Intangible Investment and Economic Growth in Japan

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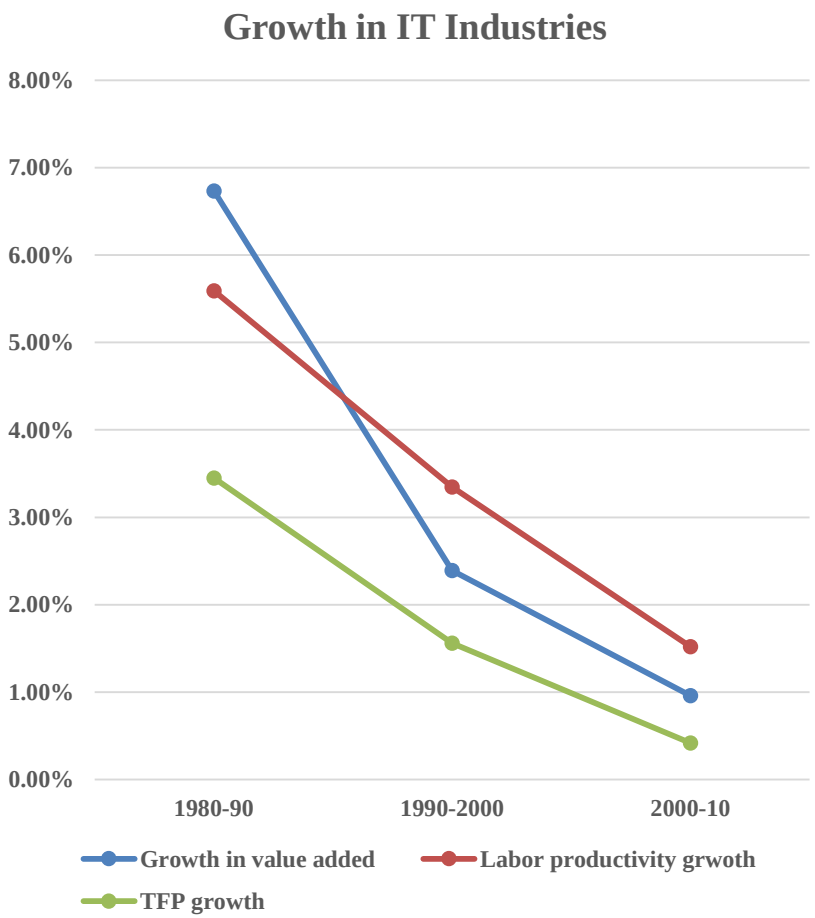
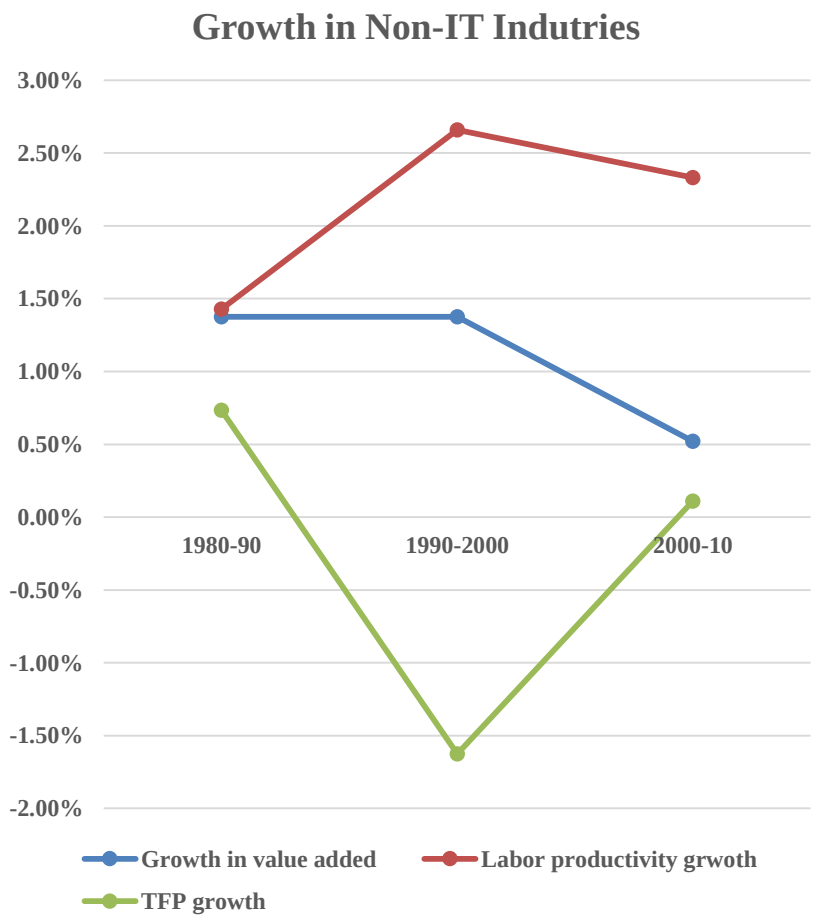
IT industries and Intangibles in Japan

- **Jorgenson, Ho, and Stiroh (2005), Inklaar, O'Mahony and Timmer (2005), Fukao, et al. (2012): IT industries are key sectors of economic growth in advanced countries.**
- **In Japan, the value added growth and TFP growth in the IT industries have surpassed those in non-IT industries.**
- **The growth strategies in Japan have strengthened the utilization in IT.**


Growth in IT Industries
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
1980-90
1990-2000
2000-10
Growth in value added
Labor productivity grwoth
TFP growth


Growth in Non-IT Indutries
3.00%
2.50%
2.00%
1.50%
1.00%
0.50%
0.00%
-0.50%
-1.00%
-1.50%
-2.00%
1980-90
1990-2000
2000-10
Growth in value added
Labor productivity grwoth
TFP growth

IT industries and Intangibles in Japan contd.

- **Economic Report of the President in the US in 2007 emphasized complementarities between IT investment and intangible investment.**
- **Corrado, Hulten and Sichel (2009) (hereafter we refer to as CHS) measured the aggregate intangible investment in the US.**
- **Following their approach, the aggregate intangible investment is measured in advanced countries.**
- **However, to examine the complementarities between IT investment and intangibles, we need to measure intangible investment by industry. →Chun et al. (2012), Miyagawa and Hisa (2013), Niebel et al. (2013), Crass et al. (2014).**

The Measurement of Intangible Investment by Industry in Japan

- **Following the CHS approach, we extended the intangible investment series developed by Chun et al. (2012) and Miyagawa and Hisa (2013) to 2010 by using the JIP database and other primary statistics.**
- **The current version of intangible investment data is opened at the following website: http://www.rieti.go.jp/en/database/JIP2011/index.html#04-6.**

The Measurement of Intangible Investment by Industry in Japan contd.

- **Revised points of 2014 version of Intangible Investment data.**

(1) As JSNA started to publish the data on own account software investment as well as custom and packaged software investment, we use the JSNA data to construct computerized information as possible as we can.

(2) Copyright and license costs →Entertainment and artistic originals.

The Measurement of Intangible Investment by Industry in Japan contd.

- **The amount of intangible investment in the 2000s is about 40 trillions of JPY.**
- **It has declined since the Leaman Shock. In particular, investment in economic competencies has declined since 2000, due to the harsh restructuring induced by the financial crisis in Japan.**
- **Intangible investment in the IT industries dominates over 60% of the total intangible investment.**

Estimated Intangible Investment in Japan

(billions of JPY)

		Total	Market Economy	Manufacturing	Service	IT industries	Non-IT indusstries
1991-2000	CI	5,332	1,504	3,270	3,270	3,511	1,274
	IP	17,094	16,753	12,142	4,561	11,954	4,799
	EC	10,375	9,038	2,620	6,236	5,446	3,592
	Total	32,800	27,296	18,032	14,068	20,911	9,665
2001-2010	CI	9,723	2,955	5,671	5,671	6,346	2,299
	IP	19,425	18,786	12,549	6,209	14,072	4,714
	EC	9,856	8,563	2,433	5,959	5,399	3,164
	Total	39,004	30,304	20,653	17,838	25,817	10,177

*CI: computerized information, IP: innovative property, EC: economic competencies

Comparison of Intangible Investment between Japan and Korea

- **The ratio of intangible investment to GVA in Japan is greater than that in Korea.**
- **However, the gap in its ratio between Japan and Korea has contracted since 1990.**
- **In some service industries, the intangible investment/GVA ratios in Korea have surpassed those in Japan. In particular, investment in computerized information in service industries is greater than that in Japan.**

Intangible Investment/GVA Ratio in Japan and Korea

	Japan				Korea			
	1981-1990	1991-2000	2001-2010	1981-2010	1981-1990	1991-2000	2001-2008	1981-2008
Total economy								
CI	0.67%	1.03%	1.87%	1.25%	0.41%	1.18%	1.85%	1.10%
IP	2.69%	3.29%	3.74%	3.30%	1.51%	2.45%	3.28%	2.35%
EC	1.84%	1.99%	1.90%	1.92%	1.67%	2.40%	2.25%	1.35%
Total	5.20%	6.31%	7.50%	6.47%	3.60%	6.03%	7.38%	5.55%

*CI: computerized information, IP: innovative property, EC: economic competencies

** The Korean data is taken from Chun and Nadiri (2013)

Intangible Investment/GVA Ratio by Industry in Japan and Korea

Industry name	1980		1990		2000		2010	
	Japan	Korea	Japan	Korea	Japan	Korea	Japan	Korea
Agriculture, forestry and fishing	1.67%	0.10%	1.68%	0.20%	2.52%	0.24%	3.07%	0.36%
Mining and quarrying	2.25%	1.28%	4.52%	2.86%	7.00%	4.41%	8.65%	5.66%
Food, beverages and tobacco	3.05%	4.54%	5.81%	9.95%	6.06%	9.56%	6.60%	15.00%
Textiles and leather	3.83%	1.73%	5.89%	4.12%	8.73%	3.93%	24.19%	5.11%
Wood, paper, and printing	3.20%	4.73%	4.90%	3.36%	6.70%	3.70%	9.54%	4.94%
Petroleum, coal and chemicals	10.57%	2.97%	14.66%	10.71%	17.50%	8.88%	18.29%	11.83%
Non-metallic mineral products except petroleum and coal	4.90%	1.13%	7.55%	3.33%	9.02%	2.25%	11.15%	3.42%
Metal, Fabricated metal products	4.19%	1.61%	6.01%	2.73%	7.20%	2.68%	6.92%	4.30%
Machinery equipment	6.17%	3.97%	8.79%	8.71%	12.86%	11.80%	15.68%	12.60%
Electrical and electronic equipment	14.83%	4.23%	18.53%	17.19%	22.93%	13.28%	32.02%	25.87%
Precision instruments	9.93%	1.39%	17.79%	7.28%	27.64%	9.24%	32.10%	19.47%
Transport equipment	9.16%	4.48%	14.19%	8.89%	16.62%	12.16%	17.44%	11.51%
Furniture and other manufacturing industries	7.17%	2.49%	10.58%	5.13%	21.55%	6.13%	16.94%	5.16%
Electricity, gas and water supply	1.71%	1.64%	3.76%	1.88%	5.06%	5.00%	5.99%	13.22%
Construction	2.03%	1.31%	2.96%	3.97%	3.67%	3.02%	3.13%	3.12%
Wholesale and retail trade	3.00%	1.40%	4.96%	1.92%	5.30%	4.07%	4.70%	3.54%
Restaurants and hotels	1.84%	4.87%	4.73%	3.62%	4.10%	1.51%	4.08%	1.29%
Transport and storage	1.91%	1.31%	2.08%	1.52%	2.56%	3.20%	4.23%	2.57%
Financial intermediation	4.01%	4.12%	4.99%	6.01%	8.36%	8.12%	12.75%	9.15%
Real estate and renting	2.01%	2.16%	2.82%	3.88%	4.40%	4.99%	5.19%	2.27%
Information and communication	4.76%	4.02%	13.85%	5.00%	15.63%	11.06%	16.56%	15.36%
Business services	3.71%	6.41%	6.27%	8.53%	7.81%	7.16%	10.27%	6.11%
Public administration and defense	3.04%	3.34%	4.11%	3.65%	5.32%	4.72%	6.33%	3.61%
Education	1.48%	2.76%	1.73%	3.50%	1.83%	4.41%	1.57%	4.19%
Health and social work	1.74%	1.84%	3.28%	1.89%	3.25%	2.22%	1.42%	2.28%
Culture and entertainment services	1.41%	2.29%	3.04%	2.99%	5.04%	4.56%	2.88%	7.86%
Other service activities	2.01%	2.37%	3.10%	2.06%	3.79%	4.18%	3.23%	5.44%

*** Intnagible investment/GVA ratios in Korea in 2008 are expressed in the last column.**

**** Intangible investment in Korea is measured in Chun, et. al. (2012)**

Figure 1-1 Intangible Investment by Industry and Component in Japan (2010)

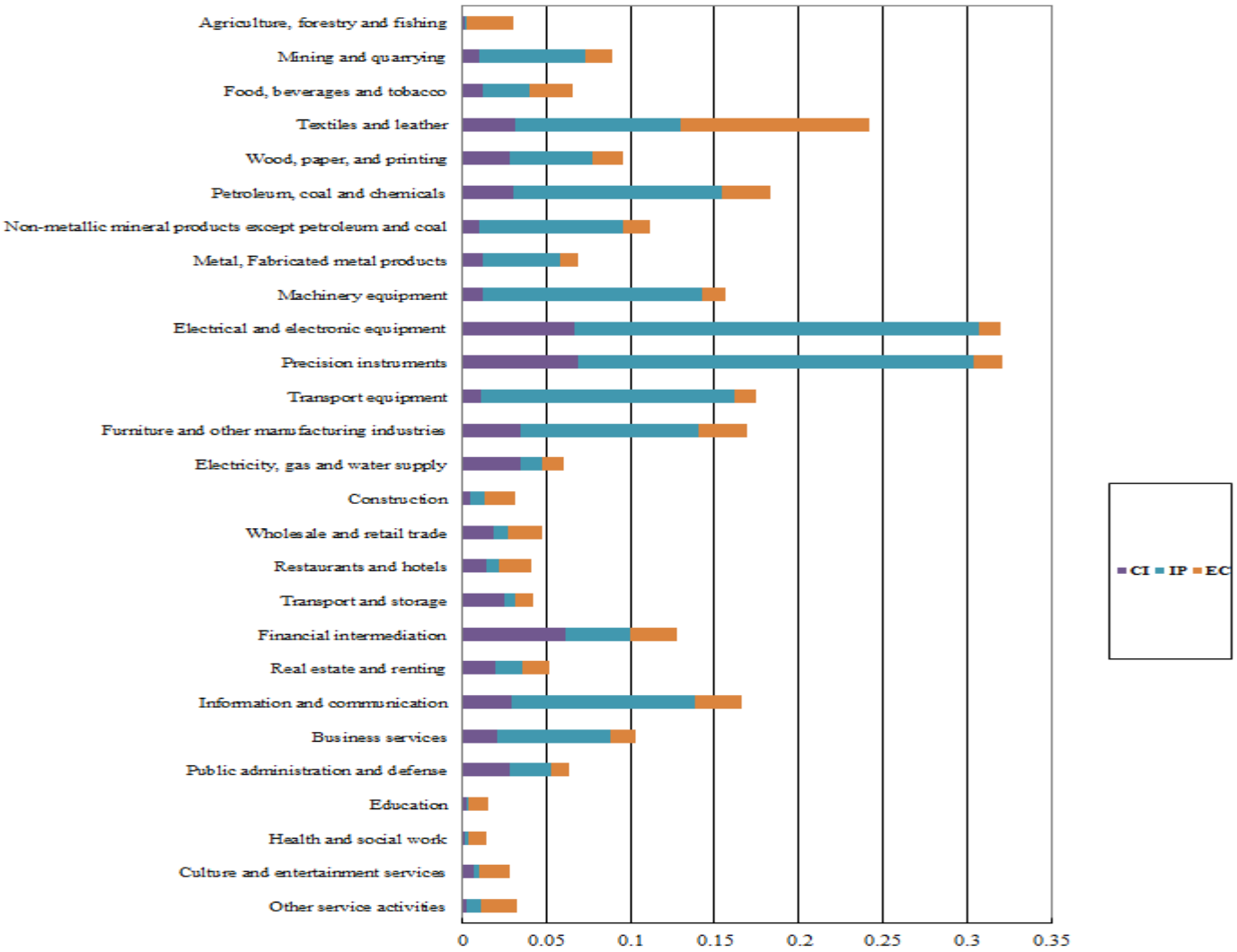
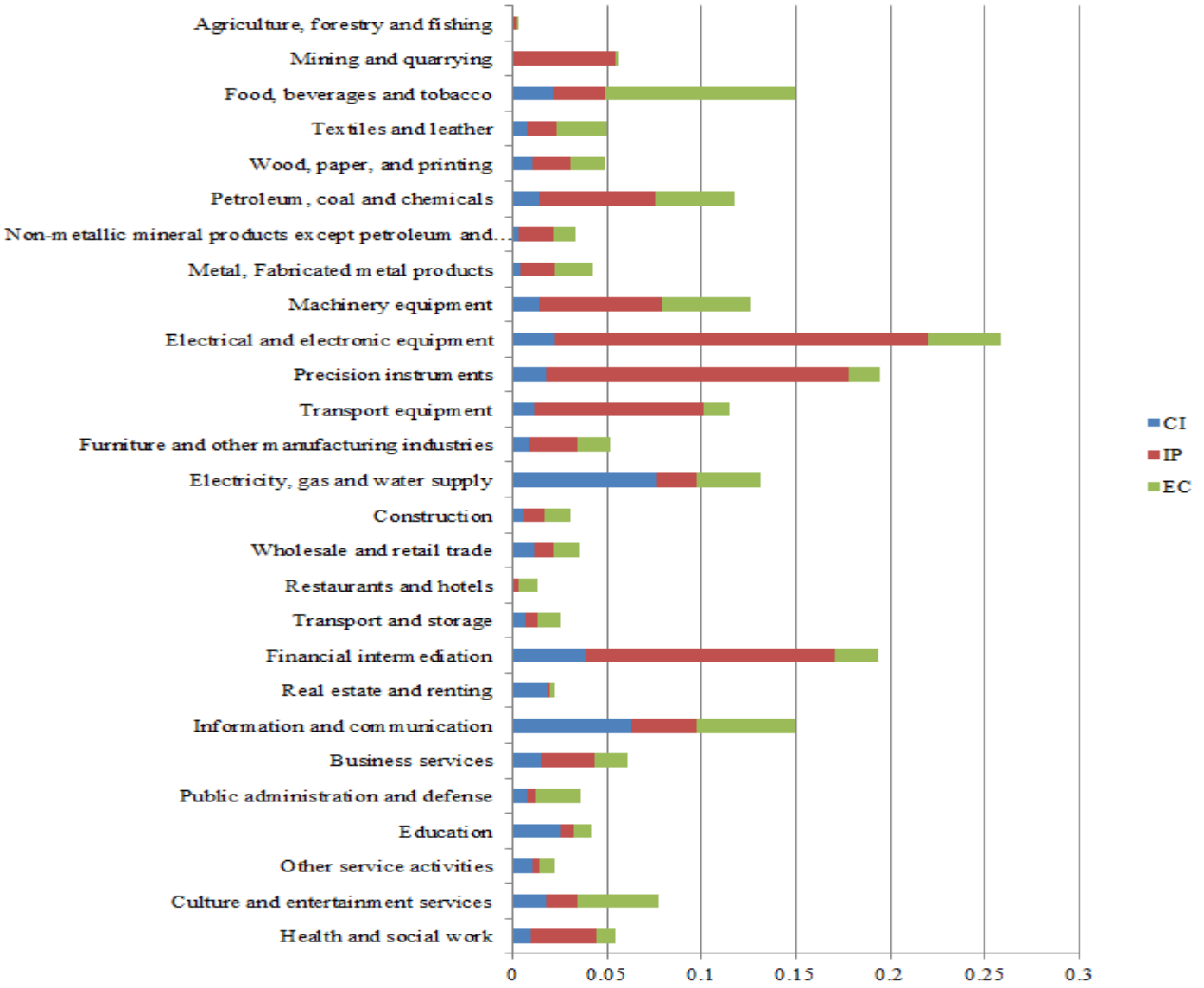


Figure 1-2 Intangible Investment by Industry and Component in Korea (2008)



Capital Stock in Intangibles in Japan

- **When we construct capital stock in intangibles by perpetual inventory method, we use two types of depreciation rates; the first type follows Corrado et al. (2013) and the second type is measured from our own survey on intangibles.**
- **As Japanese firms expect that stock in innovative property deteriorates rapidly, depreciation rates of assets in innovative property are larger than those measured by Corrado et al. (2013).**

Depreciation rates for intangible assets

(%)

Category	Corrado et al. (2013)	Survey on intangibles in Japan
Computerized information	31.5	32
Scientific R&D	15	26
Mineral exploitation	7.5	7.5
Entertainment and artistic originals	20	48
Other intangbles in innovative property	20	39
Brand equity	55	66
Firm-specific human capital	40	32
Organizationla reform	40	47

Capital Stock in Intangibles in Japan contd.

- **The amount of intangible assets in Japan is 167 trillions of JPY, when we use depreciation rates developed by Corrado et al. (2013).**
- **However, the amount of intangible assets using alternative depreciation rates is 124 trillion of JPY in 2010 due to the decrease in assets in innovative property.**
- **In both cases, the growth rate in capital stock in intangibles has slowed down since 1990. In particular, the growth rate in economic competencies turned negative in the 2000s.**
- **In some service industries, the growth rates in intangibles also turned negative in the 2000s.**

Capital Stock in Intangible Assets in Japan (Corrado et, al.'s case)

Corrado, et,al.	2010 billions of JPY	1985-1990 annual growth rate (%)	1990-2000 annual growth rate (%)	2000-2010 annual growth rate (%)
Market economy				
CI	29,353	14.36%	6.05%	5.23%
IP	120,981	12.73%	4.15%	1.75%
EC	16,964	5.65%	1.50%	-2.00%
Total	167,297	11.31%	3.91%	1.77%
Manufacturing				
CI	10,082	11.57%	6.71%	6.12%
IP	85,649	12.06%	3.73%	1.16%
EC	4,844	4.19%	0.46%	-1.55%
Total	100,574	11.18%	3.63%	1.38%
Service				
CI	19,218	15.70%	5.77%	4.81%
IP	35,067	15.51%	5.61%	3.47%
EC	11,644	6.65%	1.98%	-2.27%
Total	65,929	11.82%	4.45%	2.45%
IT industries				
CI	21,338	14.46%	5.74%	5.05%
IP	89,306	13.66%	4.47%	2.14%
EC	10,189	5.69%	1.82%	-2.07%
Total	120,833	12.18%	4.23%	2.11%
Non-IT industries				
CI	8,015	14.16%	7.16%	5.73%
IP	31,675	10.80%	3.41%	0.74%
EC	6,775	5.59%	1.03%	-1.88%
Total	46,465	9.62%	3.22%	0.95%

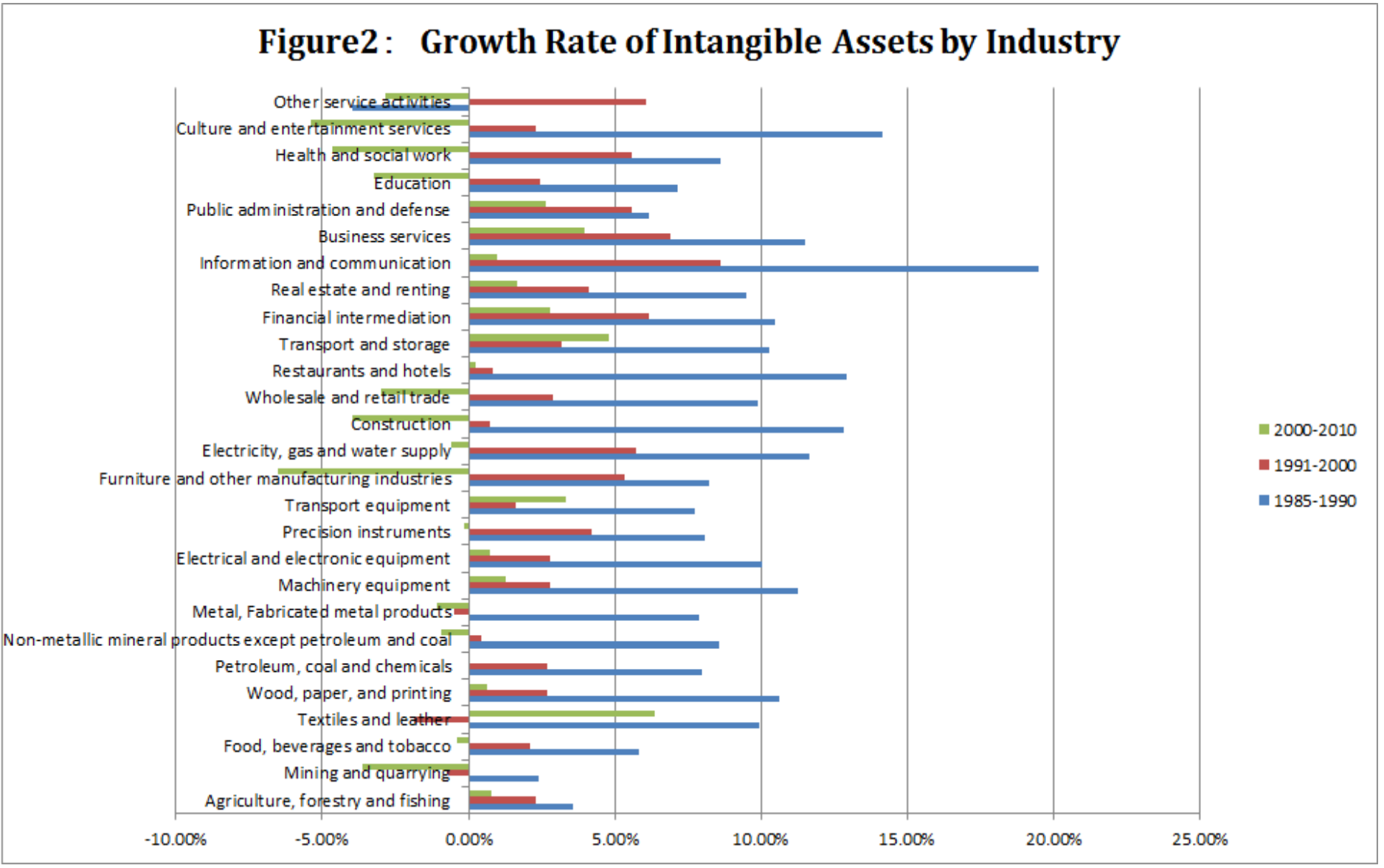
*CI: computerized information, IP: innovative property, EC: economic competencies

Capital Stock in Intangible Assets in Japan (based on the Japanese survey)

Survey in Japan	2010 billions of JPY	1985-1990 annual growth rate (%)	1990-2000 annual growth rate (%)	2000-2010 annual growth rate (%)
Market economy				
CI	28,660	14.23%	6.04%	5.19%
IP	76,896	10.58%	3.66%	2.73%
EC	18,595	5.60%	1.61%	-1.78%
Total	124,210	9.50%	3.51%	2.35%
Manufacturing				
CI	9,844	11.45%	6.70%	6.09%
IP	36,588	8.12%	1.68%	1.06%
EC	5,382	3.98%	0.64%	-1.39%
Total	51,814	7.63%	2.00%	1.48%
Service				
CI	18,765	15.57%	5.76%	4.77%
IP	40,221	17.65%	7.12%	4.64%
EC	12,736	6.68%	2.07%	-2.01%
Total	71,781	12.17%	5.06%	3.07%
IT industries				
CI	20,831	14.32%	5.74%	5.00%
IP	61,462	11.88%	4.39%	3.30%
EC	11,342	5.64%	1.91%	-1.80%
Total	93,694	10.50%	4.07%	2.81%
Non-IT industries				
CI	7,829	14.07%	7.12%	5.71%
IP	15,435	7.82%	1.70%	0.77%
EC	7,253	5.54%	1.16%	-1.73%
Total	30,516	7.52%	2.21%	1.05%

*CI: computerized information, IP: innovative property, EC: economic competencies

Figure2 : Growth Rate of Intangible Assets by Industry



Growth Accounting with Intangibles

- **When we conduct growth accounting with intangibles, the role of intangible assets on economic growth has increased since 1995.**
- **In particular, accumulation in intangibles plays a key role in economic growth in the service sector and the IT industries.**
- **We find that the effects of intangibles on economic growth are concealed in capital accumulation and TFP growth in a traditional growth accounting.**

Growth Accounting with Intangibles and a Traditional Growth Accounting

	1985-95	1995-2010
Market economy		
GDP growth	**3.04%**	**0.55%**
Labor input	**0.39%**	**-0.38%**
Tangible capital input	**1.54%**	**0.39%**
Intangible capital input	**0.48%**	**0.21%**
TFP growth	**0.62%**	**0.33%**
Manufacturing		
GDP growth	**2.51%**	**1.45%**
Labor input	**-0.31%**	**-0.82%**
Tangible capital input	**1.39%**	**0.30%**
Intangible capital input	**0.86%**	**0.33%**
TFP growth	**0.57%**	**1.65%**
Service		
GDP growth	**3.57%**	**0.19%**
Labor input	**0.82%**	**-0.19%**
Tangible capital input	**1.63%**	**0.43%**
Intangible capital input	**0.33%**	**0.18%**
TFP growth	**0.79%**	**-0.23%**
IT industries		
GDP growth	**5.00%**	**1.38%**
Labor input	**0.33%**	**-0.09%**
Tangible capital input	**1.54%**	**0.51%**
Intangible capital input	**0.66%**	**0.34%**
TFP growth	**2.47%**	**0.63%**
Non-IT industries		
GDP growth	**1.03%**	**-0.47%**
Labor input	**0.45%**	**-0.72%**
Tangible capital input	**1.52%**	**0.23%**
Intangible capital input	**0.30%**	**0.08%**
TFP growth	**-1.24%**	**-0.06%**

	1985-90	1990-95
Market economy		
GDP growth	**3.13%**	**0.43%**
Labor input	**0.44%**	**-0.39%**
Capital input	**1.64%**	**0.44%**
TFP growth	**1.05%**	**0.38%**
Manufacturing		
GDP growth	**2.80%**	**1.30%**
Labor input	**-0.28%**	**-0.94%**
Capital input	**1.56%**	**0.45%**
TFP growth	**1.52%**	**1.80%**
Service		
GDP growth	**3.57%**	**0.12%**
Labor input	**0.86%**	**-0.18%**
Capital input	**1.70%**	**0.45%**
TFP growth	**1.00%**	**-0.16%**
IT industries		
GDP growth	**5.29%**	**1.27%**
Labor input	**0.38%**	**-0.09%**
Capital input	**1.65%**	**0.63%**
TFP growth	**3.26%**	**0.72%**
Non-IT industries		
GDP growth	**1.01%**	**-0.55%**
Labor input	**0.49%**	**-0.73%**
Capital input	**1.63%**	**0.24%**
TFP growth	**-1.12%**	**-0.06%**

Growth Accounting with Intangibles contd.

- **International comparison of growth accounting shows that the contribution of intangibles to labor productivity growth in Japan is the lowest in advanced countries.**
- **The growth strategy in Abenomics published last year emphasized that the government support investment in tangible assets aggressively.**
- **However, the Japanese government should support intangible investment as well as tangible investment to restore the Japanese economy through change in industrial structure.**

International Comparison of Growth Accounting

(%)

	Labor productivity growth	Capital deepening			Labor composition	TFP growth
			Tangible assets	Intangible assets		
Japan	2.1	0.9	0.7	0,2	0.8	0.5
Austria	2.4	0.8	0.3	0.5	0.2	1.4
Belgium	1.8	0.7	0.2	0.5	0.1	0.9
Chech Republic	4.2	2.4	1.9	0.5	0.3	1.5
Denmark	1.4	1.2	0.7	0.5	0.2	-0.1
Finland	3.8	0.9	0.2	0.7	0.2	2.6
France	1.9	1.0	0.4	0.6	0.4	0.4
Germany	1.7	1.0	0.7	0.3	0.0	0.7
Ireland	3.8	1.4	0.8	0.6	0.1	2.2
Italy	0.6	0.7	0.5	0.2	0.2	-0.4
Netherlands	2.3	0.9	0.4	0.5	0.7	2.8
Slovenia	5.3	1.7	1.2	0.5	0.7	2.8
Spain	0.8	1.0	0.7	0.3	0.5	-0.6
Sweden	3.7	1.9	1.1	0.8	0.3	1.4
UK	2.9	1.5	0.8	0.7	0.4	1.1
US	2.7	1.7	0.8	0.9	0.2	0.8

*** In Japan, labor productivity growth from 1995 to 2010 is decomposed and the decomposition of labor productivity grwoth conducted by Corrad et, al. (2013).**

Thank you for your attention!