Productivity across Countries

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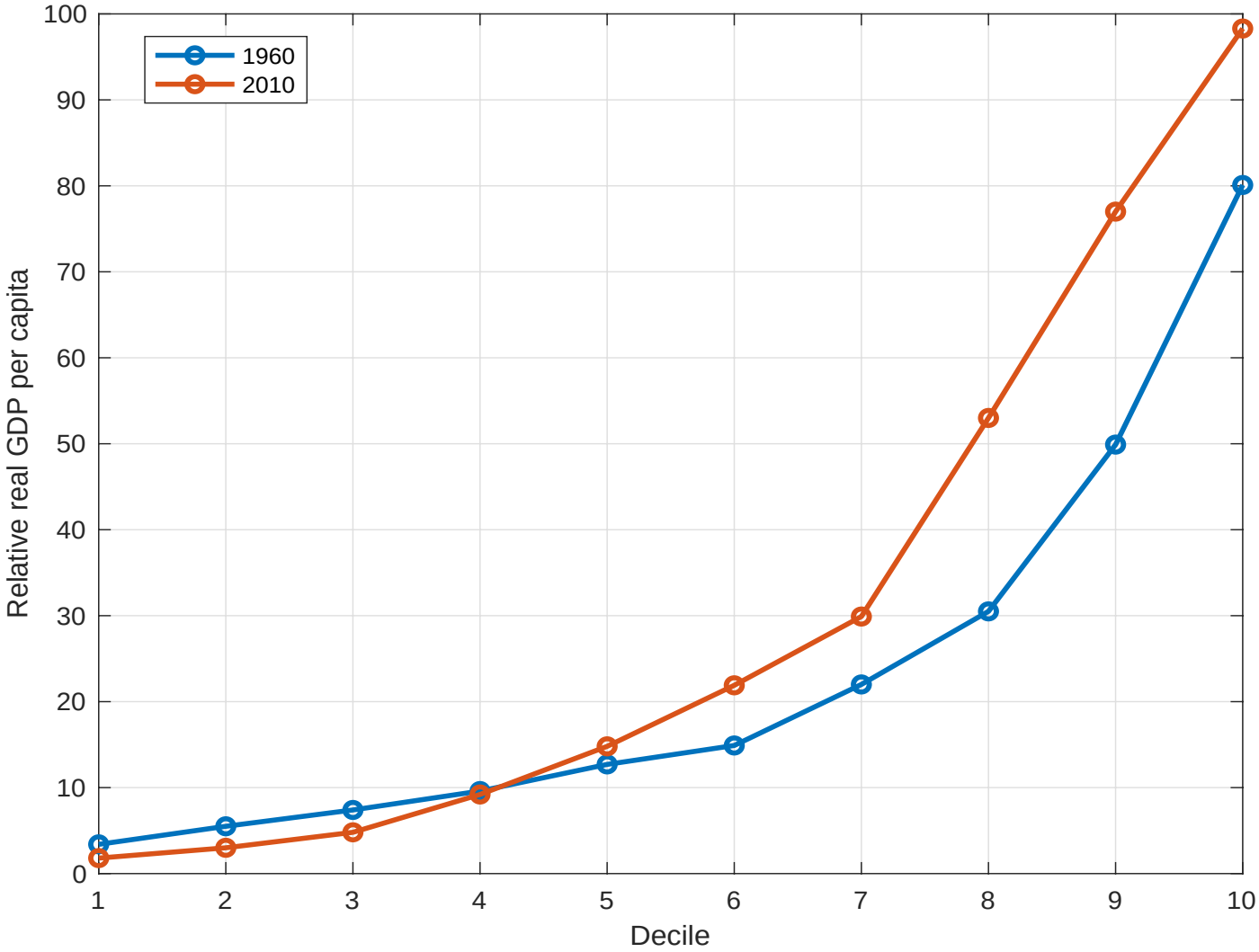
Outline

Fact 1: Large differences in GDP per capita

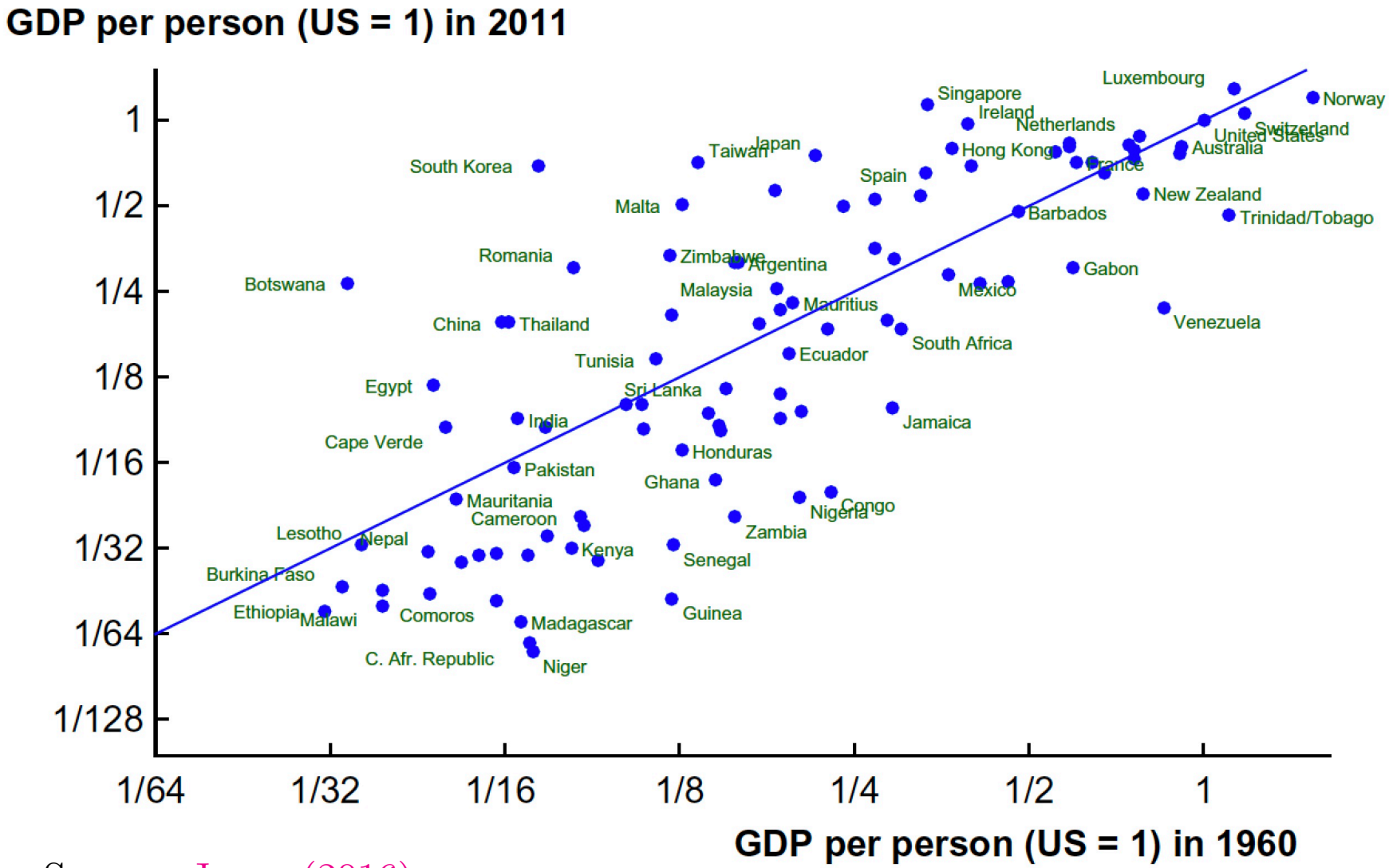


Fact 2: Differences due to policy

Relative GDP per capita over time, some countries

Country	1960	1980	2000	2014
Botswana	2.3	7.5	21.5	29.1
Ethiopia	2.5	2.5	1.2	2.6
Malawi	4.7	4.3	2.1	1.9
China	5.6	5.7	9.5	24.6
Korea	6.2	18.3	50.5	68.2
Zimbabwe	11.3	10.0	6.1	3.1
Singapore	14.3	41.7	83.3	149.7
Japan	30.8	63.2	73.9	68.2
Mexico	32.0	38.1	25.4	31.1
Austria	53.4	62.9	77.8	92.7
United Kingdom	68.0	64.7	74.9	75.3
New Zealand	81.2	60.2	59.4	66.0

Fact 2: Differences due to policy



- Source: Jones (2016)

Fact 3: Differences due to productivity

$$\underbrace{\frac{Y}{P}}_{\text{GDP per capita}} = \underbrace{\text{TFP}^{\frac{1}{1-\alpha}} \cdot \left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}} \cdot h}_{\text{labor productivity}} \times \underbrace{n \cdot \frac{E}{P}}_{\text{labor per capita}}$$

- Cross-country income differences mostly accounted for by total factor productivity (TFP) (e.g. Klenow and Rodriguez-Clare 1997; Jones 2016)
- Similar conclusion when accounting for human capital (e.g. Erosa, Koreshkova, and Restuccia 2010; Manuelli and Seshadri 2014)

The Latin American Development Problem

- Restuccia (2013), Economia, https://muse.jhu.edu/article/511861

- GDP per capita in Latin America (LA) relatively low
  - 0.30 in 1960, 0.23 in 2009, relative to the United States (US)
- Questions:
  - What factors (employment, hours, capital, productivity,...) account for this poor economic performance?
  - Why are these factors low?

Decomposing GDP per Capita

GDP per capita Y/P can be written as:

$$\frac{Y}{P} = \frac{Y}{nE} \times \frac{E}{P} \times n$$

where Y/nE is labor productivity, E/P is the employment to population ratio, and n is hours per worker

Relative LA to US:

$$\frac{(Y/P)_{LA}}{(Y/P)_{US}} = \frac{(Y/nE)_{LA}}{(Y/nE)_{US}} \times \frac{(E/P)_{LA}}{(E/P)_{US}} \times \frac{n_{LA}}{n_{US}}$$

Question: Which components explain a 0.2-0.3 factor difference in GDP per capita?

GDP per Capita Differences

$$1960: \quad \underbrace{\frac{(Y/P)_{LA}}{(Y/P)_{US}}}_{0.30} = \underbrace{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}}_{0.34} \times \underbrace{\frac{(E/P)_{LA}}{(E/P)_{US}}}_{0.82} \times \underbrace{\frac{n_{LA}}{n_{US}}}_{1.07}$$

$$2009: \quad \underbrace{\frac{(Y/P)_{LA}}{(Y/P)_{US}}}_{0.23} = \underbrace{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}}_{0.24} \times \underbrace{\frac{(E/P)_{LA}}{(E/P)_{US}}}_{0.87} \times \underbrace{\frac{n_{LA}}{n_{US}}}_{1.11}$$

- Relative labor input $\left(\frac{E}{P} \times n\right)$: 0.88 in 1960 and 0.97 in 2009
- Low relative GDP per capita LA: a labor productivity problem!

Decomposing Labor Productivity

Aggregate production function

$$Y = AK^{\alpha}(hEn)^{1-\alpha}$$

where A is total factor productivity (TFP), K is physical capital, and h is human capital per worker

In intensive form relative GDP per hour (y):

$$\frac{y_{LA}}{y_{US}} = \left(\frac{A_{LA}}{A_{US}}\right)^{\frac{1}{1-\alpha}} \times \left(\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right)^{\frac{\alpha}{1-\alpha}} \times \frac{h_{LA}}{h_{US}}$$

Physical Capital to Output Differences

	1960	2008
$(K/Y)_{LA}$	2.32	1.76
$(K/Y)_{US}$	2.05	2.57
Ratio	1.13	0.69
$\left(\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right)^{\frac{\alpha}{1-\alpha}}$	1.06	0.83

- No substantial differences in capital accumulation
- Fall in capital accumulation accounts for more of the decline in relative productivity

Human Capital Differences

- Substantial differences in average years of schooling: range 2 to 9 in 1960 and 7 to 12 in 2010 — key is how schooling translates into human capital differences
- Standard models of human capital imply log linear relationship between human capital and income,

$$\log h = c_h + \gamma \log y \qquad (h = c_h y^{\gamma})$$

- Hence, relative GDP per hour (y):

$$\frac{y_{LA}}{y_{US}} = \left(\frac{A_{LA}}{A_{US}}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}} \left(\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right)^{\frac{\alpha}{(1-\alpha)(1-\gamma)}}$$

- Using cross-section heterogeneity across individuals in US, Erosa, Koreshkova, and Restuccia (2010) estimate $\gamma \approx 0.46$

Labor Productivity Differences

$$1960: \quad \underbrace{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}}_{0.30} = \underbrace{\left(\frac{A_{LA}}{A_{US}}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}}}_{0.27} \times \underbrace{\left(\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right)^{\frac{\alpha}{(1-\alpha)(1-\gamma)}}}_{1.12}$$

$$2009: \quad \underbrace{\frac{(Y/nE)_{LA}}{(Y/nE)_{US}}}_{0.23} = \underbrace{\left(\frac{A_{LA}}{A_{US}}\right)^{\frac{1}{(1-\alpha)(1-\gamma)}}}_{0.32} \times \underbrace{\left(\frac{(K/Y)_{LA}}{(K/Y)_{US}}\right)^{\frac{\alpha}{(1-\alpha)(1-\gamma)}}}_{0.71}$$

- TFP ratio (A_{LA}/A_{US}) 0.62 in 1960, 0.66 in 2009
- Low relative income driven by low TFP
- Decline in relative income driven by decline in capital accumulation

Key Question

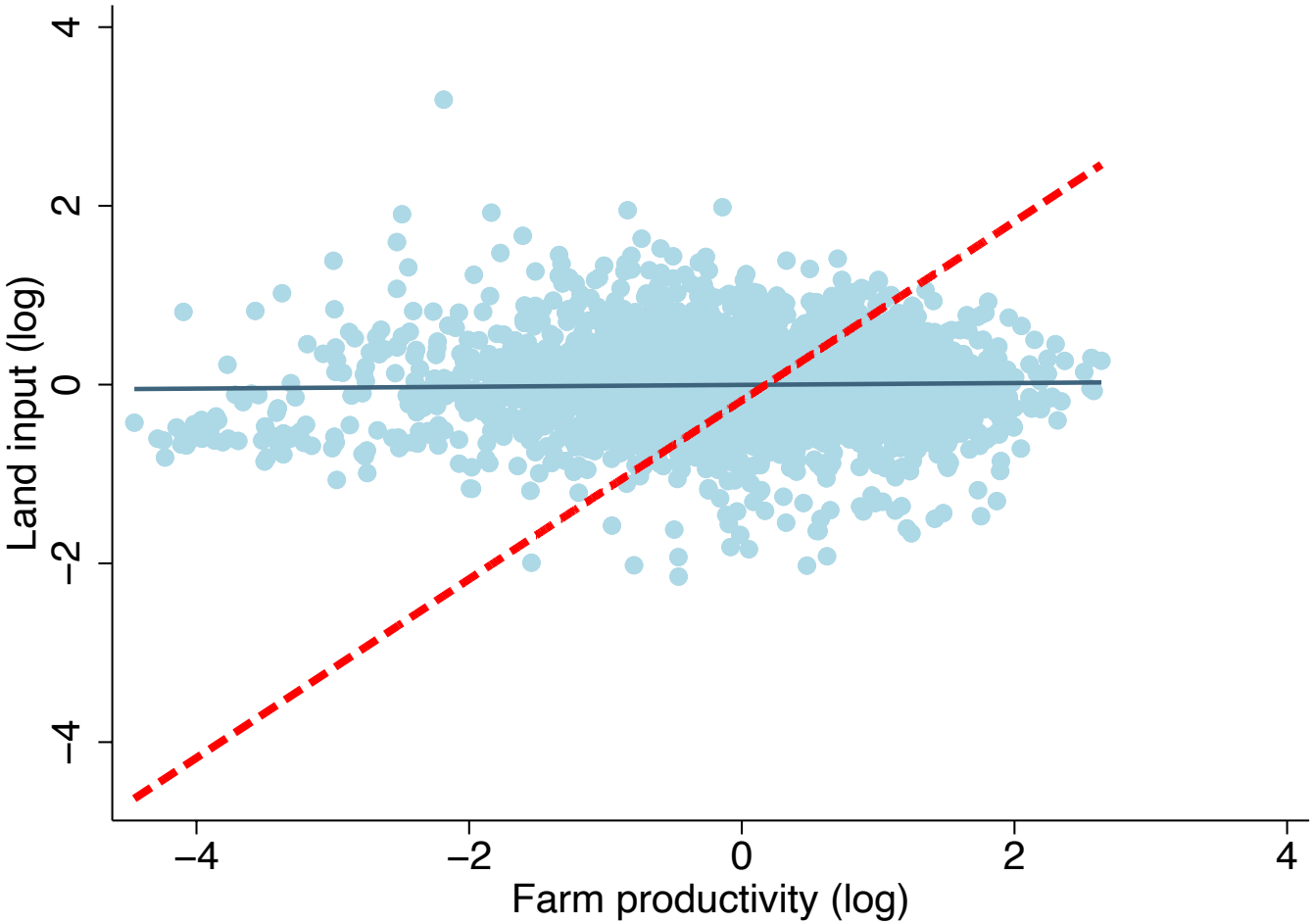
What accounts for TFP differences across countries?

- One explanation is that poor countries are slow in adopting advanced technologies and best practices
- Another distinct but complementary explanation is that resources are not allocated to best uses across firms in poor countries causing misallocation
- Explanations may be linked via same underlined policies and institutions

Causes of misallocation

- Regulation, discretionary provisions such as firing costs, size-dependent policies
  ...a regulation may apply to all producers but enforced among larger (more productive) producers, connects to informality
- Selective industrial policy
- Land institutions
- Financial frictions
- Trade restrictions
- Useful references:
  - Cusolito and Maloney (2018), Productivity Revisited..., The World Bank
  - Pages (2010), The Age of Productivity..., IDB-Springer

Agricultural Land Misallocation in China

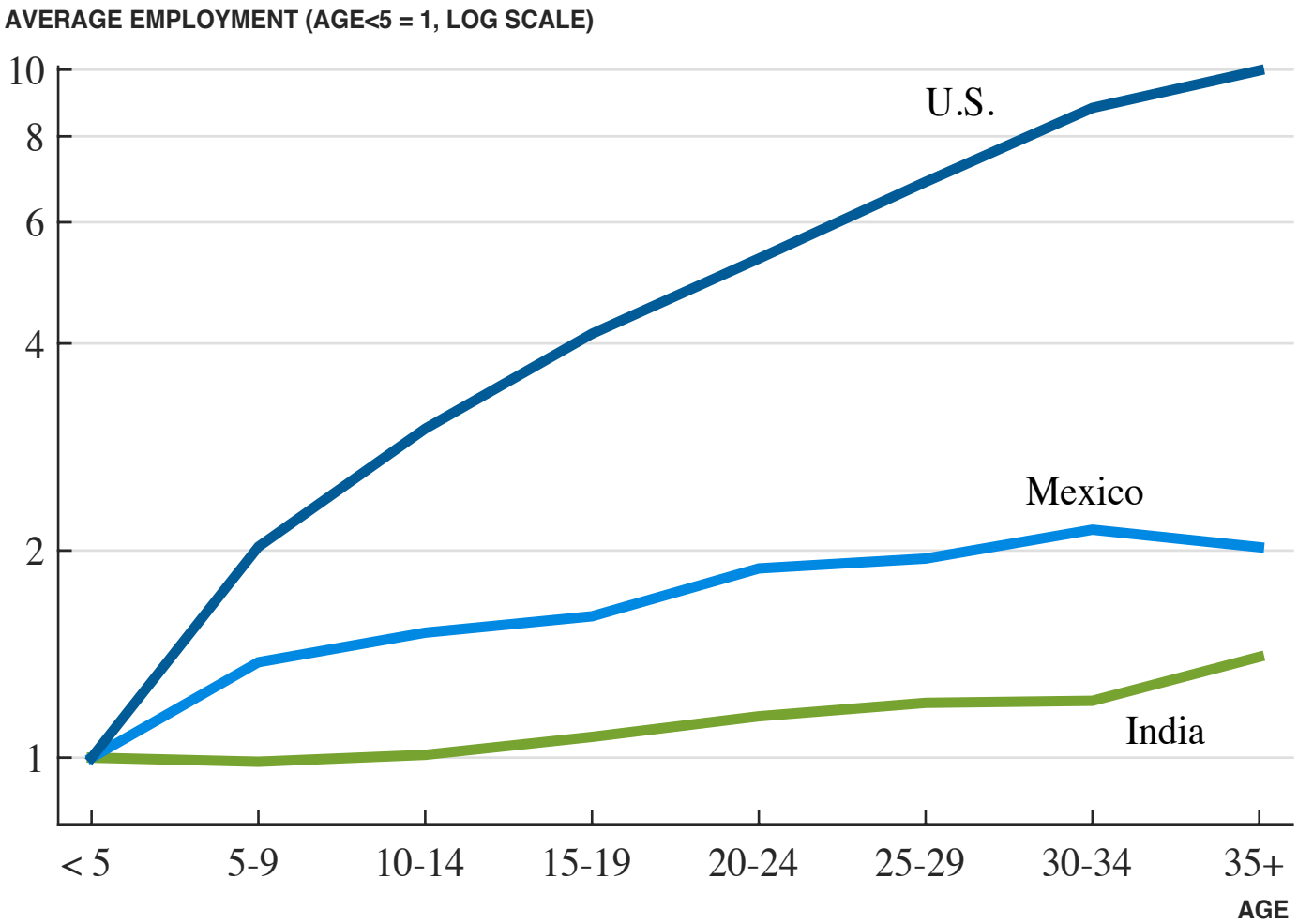


- Adamopoulos, Brandt, Leight, and Restuccia (ECMA 2021): Efficient reallocation across farms within villages increase agricultural productivity by 24%, 53% nationwide

Characteristics of Misallocation

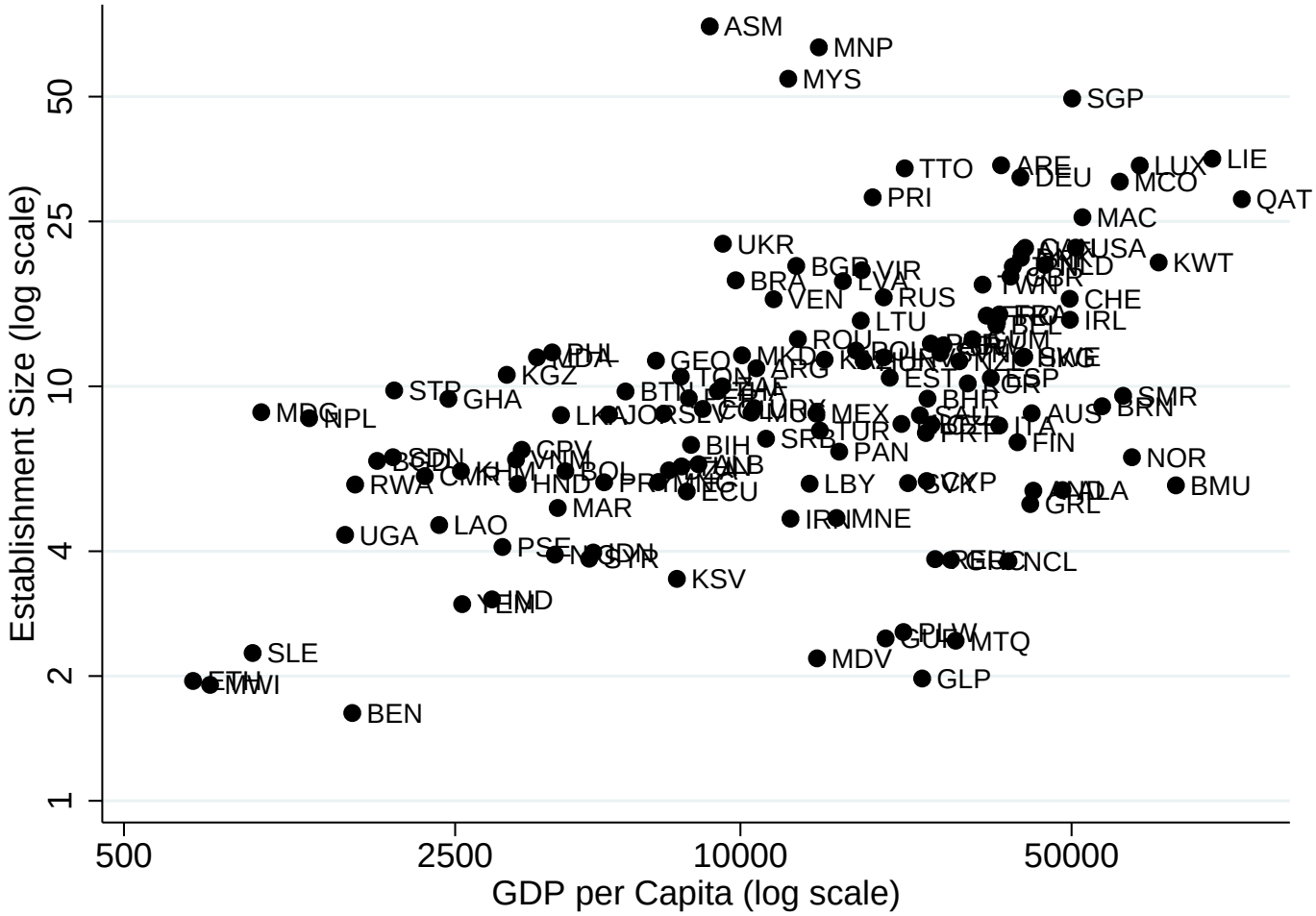
- Idiosyncratic effects from policies/institutions: dispersion in effective prices (wedges) across producers
- Systematic idiosyncratic effects: policies/institutions that effectively penalize more productive producers (correlated distortions)
  - Systematic idiosyncratic effects common, most often implicit/effective, not designed
  - Effective tax on growth and innovation
  - Connects misallocation with average establishment size

Plant Life-Cycle Employment Growth



- Source: Hsieh and Klenow (2014)

Average Establishment Size (Manufacturing)



- Source: Bento and Restuccia (AEJ:Macro 2017). Similar evidence for services (Bento-Restuccia JME 2021)

Conclusions

- Productivity at the core of cross-country differences in macroeconomic outcomes
- Misallocation of resources quantitatively important in accounting for productivity differences, not a single source
- Misallocation is an effective tax on growth an innovation, leading to larger productivity differences