Getting Back to the Basics: Productivity

The Role of Technology and Innovation in Inclusive and Sustainable Industrial Development

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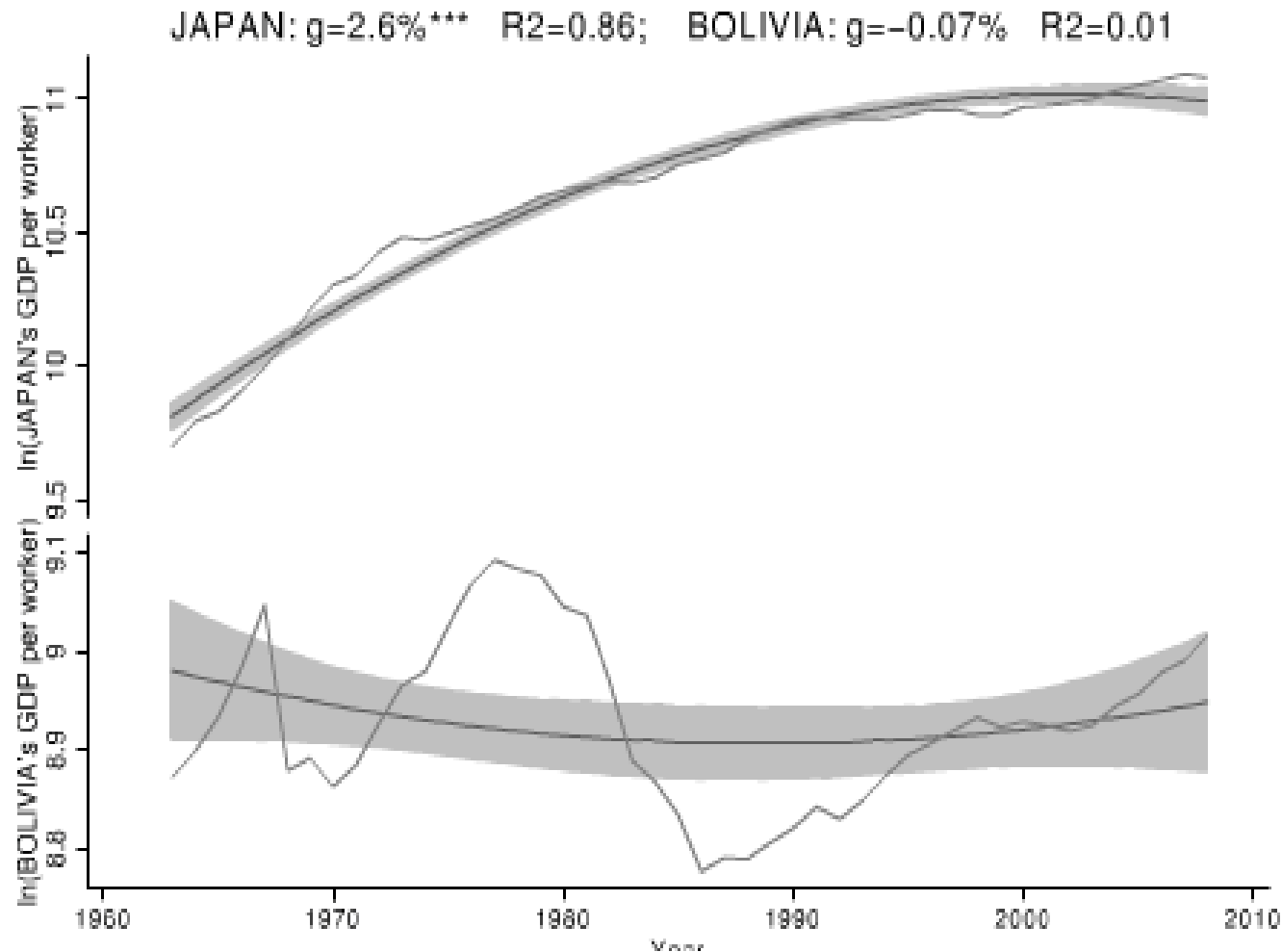World Productivity Distribution

Past, Current, and Steady-State Gaps
&
The Role of Technology Transfer

The wealth of a nation is not measured by its supply of precious metals, but by the productivity of its labor force.
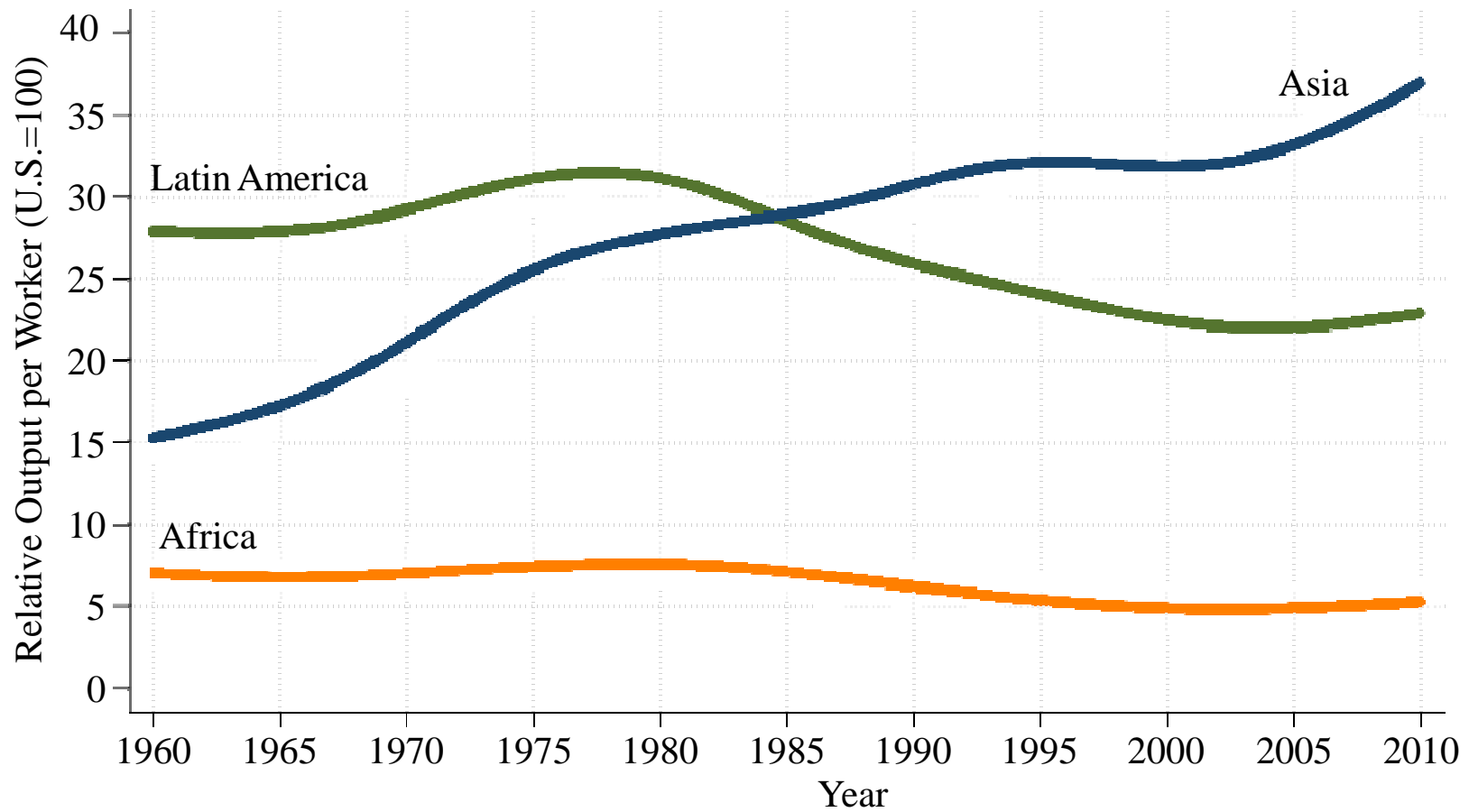
- Adam Smith, 1776

Solving the puzzle of missing 'development' through 'productivity' analyses & comparative institutional studies…


JAPAN: g=2.6%*** R2=0.86; BOLIVIA: g=-0.07% R2=0.01

Source: Mendez-Guerra, C.(2012) *On the Determinants of Bolivia's Economic Growth: Productivity and Institutional Puzzles,* Master Thesis, Nagoya University.

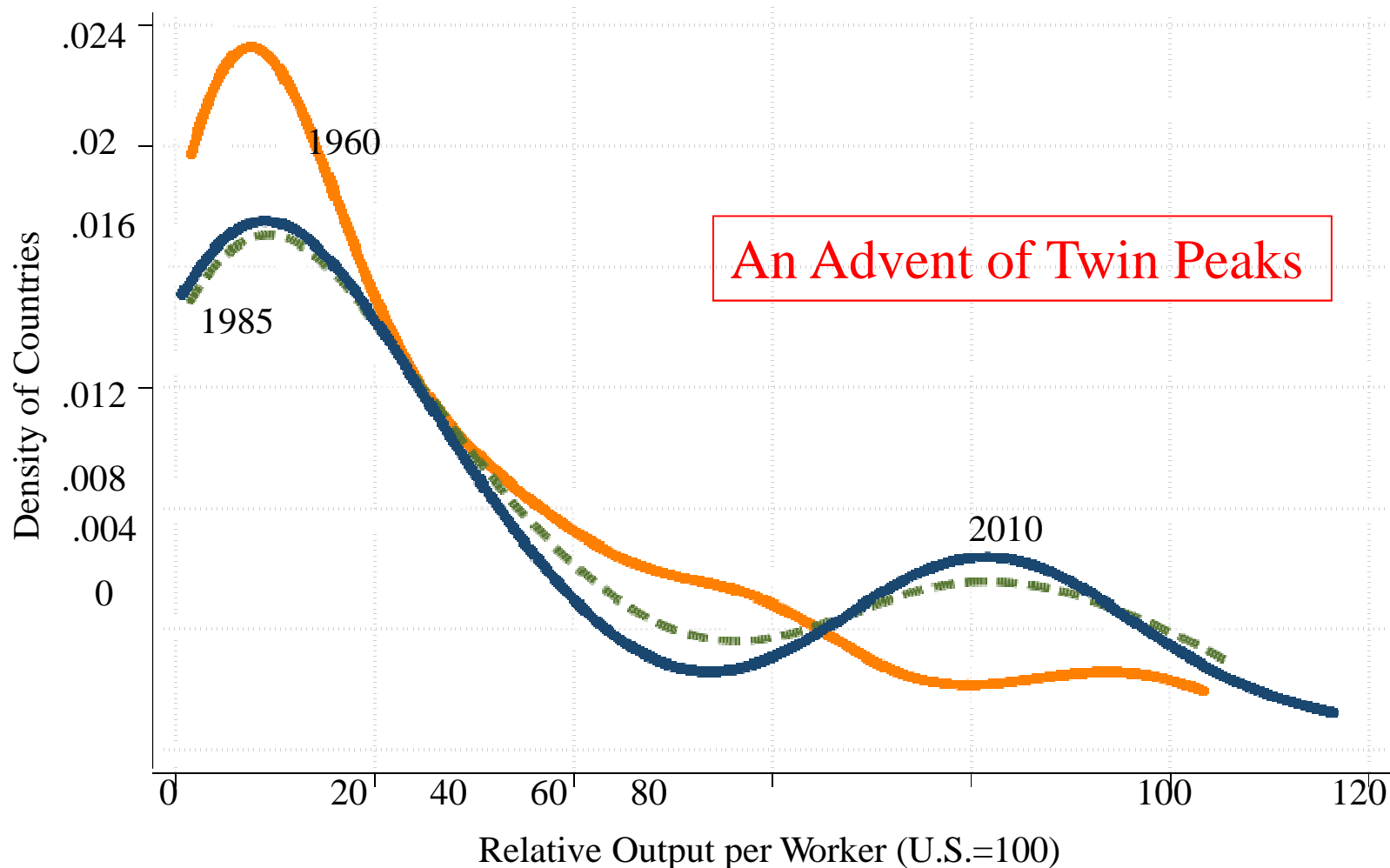# Relative Ouput per Worker by Region

Source: Mendez-Guerra C. (2015). *Essays on Aggregate Productivity, Structural Change, and Misallocation*. Saarbrücken: LAP LAMBERT Academic Publishing
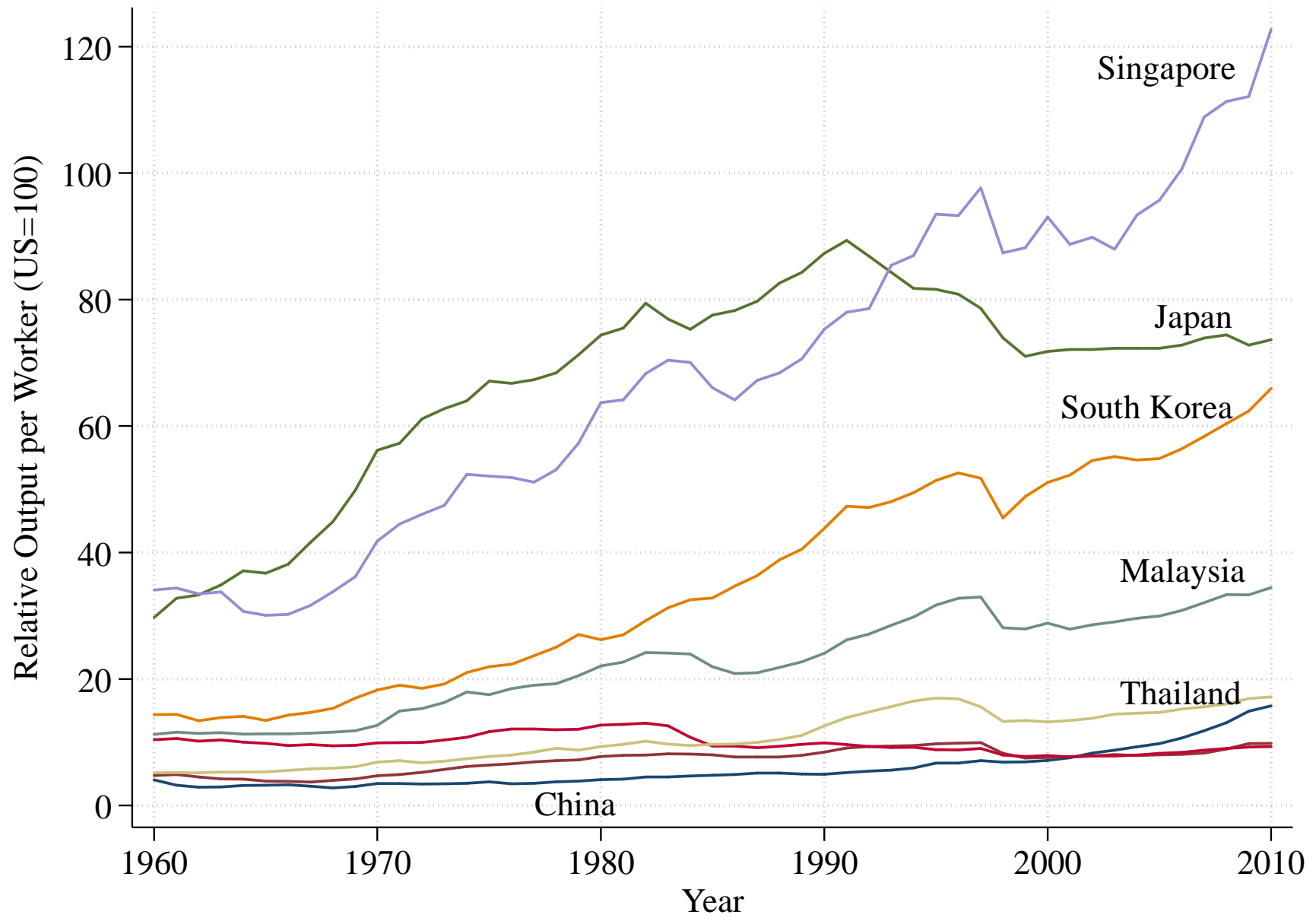
Source: Mendez-Guerra C. (2015). *Essays on Aggregate Productivity, Structural Change, and Misallocation*. Saarbrücken: LAP LAMBERT Academic Publishing

	Relative Output per Worker		
	1960	1985	2010
China(CH2)	4.04	4.76	15.74
Indonesia(IDN)	4.71	8.03	9.79
Japan(JPN)	29.73	77.55	73.63
Korea Rep.(KOR)	14.38	32.80	65.95
Malaysia(MYS)	11.21	21.93	34.44
Philippines(PHL)	10.38	9.40	9.34
Singapore(SGP)	34.09	66.05	122.75
Thailand(THA)	5.15	9.65	17.19
AVERAGE	14.21	28.77	43.60

What about the shape of World Productivity Distribution?

World Productivity Distribution

An Advent of Twin Peaks

Density of Countries

Relative Output per Worker (U.S.=100)

1960

1985

2010

Source: Mendez-Guerra C. (2015). The World Productivity Distribution: Convergence and Divergence Patterns in the Postwar Era, *Latin American Journal of Economic Development* , Vol (24) , pp79-96.

__Productivity depends on the equipment, skills, and technology available to workers.__

- Solow, 1957

Model

- Based on Jones (1997), consider the following economy:

$$Y(t) = K(t)^\alpha \left(A(t)H(t) \right)^{1-\alpha},$$

$$H(t) = e^{\phi S(t)} L(t),$$

$$k(t) = s_K(t) y(t) - (n(t) + \delta) k(t),$$

- In steady state:

$$y_i(t) = \left(\frac{s_{K_i}}{n_i + g_A + \delta} \right)^{\frac{\alpha}{1-\alpha}} h_i A_i(t).$$

- In relative terms (USA=1):

$$y_i(t) = \xi_{K_i}^{\frac{\alpha}{1-\alpha}} h_i A_i(t),$$

where $y_i \equiv \frac{y_i(t)}{y_{US}(t)}$, $\xi_{K_i} \equiv \frac{\xi_{K_i}}{\xi_{K US}}$, $h_i \equiv \frac{h_i}{h_{US}}$, $A_i \equiv \frac{A_i(t)}{A_{US}(t)}$, and $\xi_{K_i} \equiv \frac{s_{K_i}}{n_i + g_A + \delta}$.
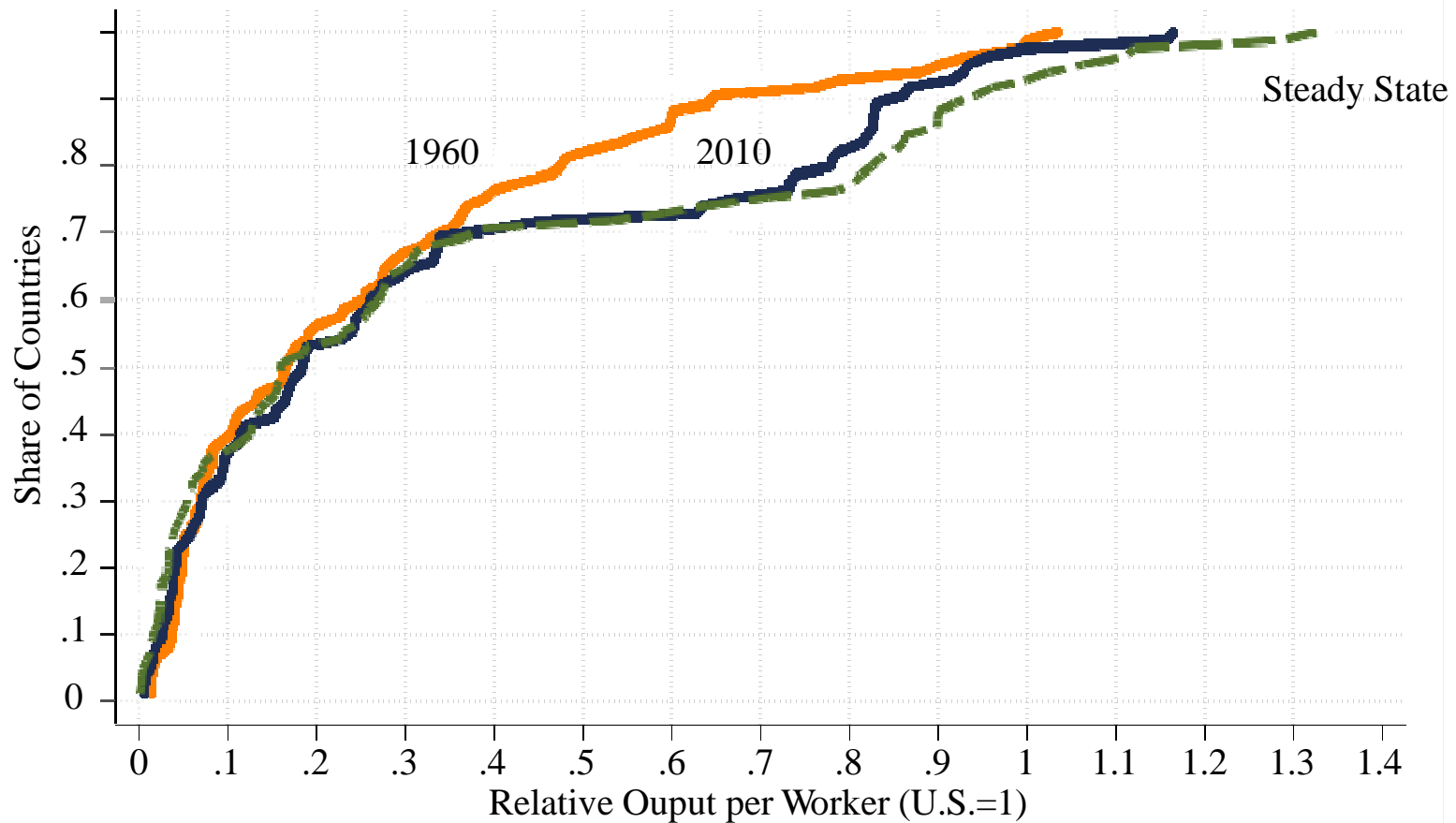
Parameter	Calibration	Source
α	$\frac{1}{3}$	Mankiw, Romer, and Weil (1992)
φ	0.10	Psacharopoulos and Patrinos (2004)
$g_A + \delta$	0.075	Mankiw, Romer, and Weil (1992)

Evolution of the Labor Productivity Distribution (Base Model)
How might the world productivity distribution look like in Steady State?

Cumulative World Productivity Distribution

Simulations Scenarios

$$y_i(t) = \xi_{K_i}^{\frac{\alpha}{1-\alpha}} h_i A_i(t),$$

1. Inputs Convergence

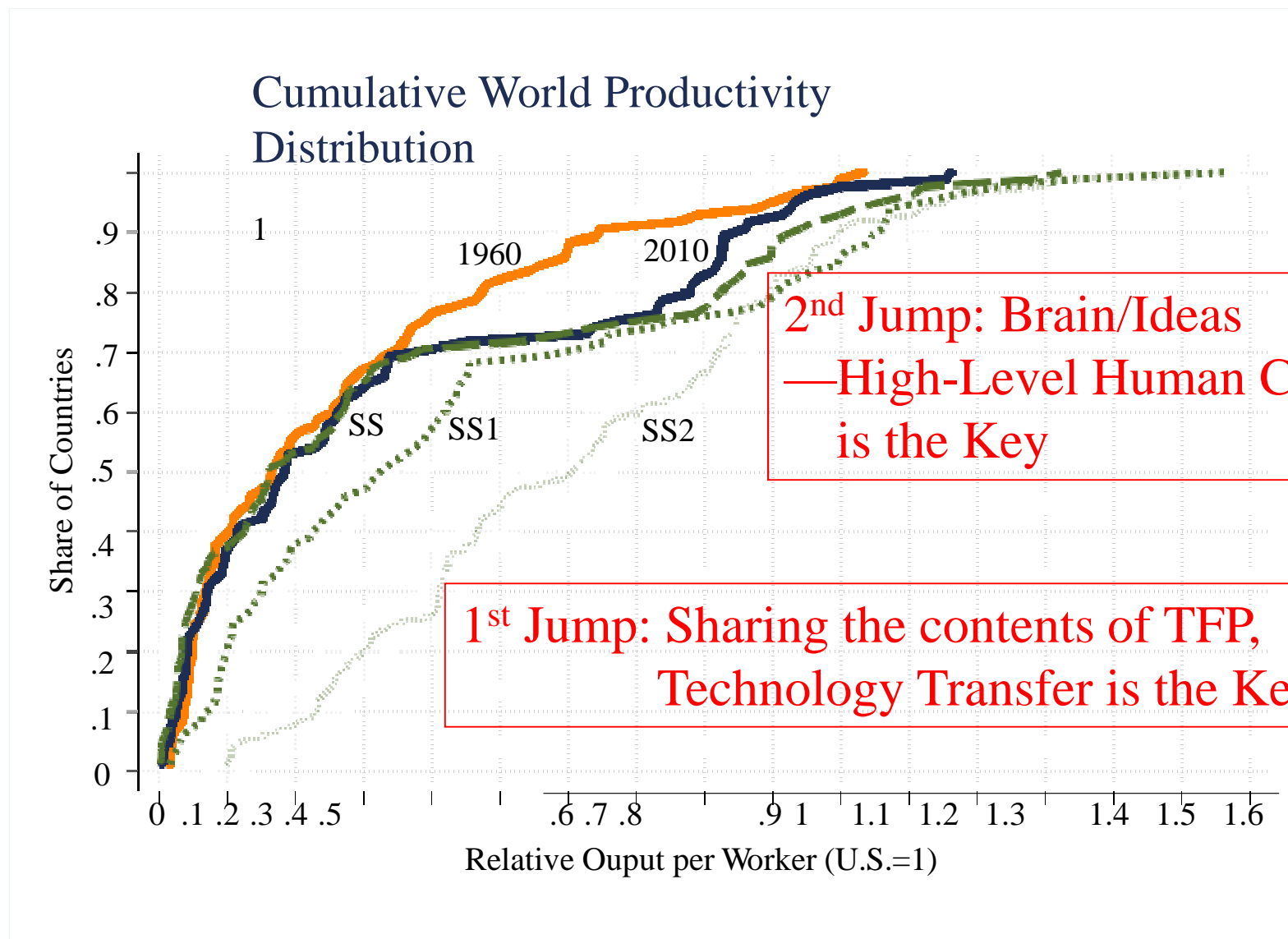   – What if developing countries had the same level of equipment and skills but keep their own level of technology?

2. TFP Convergence

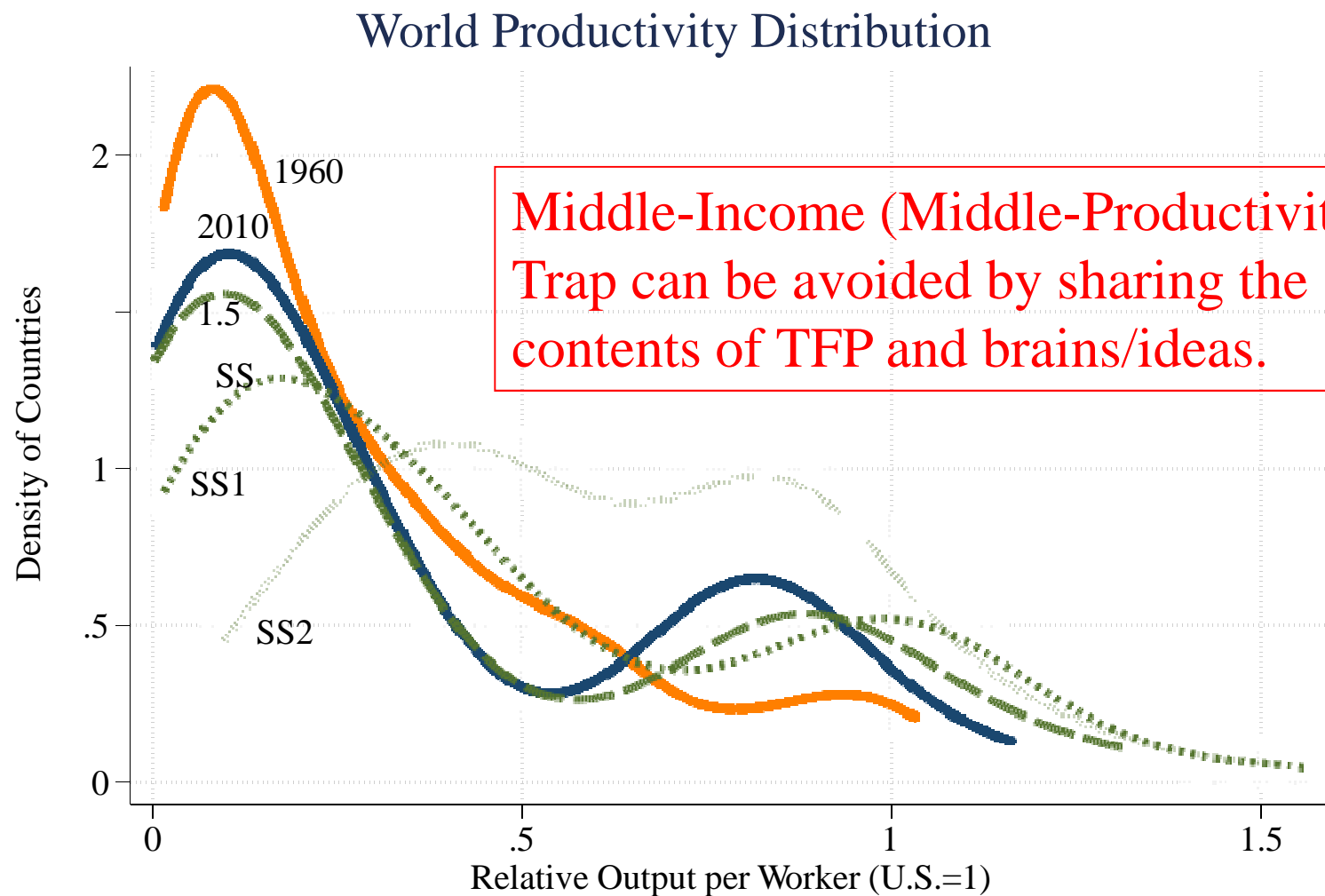   – What if developing countries had the same level of technology but keep their equipment and skills fixed?

Scenario 2: "TPF" Convergence
How big is this effect?

Cumulative World Productivity Distribution

2nd Jump: Brain/Ideas —High-Level Human Capital is the Key

1st Jump: Sharing the contents of TFP, Technology Transfer is the Key

Source: Mendez-Guerra C. (2015). *Essays on Aggregate Productivity, Structural Change, and Misallocation*. Saarbrücken: LAP LAMBERT Academic Publishing

How might the world productivity distribution look like in the future?

World Productivity Distribution

Middle-Income (Middle-Productivity) Trap can be avoided by sharing the contents of TFP and brains/ideas.

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	Long-Run Relative Ouput per Worker				
	ASEAN3	Thailand	Lat. America	Asia	Africa
1960	0.14	0.05	0.28	0.15	0.07
2010	0.42	0.17	0.23	0.37	0.05
Steady State	0.51	0.19	0.18	0.42	0.05
Input Convergence	0.53	0.27	0.32	0.50	0.13
TFP Convergence	0.93	0.71	0.55	0.75	0.33

Topic 2

Research Agenda & Policies
for
Inclusive Industrial Development

[Inputs to Labor Productivity]
◆Capital Deepening & Skill Development
◆Brain-Power Networking (highly innovative HR)
is needed to get out of the 'Middle-Income Trap' and
at the higher end of productivity growth.

✚

[Inside the TFP Blackbox]
◆Technology Transfer & Product/Process Innovations
◆Institutions and Policies for Industry Promotion
◆Institutions and Policies to move workers toward
sectors/industries with higher productivity growth.
➡ Reduce the Loss of (Labor) Misallocation

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**Inclusive Industrial Development
Sustainable Society**

UNIDO IDR2016 Messages …

◆**Premature deindustrializaion is detrimental**

Premature shifts of labor into unproductive service sectors….. **NO**

Trade liberalization without preparedness that hinders industrial development….. **NO**

➔**High relevance to the Bolivian case**

◆**Technology transfer & innovations through global integration such as GVC**

◆**Pooling financial/research resources in a global knowledge base for a hightened technological capabilities**

◆**….. More…..**

⬇⬇

Inclusive Industrial Development (ISID)

Topic 3

What we expect
 from UNIDO and the IDR Team.....

My Wish List

 Following the tradition of **productivity** promotion (e.g. Productivity Reports), continue to support creation of productive and competitive industries.

 Eternal pursuit of the contents of TFP (not as a measurement of ignorance). Support institution building and (industrial) policies in order to reduce 'Misallocation' of labor force for 'Inclusive' industrial development.

 Support/develop well-coordinated intellectual networks in order to seek a way out of the 'Middle-income Trap.'

 Analyze/utilize the roles of **FDIs and MNCs (GVC)** in productivity/technology improvements both in net and gross output functions.

The End ...

References

- Jones C. (1997). Convergence Revisited. *Journal of Economic Growth* 2 (2): 131–53.

- Mankiw, G., D. Romer, and D. Weil. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics* 107 (2): 407–37.

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