



Non-R&D intangibles as drivers of growth

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Topics for discussion

- Non-R&D intangibles
 - ✓ What are they?
 - ✓ How big are they
 - ✓ Who invests in them?
 - Sneak preview of INTAN-Invest sector-level estimates
- What are the mechanisms that link non-R&D intangibles to growth?
 - ✓ Globalization and intangibles
 - ✓ Complementarities with R&D/NPD and ICT
- Growth accounting results
- Conclusions

The CHS framework

Broad category

Type of Investment

Computerized
Information

- Software
- Databases

Innovative
Property

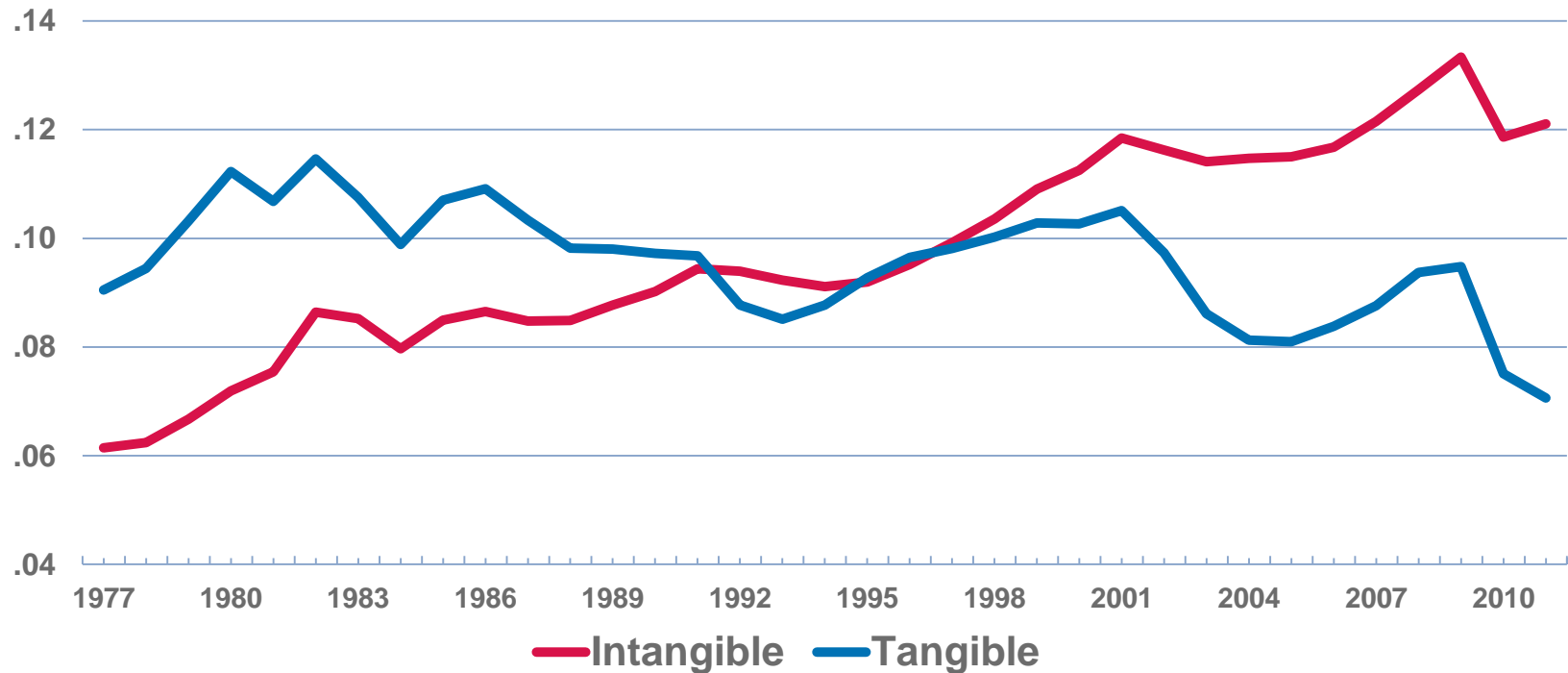
- R&D
- Mineral exploration
- Entertainment and artistic originals
- Design and other new product development costs

Economic
Competencies

- Branding (mkt. research and long-lived advertising)
- Firm-specific human capital (training)
- Organizational capital (business process investment)

The U.S. intangible investment rate overtook the tangible rate by the end of the 1990s

Investment, Private industries, 1977 to 2011
(ratio to existing GDP)

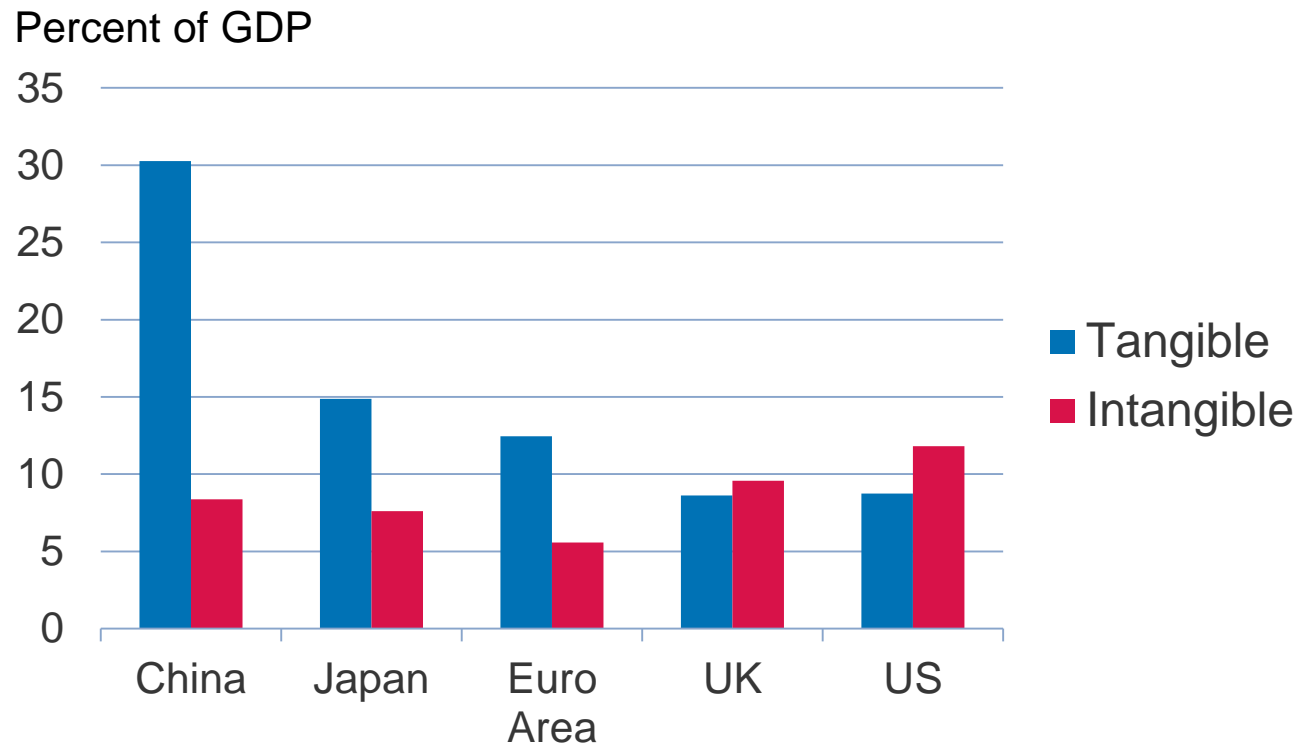


Excludes real estate/housing.

Source—Corrado and Hulten (2010, 2012).

Also in the U.K., and others are not that far behind.

Investment in tangible and intangible assets, 2007



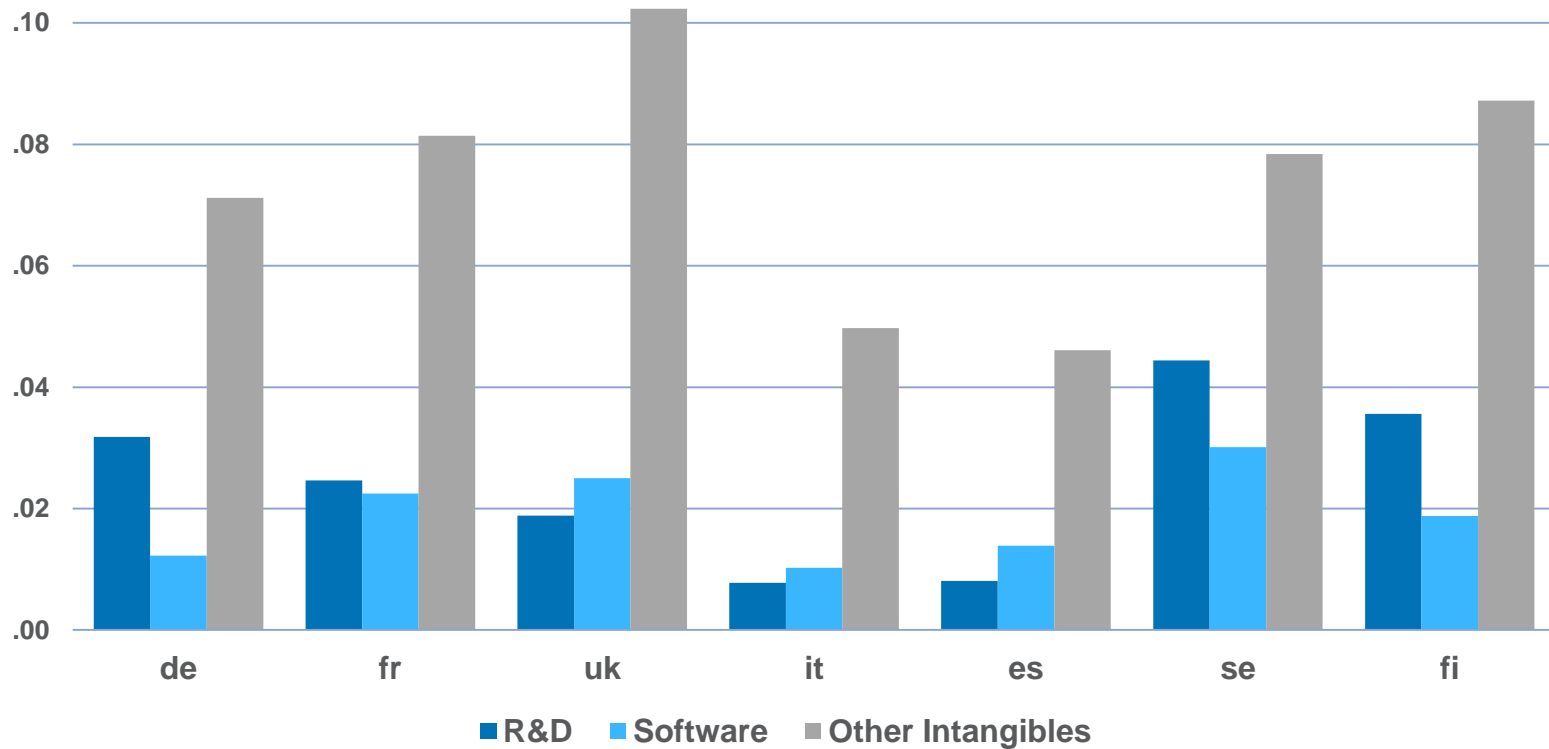
*Note. Euro Area excludes Luxembourg.
Source. Corrado and Hao (2013).*

Non-R&D intangibles: how big are they?

Very big indeed

Intangible Capital Factor Shares, 1995-2010

Share of market sector value added

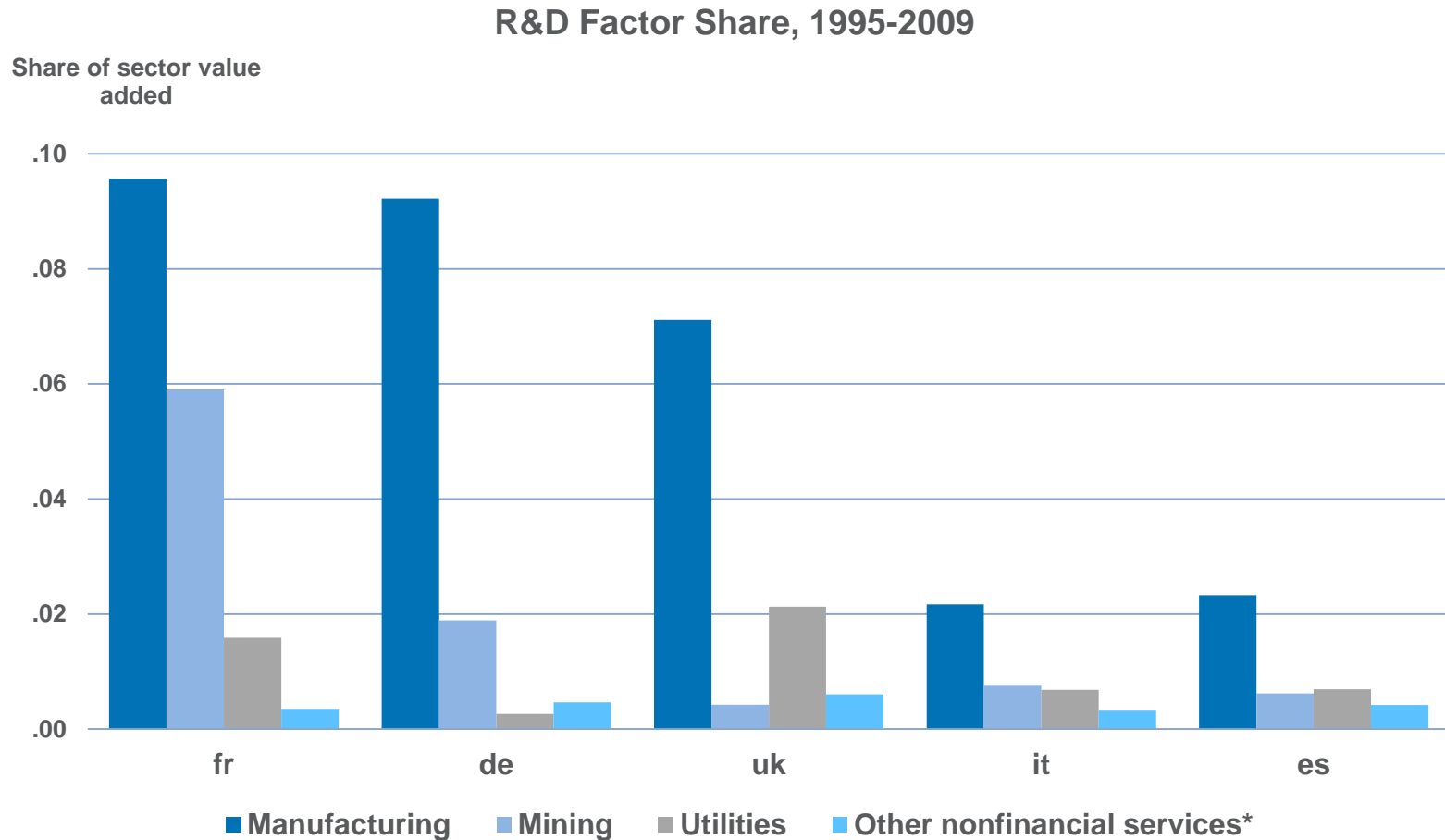


Source: Elaboration of INTAN-Invest estimates.

Non-R&D intangibles: who invests in them?

Because R&D is mainly performed by the industrial sector.

..



Source: Elaboration of INTAN-Invest estimates.

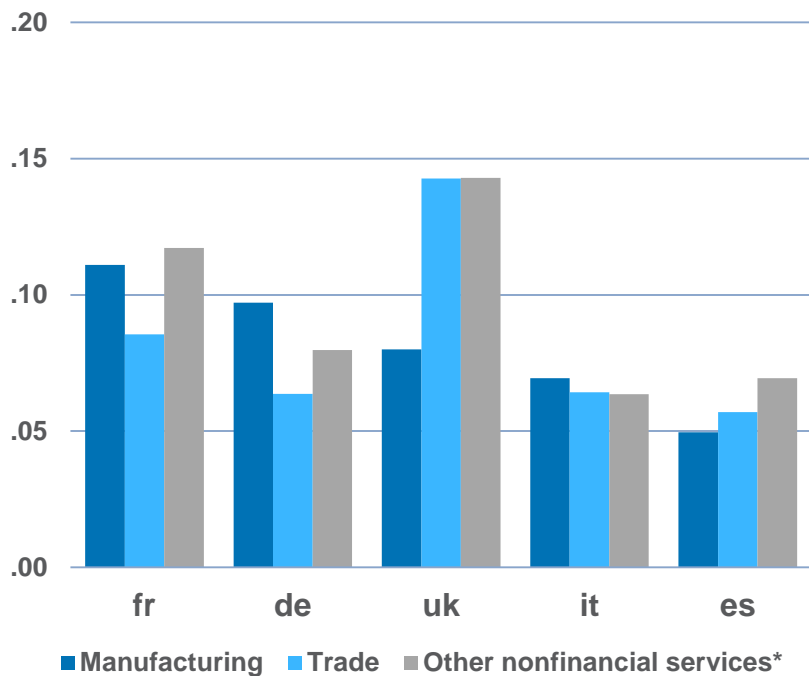
* Agriculture, construction and financial services are excluded.

Non-R&D intangibles: who invests in them?

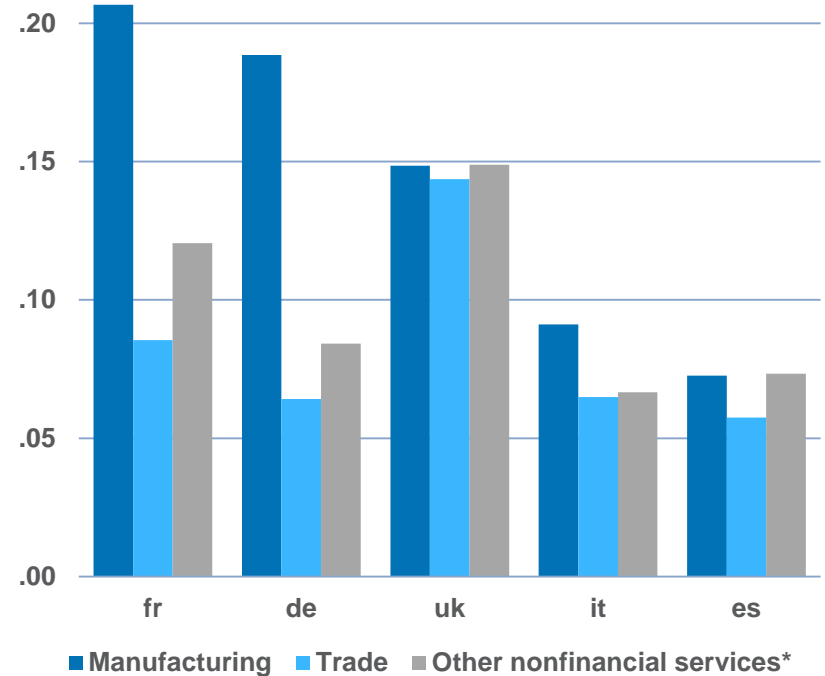
... non-R&D intangibles are distributed more evenly across sectors (in these countries)

Intangible Capital Factor Share by Major Sector, 1995-2009

Excluding R&D



All intangibles



Source: Elaboration of INTAN-Invest estimates.

* Agriculture, mining, utilities, construction and financial services are excluded.

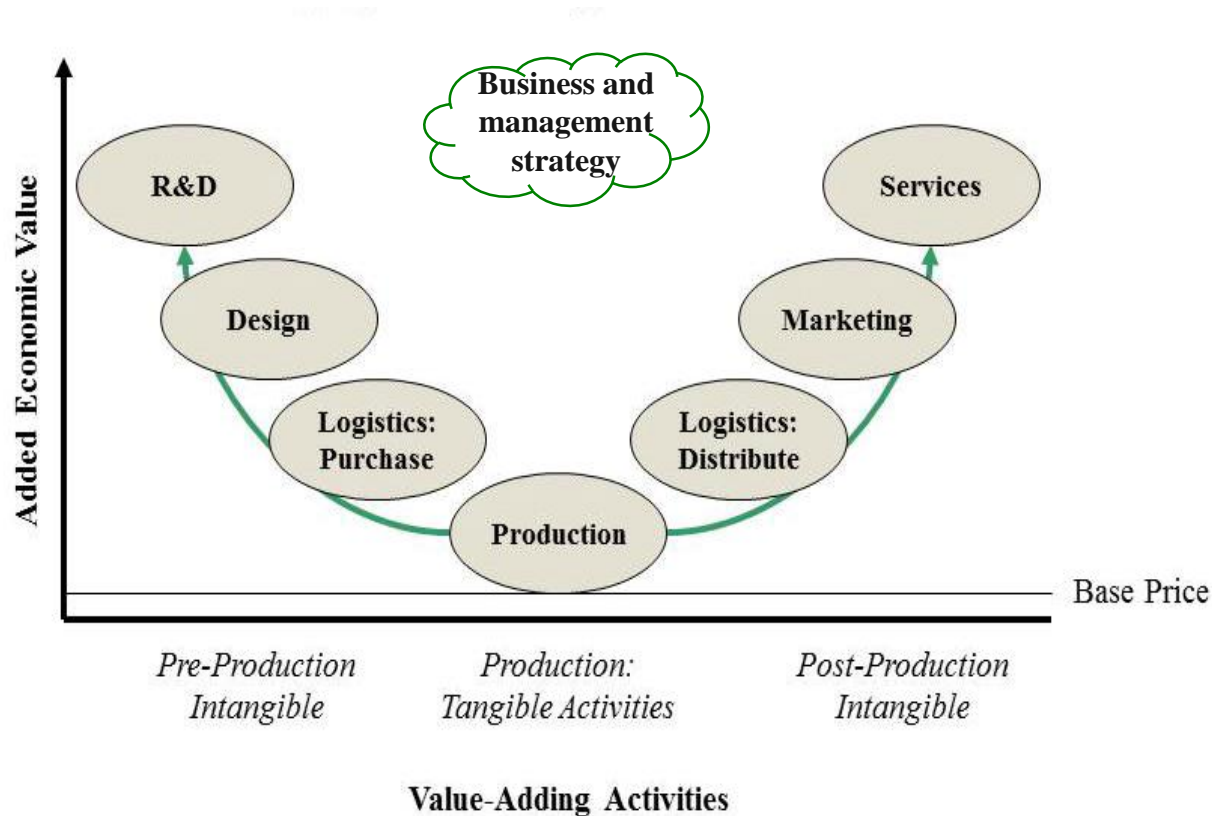
The intangible investment framework

- Origin of framework: policy-makers need measures of the productive capacity of their economies
- Basic idea: common sense notion that investments in innovation are not costless (but grounded in optimal growth theory)
- Because returns to intangible capital are appropriable for nontrivial life lengths (and a large micro literature supported connections between these investments and productivity), intangible investment was modeled using the standard growth accounting framework
 - ✓ This does not mean that the underlying firm or industry production functions cannot exhibit complementarities between different intangible assets, or between intangibles and tangibles

Examples of synergies

- Globalization and value chains
- Everything a firm does contributes to its brand
- Non-rival nature of non-R&D intangibles
- ICT and investments in intangible capital

Intangibles as business functions in a global value chain

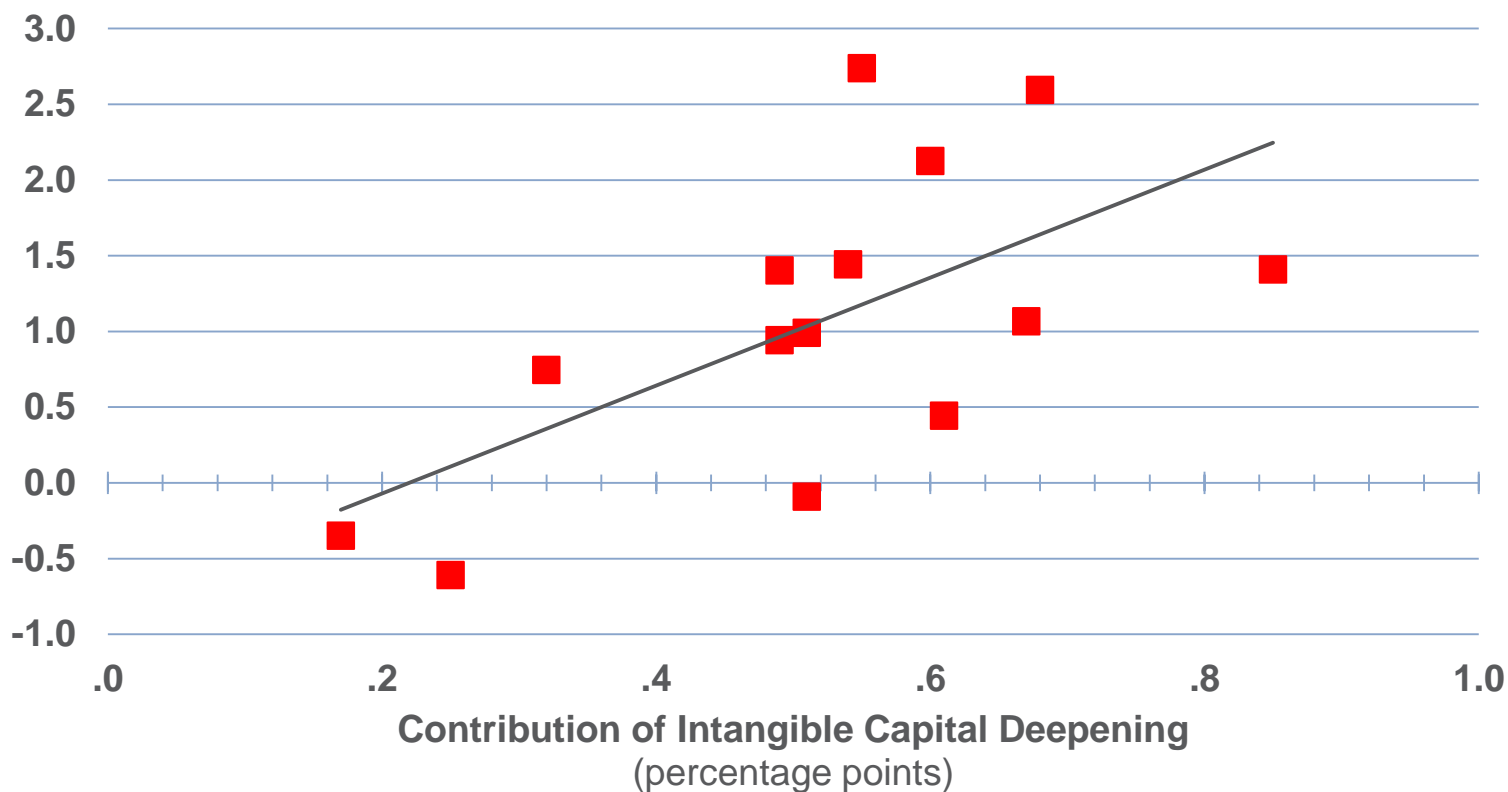


Source—Adaptation of figure in “Knowledge-based Capital, Growth and Competitiveness” by Dirk Pilat. Available at http://simpatic.eu/wp-content/uploads/2013/03/2013-03-26_Dirk-Pilat.pdf

The non-rival nature of intangibles implies a theoretical link to MFP growth via diffusion

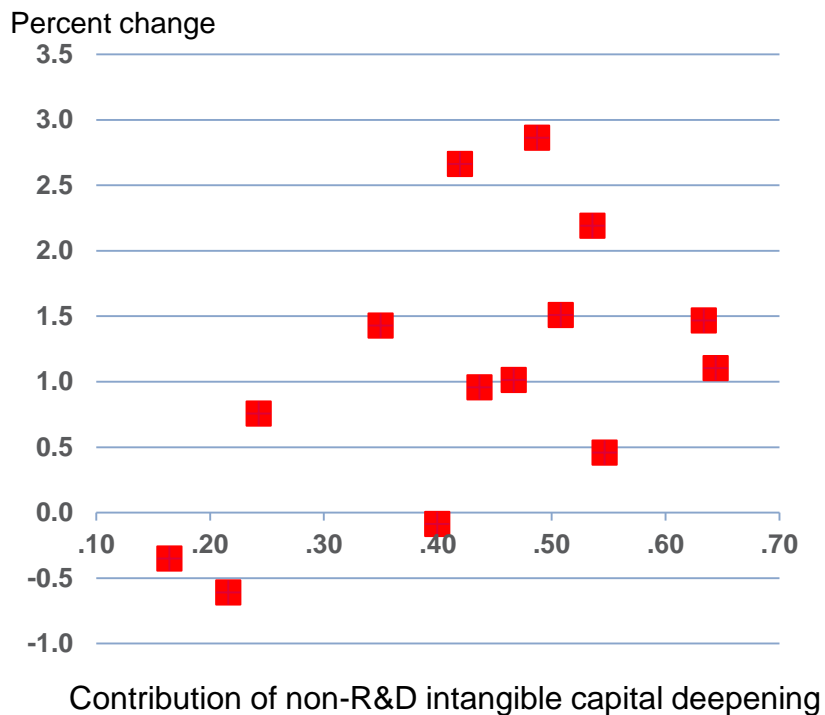
MFP growth in 14 EU countries, 1995-2007

Percent change

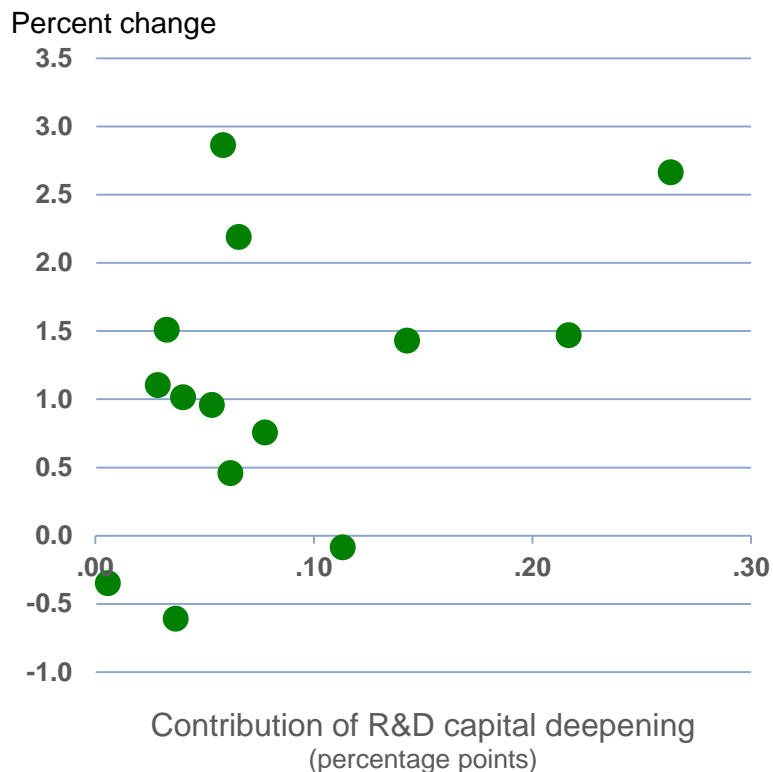


Relationship using non-R&D intangibles looks as strong as R&D

MFP growth in 14 EU countries, 1995 to 2007

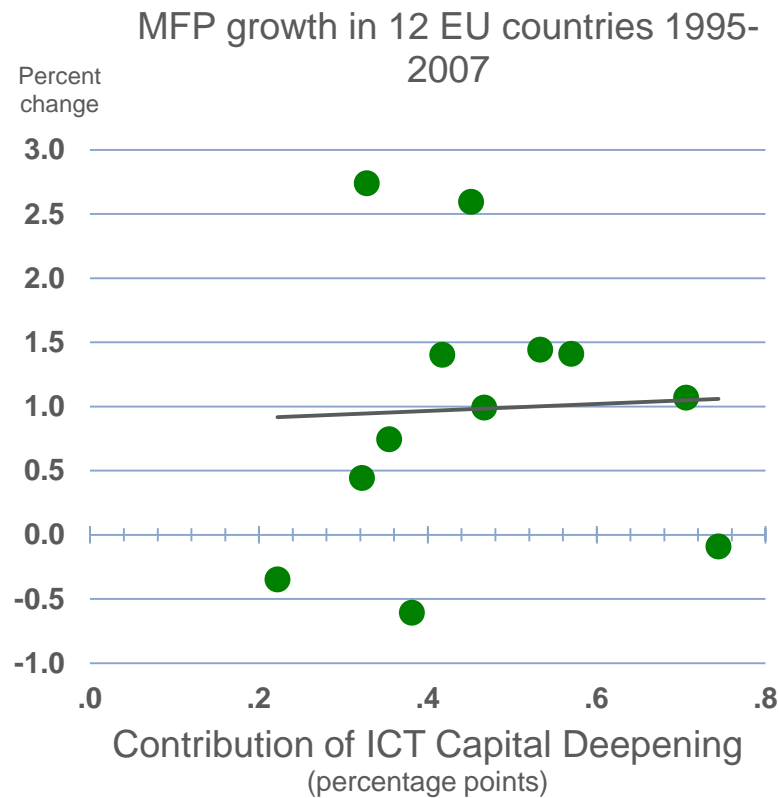


MFP growth in 14 EU countries, 1995 to 2007

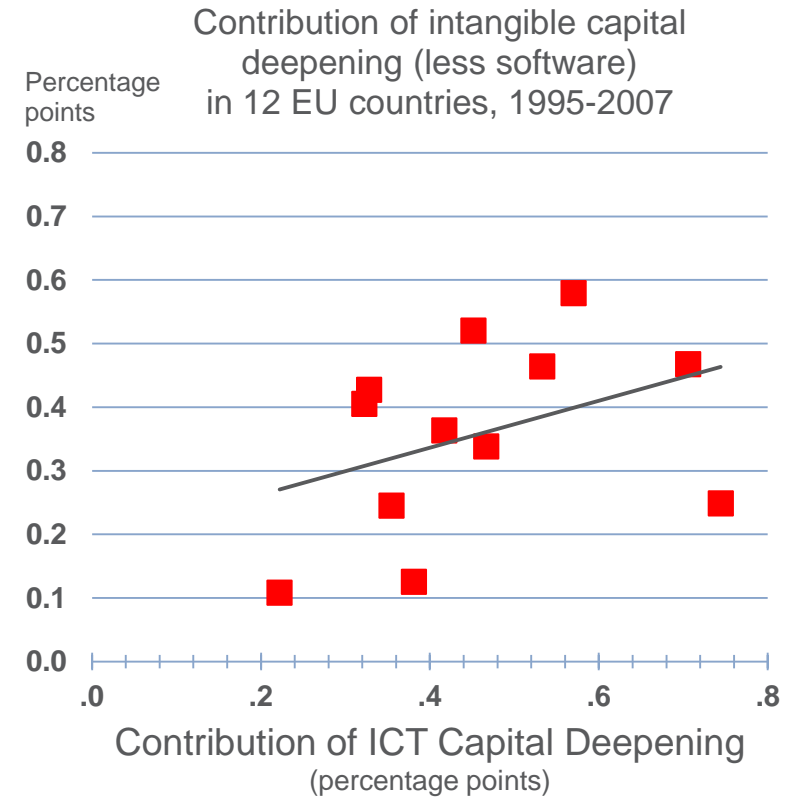


Intangibles and ICT are complementary

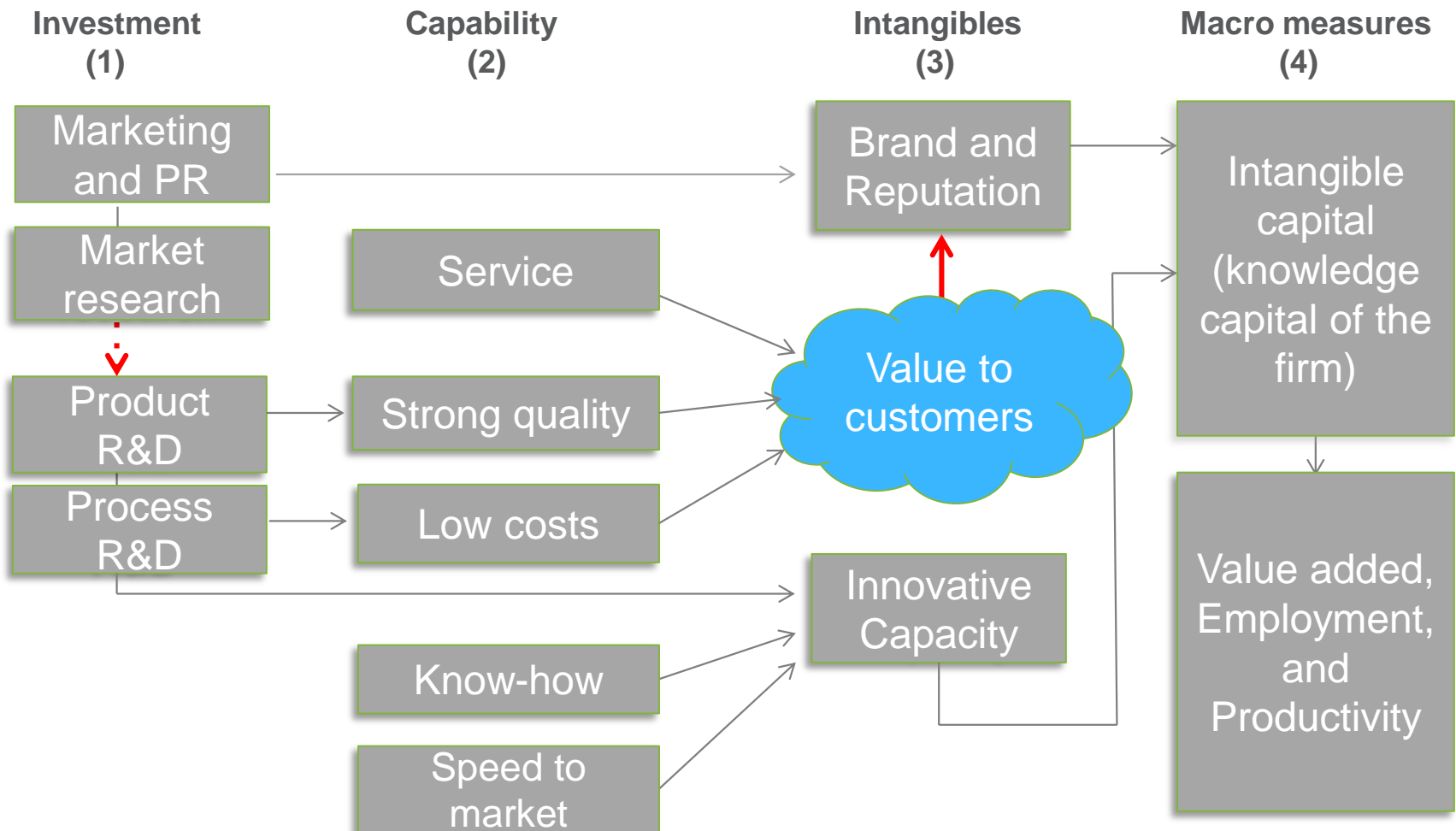
Spillovers from ICT are hard to detect



But intangibles and ICT exhibit complementarity

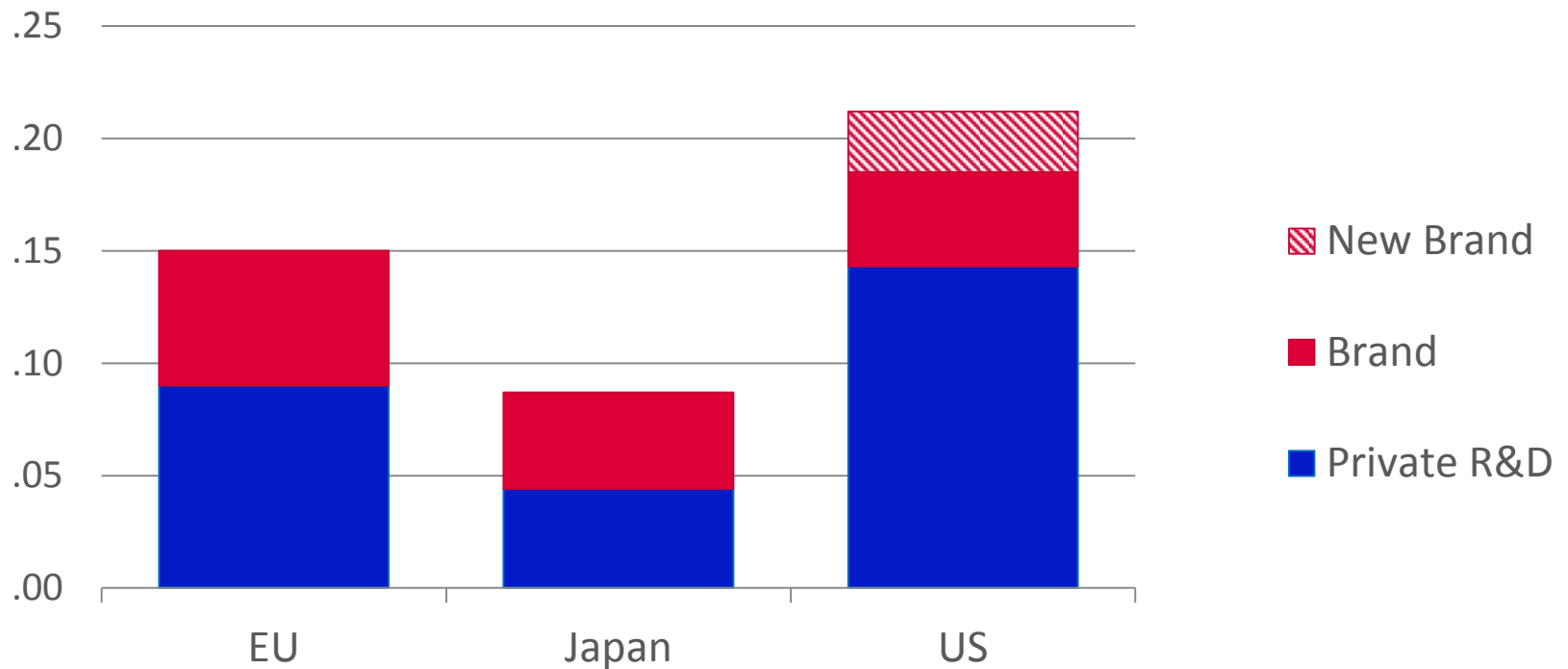


Brand investment's impact on economic growth: it doesn't necessarily work in the usual way



Direct contribution of brand to growth compared with direct contribution of private R&D ...

Percentage point contribution to growth in output per hour (OPH), 1995-2007

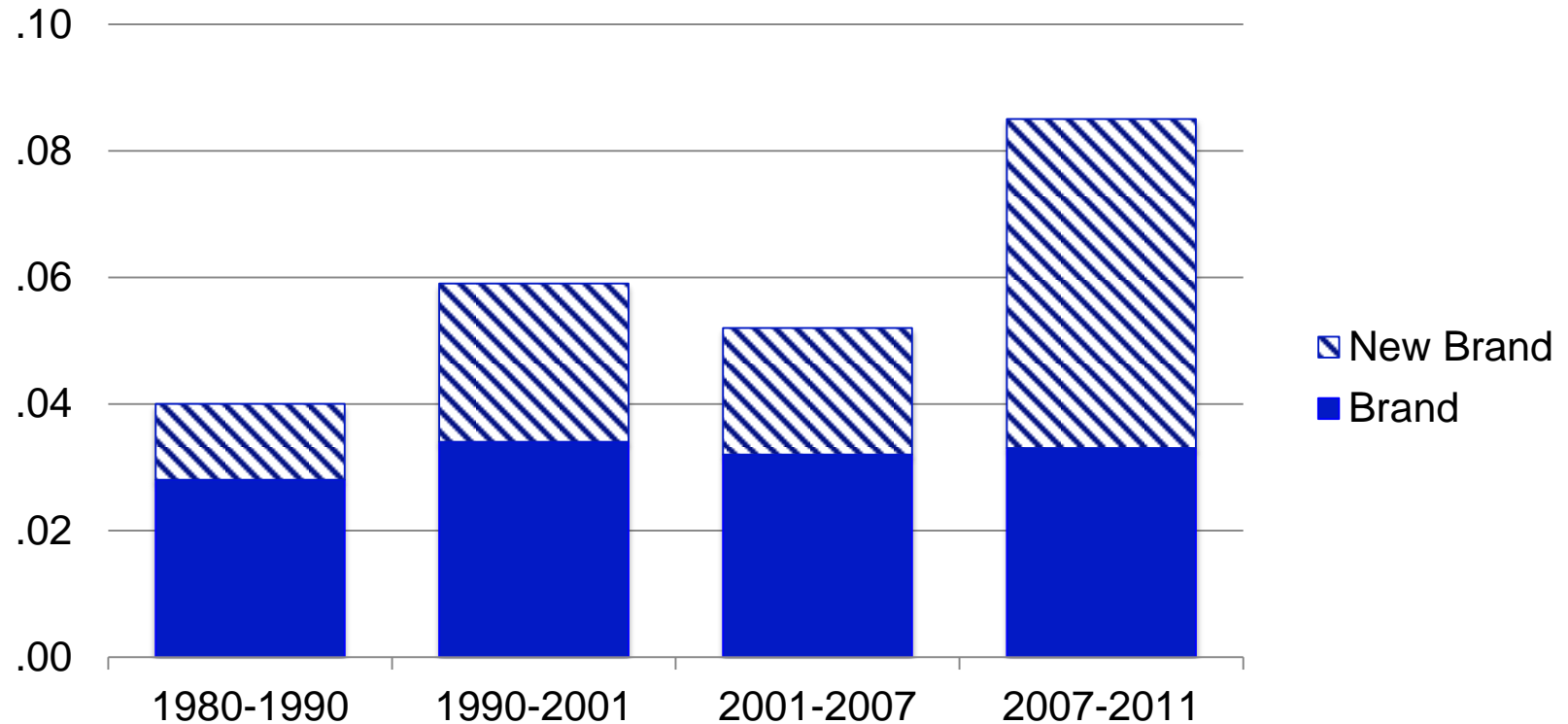


Note. EU is the simple average of 12 European countries.

Source. Corrado and Hao (2013). R&D and existing contribution of brand based on information reported in Corrado et al. (2013) and Miyagawa and Hisa (2013). Private R&D refers to R&D performed by for-profit industries only (i.e., academic R&D is excluded).

Our new U.S. work suggests the contribution of brand to growth in output per hour increased in relative importance since 2007

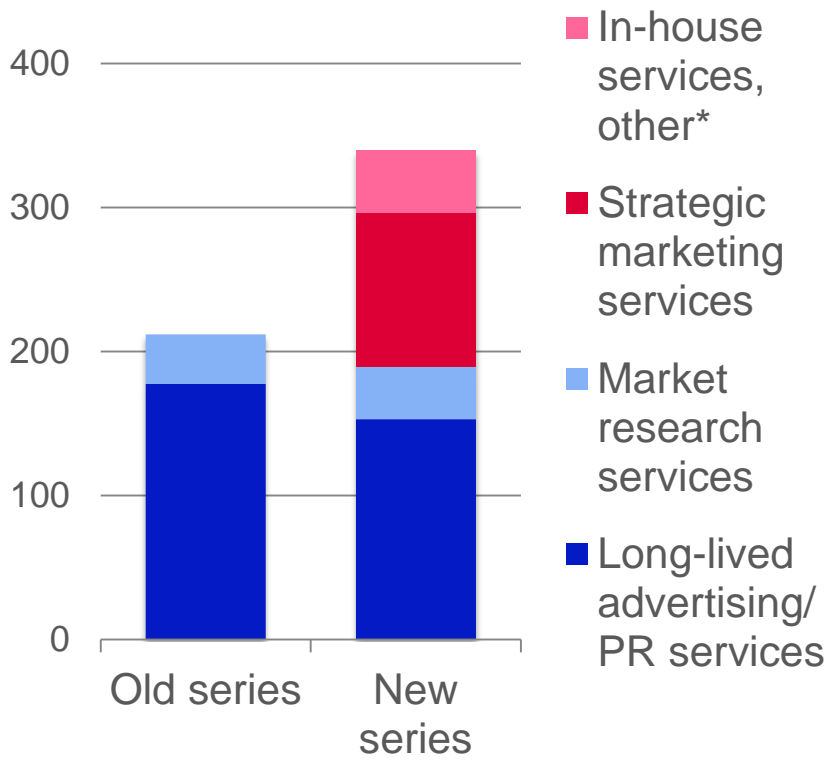
Percentage point contribution to growth in output per hour



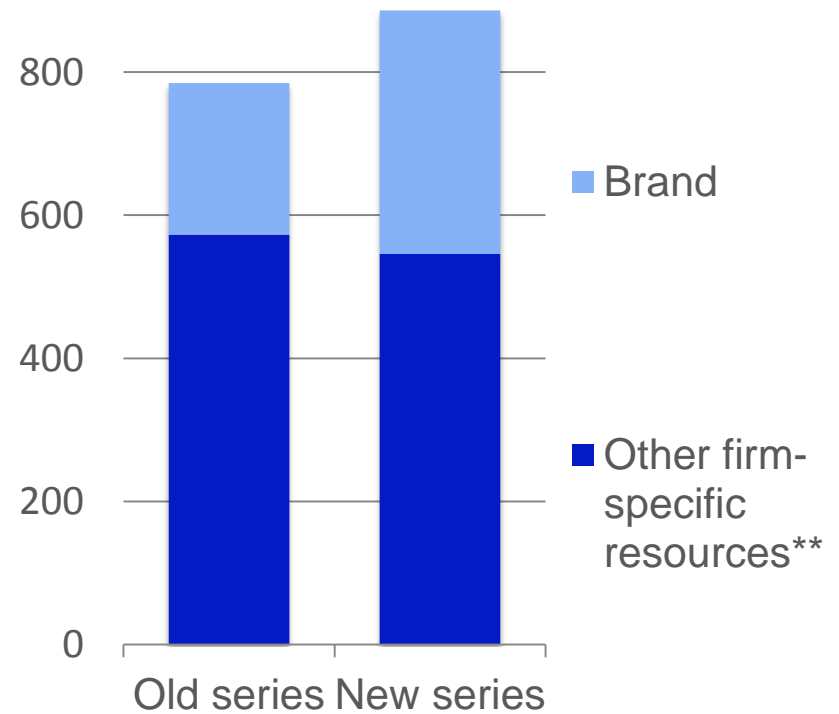
Source. Corrado and Hao (2013). Output is private industry excluding education, health, and real estate. The first three periods shown are between years with business cycle peaks as defined by the NBER.

What accounts for the difference?

Brand Investment
billions of dollars, 2010



Economic competencies investment
billions of dollars, 2010

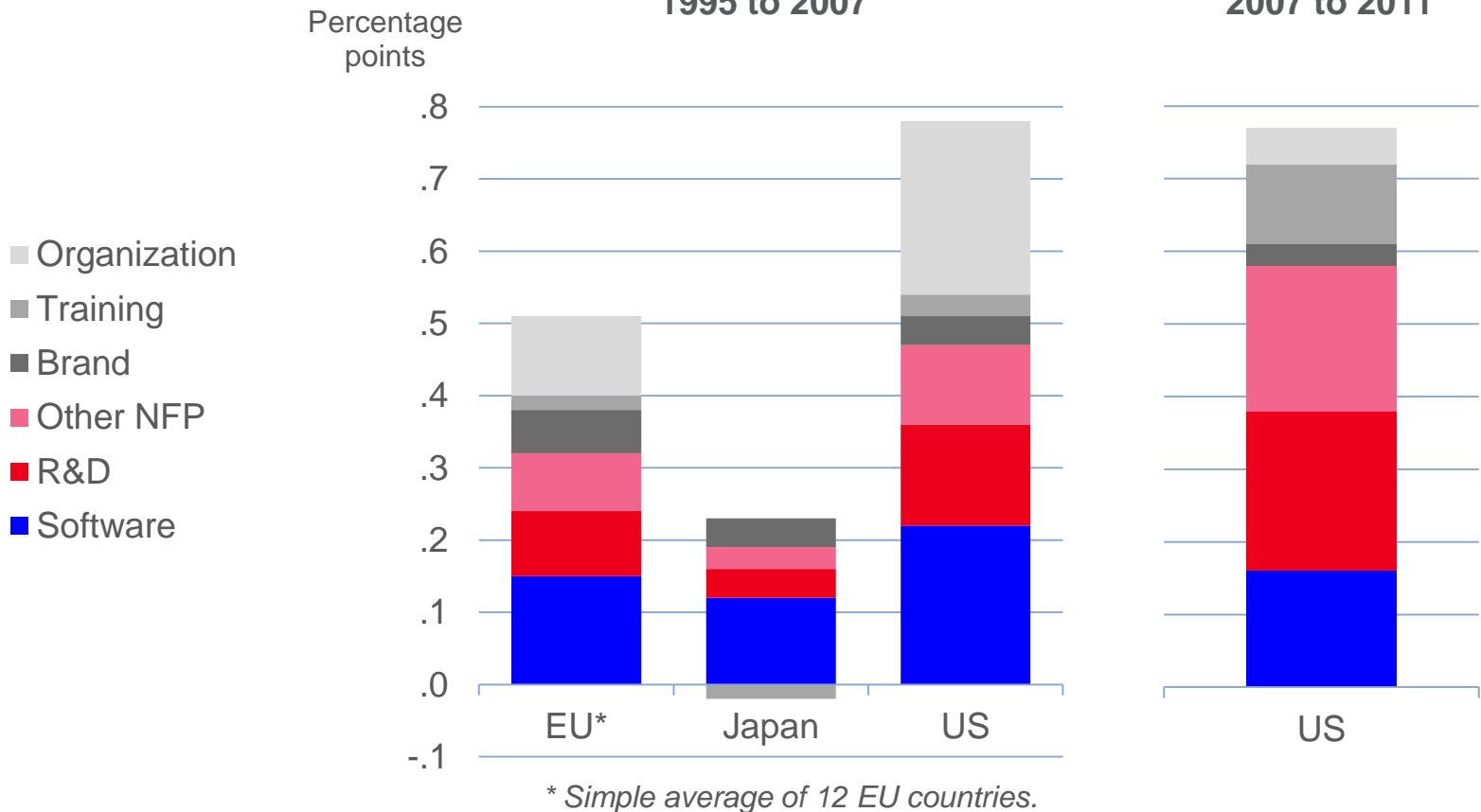


* Strategic marketing and market research include both in-house and purchased components.

** Organizational capital and firm-specific human capital.

Policy makers need more current data

Contribution of components of intangible capital to the growth of market sector labor productivity, 1995 to 2007



Source: Corrado and Hao (2013) based in part on estimates kindly provided by Massimiliano Iommi and Tsutomu Miyagawa.

The intangibles framework

- Designed to better capture private business investment
- Some of its lessons:
 - ✓ Innovation is more than ICT. Complementary organizational and training investments will continue to be important for firms and industries to thrive in the digital future
 - ✓ Intangible investments include more than R&D. Software, databases, and design are sizeable and important aspects of NPD in services industries
- Full accounting of investment requires estimates for the public sector and estimates at the industry level
- Internationalization of intangibles is an important area of future study
 - ✓ The non-rival nature of intangibles suggest they can be (and are being) re-deployed across the globe yet we do not track this at all well

Data and ability to craft good policy are related

- The spillovers and complementarities picture needs to be filled in
 - ✓ This and policy analysis more generally also requires estimates of public intangibles and private intangibles at the industry level
- Stimulating investment in innovation and promoting the diffusion of innovative activity, requires more timely data on intangibles
 - ✓ Monitor the size and nature of an economies' investments in innovation
 - ✓ Monitor the diffusion of innovative activity (i.e., measure productivity)
 - ✓ Prepare accurate estimates of potential economic growth



Thank you.



Back ups

Investment and legal forms

based on Clayton/Mitra-Kahn

Type of Investment ¹	Legal Forms					Tacit
	IPR				Other (trade secrets, contracts, etc.)	
	Patents	Copyright	Design IPR	Trade-mark		
Software	X	X	X	X		X
Databases		X			X	X
Science R&D	X		X			X
E&A originals		X	X			X
Design		X	X	X		X
Market research and communication spending		X		X	X	X
Business process	X	X			X	X
Training					X	X

1. Mineral exploration is excluded.

Comments on IPRs and the intangible investment framework

- The intangibles framework sets IPRs in a macroeconomic context
- The intangibles framework defines investment more broadly than IP rights because investment is any spending that has a return in future years
 - ✓ Mapping between investment types and IPRs is not unique (Clayton/Mitra-Kahn). There are many overlapping rights.
 - ✓ Even for IPR policy, it remains important to know how much firms are investing in innovation (as opposed to creating IPRs per se)
- IPR policy is informed by knowing how much innovation investment is attributable to firms creating IPRs or not
- Innovation policy is informed by knowing how firms protect their innovations w/o using IPRs (e.g., lead time and secrecy)

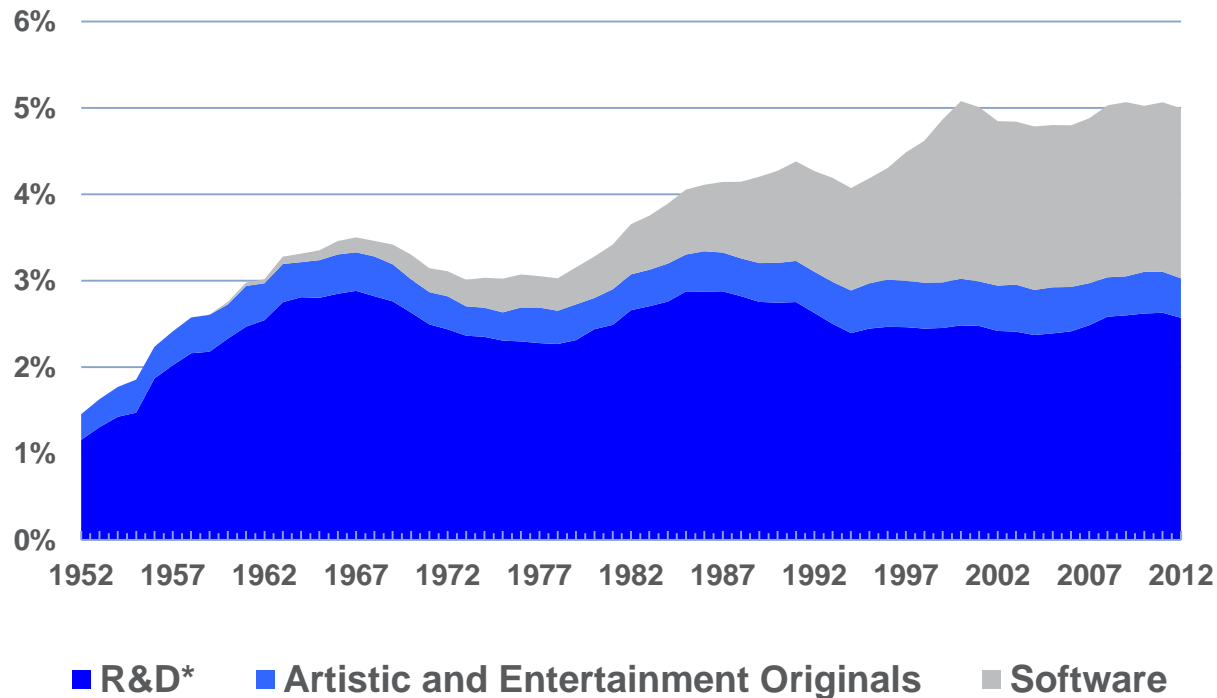
New investment series

- The two newly recognized asset types (R&D and AEO) are grouped with computer software to form a new sub-category of investment called *Intellectual Property Products*.
- Total fixed investment is then presented as consisting of three broad sub-categories:
 - ✓ Structures
 - ✓ Equipment, and
 - ✓ Intellectual Property Products (IPP).
- **IPP investment then is a new U.S. macroeconomic time series**—and it is no chump change

IPP investment was 5 percent of GDP in 2012

U.S. Investment in Intellectual Property Products, 1952 to 2012

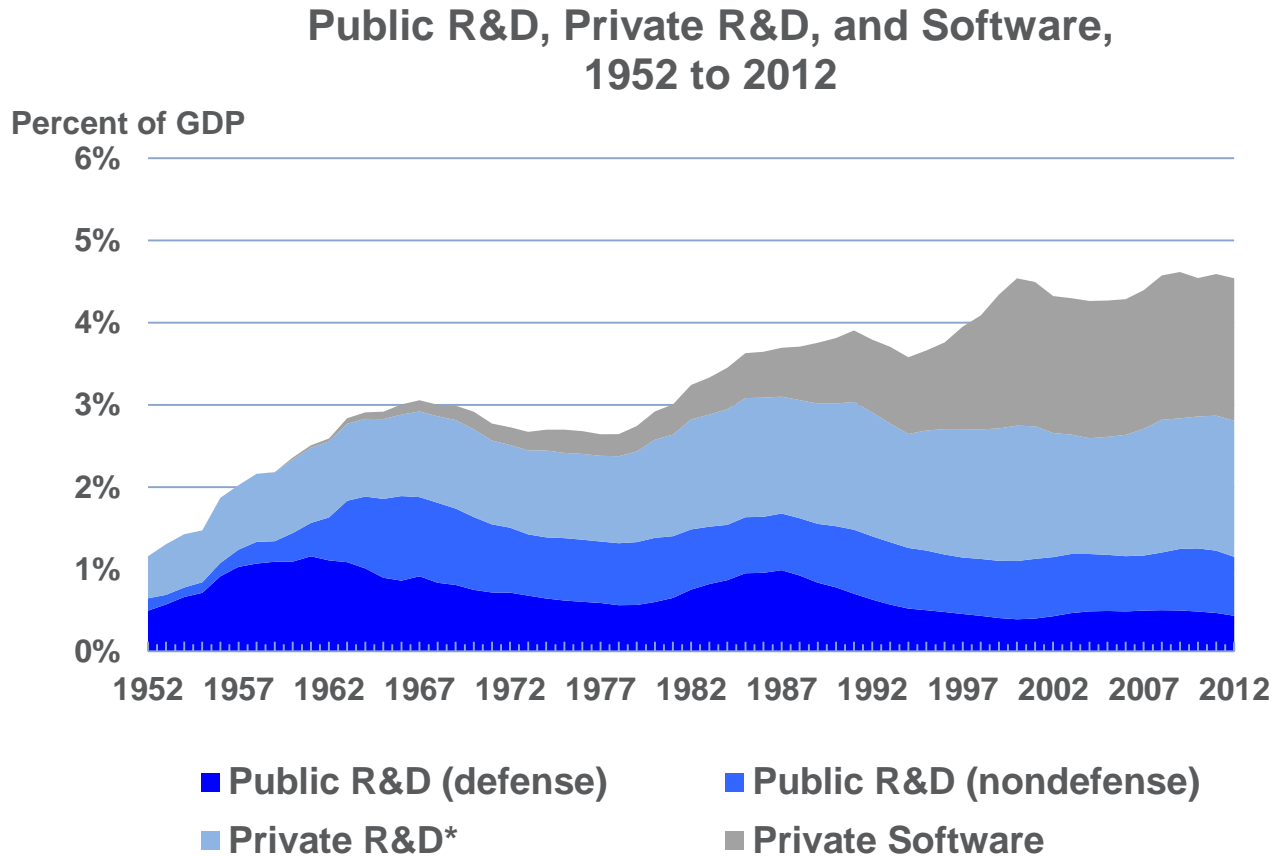
Percent of GDP



- **Software R&D is included in software.**

Source—Author's laboration data from the U.S. BEA.

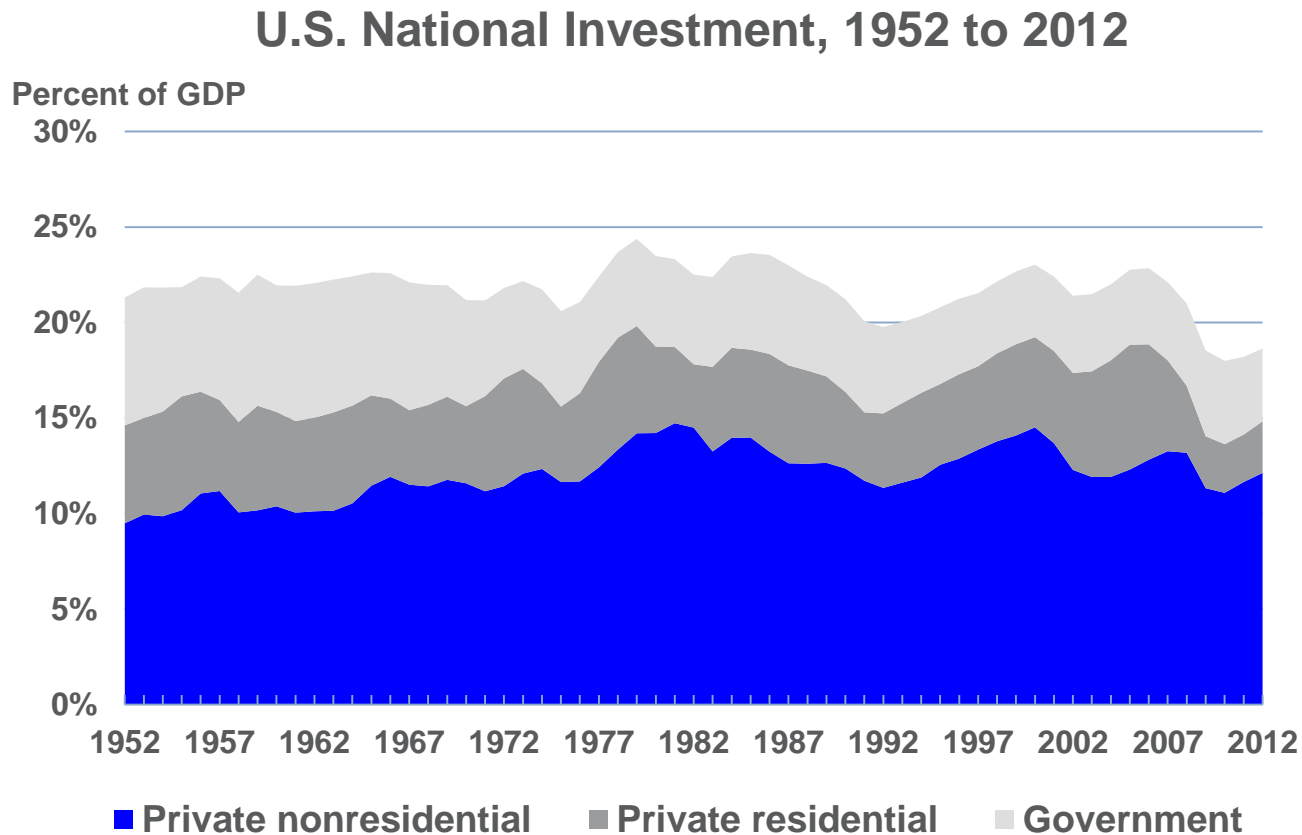
About 1/4 of total IPP is public investment (on average)



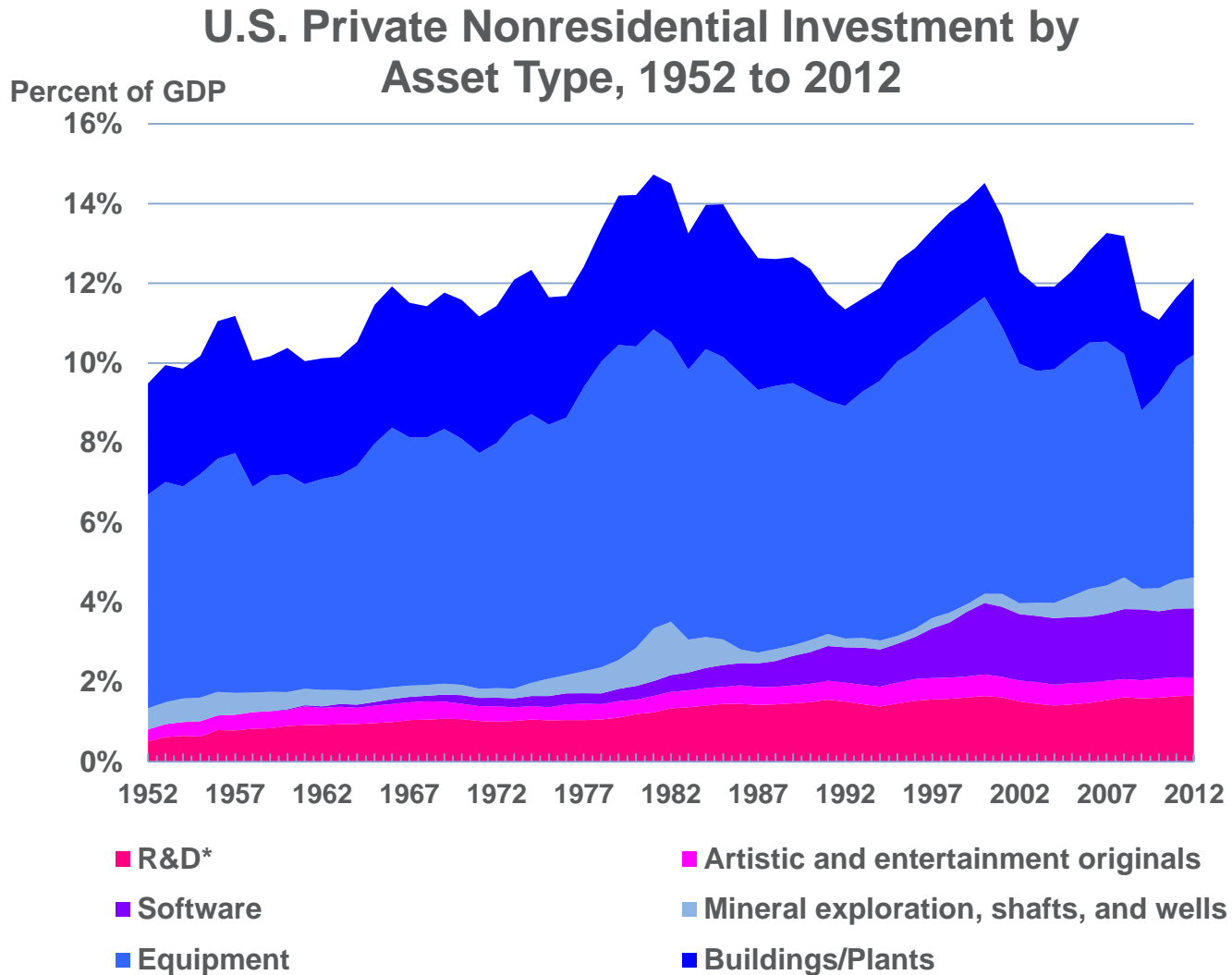
• **Software R&D is included in software.**

Source—Author's elaboration data from the U.S. BEA.

U.S. national investment rate is higher, but has the same pattern as in pre-revision data



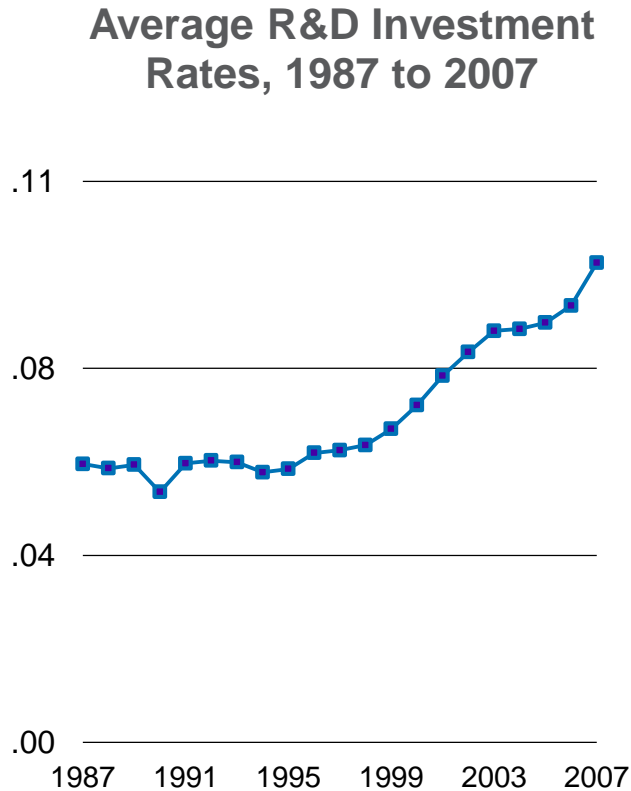
IPP now a driver of private nonresidential investment



Manufacturing and Intangible Assets

- In the late 1960s, based on pre-revision data, manufacturing accounted for nearly one-quarter of private nonresidential investment (and 30 percent of equipment) in the United States.
- By the 1990s, the sector still accounted for one-fifth, but in the last five years for which we have data (2007 to 2011), only *one-eighth* of total private nonresidential investment is accounted for by manufactures.
- This underscores the importance of including R&D in the investment picture (as much R&D is performed in manufacturing and without counting these investments the picture of manufacturing is distorted)

US Private Business R&D Intensity on the rise.....



Note—Series plotted is Industry R&D investment relative to gross output, average for 13 BEA industries

- The stable R&D to GDP share masks a significant rise in private industry R&D intensities....
- Why are these intensities rising whereas that for GDP is not?
 - ✓ Globalization
 - ✓ The share of GDP contributed by value added in R&D-performing industries is falling

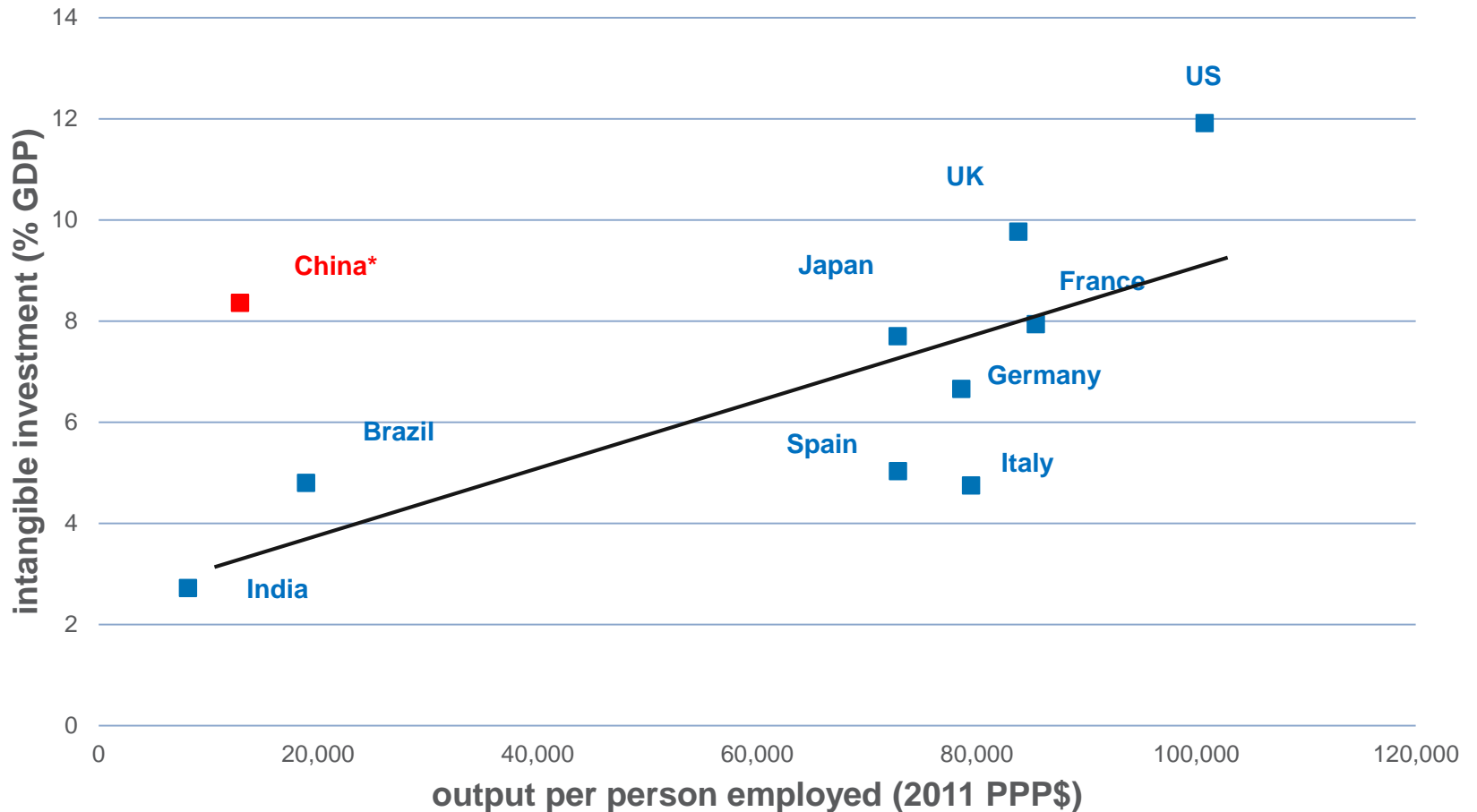
Manufacturing, Global Value Chains, and Intangible Assets

- Traditional understandings of manufacturing are inadequate to explain the process whereby goods are produced in the modern world economy.
- Much of the value in many goods comes from activities such as design, product development, marketing and brand, and supply-chain logistics—functions that are not necessarily performed by the same enterprises, or at the same locations, as physical production.
- This shift to global supply chains has had profound impacts on the nature of value creation
- ... making it difficult for the statistical systems to keep up.

Major findings in this literature

- GDP (and gross saving and investment rates) are 5 to 10 percentage points higher when intangibles are classified as investment compared with when they are excluded
- Intangible investment overtook tangible investment in some countries (UK and US) by the late 1990s (charts)
- For the US and certain others, capital deepening becomes the dominant source of economic growth
- Higher rates of intangible investment are associated with higher levels of GDP per worker (chart)
 - ✓ Higher propensity to invest in intangibles may of course stem from other factors, such as the nature of customer demand

International comparisons: Higher rates of intangible investment are associated with higher levels of GDP per worker



NOTE—Intangible investment in China and India is total economy, whereas for other countries investment is for the market sector.
*China not used to determine the regression line. Source—Unpublished update to van Ark, Hao, Corrado, and Hulten (2009).

Correlations insufficient for policy analysis

- The non-rival nature of intangible capital implies a theoretical link to MFP growth via diffusion, suggesting that spillovers from intangibles likely exist beyond the well-researched effects from R&D
- Using a cross-country econometric approach controlling for endogeneity, Corrado, Haskel and Jona-Lasinio (2012) find evidence for spillovers from intangible assets using a dataset covering 10 EU countries and the United States.
 - ✓ spillovers refers to a estimated output elasticity of an input that is in excess of its conventionally-calculated factor share
- CHJ also find strong complementarities between ICT intensity at the industry level and a country's intangible capital intensity
 - ✓ . . . suggesting that returns to intangible capital are greatest in countries whose industries have above-average ICT intensities