# Heterogeneous Firms in Macroeconomics

## From Aggregate Functions to Firm-Level Dynamics

Based on Chapter 22 by
Toshihiko Mukoyama

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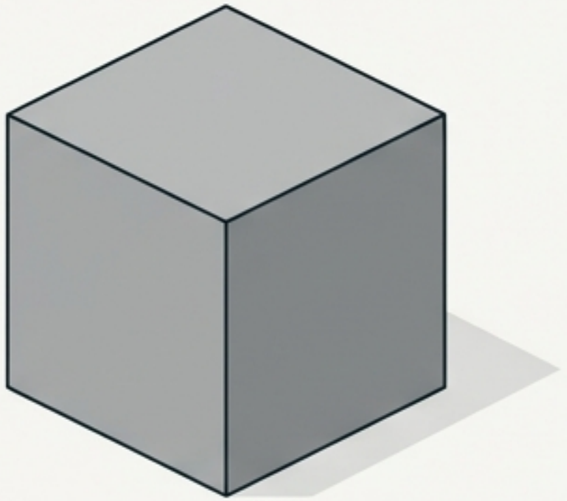
Traditional macroeconomics assumes an aggregate production function $Y = F(K,L)$, implying all firms are identical or perfectly efficient. This deck explores the reality: a "fat-tailed" economy defined by massive heterogeneity, constant reallocation, and complex policy implications that the representative firm model cannot see.

## The Representative Firm



$$Y = F(K, L)$$

- **Assumption:** All firms are identical or perfectly efficient.
- **Technology:** Homogeneous production functions.
- **Market:** Perfect substitution and static efficiency.

## The Heterogeneous Economy

- **Scale:** Massive dispersion (Mom-and-pop vs. Amazon).
- **Dynamism:** Constant entry, exit, expansion, and contraction.
- **Differentiation:** Imperfect substitutability of goods.

**Key Question: How does firm-level heterogeneity alter our answers to standard policy questions regarding taxation, regulation, and business cycles?**

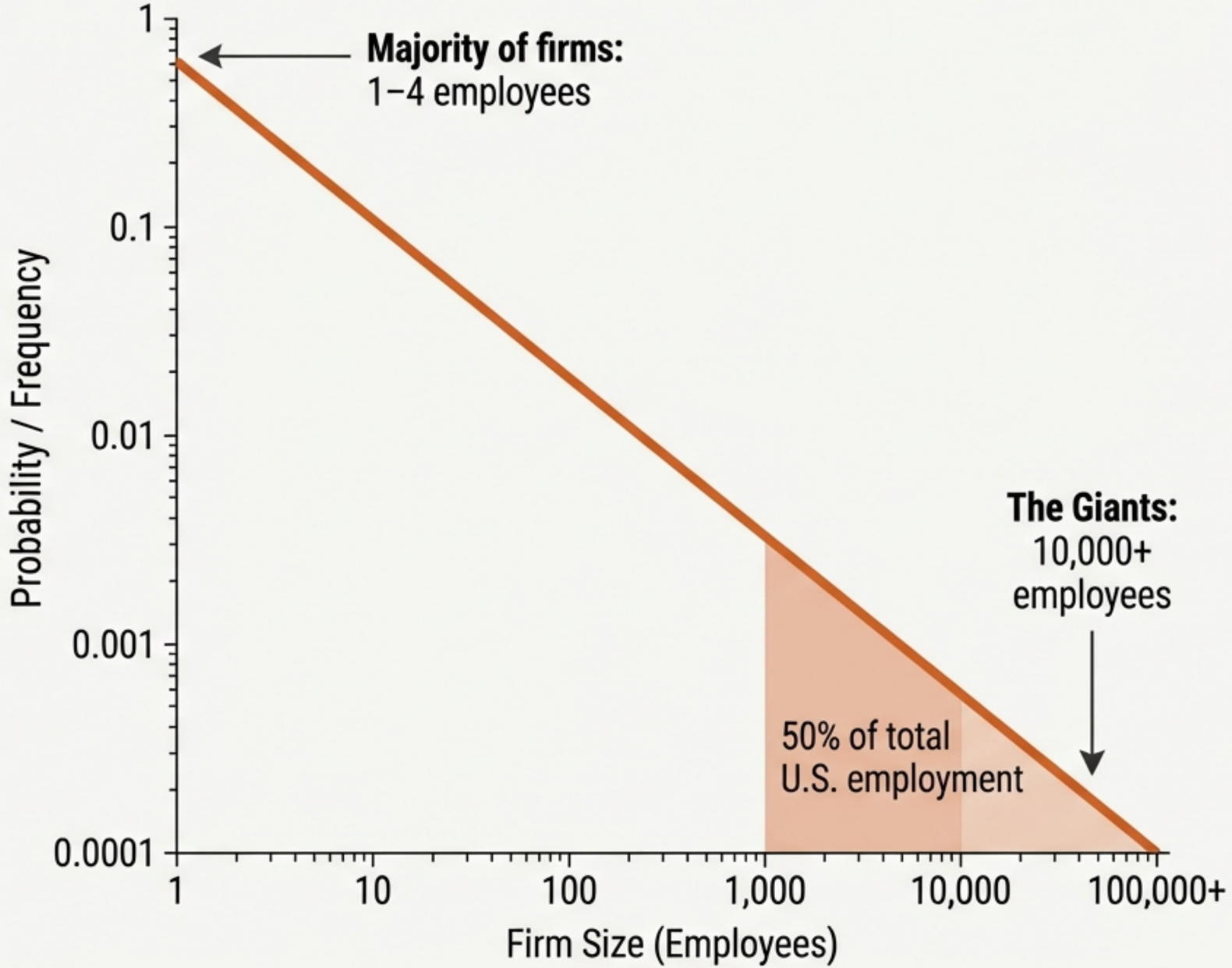
# A Fat-Tailed Economy: The Rise of Mega-Firms

- **The Many**
  The vast majority of U.S. firms are micro-enterprises (1-4 employees).

- **The Heavyweights**
  Despite the count, ~50% of total employment is concentrated in firms with 1,000+ employees.

- **Trend Note**
  Since the 1990s, the dominance of 'Mega-firms' has surged, correlated with average markups rising from ~1.2 to ~1.55 (De Loecker et al., 2020).

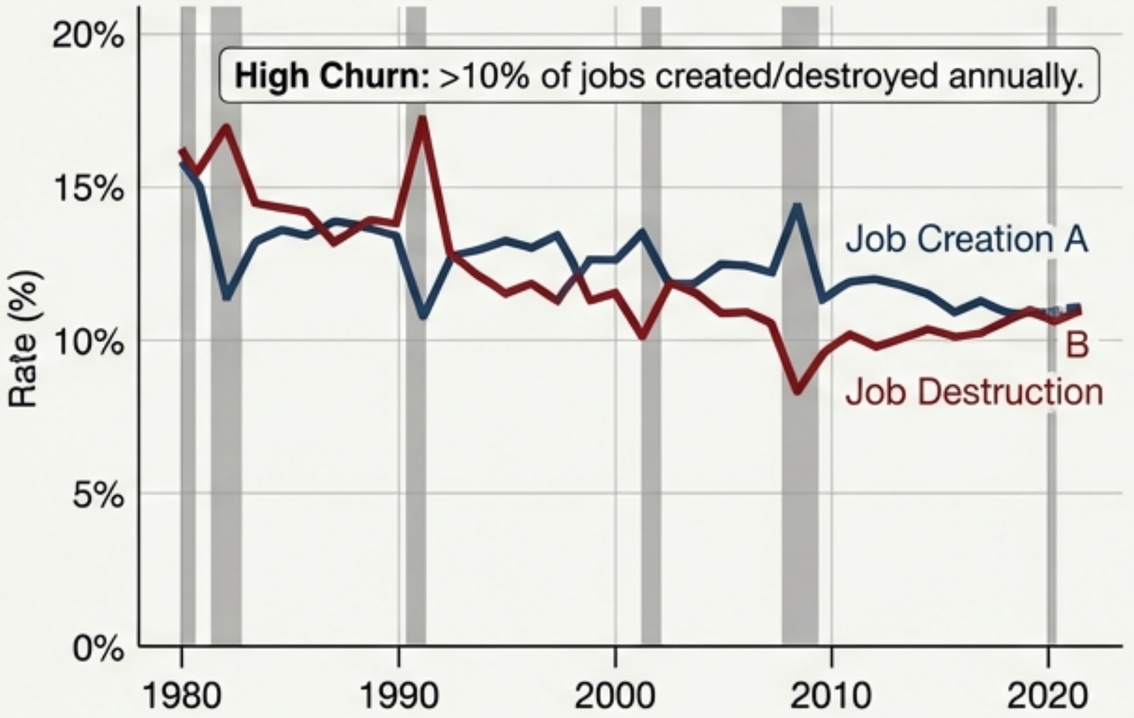
## Pareto Distribution (Log-Log Plot)



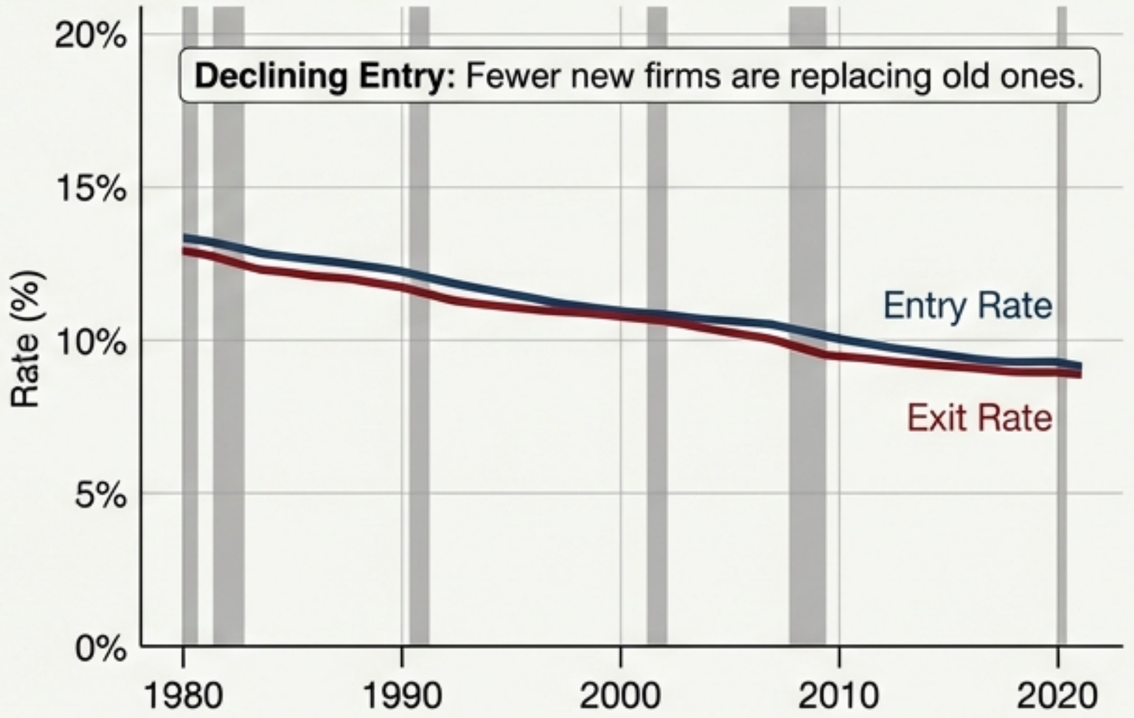
# Business Dynamism: The Engine is Slowing Down

The U.S. economy is seeing a structural decline in the reallocation of resources.

## Job Flows (1980-2020)




## Entry & Exit Rates (1980-2020)



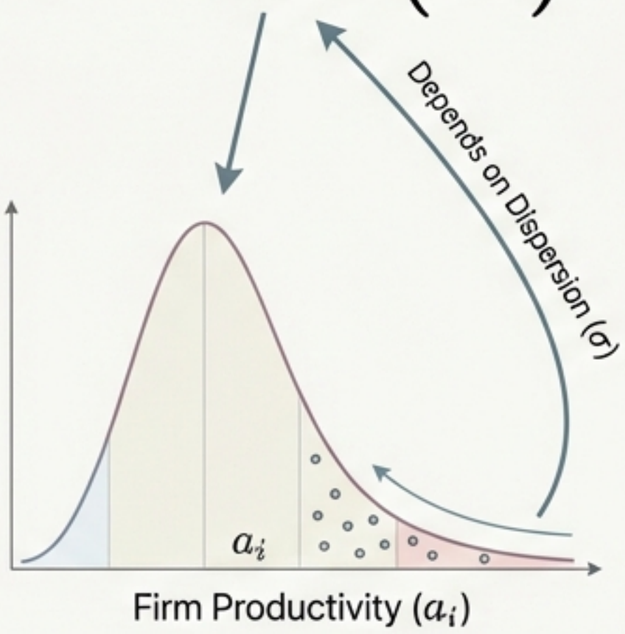

**Insight:** 'Declining Business Dynamism' suggests inputs are moving less frequently from unproductive to productive firms, potentially dragging down TFP.

# Aggregation: Why Dispersion Matters for Efficiency

$$Y = AF(X)^{\gamma}$$

## The Mechanism

Aggregate productivity (A) is not just the average of firm productivities. It is derived from their distribution.



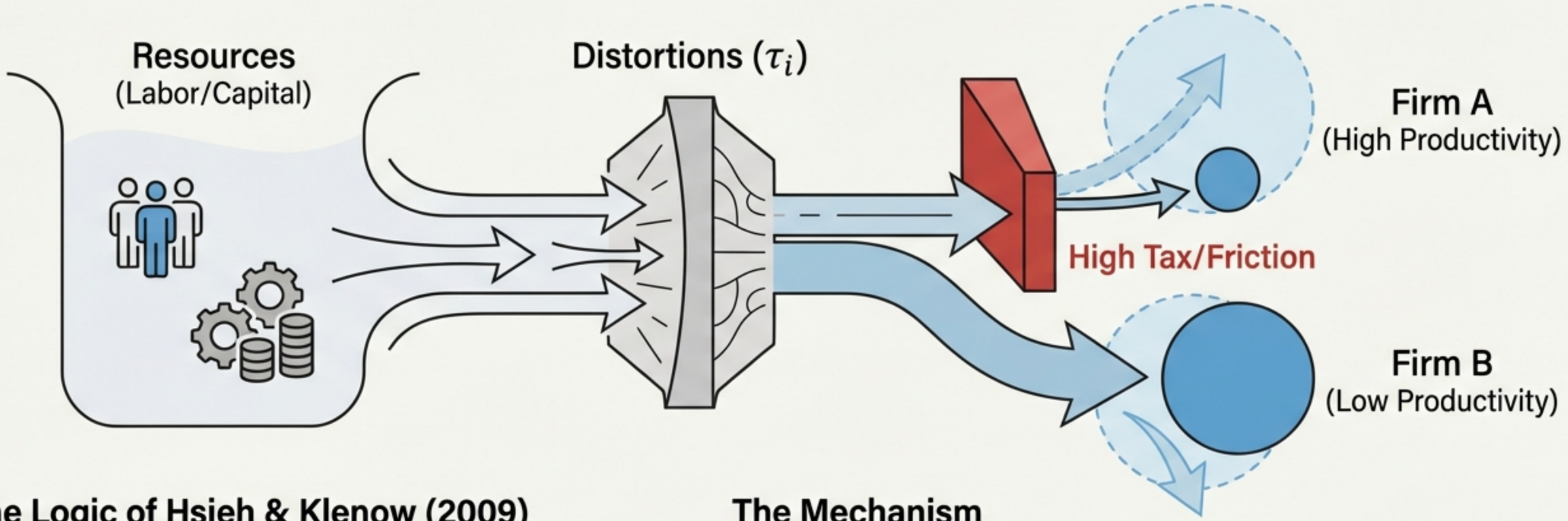

## Allocative Efficiency

In a frictionless market, resources flow to the best performers. High dispersion ($\sigma$) means there are more "super-productive" firms in the tail. If resources can move freely to them, aggregate output rises.

**Key Insight:** Higher dispersion in firm productivity can actually raise aggregate output because the economy has more room to allocate resources to the right tail.

# The Cost of Misallocation

$A$ drops when $\tau_i$ is correlated with $a_i$




## The Logic of Hsieh & Klenow (2009)

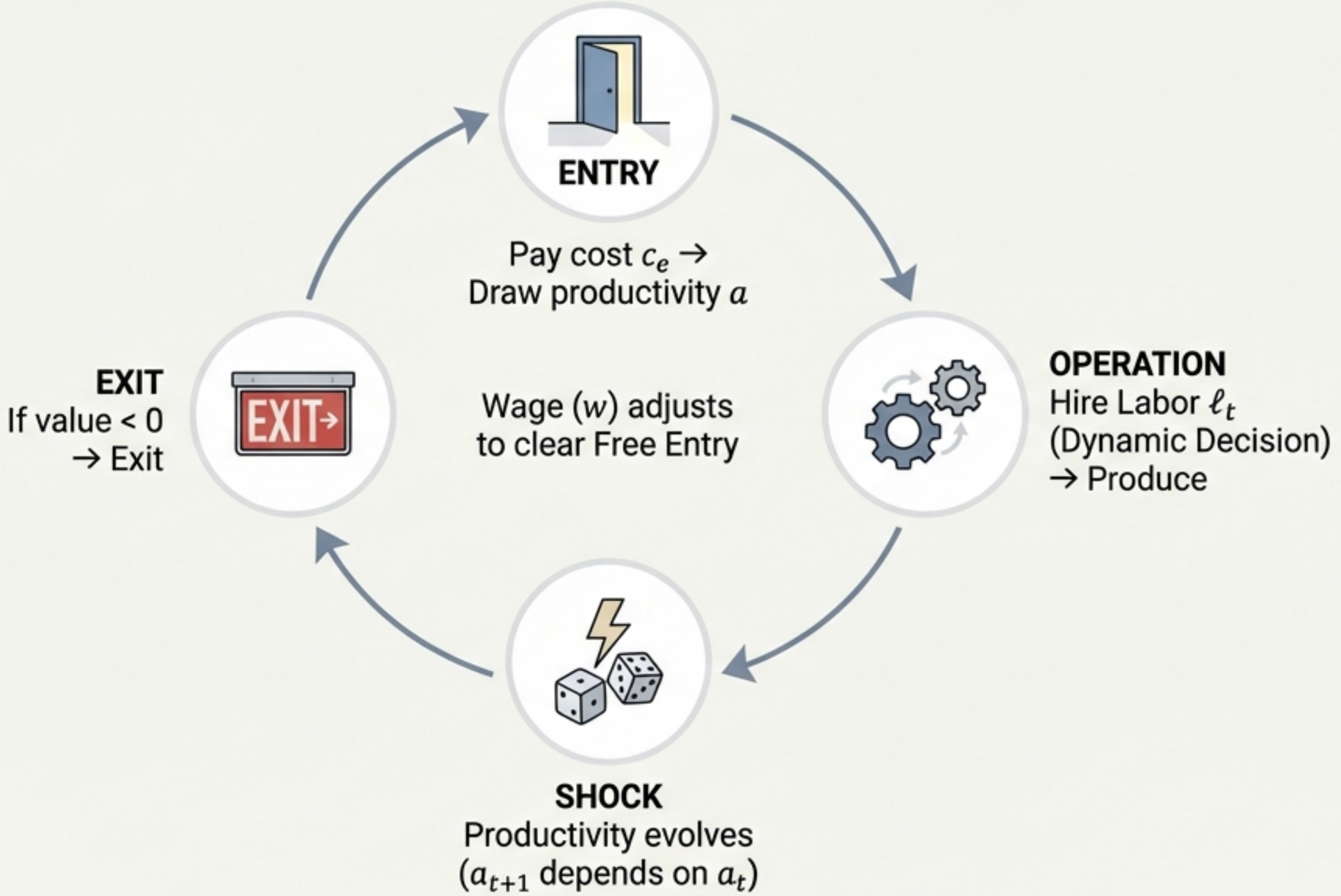
TFP loss often comes not from a lack of technology, but from resources getting stranded.

## The Mechanism

- If productive firms face high distortions ($\tau_i$), they cannot grow.
- If unproductive firms are subsidized or protected, they survive too long.

**Outcome: The aggregate economy operates inside its production possibility frontier.**

# The Hopenhayn Framework: A Lifecycle of Decisions




**General Equilibrium Model**

Firms are forward-looking. They anticipate future shocks and firing costs when making hiring decisions today.

**Equilibrium Condition**

The wage ($w$) falls until the expected Value of Entry equals the Cost of Entry.

# Policy Experiment I: The Unintended Consequences of Firing Taxes

→💲 **The Intervention**
Government imposes a tax on reducing the workforce to protect jobs.

↓👤 **Direct Effect**
Firms fire fewer workers. Job Destruction (JD) drops from 0.28 to 0.21.

↑😱 **The "Bite" (Indirect Effect)**
Firms are scared to hire. The hiring freeze outweighs the firing freeze.

Table 22.1: The Impact of Firing Taxes

| Metric | No Tax ($\tau = 0$) | High Tax ($\tau = 0.2$) |
|---|---|---|
| Wage ($w$) | 1.00 | 0.957 |
| Total Employment ($L$) | 100 | 97.4 |
| Productivity ($\$Y/L$) | 100 | 98.3 |
| Job Flows ($JC/JD$) | 0.28 | 0.21 |

**Result:** Total employment declines and productivity falls due to misallocation (firms are stuck with bad matches).

# Policy Experiment II: Entry Barriers Protect Incumbents

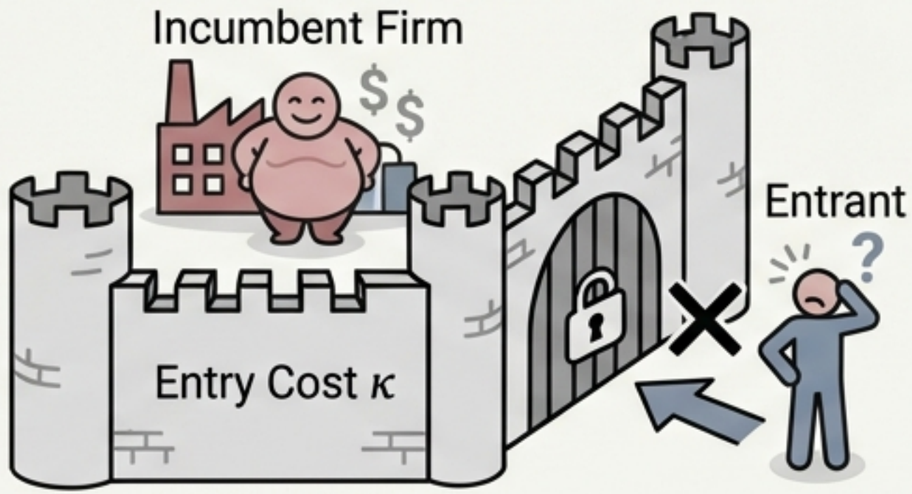
- **The Mechanism**
  High entry costs reduce competition. To satisfy the Free Entry Condition ($W_e = c_e + \kappa$), the value of being an incumbent must rise.

- **The Cost**
  For incumbent value to rise, **Wages ($w$) must fall.**

- **Tension**
  Incumbents become larger and less efficient (decreasing returns).
  Incumbents win; Workers and Entrants lose.

Table 22.2: **The Impact of Entry Barriers**

| Metric | Free Entry ($\kappa = 0$) | High Barriers ($\kappa = 5.0$) |
|---|---|---|
| Wages ($w$) | 1.000 | **0.879** |
| Total Output ($Y$) | 100 | 87.9 |
| Avg Firm Size | Baseline | Larger & Older |



# Monopolistic Competition: The Constant Markup World

$$\text{Price} = \frac{\sigma}{\sigma - 1} \times \text{Marginal Cost}$$


**Standard Model (Dixit-Stiglitz)**

- Each firm produces a unique good.
- Pricing power is determined solely by the elasticity of substitution (σ).
- Markups are fixed parameters.

**Limitation**

This model cannot explain the empirical reality of ***rising*** markups or the correlation between firm size and pricing power.

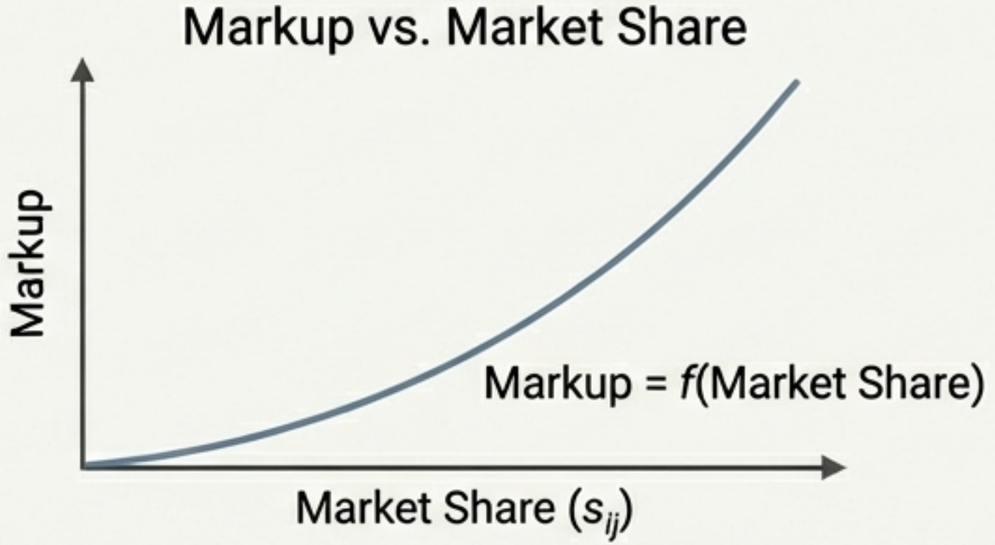
# Oligopoly & Endogenous Markups (Atkeson & Burstein)

## Explaining the Rise of Mega-Firms and Prices

- **The Shift**
  Competition happens *within* sectors. Firms play Cournot or Bertrand games against a finite number of competitors.

- **The Result**
  Markup is not constant; it depends on **Market Share**. As firms get larger (Slide 3), they charge higher markups.

- **Implication**
  Firm heterogeneity drives markup heterogeneity.

# The Granular Hypothesis: When Micro Shocks Move the Macro Needle

**Standard View (LLN)**

- Idiosyncratic shocks cancel out in a large economy ($1/\sqrt{N}$).
- Macro is immune to Micro.

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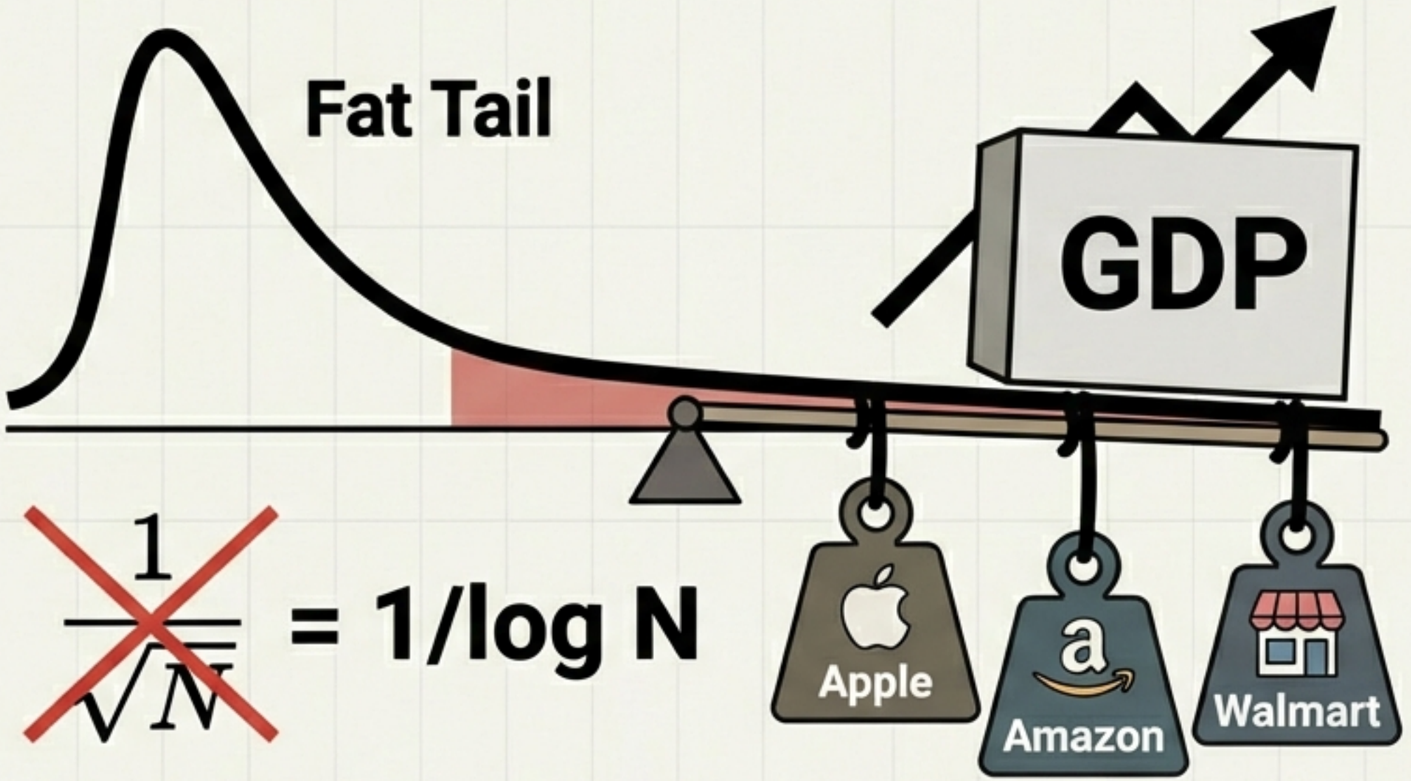



$\frac{1}{\sqrt{N}}$ = 1/log N

**The Gabaix Objection**

- Firm size follows a **Pareto Distribution**.
- Shocks to 'Granular' firms (the Giants) do *not* cancel out.

**Hulten's Theorem**

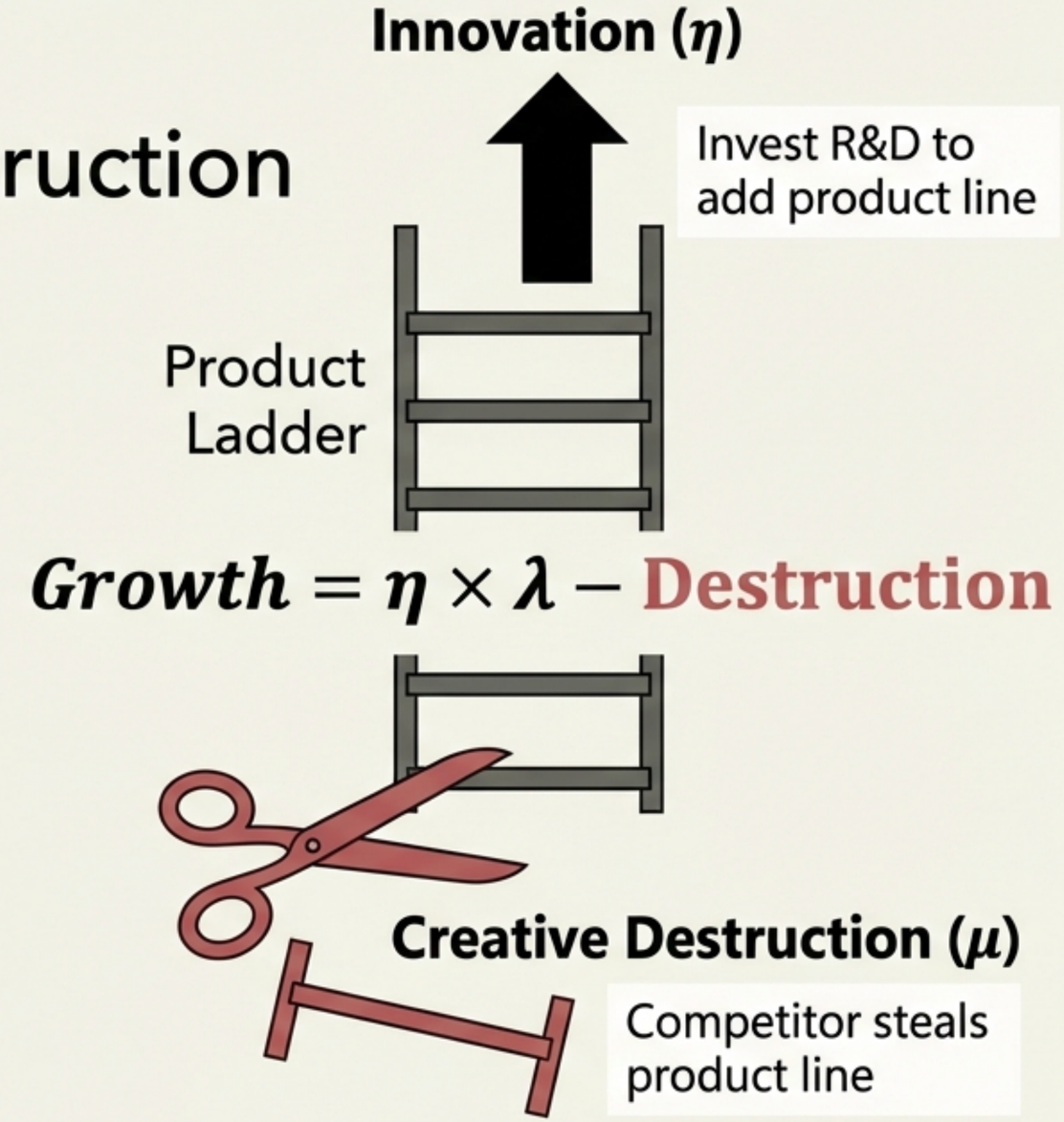
Impact scales with Sales Share (Domar Weight). Because Sales > Value Added in complex networks, shocks to giants ripple through the entire supply chain.

# Endogenous Productivity: Innovation vs. Creative Destruction

Model: Klette & Kortum (2004)

**Where does productivity ($a_i$) come from?**
It is not a random draw; it is a choice. Firms
It is not a random draw; it is a choice.
Firms invest in R&D to expand their portfolio of products.

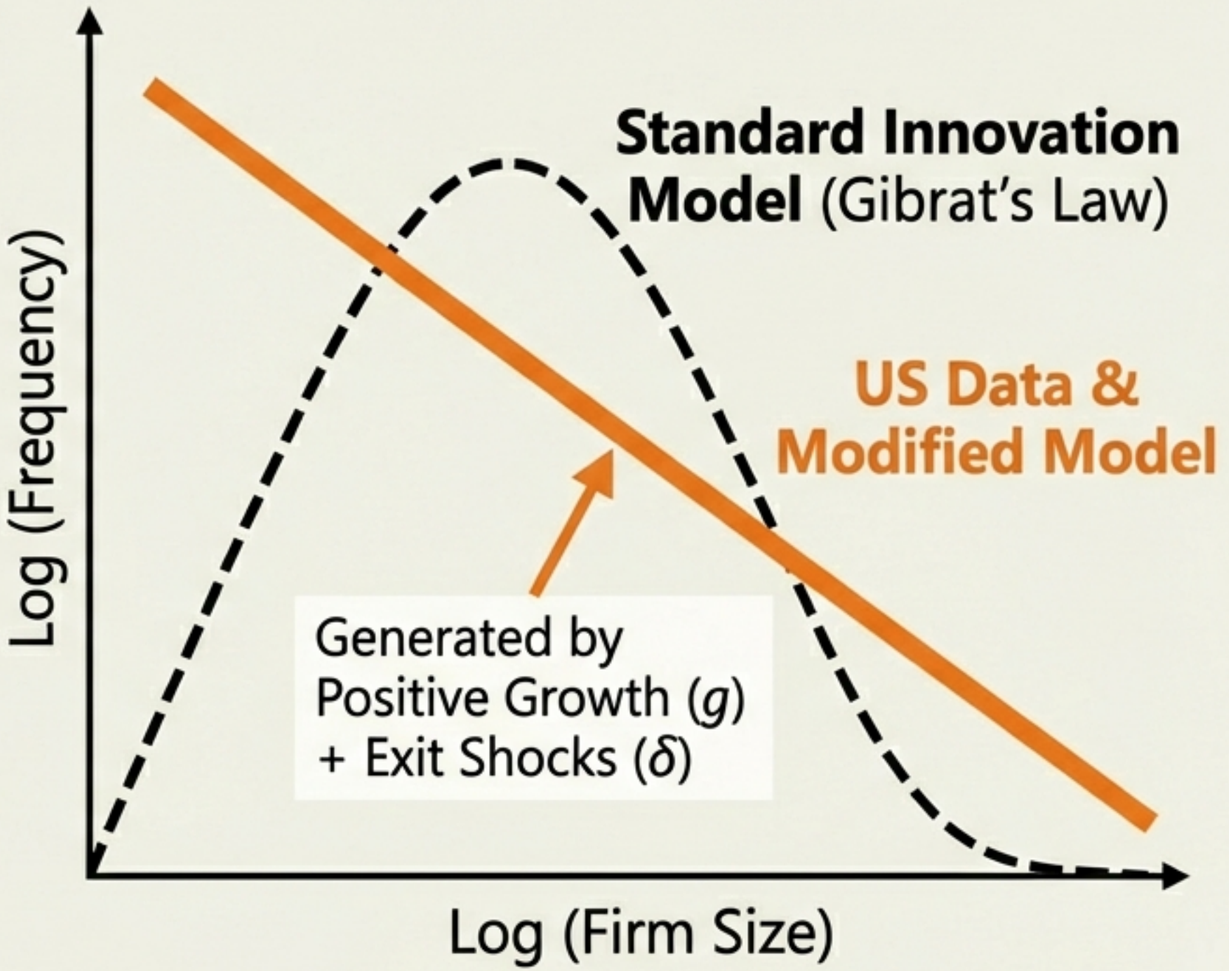
**The Engine of Growth**
Aggregate growth is driven by the net intensity of innovation by incumbents and entrants.



# Modeling the Tails: Reconciling Theory with Data

**The Challenge**
Basic innovation models predict Gibrat's Law (large and small firms grow at the same rate), generating a log-normal distribution. This misses the '**Fat Tail**' seen in reality.

**The Fix**
To match the data, successful firms must grow systematically ($g$), but face a constant risk of death ($\delta$). This combination mathematically generates the Pareto distribution.



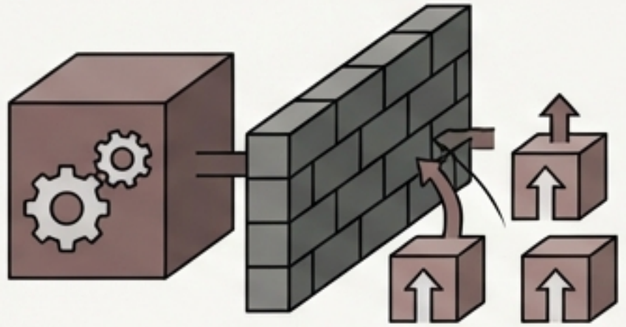
# Beyond the Representative Firm

## Efficiency

$$A = \sum_i a_i \left( \frac{L_i}{L} \right)$$

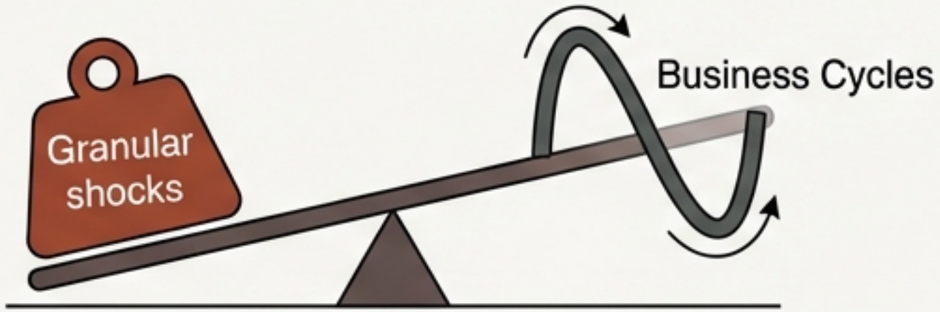
Heterogeneity drives Efficiency.

## Policy



Barriers protect incumbents, hurt wages.

## Cycles




Granular shocks drive Business Cycles.

## Market Power


Mega-firms increase Markups.

**Final Takeaway**

Understanding the modern economy requires looking under the hood of the aggregate production function. We cannot solve 21st-century economic puzzles—like the decline in dynamism or the rise of market power—with 20th-century representative r