



Comments on
**“Invention, Productivity, and the Evolution
of East Asia’s Innovation Systems”
by Lee Branstetter and Kwon Namho**

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Main arguments of the paper

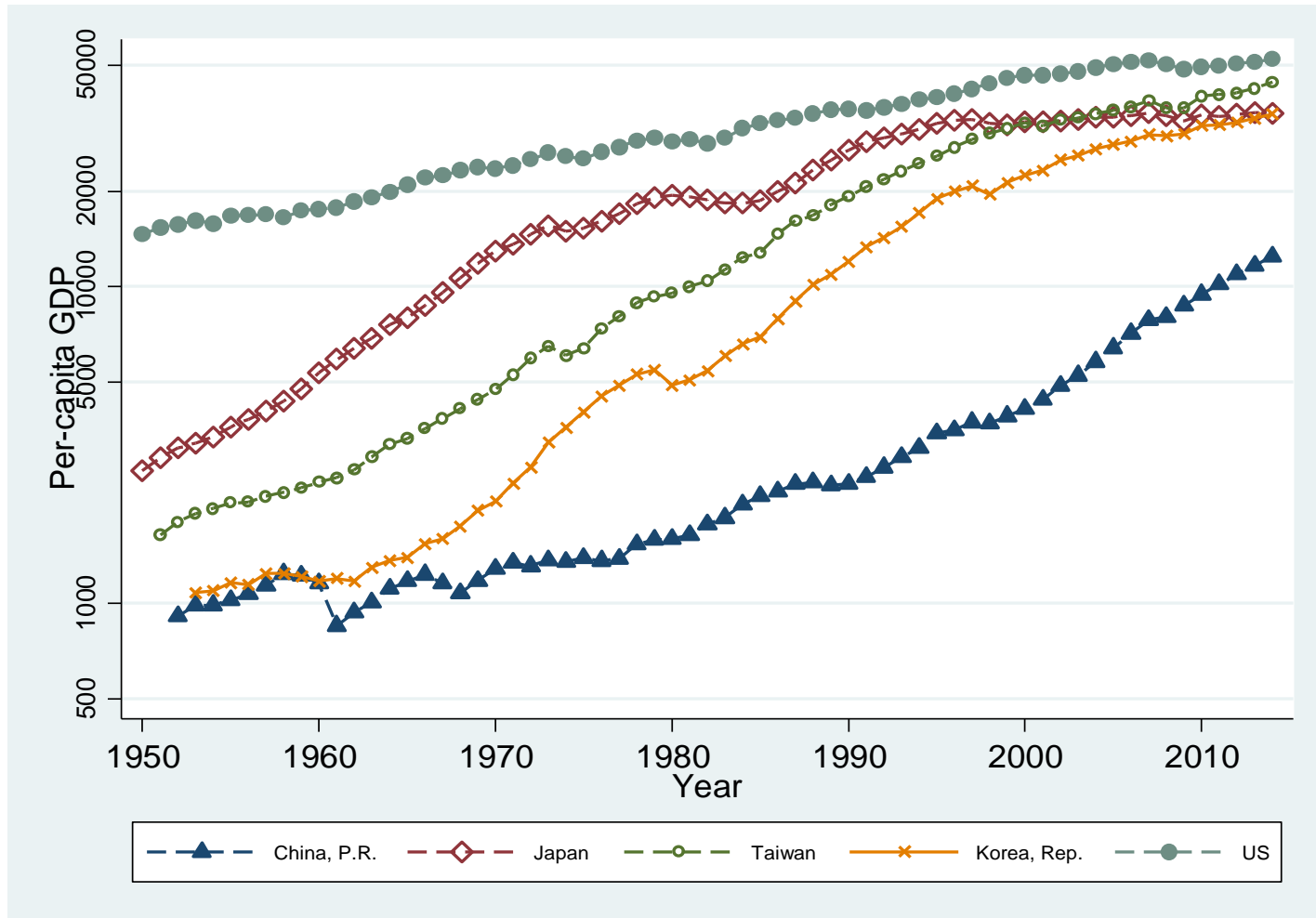
- Policies adopted in the East Asian economies during the high growth period, such as human capital policy, intellectual property policy and exchange rate policy, caused “pro-incremental” and “pro-incumbent” biases in their innovation system.
- The innovation system limited radical invention, causing diminishing returns to R&D investment in the long run.
- East Asian economies should abandon outdated policies and reform their R&D system.

General comment 1

- This paper provides useful insights, interesting case studies, and very timely discussions on the innovation system in Japan, Korea and Taiwan:
 - These East Asian economies are suffering from slower catch-up and productivity growth.
 - Technological progress must be critical to maintaining strong growth.
 - These economies need to build capabilities to create more fundamental, radical innovation.

What happened in East Asia?: Slowing economic catch-up and convergence

Per capita GDP, 1950-2014



Note: Data are per capita GDP at chained PPP-adjusted international dollar and are expressed in a proportional scale .

Source: Construction from the Penn World Table 9.0 (Feenstra, Inklaar, and Timmer 2015).

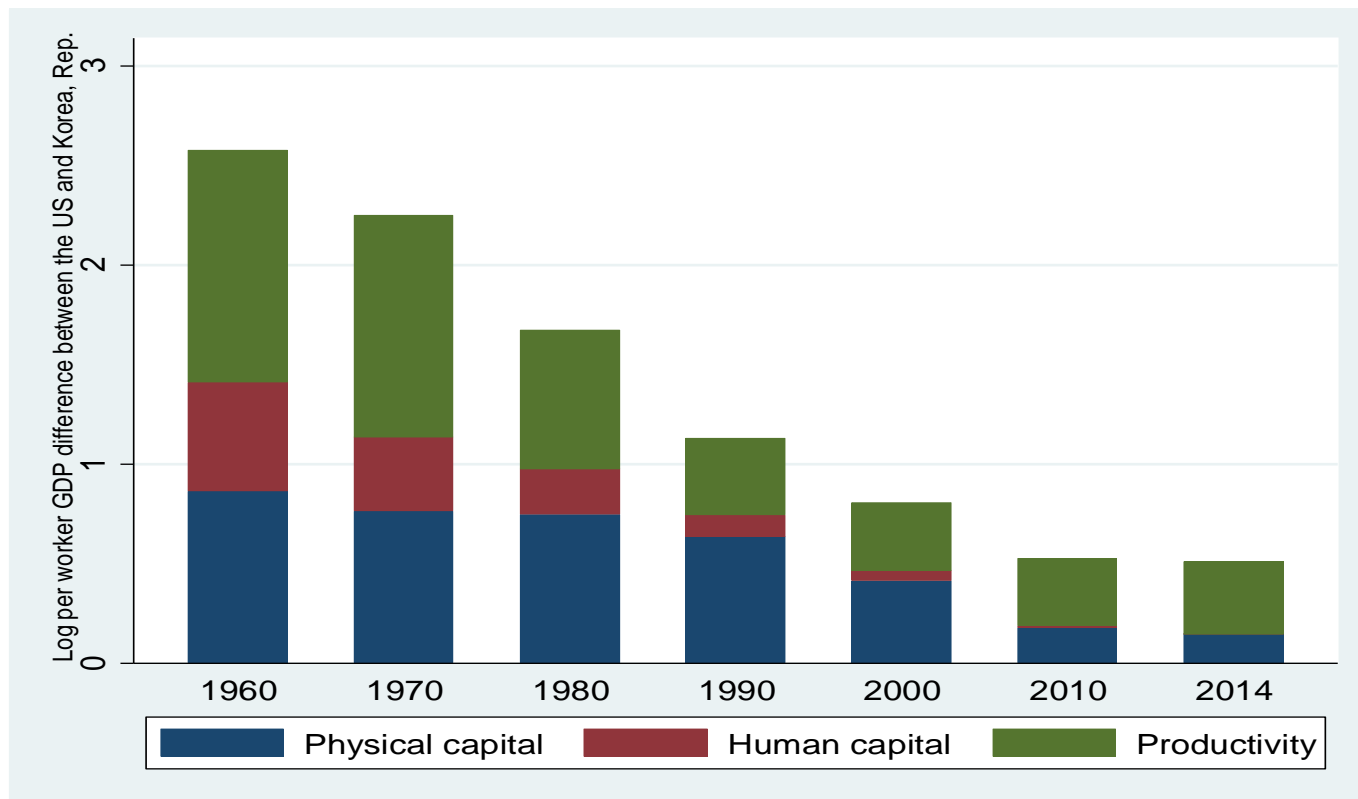
What happened in East Asia?

Declining productivity growth in South Korea

Change in the gap of per worker output and its components between Korea and the US, 1960–2014

The ratio of output per worker between the US and South Korea in log terms,

$$\ln\left(\frac{y_{US}}{y_K}\right) = \ln\left(\frac{\bar{k}_{US}}{\bar{k}_K}\right) + \ln\left(\frac{\bar{h}_{US}}{\bar{h}_K}\right) + \ln\left(\frac{A_{US}}{A_K}\right), \text{ where } \bar{k} = k^{(1-\alpha)}, \bar{h} = h^\alpha.$$



General comment 2

- This paper needs to provide a more clear theoretical framework and broad evidence to support its main arguments:
 - The discussion on “economic theory of radical technological change” is less clear about the determinants and consequences of incremental and radical innovation.
 - There is no discussion of whether research productivity has declined more rapidly in East Asian economies, compared to the US or Western Europe.
 - There is no direct evidence showing that slowing productivity growth in East Asia was due to the “pro-incremental” and “pro-incumbent” biases.
 - The “pro-incremental” and “pro-incumbent” biases can be a natural process in the development stage of the East Asian economies, which successfully transformed themselves from an imitator to an innovator.

Theory and empirical framework of research production or innovation

- A research production function or idea production function can be written as:

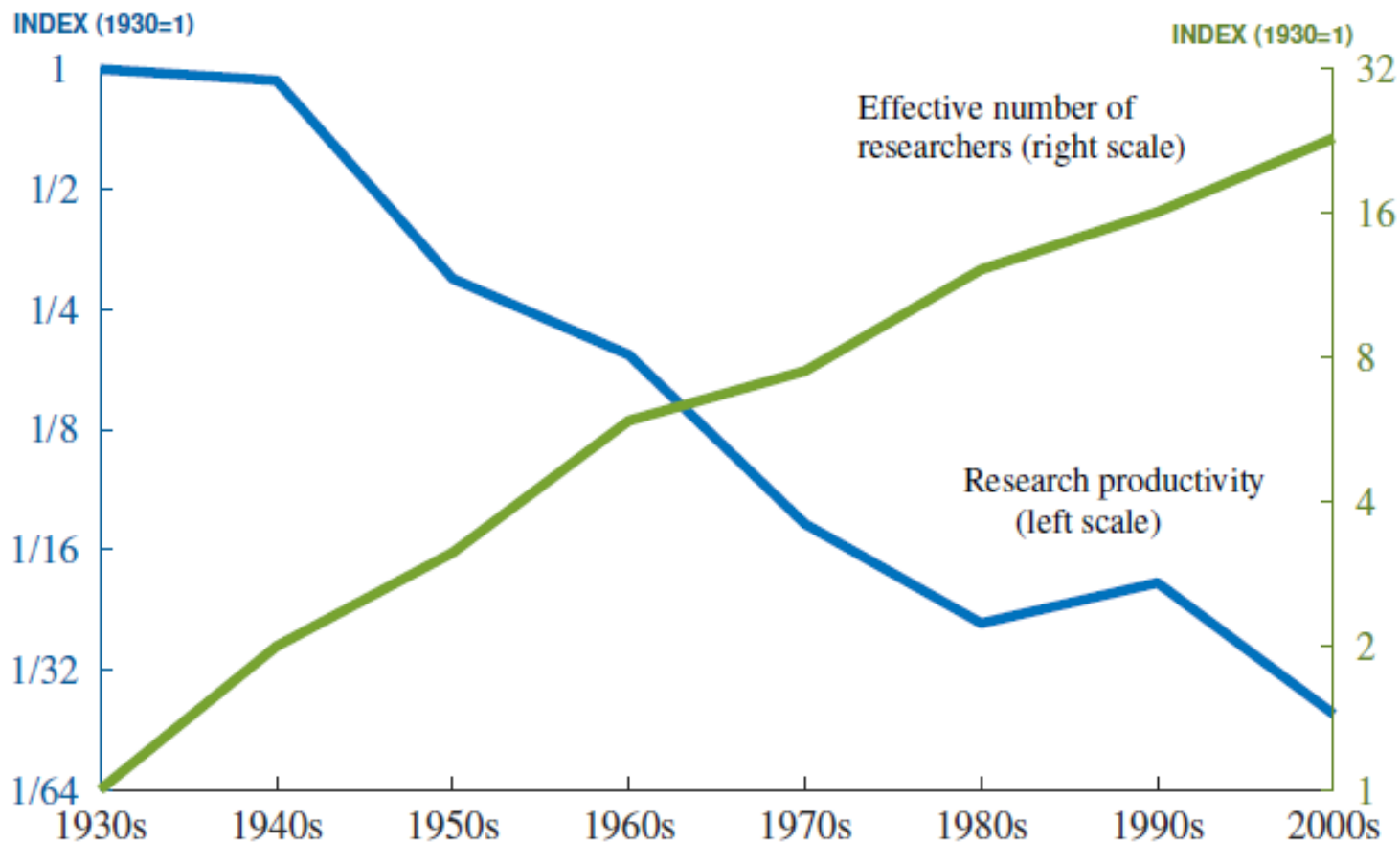
$$N_{it} = \Phi_t R_{it}$$

where N_{it} is research output (e.g., patents) of firm i at time t , Φ is the productivity of research, and R is research inputs.

- How does the pro-incremental and pro-incumbent innovation influence R , Φ , and N differently from the radical one?
- The paper cites researches, suggesting that Φ_t declined in Japan in the 1990s and that the relative decline was concentrated in parts of the electronics/IT sector where software was more important.
 - But, besides the biases, many other factors (such as economy-wide and global factors) can cause the decline in Φ_t .
 - It is also not clear whether the decline in Φ_t was a major cause of the decline in TFP growth in the East Asian economies.

Is research productivity declining everywhere?

Research productivity in the US



Note: Research productivity is the ratio of idea output, measured as TFP growth, to research effort. Both research productivity and research effort are normalized to the value of 1 in the 1930s.

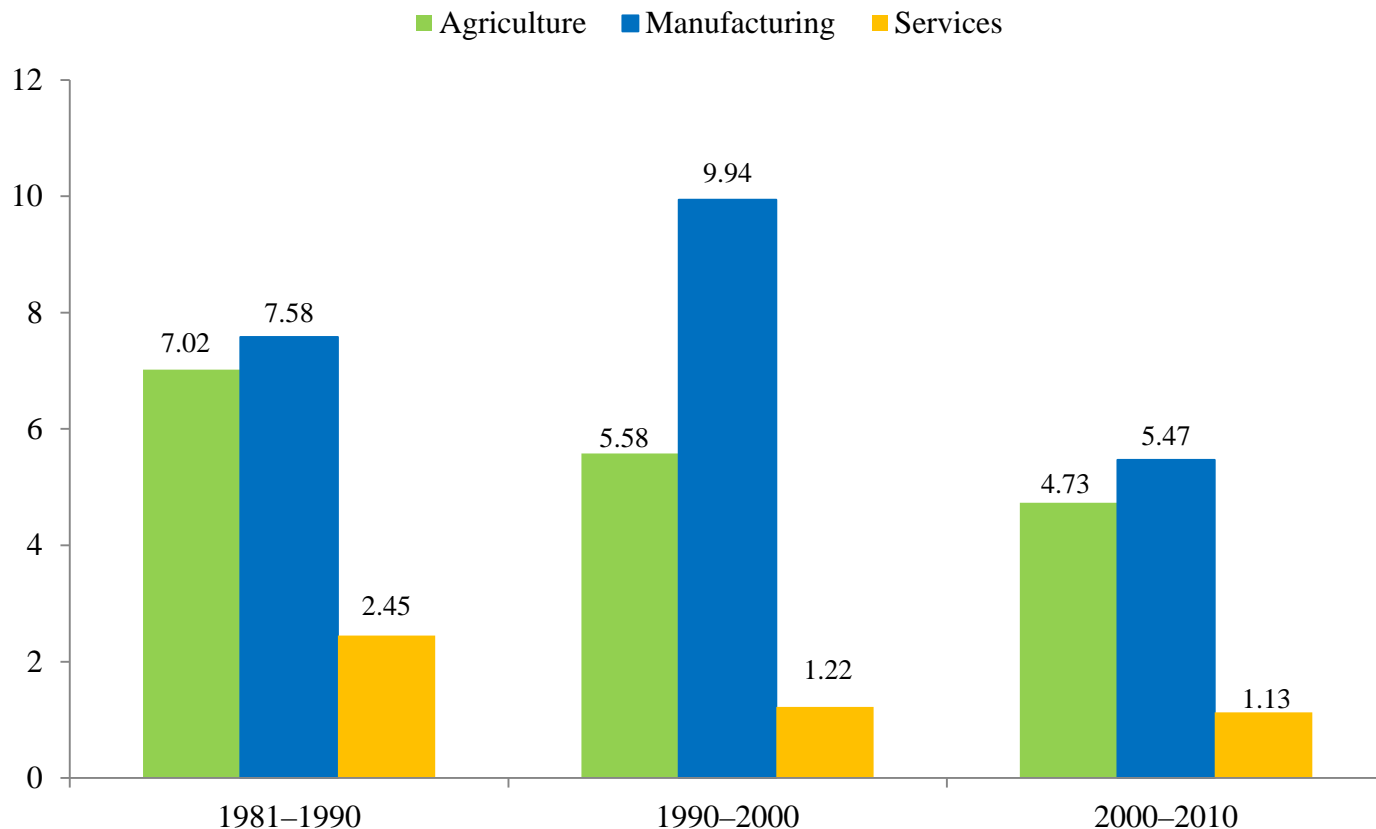
Source: Bloom et al. Are ideas getting harder to find, 2017.

Factors behind slowing TFP growth in East Asia

- Some specific factors:
 - Slowing convergence in technology (due to decline in imitation and adoption of advanced technologies)
 - Limited innovative capability
 - Low productivity growth in services sector
 - Low efficiency in resource allocation (mainly due to inefficiencies in labor and financial markets)
 - Low quality of institutions (government regulation, IP protection, corporate governance, and policy uncertainty)
- Other (more common) factors:
 - No revolutionary innovation
 - Slow diffusion across industries and firms
 - Mismeasurement
 - Secular stagnation

Gaps in sectoral growth rates in South Korea

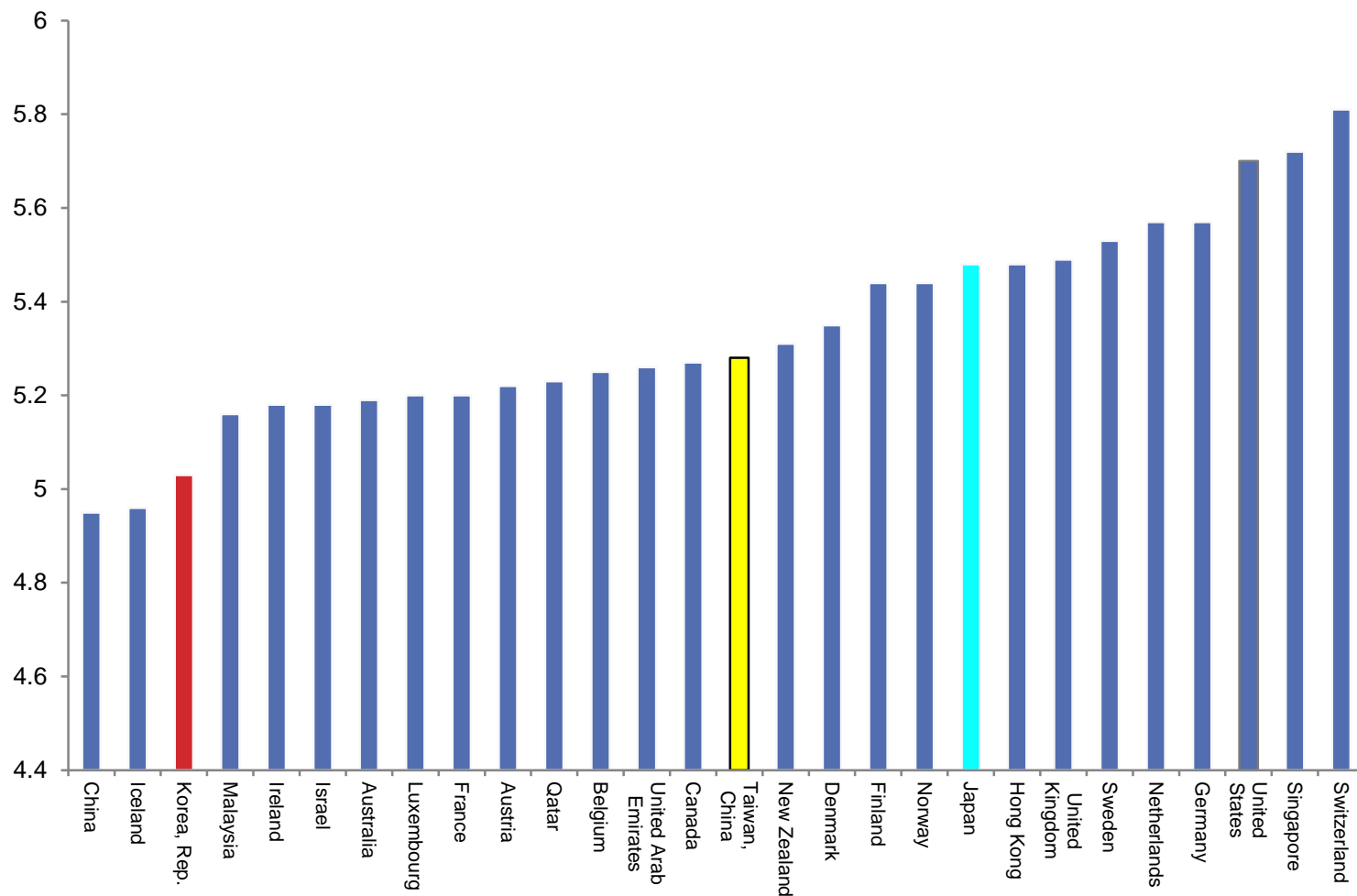
Growth Rate of Per Worker Value Added by Sector (%)



Source: Lee, J "Korea's Economic Growth and Catch-up: Implications for China, China & World Economy, 2016.

Lacking innovative capability

Global Ranking in Innovation and Business Sophistication



Source: World Economic Forum, The Global Competitiveness Report 2015–2016

Specific comment 1:

Was exchange rate policy a contributing factor for “pro-incremental” and “pro-incumbent” biases?

- This paper argues that undervalued exchange rates worked to bias Japanese (and Korean) firms away from fundamental innovation and towards incremental innovation, by making firms rely on cost advantages in global markets rather than quality improvements.
 - But, the “export-oriented policy” was effective in pushing the pace of changes in comparative advantage, from labor-intensive manufacturing to more capital-intensive and then to technology-intensive industries.
 - Data support that export firms were more innovative.
 - This paper also points out a positive role of exchange rate policy in South Korea: “it was the tantalizing prospect of outselling Japanese firms in the world’s largest markets that induced a South Korean R&D and patenting explosion.”

Evolution of South Korea's top 5 exports

	1960s	1970s	1980s	1990s	2000s	2010s
1	Iron Ore	Textiles	Textiles	Electronics	Semiconductors	Semiconductors
2	Tungsten Ore	Plywood	Electronics	Textiles	Computers	Vessel, and Ocean Structure
3	Raw Silk	Wigs	Iron and Steel Products	Footwear	Automobiles	Automobiles
4	Anthracite	Iron Ore	Footwear	Iron and Steel Products	Petrochemical Products	Flat Display and Sensor
5	Cuttlefish	Electronics	Ships	Ships	Ships	Articles of Petroleum



Specific comment 2:

What should be the priority policy to promote fundamental innovation in East Asian economies?

- Can East Asian economies emulate the US “Silicon Valley” model or the Israeli model?
- Building innovative capabilities is a significant challenge.
- The role of government intervention for technological innovation, especially radical innovation, is not always clear.
- What Korean government can do:
 - Upgrade the quality of tertiary education, and human capital in science and technology
 - Improve efficiencies in labor and financial markets
 - Increase in basic research investments.
 - Develop venture capital industry and venture start-ups
 - Reduce political instability and policy uncertainty

Specific and minor comment 3:

More precise descriptions are required: for example, on South Korea

The Korean economic miracle really dates from the mid-1960s military coup that brought General Park Chung-Hee to power. (p.13)

- “the Top 4 chaebol groups, ..., accounted for most of Korean manufacturing employment (Economist, 1995). ” (p.14)
- “The Samsung Group accounts for ...about 15% to 20% of the GDP of South Korea (LA Times, 2016; CNN, 2017). (p.34)
- “South Korea inherited (and built on) the strengths of the Japanese education system. The nation’s preeminent university, Seoul National University, was founded as a core part of the Imperial university system.” (p.15)



Thank You

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