

Lecture 10: Applications to Development

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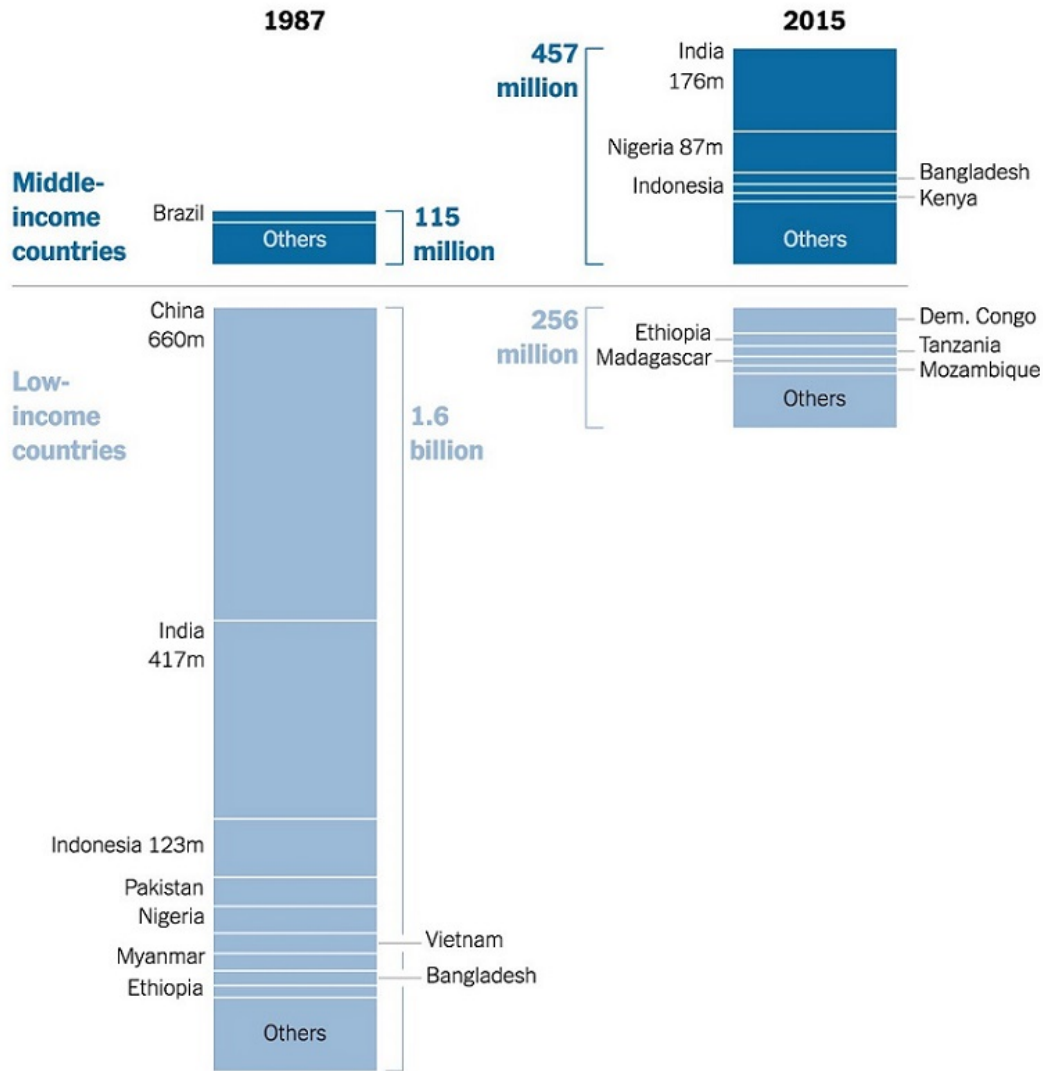
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Heterogeneous Agent Models

1. “... simultaneously speak to aggregate outcomes while also addressing a rich set of cross-sectional facts”
2. Connect to the micro-development literature. Huge gains from intellectual trade.
3. Distributional consequences

Richer Countries, but Millions Still Destitute

Number of people living in extreme poverty (less than \$1.90 per day) in 1987 and 2015. The 10 countries with the most people in extreme poverty in each year are named.



By The New York Times | Source: PovcalNet, World Bank; countries are grouped as low- or middle-income according to the World Bank's historical classifications.

Applications to Development

Today's Lecture

1. Two papers that highlight the interaction between micro-level heterogeneity and financial frictions
 - Buera, Kaboski, Shin (2021)
 - Mestieri, Schauer, Townsend (2017)
2. Industrial policy
 - Buera, Moll, Shin (2013)
 - Itskhoki and Moll (2019)
 - Buera, Hopenhayn, Shin, Trachter (2021)

Macroeconomics of Microfinance

Buera, Kaboski, Shin (2021)

- Microfinance in the 2000s
- Micro-evaluations show mixed results (small scale, short run)
- Effects at scale and in the long run?
- Approach
 - Quantitative model
 - Calibrated to micro/macro data
 - Consistency with micro-evaluations

Model Elements

- Heterogeneous productivity as entrepreneur and worker
- Collateral constraint on entrepreneurial production
- (Occasionally) binding consumption loan limit

Microfinance

$$k_{MF} \leq b_{MF} + \min \{a, 0\}$$

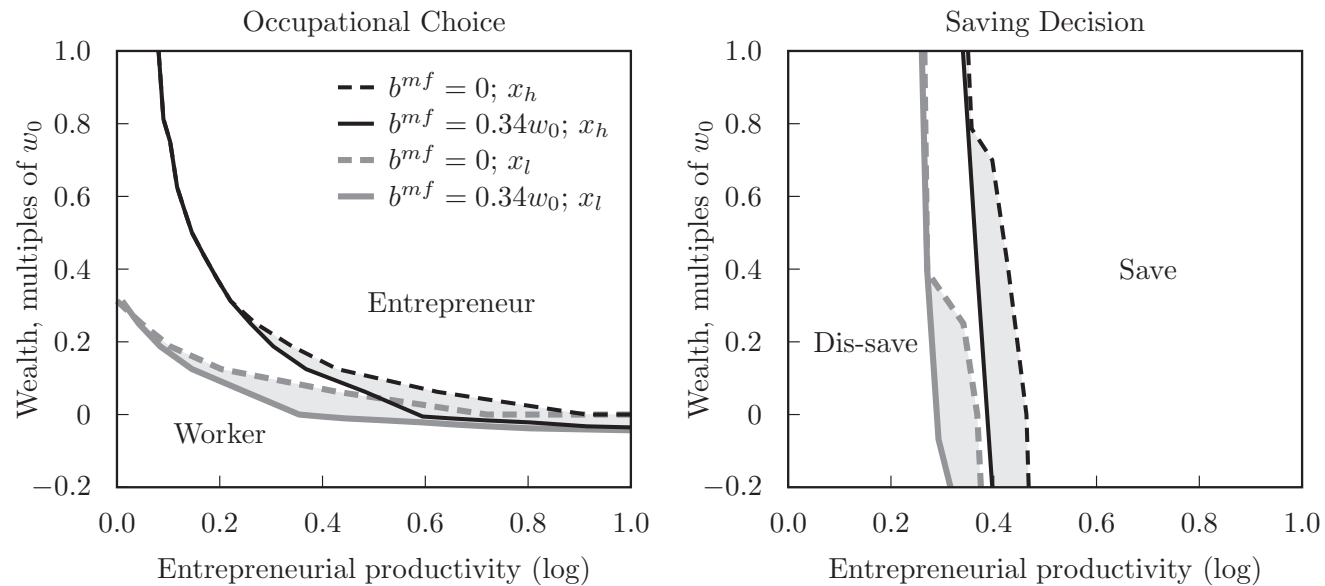
$$\max_l \{z f(k_{mf} + k_{CL}, l) - wl\} - Rk_{CL} + (1 + r) a \geq$$

$$(1 - \phi) \left[\max_l \{z f(k_{mf} + k_{CL}, l) - wl\} + (1 - \delta)(k_{mf} + k_{CL}) \right] - (1 - \delta)k_{mf}$$

- Small loan with guaranteed repayment
- Can be used for consumption or production
- Interacts with conventional financing: Expands the choice set of the poor

Occupation Choice and Saving Decision

- Prices held constant
- More entry
- More savers (poverty trap?)



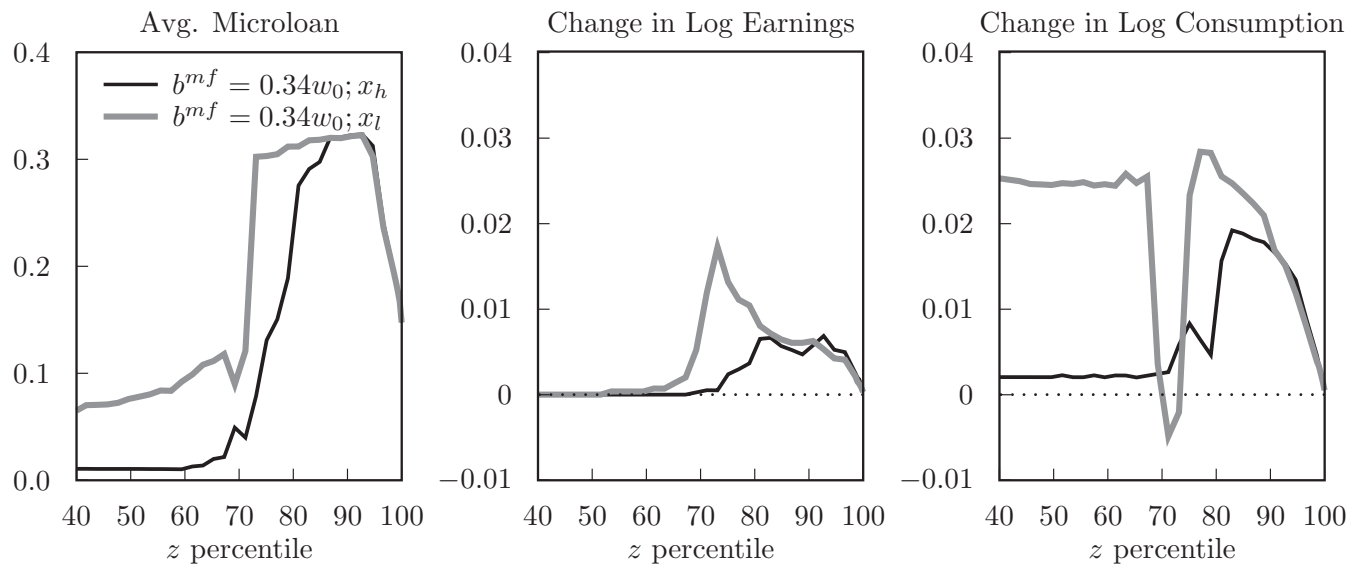
Comparison with Microevaluation in Thailand

Thailand	Microeval.	Model
Microloan credit spread	1%	1%
Avg. microloan size to GDP per worker (targeted)	0.11	0.11
Total microcredit relative to total expenditures	0.10	0.08
Total microcredit relative to total credit	0.23	0.26
Consumption	+20% [+3%,+36%]	+8%
Entrepreneurship	+4 p.p. [-1 p.p.,+9 p.p.]	+3 p.p.
Investment	-8% [-66%,+51%]	+41%
Investment prob.	+47% [+18%,+76%]	

- Thai result from Kaboski and Townsend (2011)
- Similar comparison with Banerjee, Duflo, Glennerster, Kinnan (2015) Indian study

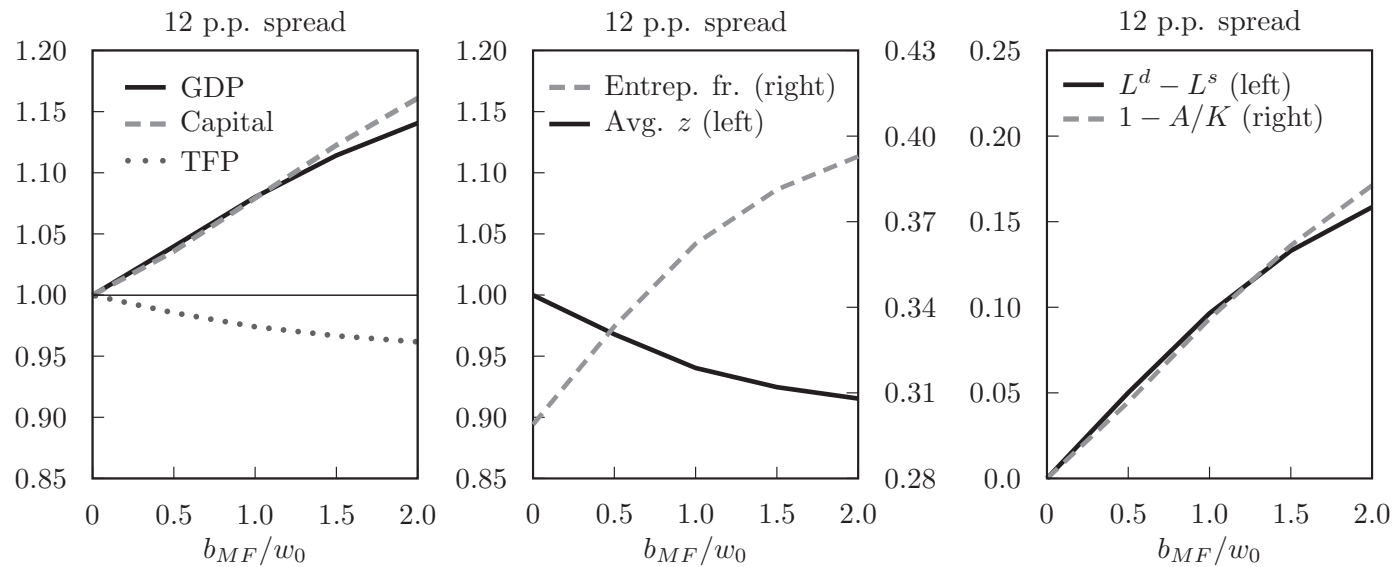
Short-run PE Effect by Entrepreneurial Productivity

- Larger effects on marginal entrepreneurs
- Used for consumption by workers
- Saving behavior of some marginal entrepreneurs



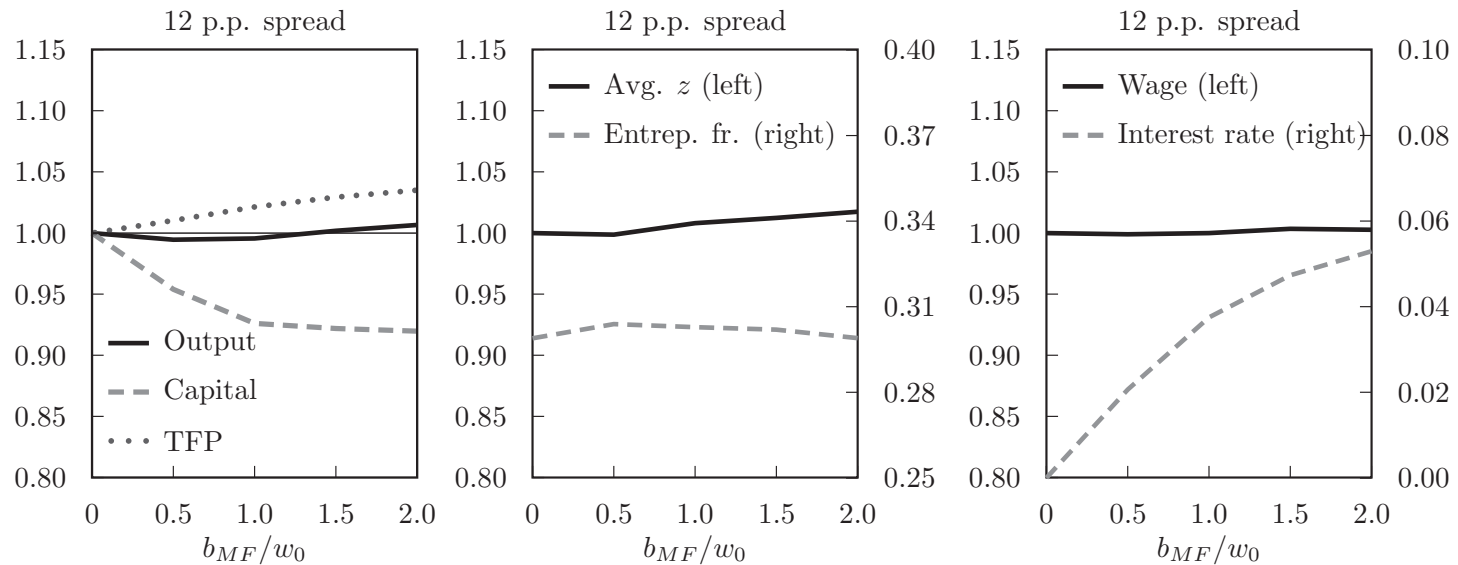
Short-run PE Effect

- More input and output
- Lower aggregate productivity



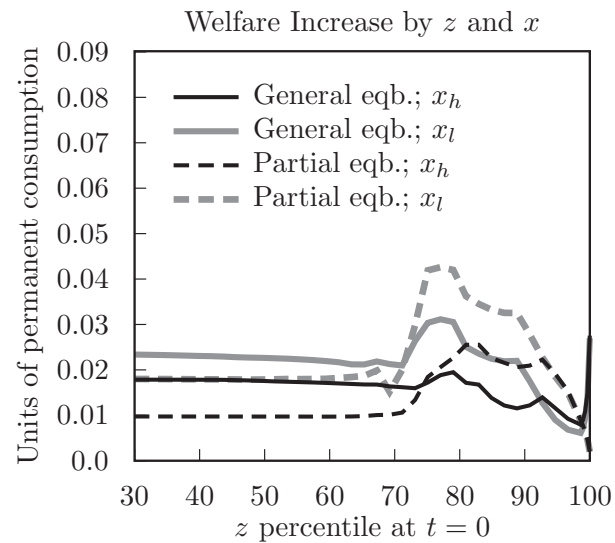
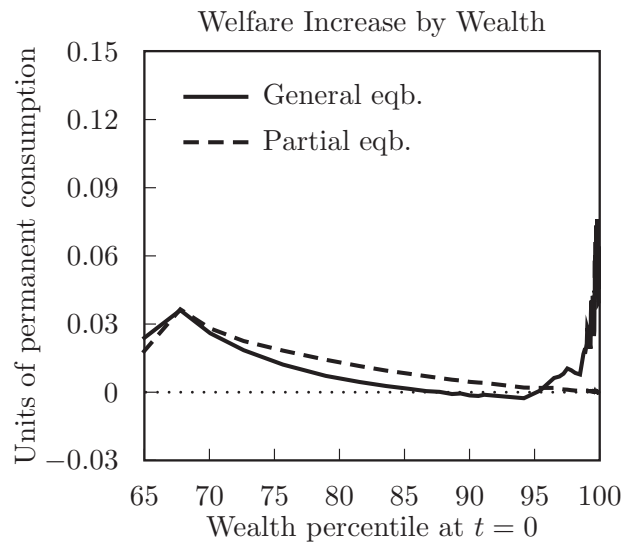
Long-run GE Effect

- Lower capital and higher aggregate productivity
- No effect on output but positive effect on consumption



Distributional Effect

- Role of consumption loan
- Higher factor price in GE can make some entrepreneurs worse off



Takeaways

- Using micro-evaluation results to discipline model analysis
- Using quantitative model to answer questions that fall outside the purview of micro-evaluations
- Extrapolating short-run PE results \neq long-run GE results
- Gains from intellectual trade (e.g., Brooks and Donovan, 2020; Lagakos, Mobarak, Waugh, 2018)

Missing Elements

- Financial frictions and market incompleteness **only**?
- Interactions among different kinds of frictions complicate inference.
- Dearth of models considering such interactions
- Endogenous productivity/human capital? (e.g., Bento and Restuccia, 2017; Bhattacharya, Guner, Ventura 2013; Gabler and Poschke, 2013; Hsieh and Klenow, 2014)

Mestieri, Schauer, Townsend (2017)

“Human capital acquisition and occupational choice: Implications for economic development”

- Financial frictions affect entrepreneurial investment and human capital investment
- Life cycle and overlapping generations: Inequality and intergenerational mobility

Empirical and Quantitative Analysis

1. Empirical evidence

- Mexican Family Life Survey (MxFLS)
- Suggestive evidence of credit constraint for both business and human capital investment
- Among below-median wealth households, running a modern business predicts less schooling for children (cost of education and opportunity cost)

2. Quantitative analysis

- Elaborate model of (modern/subsistence) entrepreneurship, human capital investment
- Life cycle and intergenerational linkages
- Role of financial frictions on development, cross-sectional inequality, and intergenerational mobility

Effect of Removing Borrowing Constraints

- Total output: +10.3%
- Total human capital: +2%
- SD of human capital: +20%
- Corr(wealth, kid human capital): 0.75 \rightarrow 0.54
- Entrepreneurs: -27 p.p. (decline of subsistence and increase of modern)
- Welfare gains concentrated in the middle

Industrial Policy

Some brief history

- Krugman (1995)
- Krueger (1997)
- Rodrik (2004)

Well-intended Policies

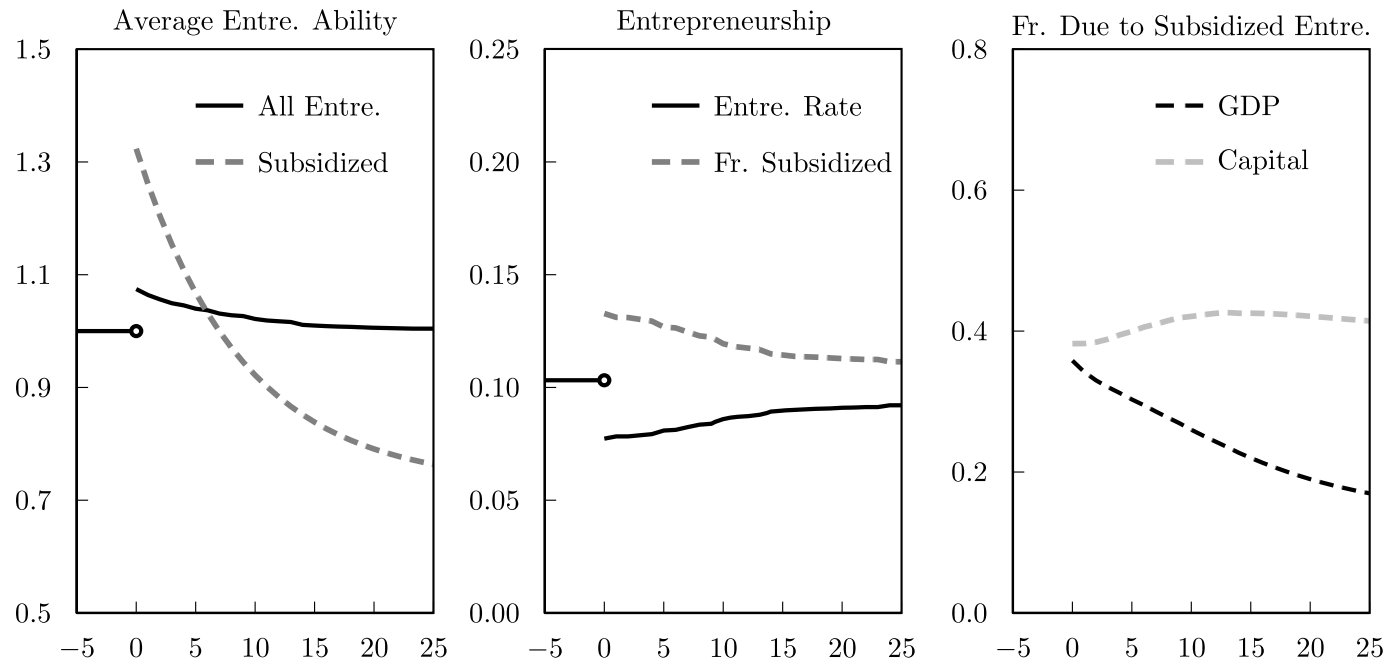
Buera, Moll, Shin (2013)

- Role for a government policy in the process of development?
- Origin of idiosyncratic distortions?
- Proof of concept, not a normative or positive exercise

Model Elements

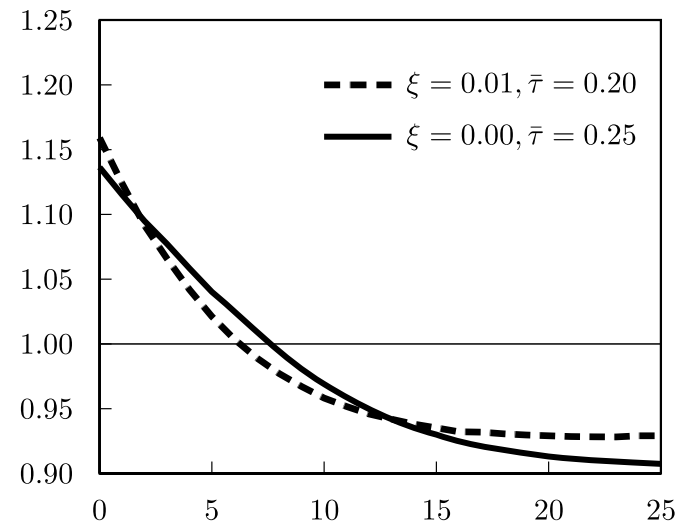
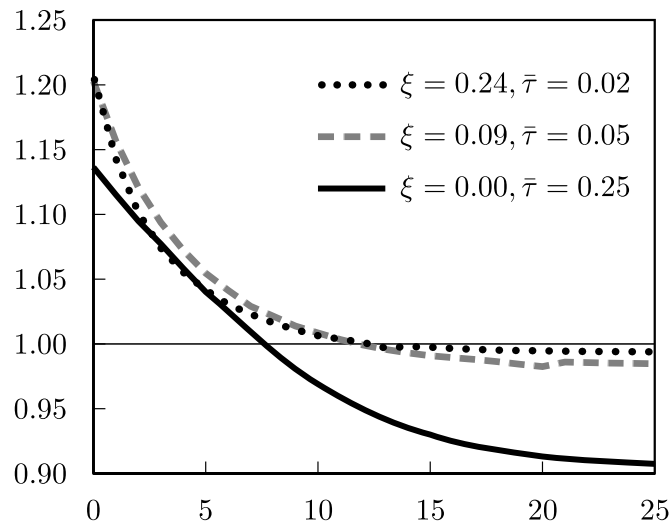
- Entrepreneurial production subject to financial frictions
- Statically, GDP/TFP can be raised if productive, under-capitalized entrepreneurs are subsidized and their credit constraint is relaxed (financed by tax on other firms)
- Once given, it may be hard to remove the subsidies (power capture by lobbying groups)
Nothing is so permanent as a temporary government program. —Milton Friedman
- With mean-reverting entrepreneurial productivity process, the subsidy recipients are less productive than the average in the long run

Results



- Positive selection initially (targeted subsidy and effect of taxes)
- Eventually, subsidy recipients drag the economy down
- In the long run, idiosyncratic taxes positively correlated with productivity (e.g., Hsieh and Klenow, 2014)

Results



- GDP normalized by pre-policy level
- Stochastic expiration of subsidies (sunset clause) will do better

Itskhoki and Moll (2019)

“Optimal development policies with financial frictions”

- Role for a government policy in the process of development?
- Normative exercise (Ramsey problem), but consistent with some historical evidence

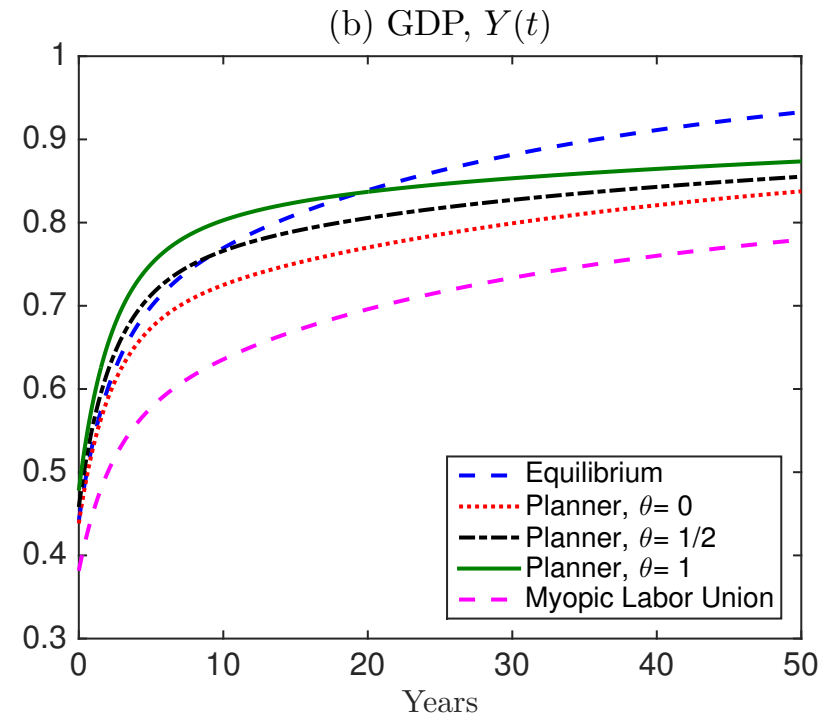
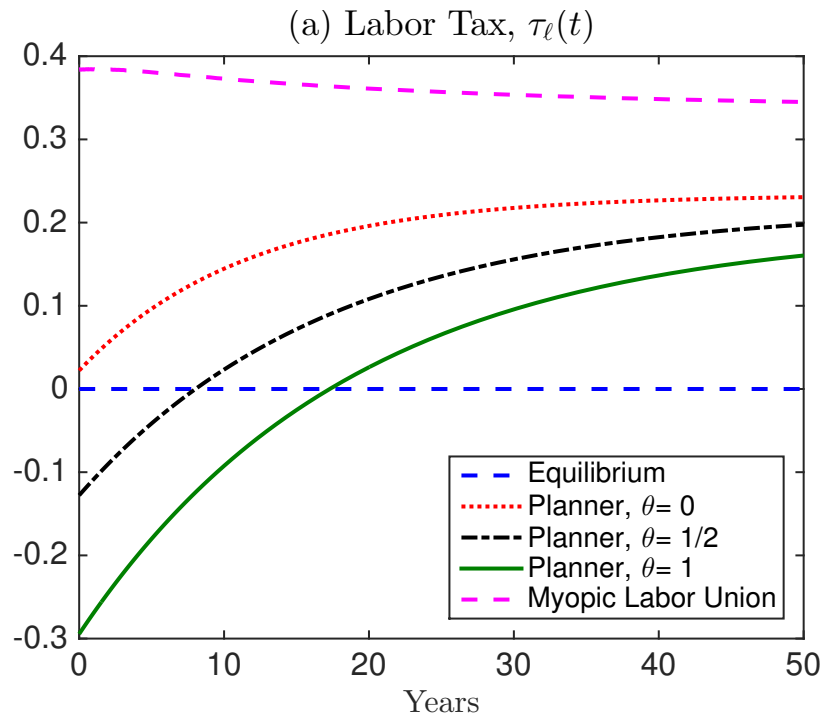
Model Elements

- Tractable continuous time model of entrepreneurial production (CRS) and collateral constraint (generalizable at the loss of tractability)
- Entrepreneurial wealth is a factor of production
- Small open economy and no ad hoc borrowing limit on workers

Theoretical Results

- Because of credit constraint,
return to wealth for entrepreneurs \gg return to wealth for workers
- For a Ramsey planner who only cares about the workers:
Labor income tax = monopoly effect - dynamic productivity effect
- Stage dependent tax: Subsidize labor (paid by lump sum tax on workers) when entrepreneurial wealth is low, and tax when high
- Indirect transfer to entrepreneurs in early stages to accelerate their wealth accumulation and output growth (even when the planner only cares about workers)

Quantitative Results



- Clear stage dependence: “pro-business” in early years, consistent with historical evidence
- Impact of the policy is modest: less than 1% increase in permanent consumption (relative to laissez-faire)

Big Push in Distorted Economies

Buera, Hopenhayn, Shin, Trachter (2021)

- Role for a government policy in the process of development?
- Model with large effects of idiosyncratic distortions
- Policy: reducing distortions and/or subsidizing technology adoption

Role of Complementarity in Technology Adoption

- Big Push of Murphy, Shleifer, Vishny (1989): Multiple equilibria
- Notion of Big Push without multiple equilibria?

Model Elements

- Differentiated goods (monopolistic competition), aggregated as final good
- Production of differentiated goods use final good—i.e., roundabout production (Jones, 2011)
- Heterogeneous firms and binary technology choice. Adoption costs (units of final good) for the productive technology

Complementarity

When more firms adopt the productive technology, for the marginal firm:

1. Its output price falls
2. Demand for its output increases
3. Adoption cost falls

If 2+3 stronger than 1, gains from adoption increases in the number of adopters: complementarity in adoption decisions.

Complementarity stronger when

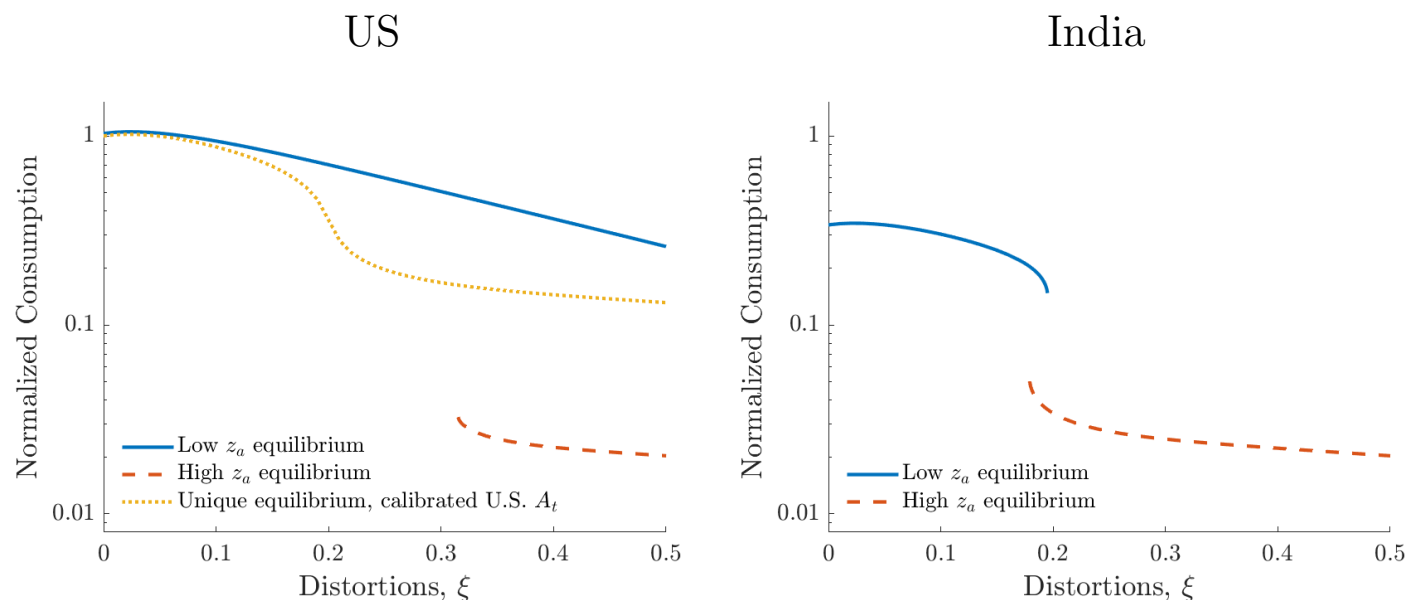
1. Differentiated goods less substitutable
2. Smaller heterogeneity in firm productivity (correlated idiosyncratic distortions)
3. Higher intermediate input intensity of the productive technology

Complementarity

1. When complementarity is strong enough, multiple equilibria
2. Even if it doesn't generate multiplicity, amplification of the effects of distortions and policies

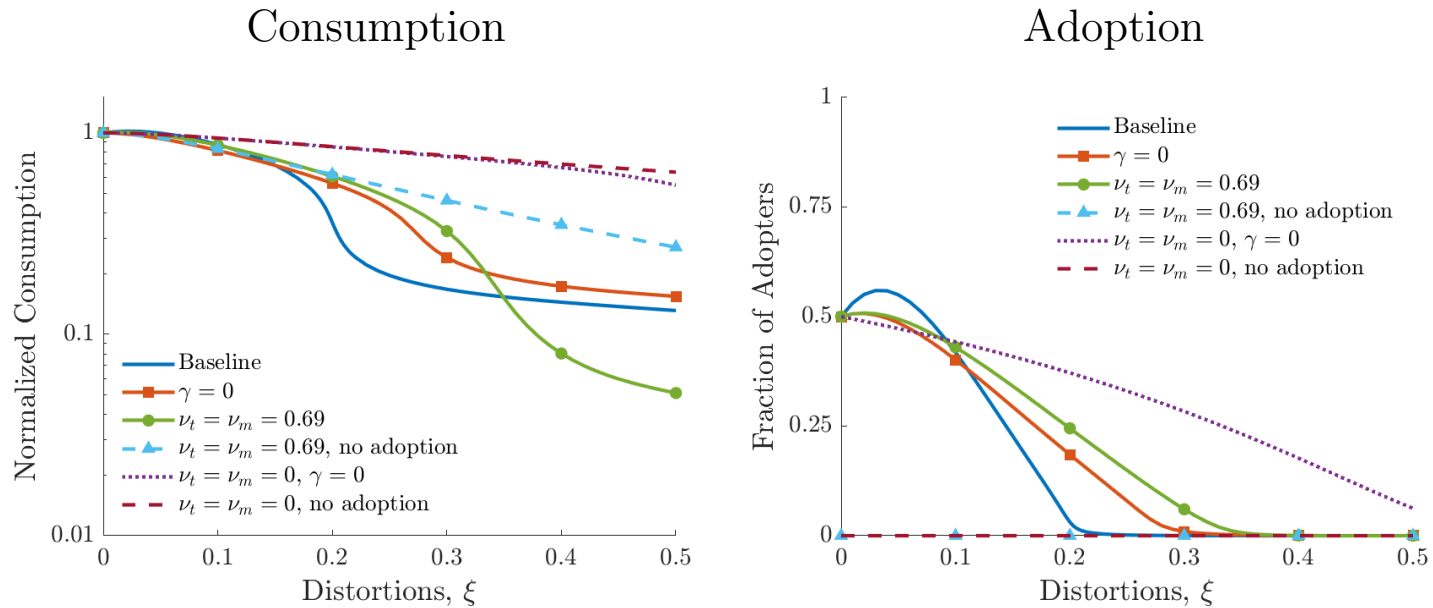
Policy implications of multiplicity? Amplification?

Multiplicity and the Impact of Distortions



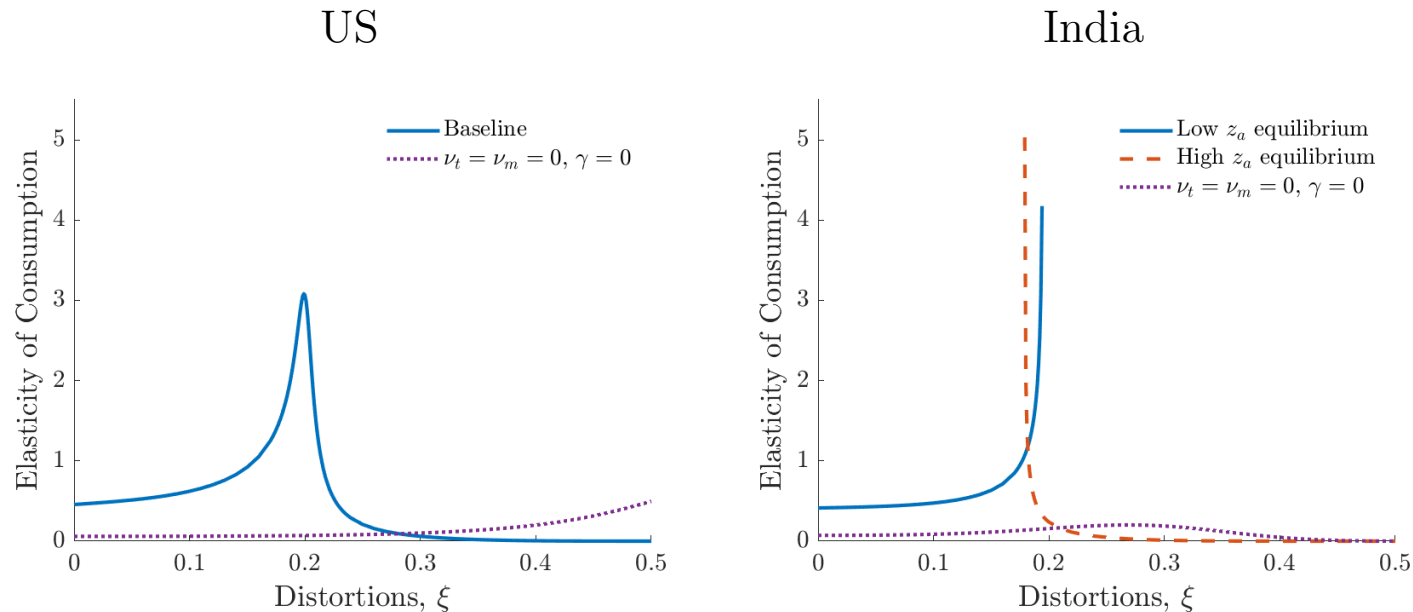
- India has more distortion ($\xi = 0.19$) and larger adoption costs
- US: unique equilibrium (yellow line); India in multiplicity region (but in good equilibrium)
- (Correlated) distortions have large impact
- Policy implications: distortion-reducing reforms

The Impact of Distortions



- Larger effect than in standard models
- Region of nonlinearity, the Big Push region

Industrial Policy



- Subsidizing technology adoption cost
- Locally disproportionate effect, the Big Push region
- Possible explanation of why some policies succeed but not others

Heterogeneous Agent Models in Development

- Fuller utilization of empirical evidence, especially micro-evaluations
- Can answer important questions hard to answer otherwise
- Natural focus on distributional consequences
- Lumpy investment and technology choice seem useful model elements for understanding data
- Much more work to be done!

p.s.

1. Frictions/misallocation and growth rates (e.g., Peters, 2020)
2. Worker-side heterogeneity (e.g., skill, occupation)
3. Discrete time vs. continuous time methods; Finite difference vs. finite state Markov chain (Phelan and Eslami, 2020)

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