

Intangible Investment in Japan

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Motivation

- Available data on intangible investment at the industry- and firm-level is increasing rapidly.
- It is a good time to collect stylized facts on intangible investment, which will contribute to further developments in economic theory on this issue.
- It seems that Japan's data on intangible investment is relatively advanced in the world.
- Another notable feature of Japan is that intangible investment has stagnated in recent years.
- We collect stylized facts on intangible investment in Japan and try to answer some questions, such as **why intangible investment in Japan has stagnated and what type of firms invest actively in intangible assets.**

Structure of This Presentation

1. Recent Trends in Macro-Level Intangible Investment in Japan

Next, using industry-level and firm-level data, we examine the following issues for each category of intangible assets.

What industries lead intangible investment?

What type of firms invest in intangible assets: large or small, young or old, productive or non-productive?

2. Innovative Property

3. Economic Competencies

4. Computerized Information

Analysis is very preliminary. We have not examined the impact of intangible assets on productivity yet.

Major Data Sources on Intangible Investment in Japan

Industry level:

JIP Database 2011: <http://www.rieti.go.jp/en/database/JIP2011/index.html>

- Nominal and real investment flows and real stock data for each category of intangible investment for 108 industries, which cover the whole economy, are available for 1985-2009. The JIP Database Project collaborates with the EU KLEMS Consortium and the World KLEMS Database Project, and KLEMS-type data are available.
- Estimation procedures are explained in:
Miyagawa, T., and S. Hisa (2012) “Estimates of Intangible Investment by Industry and Productivity Growth in Japan,” Gakushuin University.
Fukao, K., T. Miyagawa, K. Mukai, Y. Shinoda and K. Tonogi (2009) “Intangible Investment in Japan: Measurement and Contribution to Economic Growth,” Review of Income and Wealth, Vol. 55, No. 3, pp. 717-736.

Firm level:

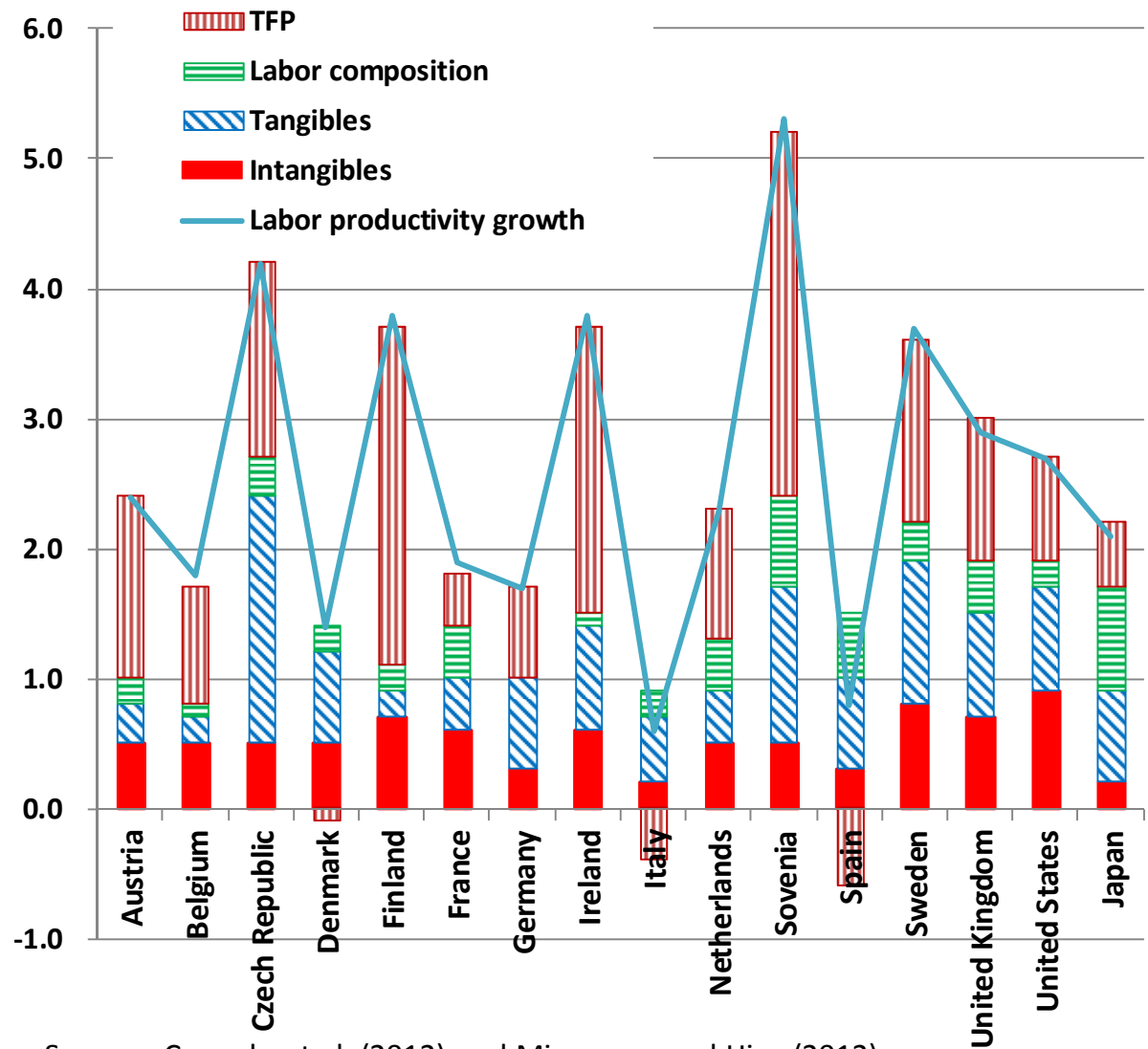
Basic Survey of Japanese Business Structure and Activities

- The survey is conducted annually since 1994 by the Ministry of Economy, Trade and Industry (METI). The survey covers all firms with at least 50 employees and 30 million yen of paid-in capital in manufacturing, mining, commerce, and most service sectors.
- The data include R&D expenditures, expenditures for advertisement, stock of software investment (package and order-made, available only from 2006), Off-JT (opportunity cost is not included, available only from 2009).

1. Recent Trends in Macro-Level Intangible Investment in Japan

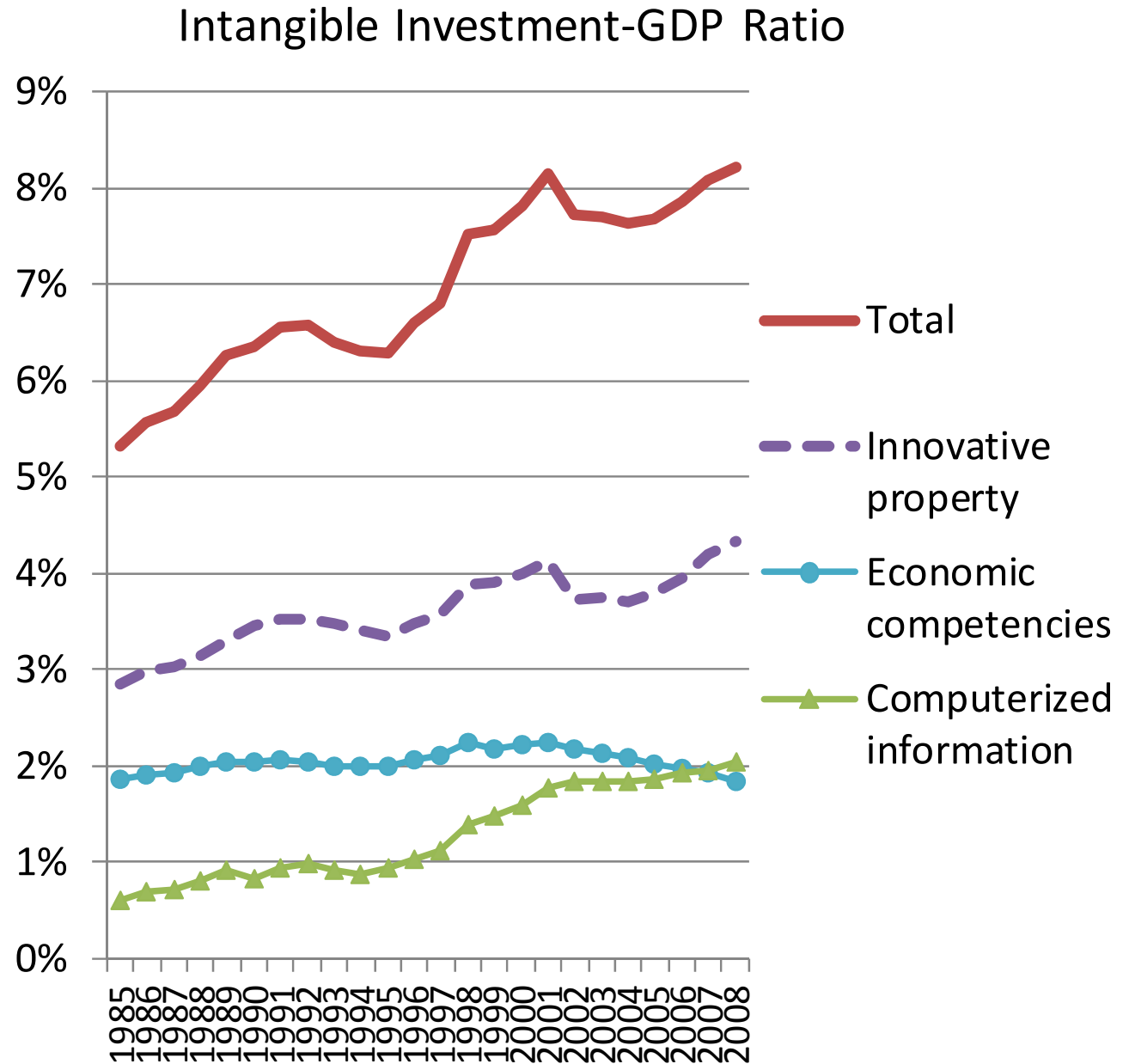
According to recent studies, the contribution of intangible investment to labor productivity growth in Japan is the lowest among the major developed countries.

Contribution to the growth in output per hour: 1995 to 2007 (annual rate, %)



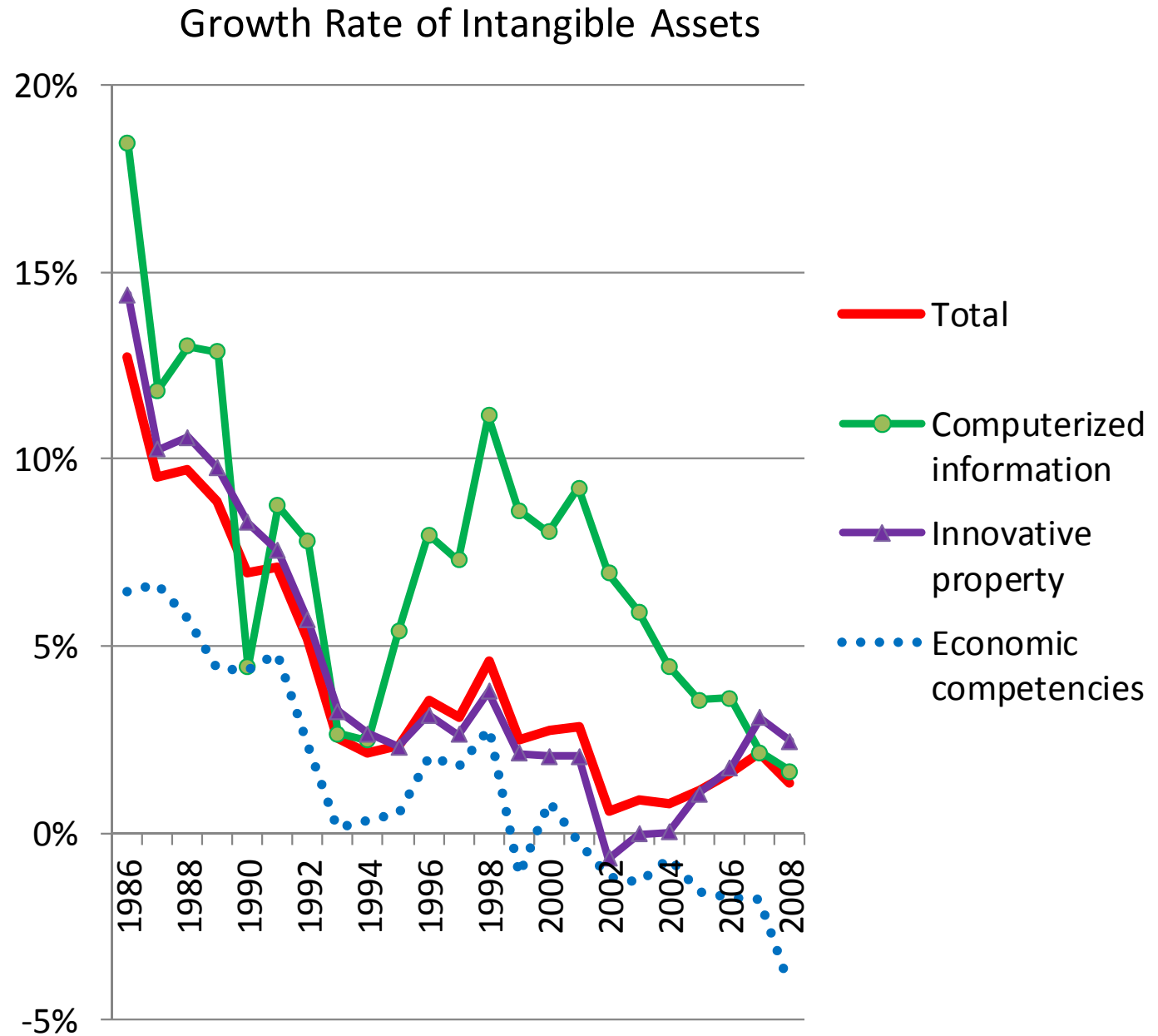
Source: Corrado et al. (2012) and Miyagawa and Hisa (2012).

Looking at intangible investment in detail shows that, since around 2000, investment in economic competencies and in computerized information has stagnated particularly.



Source: JIP Database 2011.

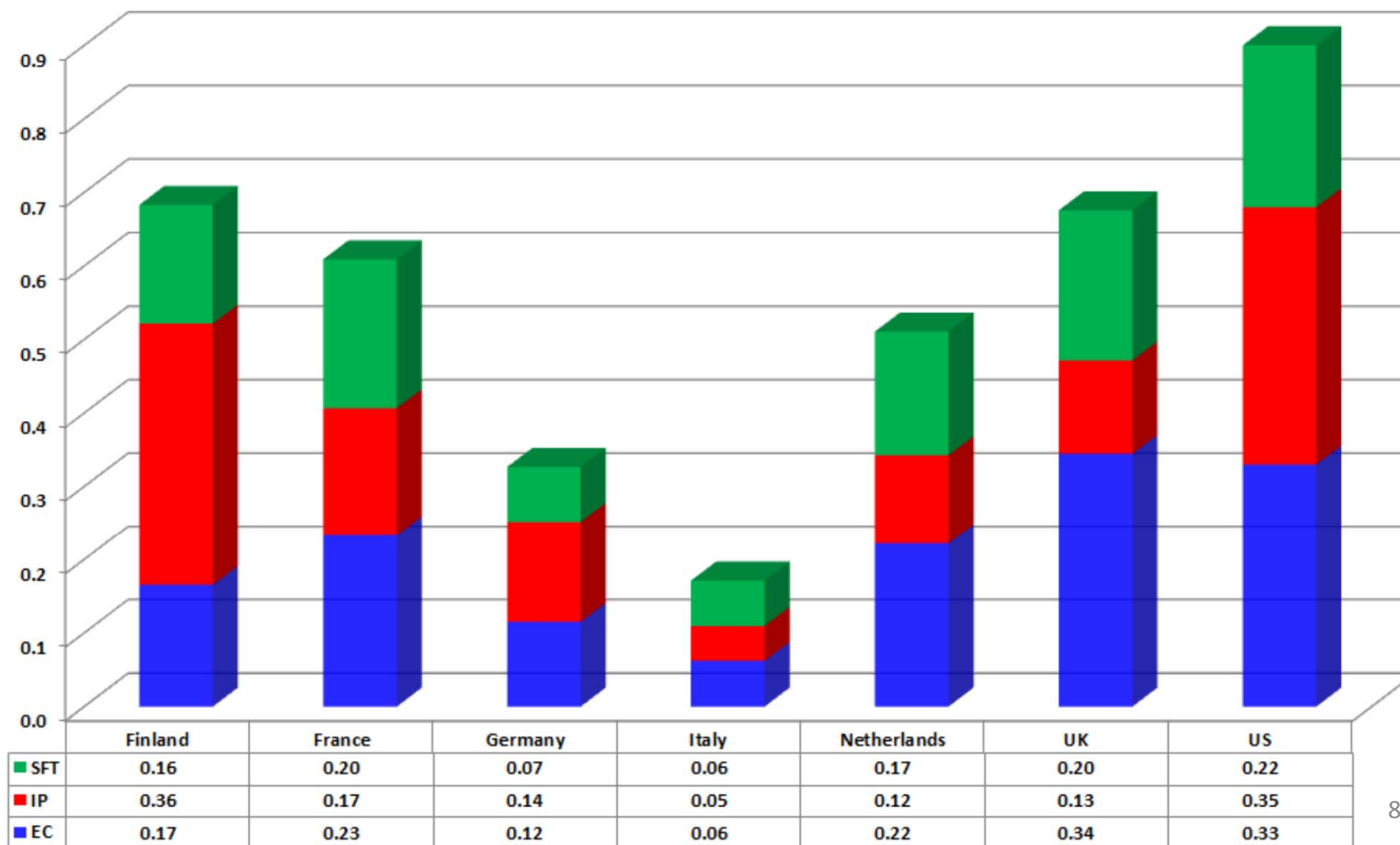
In the 2000s, intangible assets in economic competencies recorded negative growth in Japan.



Source: JIP Database 2011.

In contrast with Japan's experience, all three categories of intangible assets made a positive contribution to labor productivity growth in the US and European countries (Corrado et al. 2012).

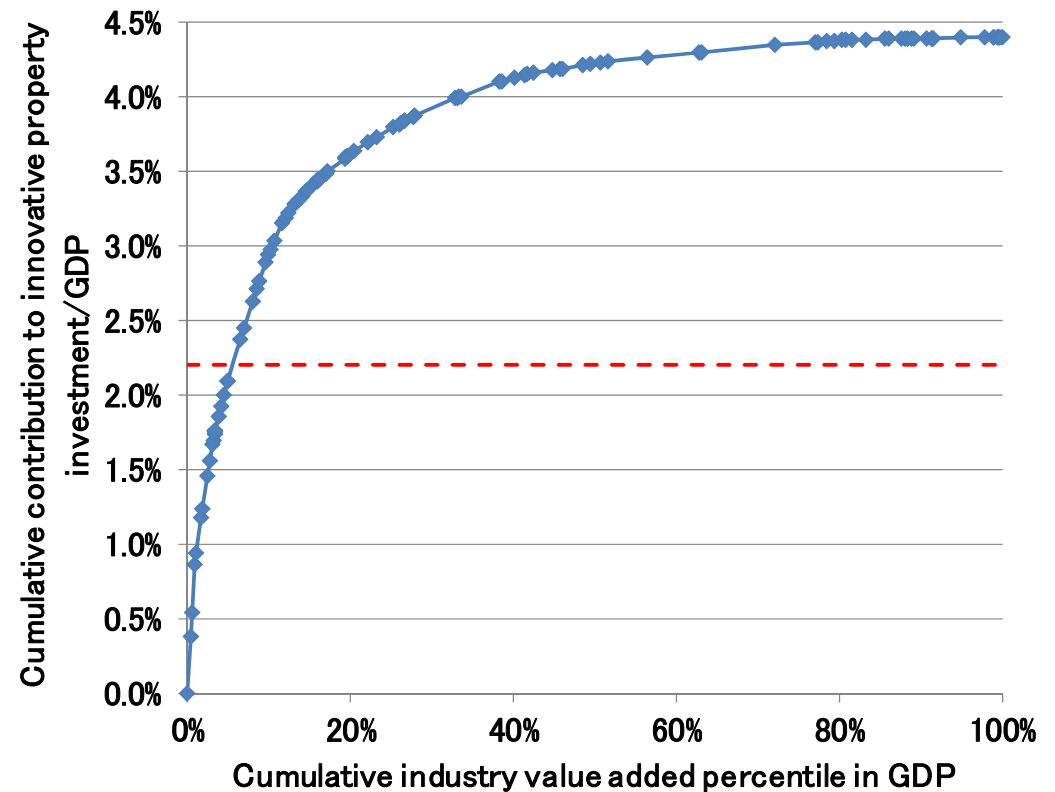
Figure 8. Contribution of Subcomponents of Intangibles to Labor Productivity Growth (1995-2007)



2. Innovative Property Investment in Japan

- Innovative property investment is concentrated in a small number of industries.
- Four industries (broadcasting, communication equipment, motor vehicle parts and accessories, and pharmaceutical products), which produce 3% of GDP, conduct 25% of Japan's total innovative property investment.
- The stagnation in innovative property investment could be due to a decline in the value added share of innovative property intensive industries.

Cumulative Contribution of Industries to Innovative Property Investment: 2000–08



Source: JIP Database 2011.

Did the Value Added Share of Innovative Property Intensive Industries Decline in Japan?

Using the following identity, we decompose the slowdown of the macro-level increase in the innovative property investment-GDP ratio into the inter-industry effect and the intra-industry effect.

$$\frac{\sum_i Z_{T,i}}{\sum_i Y_{T,i}} - \frac{\sum_i Z_{0,i}}{\sum_i Y_{0,i}} = \left(\sum_i \frac{Z_{T,i}}{Y_{T,i}} \frac{Y_{T,i}}{\sum_i Y_{T,i}} - \sum_i \frac{Z_{T,i}}{Y_{T,i}} \frac{Y_{0,i}}{\sum_i Y_{0,i}} \right) + \left(\sum_i \frac{Z_{T,i}}{Y_{T,i}} \frac{Y_{0,i}}{\sum_i Y_{0,i}} - \sum_i \frac{Z_{0,i}}{Y_{0,i}} \frac{Y_{0,i}}{\sum_i Y_{0,i}} \right)$$

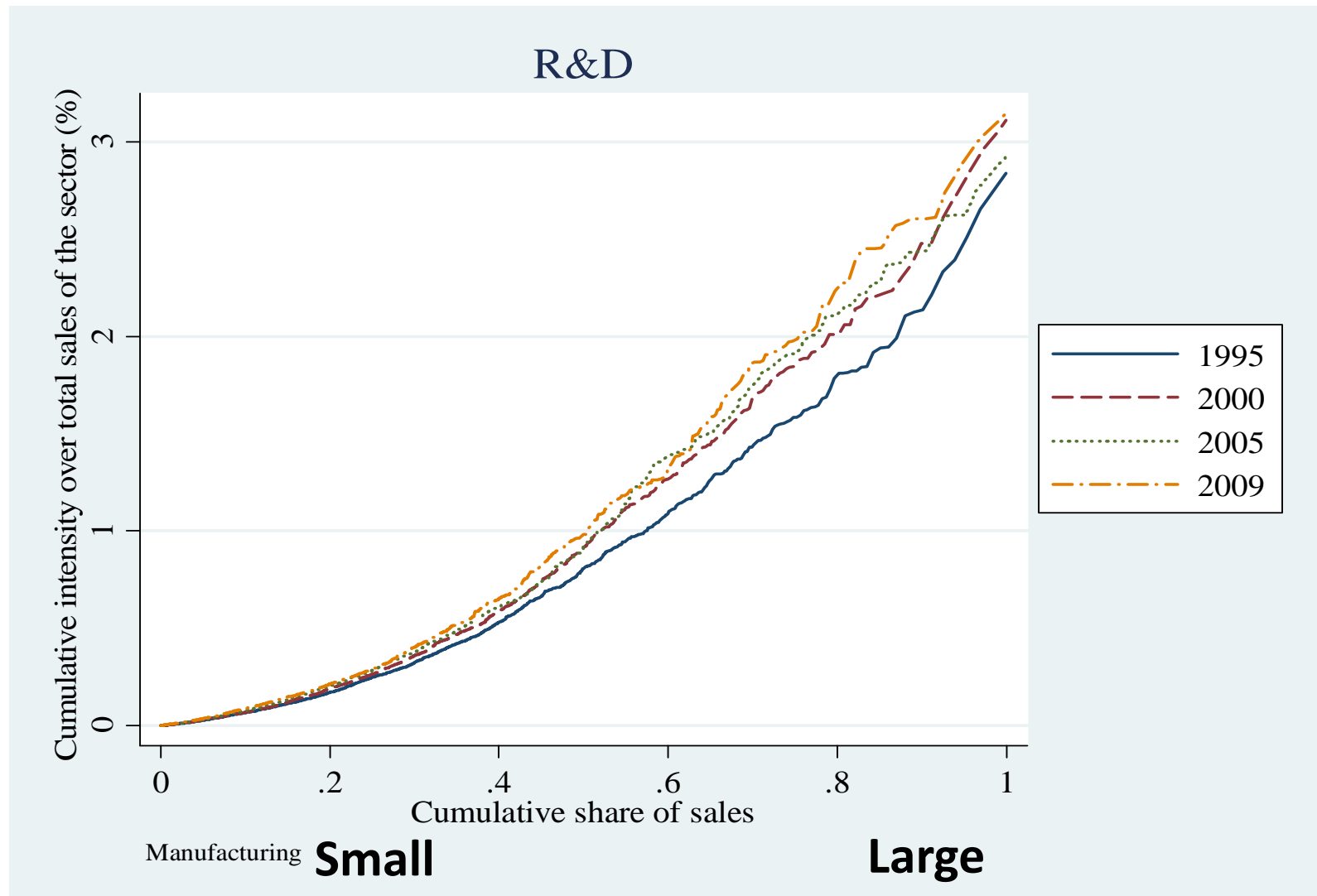
where $Z_{t,i}$ denotes innovative property investment by industry i in year t and $Y_{t,i}$ denotes the nominal value added of industry i in year t .

Period	Total effect	Inter-industry effect	Intra-industry effect (percentage points)
1990-2000	0.69%	-0.23%	0.92%
2000-2008	0.40%	-0.60%	1.00%

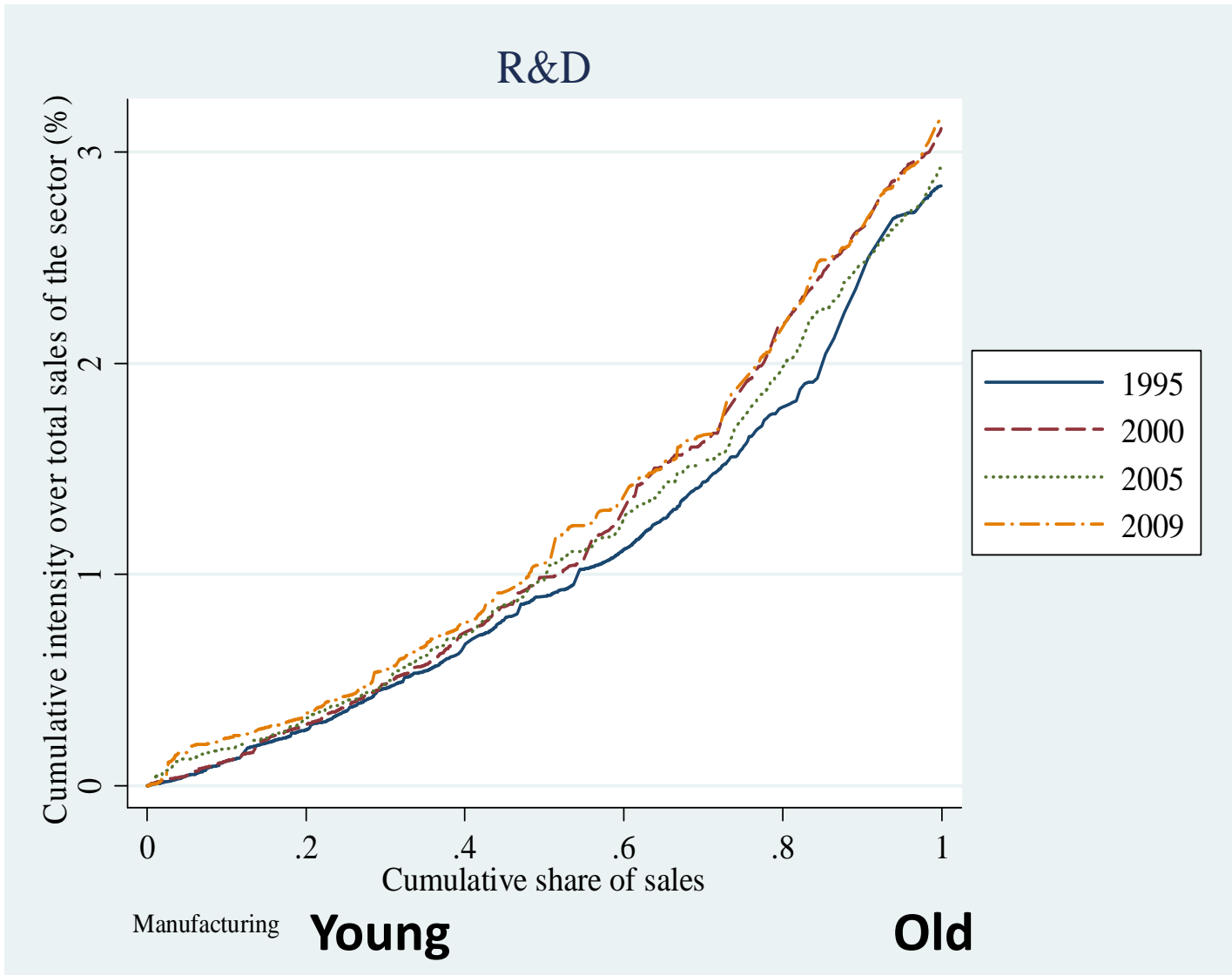
The decline of the value added share of innovative property intensive industries has contributed to the stagnation in investment.

Who Conducts R&D Investment in the Manufacturing Sector?

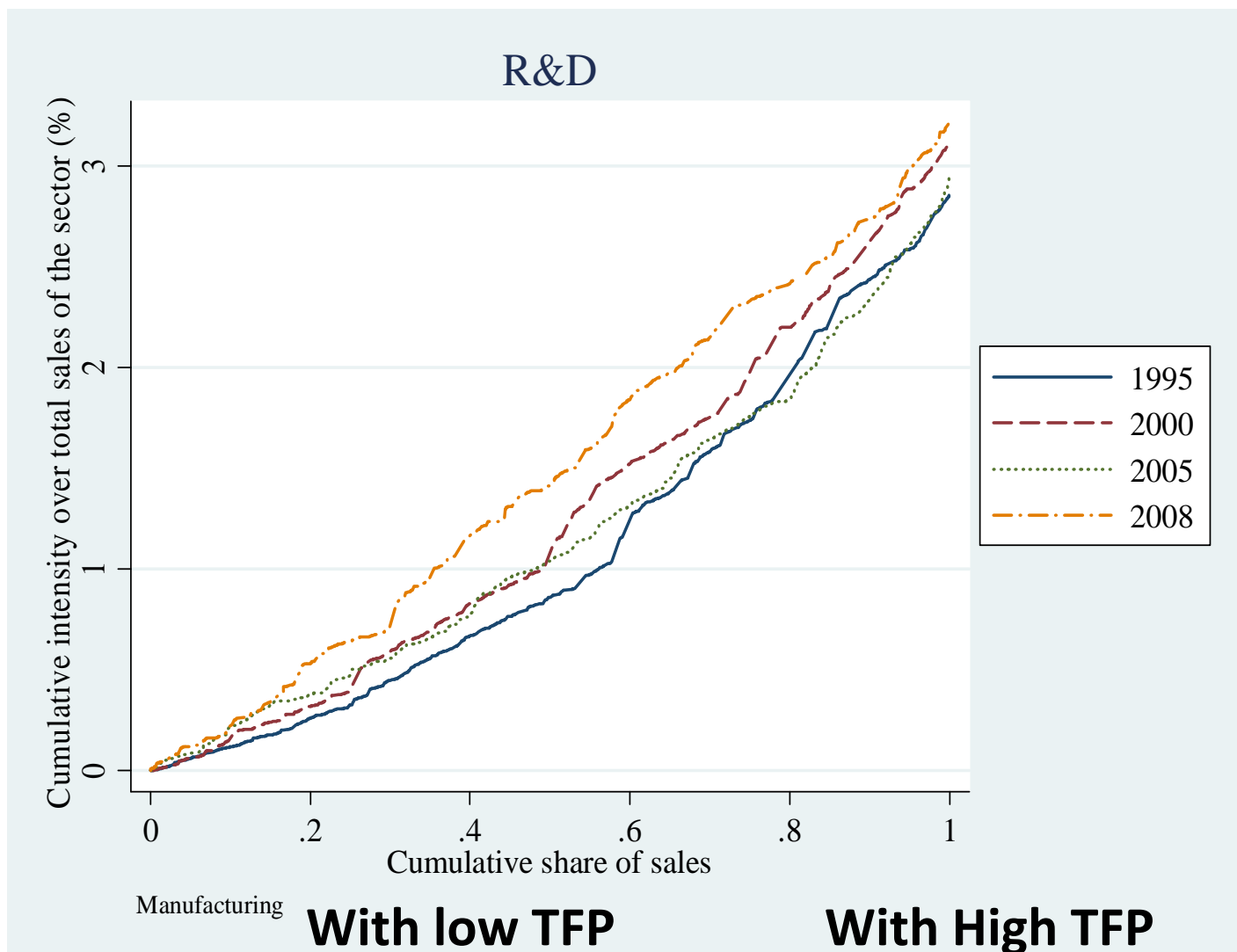
In Japan's manufacturing sector, R&D investment is concentrated in large, old and productive firms. But recently, the importance of smaller, young and less-productive firms has been increasing.



Who Conducts R&D Investment in the Manufacturing Sector – Young or Old Firms?



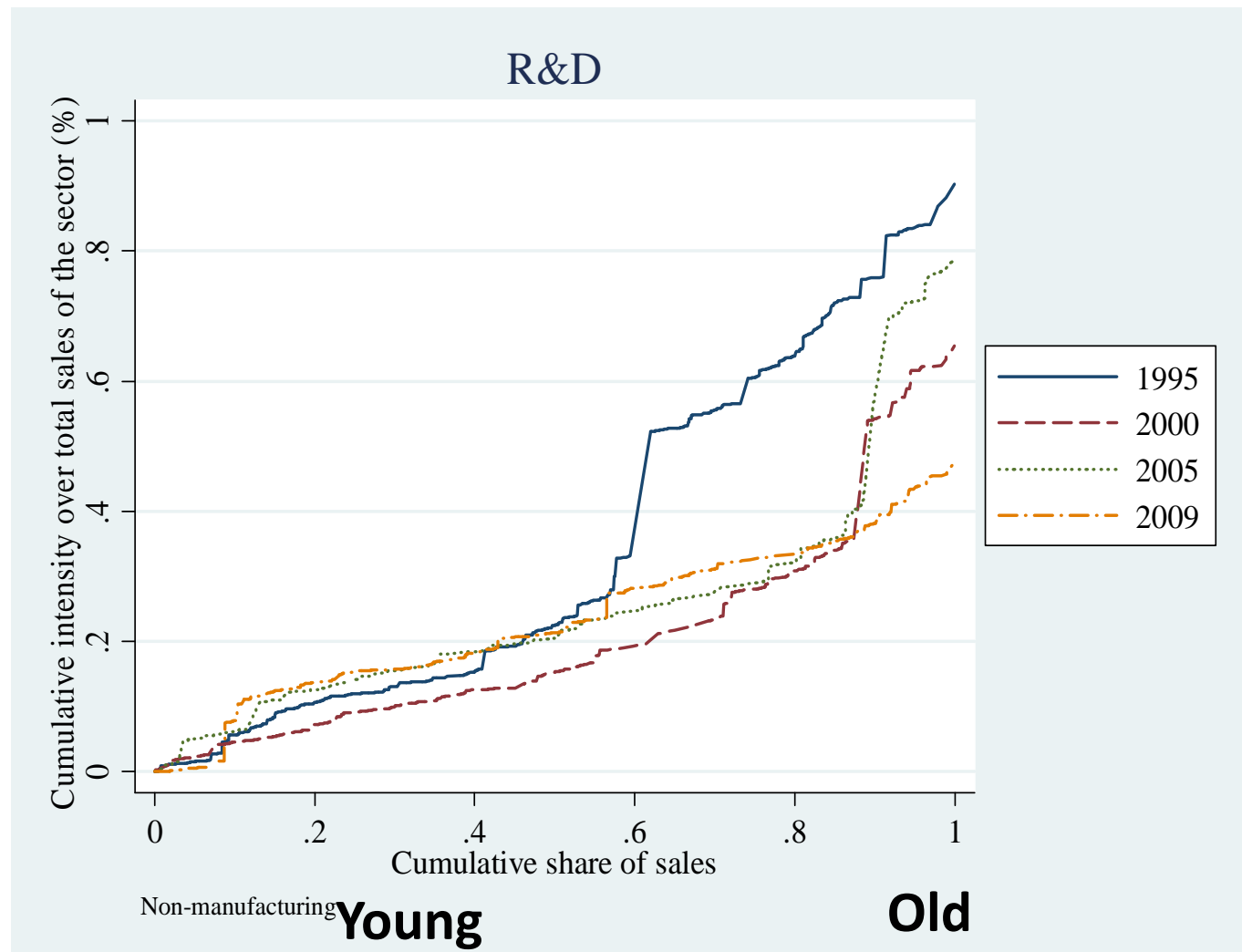
Who Conducts R&D Investment in the Manufacturing Sector - Productive or Unproductive Firms?



Note: The relative TFP level is measured for each industry of the JIP industry classification. Intangible investment is not treated as a factor input.

Who Conducts R&D Investment in the Non-manufacturing Sector?

As in the case of the manufacturing sector, smaller, young and less-productive firms have tended to conduct more R&D than other firms in recent years.

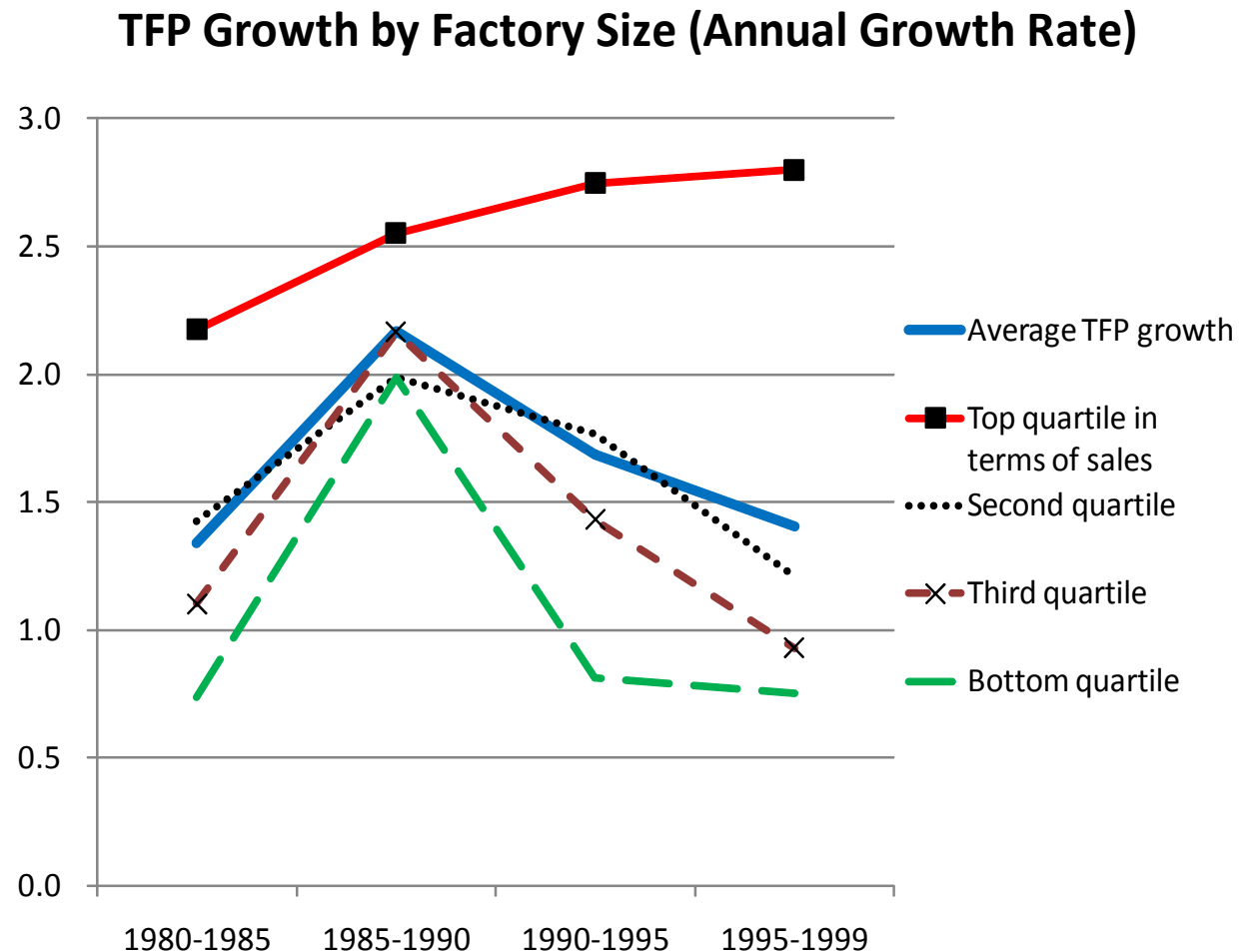


R&D by Small, Young, Less Productive Firms

- In the 1990s, the TFP growth of large firms accelerated in both the manufacturing and the non-manufacturing sector. Small and medium-sized firms (SMEs) were left behind.

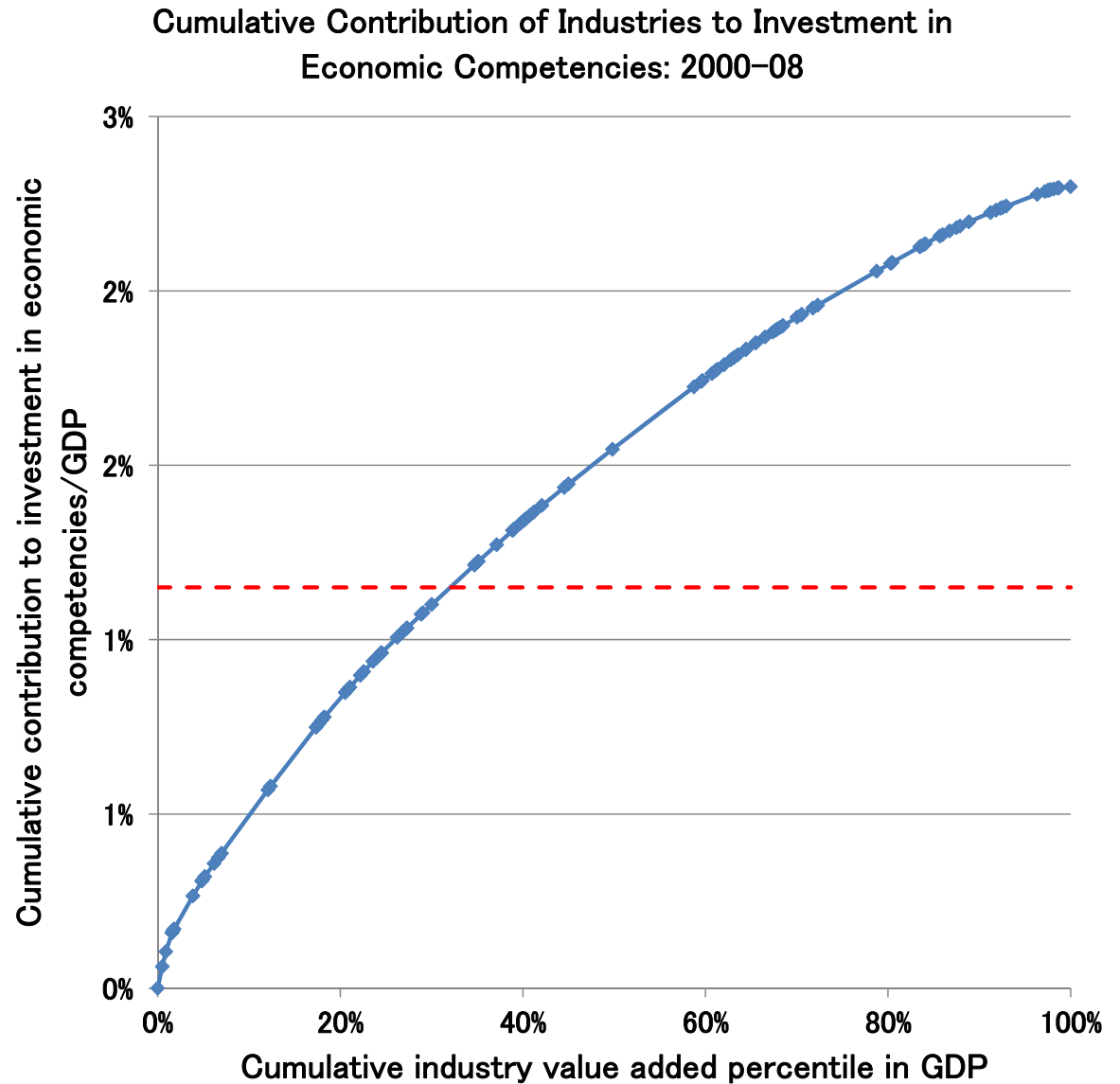
→ Possible reasons:
decrease in
technology
spillovers from large
firms.

Probably, we can
explain the recent
increase in R&D by
small, young and less
productive firms as
their response to the
decline in spillovers.



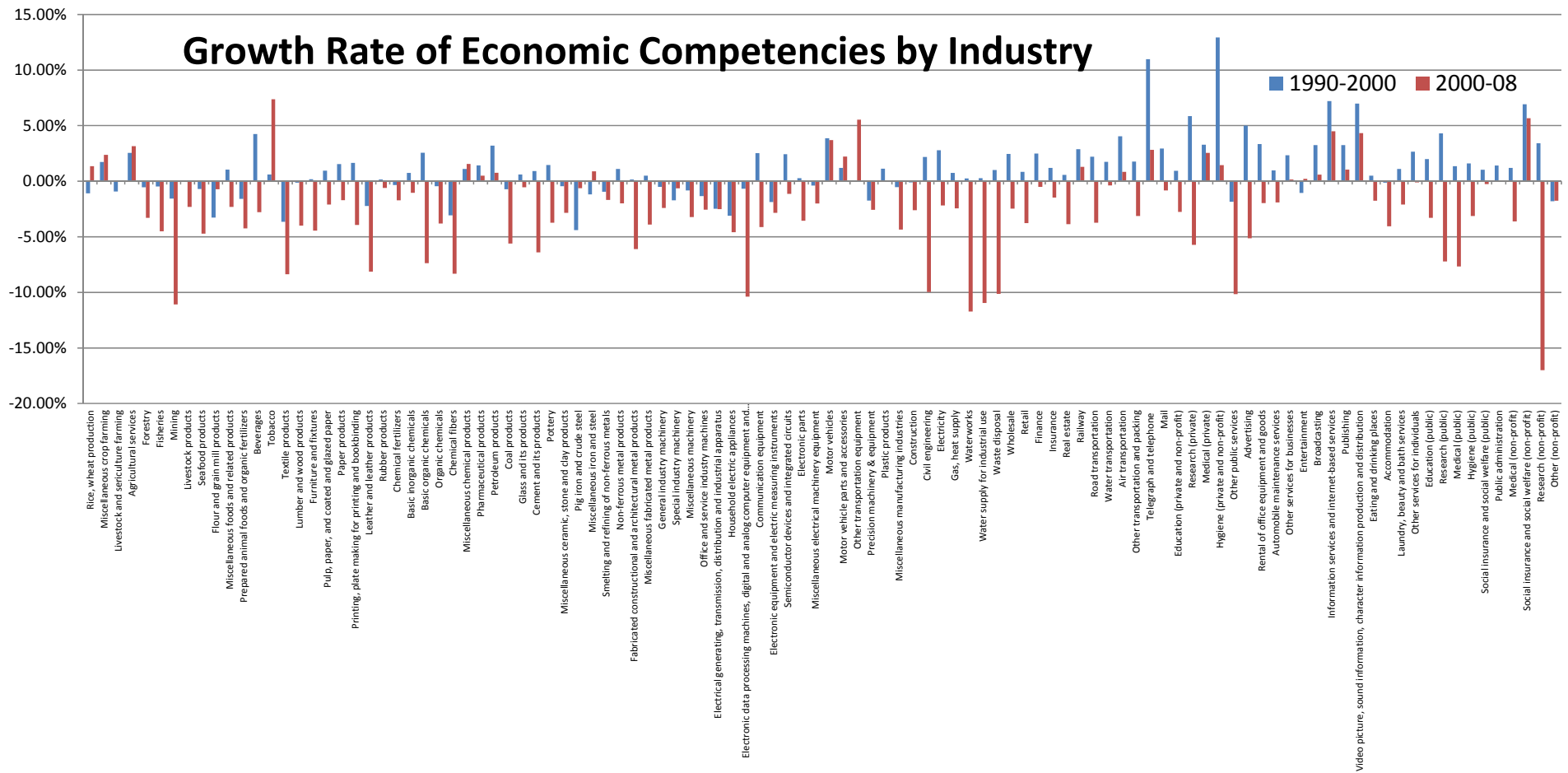
3. Investment in Economic Competencies in Japan

In the case of investment in economic competencies, the investment-sales ratio is quite similar across industries.



Source: JIP Database 2011.

In the 2000s, the stock of economic competencies declined in many industries, including most manufacturing industries. However, it increased rapidly in high growth industries such as social insurance and social welfare (non-profit), information services and internet-based services.



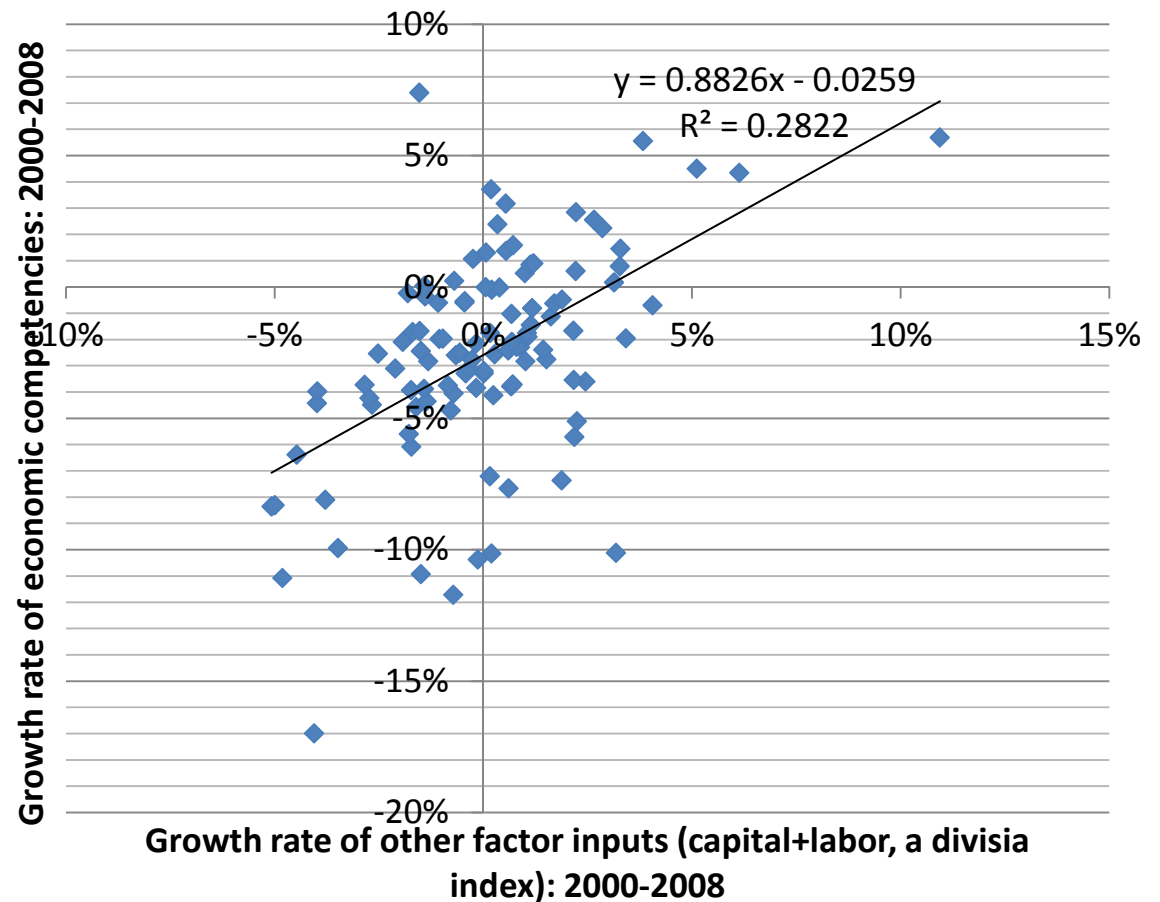
Source: JIP Database 2011.

Investment in Economic Competencies: Industry-Level Analysis

There is a high cross-industry correlation between the growth rate in economic competencies and the growth rate of other factor inputs.

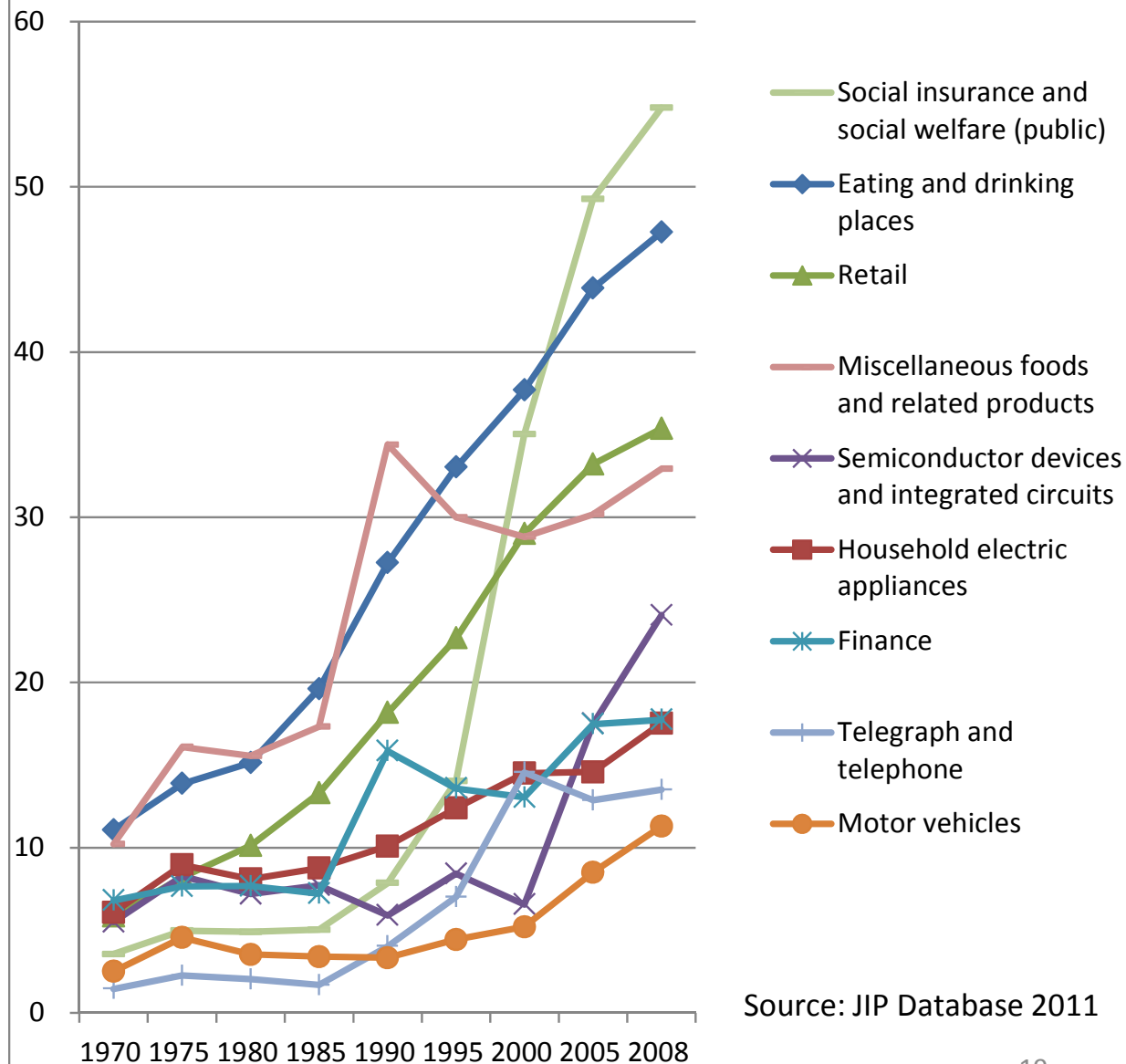
It seems that the reason Japanese firms do not invest in economic competencies is simply that they expect low sales and factor input growth.

Cross-industry Relationship between Growth of Economic Competencies and Growth of Other Factor Inputs: 2000-2008



It seems that the decline in the accumulation of economic competencies was partly caused by the harsh restructuring resulting from the long-term economic stagnation. For example, many firms increased the percentage of part time workers in total workers and did not provide intensive training in the case of part time workers. This change reduced training expenditure substantially.

Share of part-time workers in total workers by sector: 1970-2008 (in %)



Source: JIP Database 2011

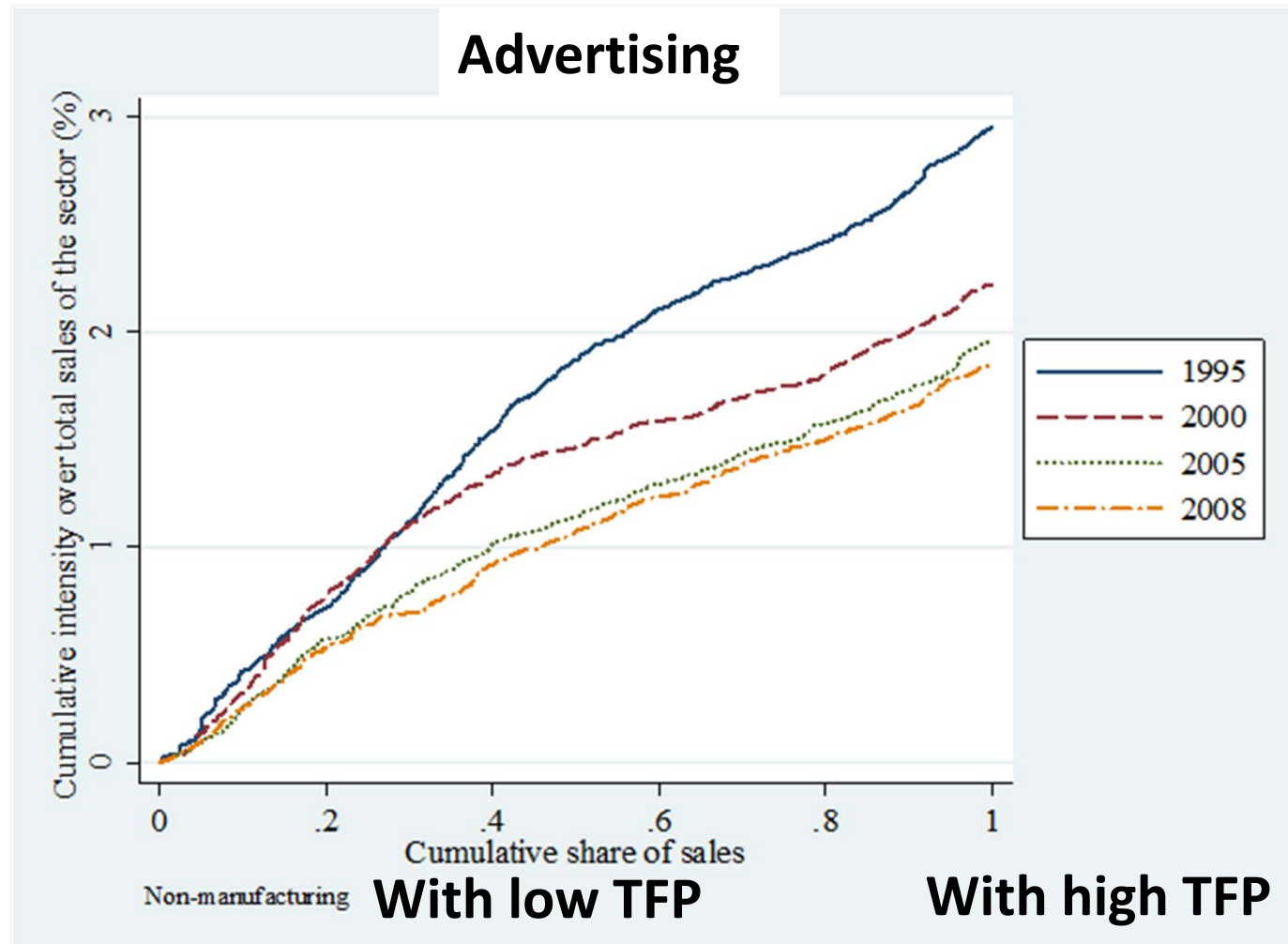
Who Conducts Advertising in the Non-manufacturing Sector?

In Japan's non-manufacturing sector, younger and less productive firms tend to conduct more advertising than other firms.

Non-manufacturing

	OLS				Fixed effect estimation			
Advertising / Sales (%)								
lnTFP (-1)	-1.164 *** [0.029]			-1.066 *** [0.028]	-0.037 * [0.020]			-0.041 ** [0.020]
lnEMP (-1)		0.309 *** [0.007]		0.325 *** [0.007]		-0.114 *** [0.013]		-0.118 *** [0.013]
lnAge			-0.255 *** [0.010]	-0.292 *** [0.010]			-0.064 *** [0.015]	-0.063 *** [0.015]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	163,264	169,926	168,924	162,321	163,264	169,926	168,924	162,321
Adj. R-Squared	0.242	0.241	0.234	0.255	-0.176	-0.17	-0.172	-0.176

Who Conducts Advertising in the Non-manufacturing Sector?



Who Conducts Off-JT in the Non-manufacturing Sector?

In Japan's non-manufacturing sector, large and productive firms tend to have a higher off-JT expenditure/sales ratio.

Non-manufacturing				
	OLS			
Off-JT expenditure / Sales (%)				
lnTFP (-1)	0.064 *** [0.012]			0.067 *** [0.012]
lnEMP (-1)		0.011 *** [0.002]		0.011 *** [0.002]
lnAge			0.004 [0.003]	0.001 [0.003]
Industry dummies	Yes	Yes	Yes	Yes
Observations	5,611	5,885	5,870	5,597
Adj. R-Squared	0.08	0.075	0.072	0.083

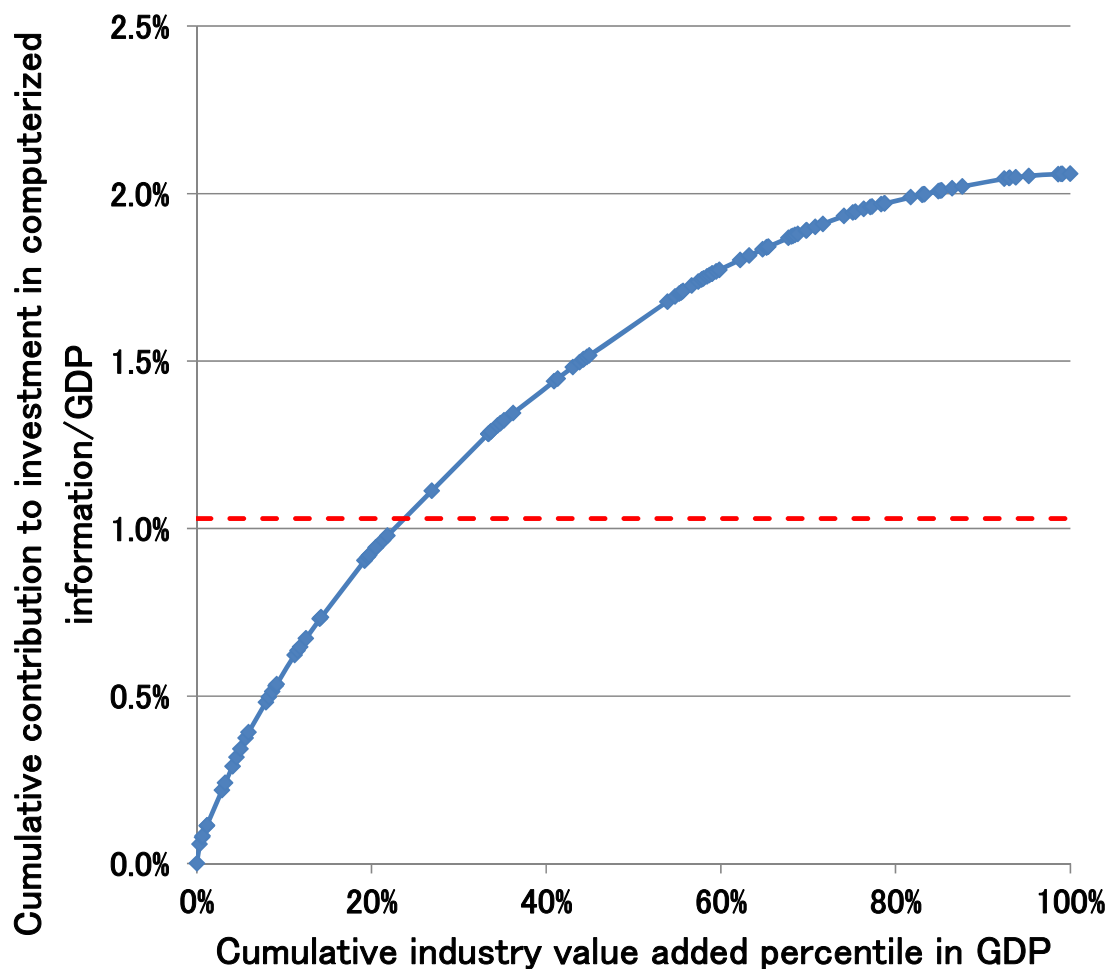
Note: We used cross-section data for 2009.

4. Investment in Computerized Information in Japan

Investment in computerized information is more concentrated in certain sectors than in the case of investment in economic competencies, but less concentrated than in the case of innovative property investment.

Industries such as information services and internet-based services, finance and insurance, and telephone and telegraph lead investment in computerized information.

Cumulative Contribution of Industries to Investment in Computerized Information: 2000–08



Who Conducts Software Investment?

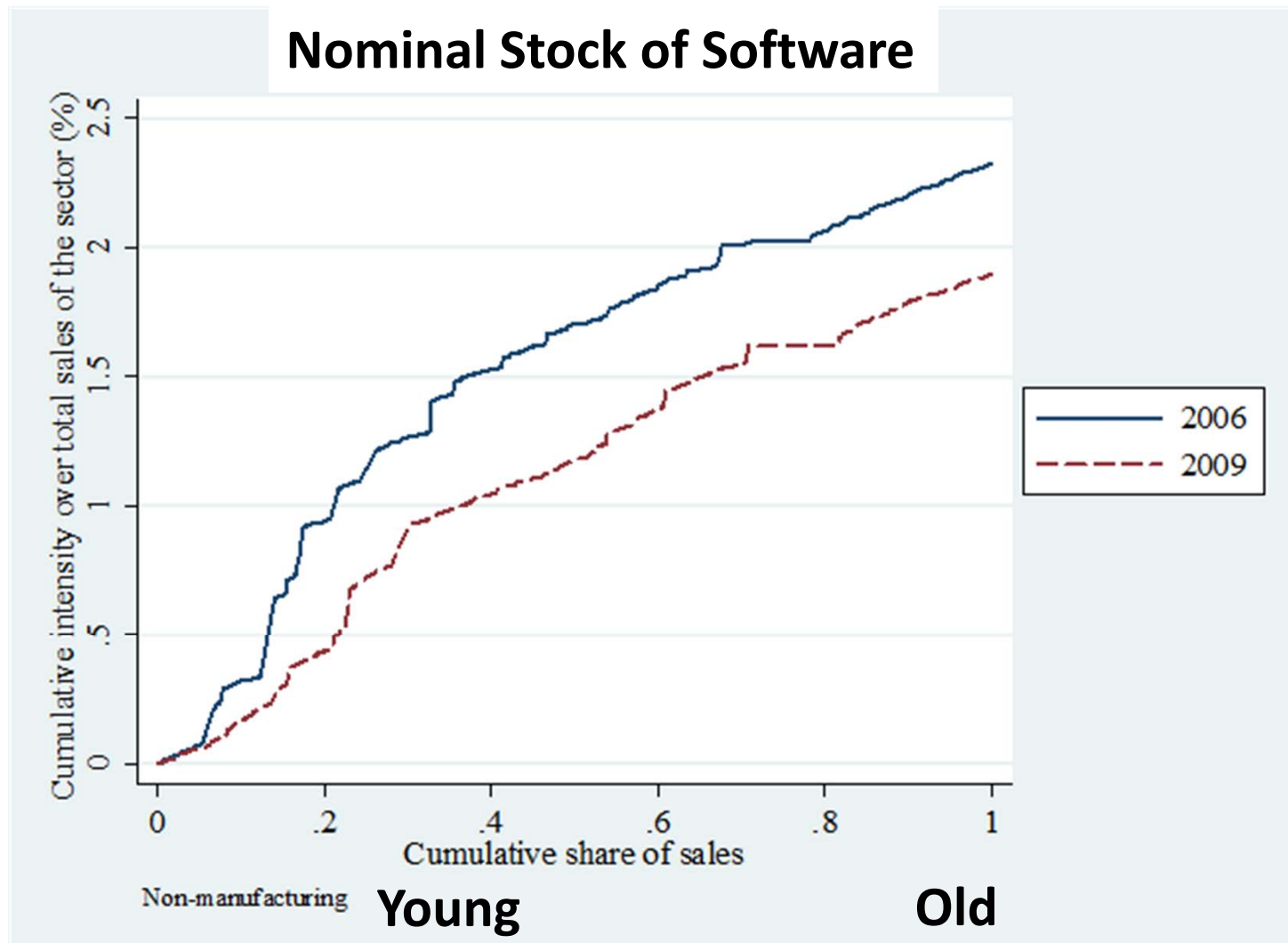
In Japan, large and productive (reverse causality?) firms tend to have a higher software stock/sales ratio. In the case of the non-manufacturing sector, younger firms tend to have a higher software stock/sales ratio.

	OLS				OLS			
	Manufacturing				Non-manufacturing			
Software stock / Sales (%)								
lnTFP(-1)	0.624 ***			0.392 ***	0.101 ***			0.172 ***
	[0.037]			[0.037]	[0.038]			[0.037]
lnEMP(-1)		0.126 ***		0.118 ***		0.169 ***		0.179 ***
		[0.004]		[0.004]		[0.008]		[0.008]
lnAge			0.007	-0.008			-0.127 ***	-0.158 ***
			[0.006]	[0.006]			[0.012]	[0.012]
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34,930	35,751	35,694	34,874	36,032	37,544	37,434	35,927
Adj. R-Squared	0.051	0.072	0.042	0.076	0.078	0.087	0.079	0.093

Note: We used pooled data for 2006-09.

Who Conducts Software Investment in the Non-manufacturing Sector?

In the case of the non-manufacturing sector, younger firms tend to have a higher software stock/sales ratio.



Conclusion

- Intangible investment in Japan has stagnated in recent years. The stagnation is particularly serious in investment in economic competencies.
- Using industry and firm-level data, we examined this trend and also investigated what industries and what type of firms led intangible investment in Japan.

Findings from Industry-Level Analysis

- In the case of innovative property and computerized information, intangible investment is concentrated in a small number of industries.

Innovative property: broadcasting, communication equipment, motor vehicle parts and accessories, and pharmaceutical products.

Computerized information: information services and internet-based services, finance and insurance, and telephone and telegraph services.

Findings from Industry-Level Analysis (Contd.)

- Our decomposition analysis at the industry level showed that a decline in the value added share of innovative property intensive industries has substantially contributed to the stagnation in investment.
- In the case of economic competencies, the investment-sales ratio is quite similar across industries. There is a high cross-industry correlation between the growth rate of economic competencies and the growth rate of other factor inputs. It seems that the reason Japanese firms do not invest in economic competencies is simply that they expect low sales and factor input growth.
- Many firms increased the percentage of part time workers in total workers and did not provide intensive training in the case of part time workers. This change reduced training expenditure substantially.

Findings from Firm-Level Analysis

- In Japan's manufacturing sector, R&D investment is concentrated in large, old and productive firms. However, **recently the importance of smaller, young and less-productive firms has been increasing.** Similarly, in the non-manufacturing sector, small, young and less-productive firms have tended to conduct more R&D in recent years.
- One promising candidate to explain these recent trends probably is that **small, young and less-productive firms have been increasing their R&D in response to the decline in technology spillovers from large firms.**
- In the case of the non-manufacturing sector, younger firms tend to conduct more advertising and have a higher software stock/sales ratio.
- It has been argued that because of low economic growth, high entry and exit cost, the zombie firm problem, etc., the sales share of young firms has been small in Japan. **Since young firms are active in several types of intangible investment, the low share of young firms may have contributed to the stagnation of intangible investment.**

Sales Share by Firm Age Group

