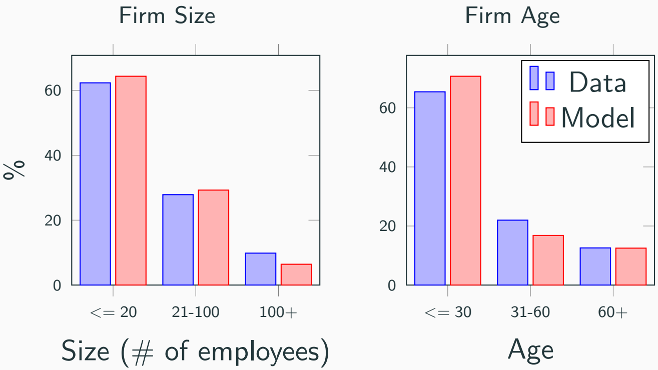
Mechanisms - Entrepreneurship Policy Function



Investment PF

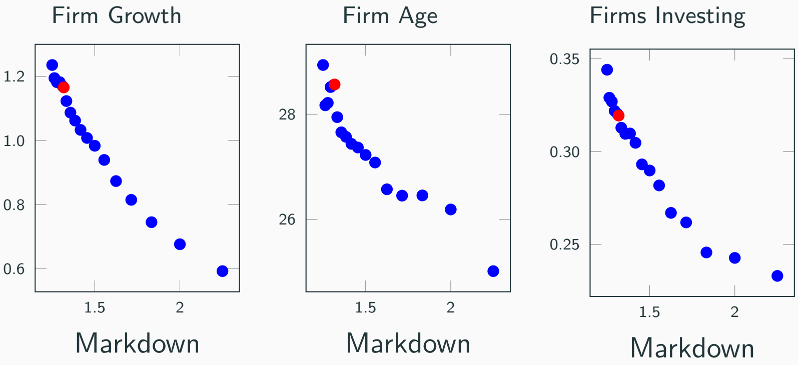
Calibration

- We calibrate the model to the Netherlands, one of the richest countries in our sample (GDPpc $54,200).
- 6 parameters are internally calibrated. Model fit.
- Untargeted distributions achieve a good fit.



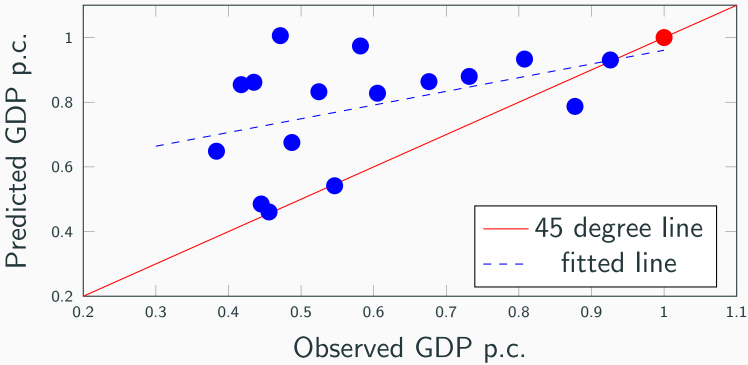
Firm Dynamics and Monopsony

- Counterfactual experiment: labor supply elasticity to get markdowns from 1.25 to 2.25.



- Lower markdowns $\Rightarrow$ higher firm growth, firm age, and investment, as in data.

Cross Country Income Differences



- Model can explain $\sim 42\%$ of differences in GDPpc through differences in LMP.

Counterfactual - Greece

- We compare the benchmark to a single counterfactual economy with ϵ^L set to match the median markdown in Greece (2.62 vs 1.3).

	Netherlands Benchmark (1)	Greece Counterfactual (2)	Greece Data (3)	Explained (4)
Share entrepreneurs invest	0.32	0.22	0.11	45.5%
Mean firm size	33.18	30.90	17.87	14.9%
Mean firm age	28.57	25.16	18.90	35.2%
Mean employment growth	1.17	0.50	0.68	138.1%
GDPpc	1.00	0.65	0.54	74.5%

Horse Race - Source of Output Losses

- How much do the channels matter?
  - 63% - static labor misallocation.
  - 14% - distortions in innovation policies.
  - 23% - distorted selection into entrepreneurship.

	Baseline	Greece (Fixed Entry and Investment)	Greece (Fixed Entry)	Greece
	(1)	(2)	(3)	(4)
Log GDPpc	1.00	0.78	0.73	0.65
%	0	63	77	100

Conclusions

- We study how labor market power affects differences in firm dynamics and aggregate income across countries.
- We build a dynamic equilibrium model of neoclassical monopsony with occupational choice.
- Differences in labor market competition explain sizeable fractions of differences in firm dynamics.
- Differences in monopsony in labor markets explain up to 42 percent of differences in income between middle and high income countries.

Appendix

Markdown Estimation

- We construct wage markdowns, μ_{it} for firm i at time t as a ratio between the firm-level marginal revenue product of labor and the wage paid (Yeh et al., 2022)

$$\mu_{it} = \frac{MRPL_{it}}{w_{it}}$$

- We assume a Cobb-Douglas specification

$$\ln(y_{it}) = \alpha + \beta \ln(l_{it}) + \gamma \ln(k_{it}) + \delta \ln(m_{it}) + \omega_{it} + \epsilon it$$

- And follow Levinsohn and Petrin (2003) to estimate

$$\ln(y_{it}) = \alpha + \beta \ln(l_{it}) + \phi(l_{it}, k_{it}, m_{it}) + \epsilon_{it}$$

  where ϕ includes capital, materials and the inverse of the demand function for materials w.r.t. ω_{it}.
- Then $MRPL_{it} = \hat{\beta}\frac{y_{it}}{l_{it}}$

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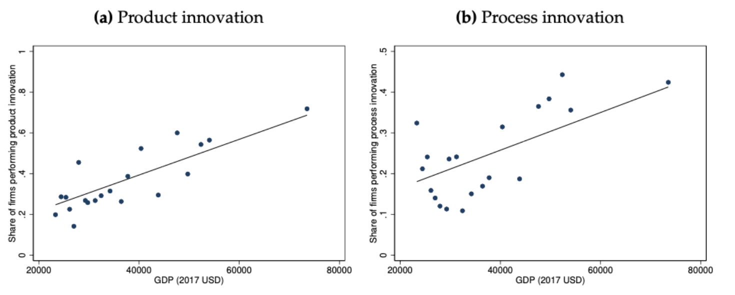
Alternative Investment Measures



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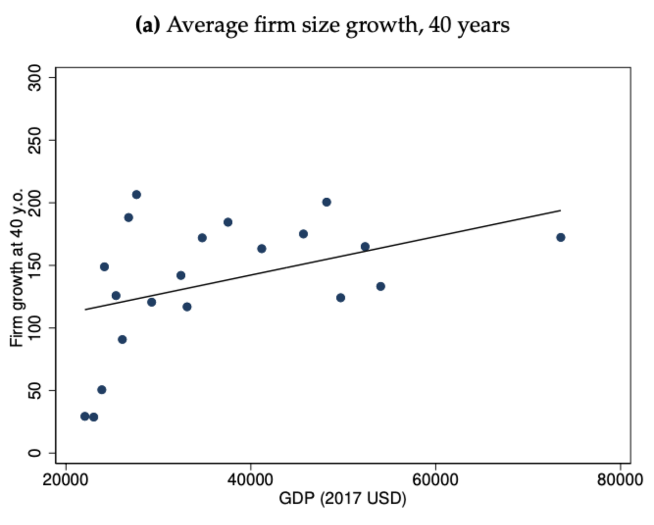
Growth Conditional on Age



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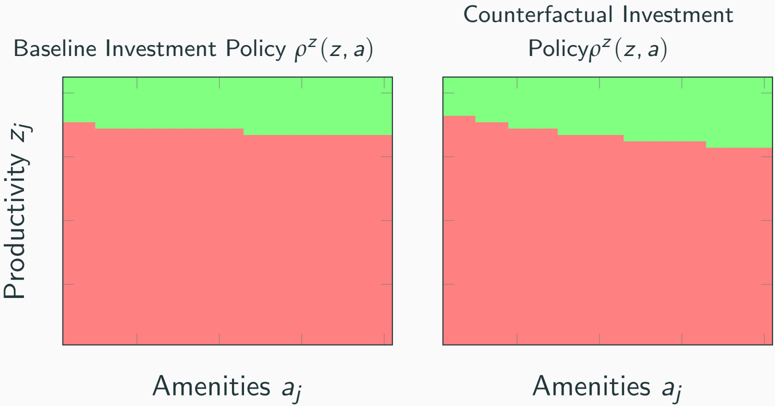
Mechanisms - Investment Policy Function



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Targeted Moments and Model Fit

Table 1: Targets and Fit

Targets	Data	Model
Average firm size	34.71	33.06
Log firm size dispersion	0.994	1.045
Average employment growth rate	1.321	1.155
Average firm age	28.93	28.25
Log wage dispersion	0.520	0.560
Firms investing in R&D, %	0.299	0.320

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Model: Equilibrium

- An equilibrium is a set of value functions $V(z, a)$, $U(z, a, z_j, a_j)$ and $\tilde{U}(z, a)$, associated policy functions $\rho^e(z, a)$ and $\rho^h(z, a)$, a wage schedule $W_j(z, a)$, an allocation of labor supply $L_j(z, a)$, an aggregate measure of workers L and a stationary distribution of agents $\Omega(z, a)$, such that:
    1. The value functions attain their maximum and the policy functions are the solution to the corresponding problems.
    2. Aggregate measure of workers is consistent with entrepreneurial choice:
    $$L = \int_{\mathcal{Z} \times \mathcal{A}} (1 - \rho^e(z, a)) d\Omega(z, a)$$
    3. The distribution of agents $\Omega(z, a)$ is stationary.

Model: Solution Algorithm

1. Guess a distribution $\Omega(z, a)$.
   1.1 Guess the entrepreneurship policy function $\rho^e(z, a)$.
   1.2 Using $\Omega(z, a)$ and $\rho^e(z, a)$, compute $\phi(z, a)$, $\mu(z, a)$, L and E.
   1.3 Solve for the fixed point of the value functions.
   1.4 Using V and $\tilde{U}$, update $\rho^e(z, a)$. Iterate on ρ^e until convergence.
2. Update $\Omega(z, a)$ by solving for the stationary distribution implied by the law of motion:

$$[\delta + (1-\delta)\rho^e(z, a)\rho^z(z, a)]\Omega(z, a) = \delta\Psi(z, a) + (1-\delta)\rho^e(z_{-1}, a)\rho^z(z_{-1}, a)\Omega(z_{-1}, a)$$

3. Iterate until convergence.