

Productivity Growth and the Role of Intangibles in East Asian Countries

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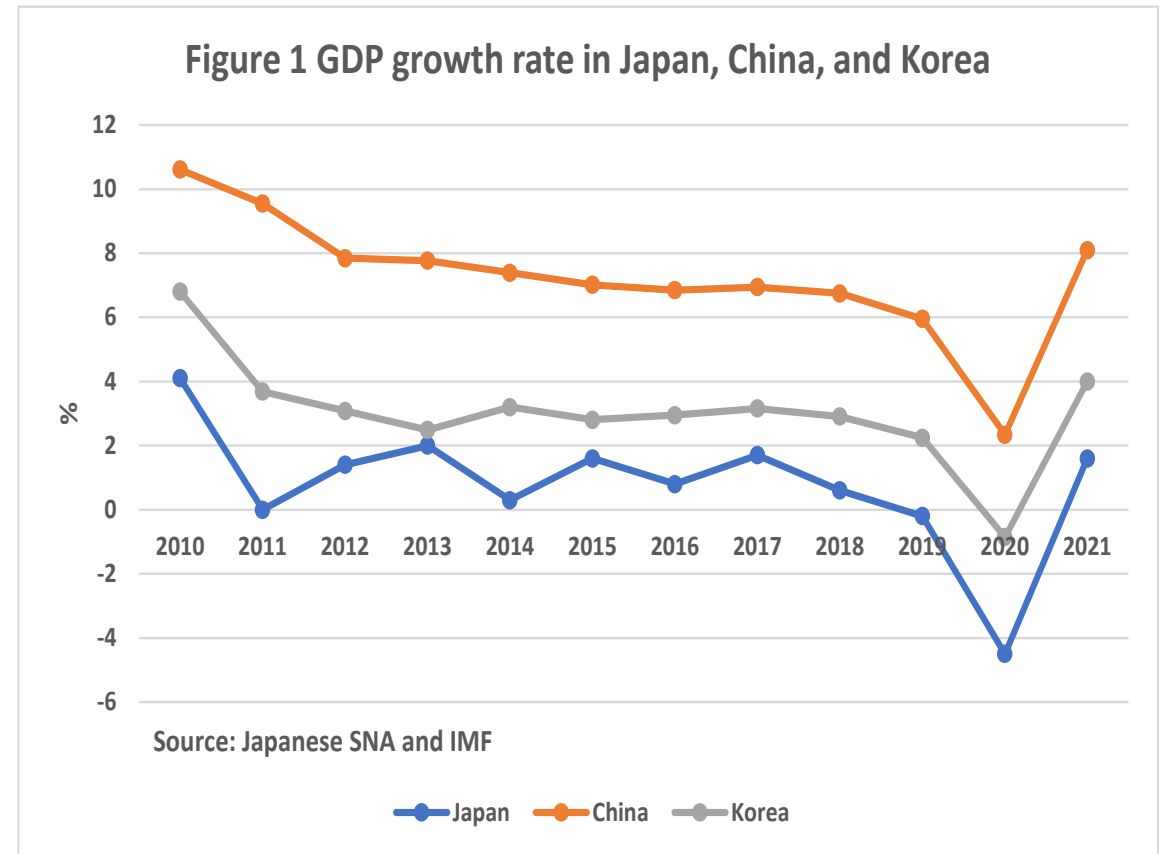
Tsutomu Miyagawa

(Gakushuin University, Japan)

tsutomu.miyagawa@gakushuin.ac.jp

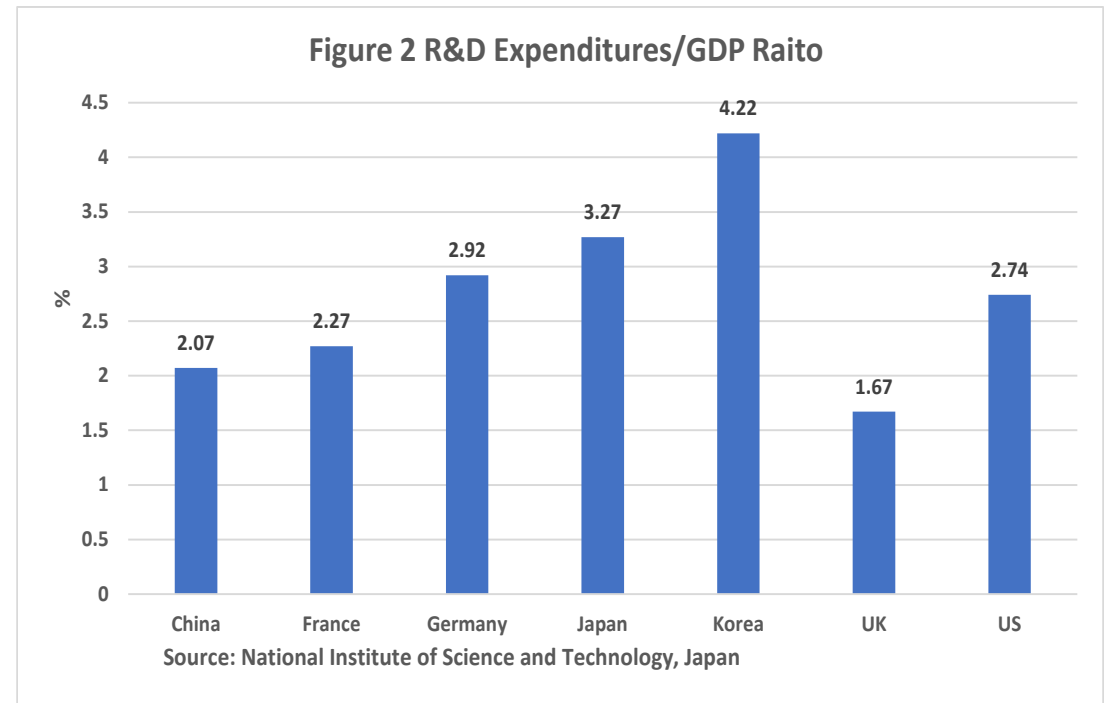
1. Outline of Economies in the Three East Asian Countries

- Among three East Asian countries (China, Japan and Korea), the Chinese economic growth rate is the highest.
- The movements in Korean economic growth are correlated with the Chinese economic growth, because the Korean economy is heavily dependent on the Chinese economy.
- The Japanese economic growth rate in the lowest in the three East Asian countries. Recently, the Korean per capita GDP surpassed the Japanese per capita GDP.



2. R&D expenditures at the aggregate and firm levels (1)

- **The Korean R&D expenditures/GDP ratio is 4% which is higher than China and advanced countries.**
- **However, at the listed firm level data in Chinese, Japanese and Korean stock markets, the ratio of R&D expenditures/ sales in China has rapidly caught up with Japanese and Korean ratios (Figure 3).**



2. R&D expenditures in the aggregate and firm levels (2)

- Boeing, Cho, Inui and Kim measured the firm-level TFP in the three east Asian countries and they examined the effects of R&D activities on TFP.**
- In the case of Japan, R&D activities increase TFP significantly.**
- In the case of Korea, R&D activities also increase TFP significantly except firms with the highest TFP levels. The technology gap contributes to TFP improvements in Korean firms.**
- In the case of Chinese firms, we find positive effects of technology gap on TFP.**
- These estimation results show a catch up process of Korean and Chinese firms to Japanese levels.**

2. R&D expenditures in the aggregate and firm levels (3)

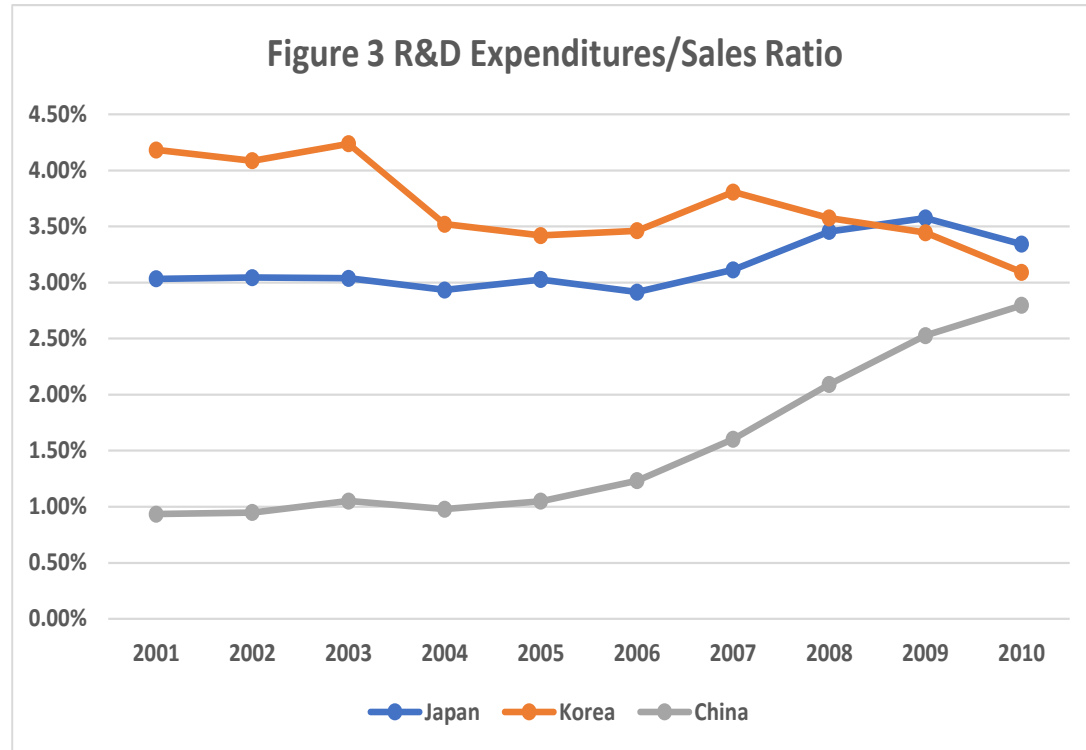


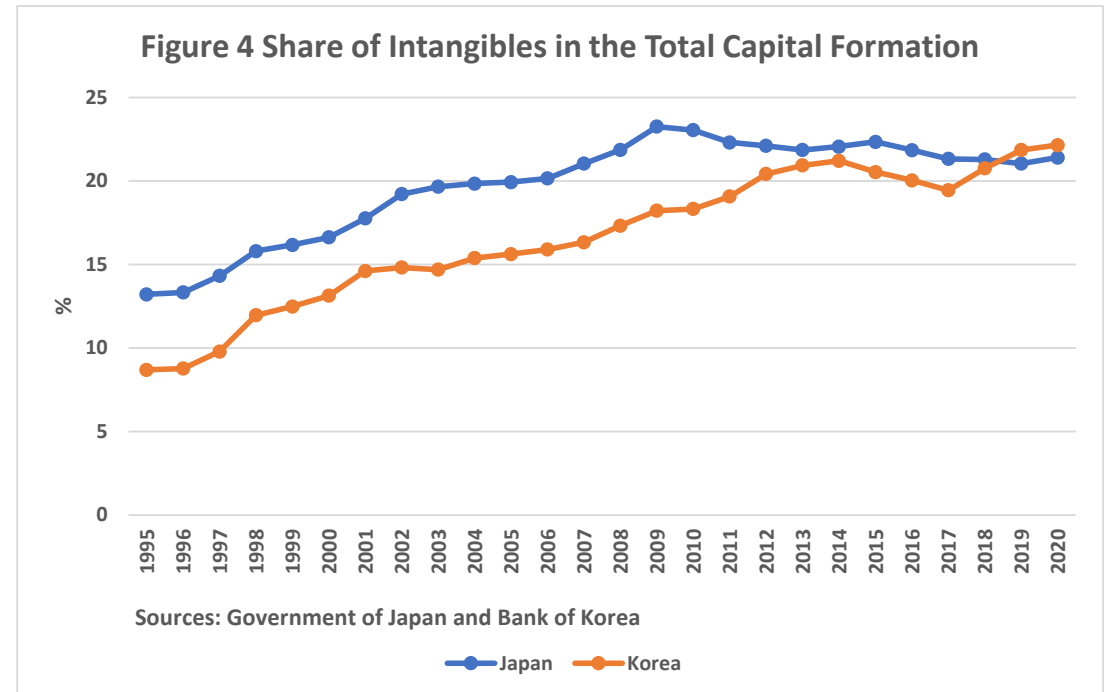
Table 1 The Effects of R&D Activities on TFP Growth

	Japan(1991-2010)	Korea(1991-2010)	China(2001-2010)
R&D ratio (t-1)	0.027* (0.015)	-0.109*** (0.035)	-0.047 (0.070)
R&D ratio (t-1)*2nd TFP group dummy	-0.001 (0.024)	0.161*** (0.057)	0.268** (0.133)
R&D ratio (t-1)*3rd TFP group dummy	0.031 (0.025)	0.154*** (0.050)	0.041 (0.171)
R&D ratio (t-1)*bottom TFP group dummy	0.045** (0.020)	0.426*** (0.041)	0.579*** (0.224)
The distance from top technology*2nd TFP group dummy	0.006*** (0.001)	0.013*** (0.002)	0.003 (0.005)
The distance from top technology*3rd TFP group dummy	0.011*** (0.001)	0.026*** (0.002)	0.012*** (0.004)
The distance from top technology*bottom TFP group dummy	0.024*** (0.001)	0.058*** (0.002)	0.023*** (0.005)
The government owned firm dummy			-0.002 (0.003)
number of samples	24,469	12,287	2,675
F value	31	8	4
R ²	0.325	0.18	0.184

Source: Boeing, Cho, Inui and Kim (2019)

3. Contributions of ICT and Other Intangibles on Economic Growth (1)

- **The share of intangibles (measured in national accounts, mainly R&D and software) in the total capital formation has increased in Japan and Korea.**
- **Although the Korean share of intangibles was lower than the Japanese share of intangibles in the 2000s, it caught up with the Japanese share in the late 2010s.**



3. Contributions of ICT and Other Intangibles on Economic Growth (2)

- We show detailed growth accounting in Japan and Korea from 1985 to 2010.**
- In both countries, the contributions of almost all capital inputs to economic growth in the second period (1995-2010) to economic growth are lower than those in the first period (1985-95).**
- However, in Korea, the contribution of R&D in the second period is the same as the first period.**
- In Japan, the contribution of ICT assets in the service sector in the second period compensates for the negative contributions of labor input and TFP.**
- The recent growth accounting in Japan shows that the decrease in capital accumulation causes low economic growth rate, while the contribution of TFP growth rate was maintained at 0.3%.**

3. Contributions of ICT and Other Intangibles on Economic Growth (3)

Table 2 Growth Accounting with Intangibles in Japan and Korea

	Japan		Korea	
	1985-95	1995-2010	1985-95	1995-2010
Market economy				
GDP growth rate	3.03%	0.62%	9.46%	4.32%
Labor input	0.38%	-0.37%	2.00%	0.60%
Capital input	2.09%	0.61%	5.61%	2.11%
Non-ICT tangible assets	1.00%	0.22%	3.88%	1.33%
ICT assets	0.54%	0.29%	1.04%	0.36%
R&D asset	0.29%	0.08%	0.30%	0.29%
Non-R&D intangibles	0.26%	0.02%	0.38%	0.12%
TFP growth rate	0.56%	0.38%	1.86%	1.61%
Manufacturing sector				
GDP growth rate	2.51%	1.53%	11.14%	6.55%
Labor input	-0.29%	-0.77%	1.87%	-0.18%
Capital input	2.49%	0.70%	6.40%	2.84%
Non-ICT tangible assets	0.90%	0.28%	3.61%	1.74%
ICT assets	0.46%	0.17%	1.60%	0.25%
R&D asset	0.85%	0.23%	0.74%	0.72%
Non-R&D intangibles	0.28%	0.02%	0.45%	0.13%
TFP growth rate	0.31%	1.59%	2.87%	3.88%
Service sector				
GDP growth rate	3.57%	0.25%	10.14%	3.38%
Labor input	0.80%	-0.18%	3.27%	1.54%
Capital input	2.02%	0.67%	5.92%	1.84%
Non-ICT tangible assets	1.03%	0.19%	4.58%	1.19%
ICT assets	0.62%	0.37%	0.84%	0.47%
R&D asset	0.04%	0.02%	0.08%	0.06%
Non-R&D intangibles	0.34%	0.09%	0.42%	0.12%
TFP growth rate	0.74%	-0.23%	0.94%	-0.01%

Source: Chun, Miyagawa, Pyo and Tonogi (2016)

Table 3 Growth Accounting with Intangibles (2005-2015)

	France	Germany	Japan	UK	US
GDP growth rate	0.98%	1.43%	0.30%	1.19%	1.40%
Contribution of labor input	0.61%	0.38%	-0.10%	0.43%	0.37%
Contribution of capital input	0.22%	0.29%	0.10%	0.47%	0.54%
Contribution of tangible assets	0.13%	0.20%	0.09%	0.47%	0.39%
Contribution of intangible assets	0.08%	0.08%	0.01%	0.00%	0.14%
Contribution of TFP	0.16%	0.77%	0.31%	0.29%	0.49%

Sources: JIP database 2018 and EUKLEMS database 2019

3. Contributions of ICT and Other Intangibles on Economic Growth (4)

- **In China, the value added growth in the non-ICT manufacturing sector did not slow in the last period (2007-12), although value added growth in other sectors fell due to the Global Financial Crisis.**
- **As for the factor contribution of value added growth, the contribution of capital input has increased which shows that the Chinese high economic growth rate has been led by rapid capital accumulation.**

Table 4 Sources of Aggregate Value-added Growth in China (1981-2012)

	1981-1991	1991-2001	2001-2007	2007-2012
	Industry contribution to value-added growth			
Value added growth due to in %	8.81	8.85	11.37	9.22
-ICT producing	0.52	0.67	1.25	0.68
-ICT using manufacturing	2.15	1.86	2.34	1.37
-ICT using services	1.37	0.99	2.82	2.74
-Non-ICT manufacturing	1.73	3.10	2.55	3.04
-Non-ICT services	0.79	0.41	1.48	0.72
-Non-ICT other sectors	2.25	1.81	0.93	0.68
	Factor contribution to value-added growth			
Value added growth due to in %	8.81	8.85	11.37	9.22
-Capital input	5.82	7.00	9.43	10.39
-Stock	5.83	7.08	9.45	10.39
-Quality	-0.01	-0.08	-0.09	0.02
-Labor input	1.12	1.12	0.59	0.25
-Homogenous hours	1.07	0.69	0.54	-1.00
-Labor quality	0.06	0.43	0.05	1.26
-Aggregate TFP	1.86	0.72	1.32	-1.42

Source: Wu and Liang (2017)

Thank you for inviting me to the final conference!
I wish you all the best.