Intangible Assets in National Accounts: Policy-makers need better data

Carol A. Corrado

The Conference Board and

Georgetown University Center for Business and Public Policy

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Outline of remarks

- Some thoughts on the CHS framework
  - ✓ Origin
  - ✓ Categories and applicability
  - ✓ Linkage to IPRs
- Some findings useful to policy-makers
  - ✓ Spillovers
  - ✓ Complementarities

- Some thoughts on the CHS framework

Origin: policy-makers need measures of the productive capacity of their economies (potential output)

- Whether survey-based on not, requires modeling production and capital accumulation
- . . . and estimating trend rate of productivity (MFP) change
  - ✓ Traditional view of productivity is that it results from commercial appropriation of advances in knowledge (e.g., fruits of R&D)
  - ✓ Traditional view of capital accumulation is that it results from “duplication” (e.g., expansion of markets)

Origins, continued

- Now consider:
  - ✓ IT revolution, or that ICT investments were key to the pickup in US productivity in the mid-1990s
    - especially noticeable after BEA capitalized software in 1999
  - ✓ Common sense notion that innovation is not costless
  - ✓ Literature showing that returns on investments in R&D and in ICT and organizational change very large

Intangibles, innovation, and productivity

- Traditional capital estimates are understated b/c many costs of innovation are not counted as investment
- The CHS "economic" view of macroeconomic investment stands in contrast to this practice.
  - ✓ view is based on the optimal growth literature
  - ✓ "any use of resources today designed to increase the productive capacity of the firm in the future is investment." Corrado, Hulten, and Sichel (2006, 2009).
- Implementation of the view modernizes the portrayal of business activity in national accounting systems
  - ✓ …. and provides policy-makers with more relevant data

The CHS framework

Broad category	Type of Investment
Computerized Information	• Software • Databases
Innovative Property	• R&D • Mineral exploration • Entertainment and artistic originals • Other new product development costs (e.g. design)
Economic Competencies	• Branding and reputation (mkt. research and advertising) • Firm-specific human capital (training) • Organizational capital (business process investment)

The intangibles framework

- Designed to better capture private business investment
- In recent work with Hulten, we use the intangibles framework and propose building an “innovation account” to illuminate innovation processes
- Full accounting requires estimates for the public sector (most are already there, recorded as consumption) and industry estimates
- The non-rival nature of most intangibles suggests they can be deployed (without duplication) in other geographies
  - ✓ suggests the internationalization of intangibles is an important area of future study
  - ✓ firm returns and capital lifetimes, especially for MNCs, may be greater than originally thought

Investment and legal forms

based on Clayton/Mitra-Kahn (vs OECD/Kahin slide 6)

Type of Investment[1]	Legal Forms					Tacit
	IPR				Other (trade secrets, contracts, etc.)	
	Patents	Copyright	Design IPR	Trade-mark		
Software	X	X	X			
Databases		X			X	
Science R&D	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

1. Mineral exploration is excluded.

Comments on IPRs and the intangible investment framework

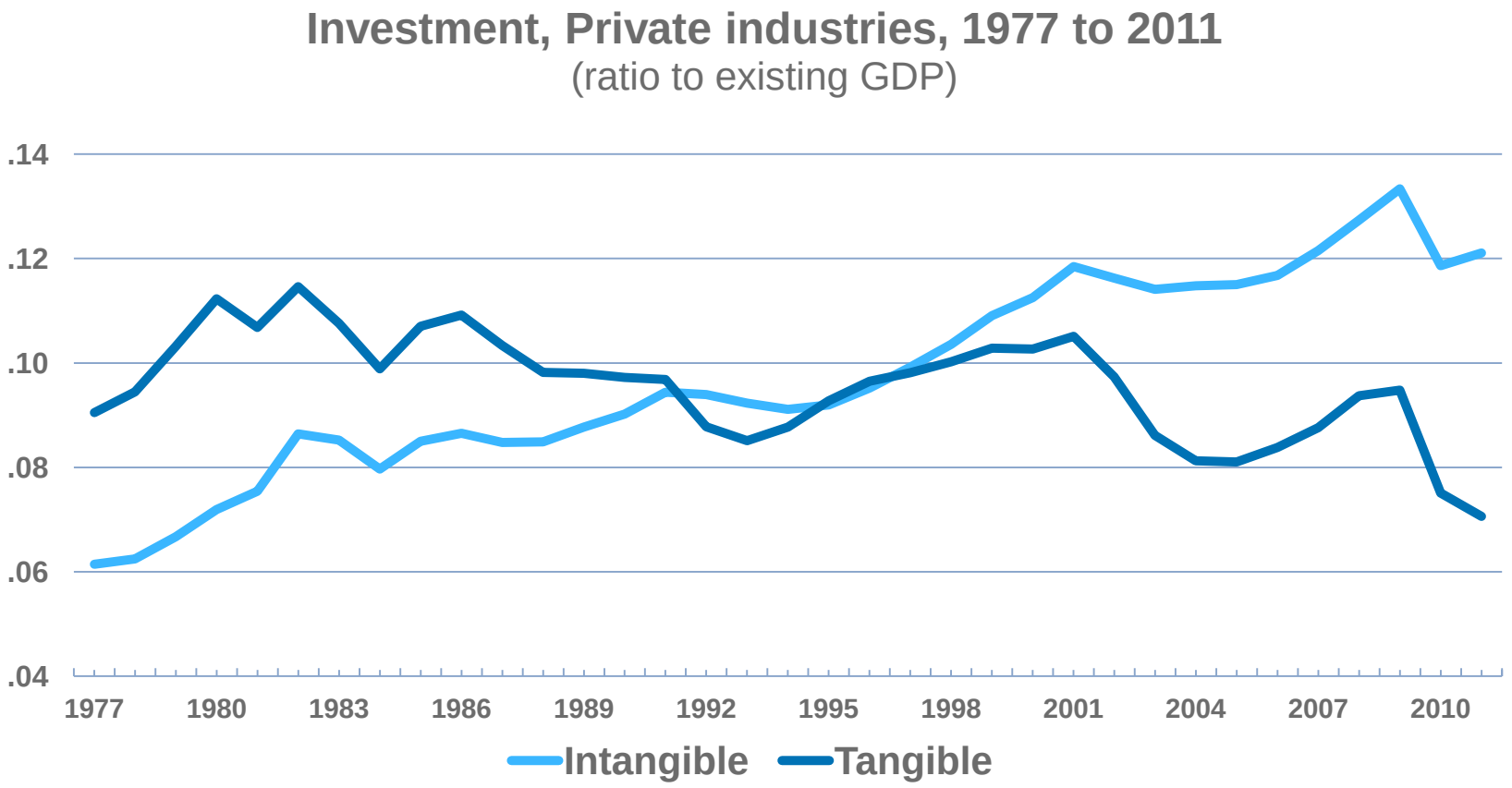
- The intangibles framework sets IPRs in a macroeconomic context
- The intangibles framework defines investment more broadly than IP rights because investment is any spending that has a return in future years
  - ✓ Mapping between investment types and IPRs is not unique (Clayton/Mitra-Kahn). There are 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)

- Some findings useful to policy makers

Major findings are well known

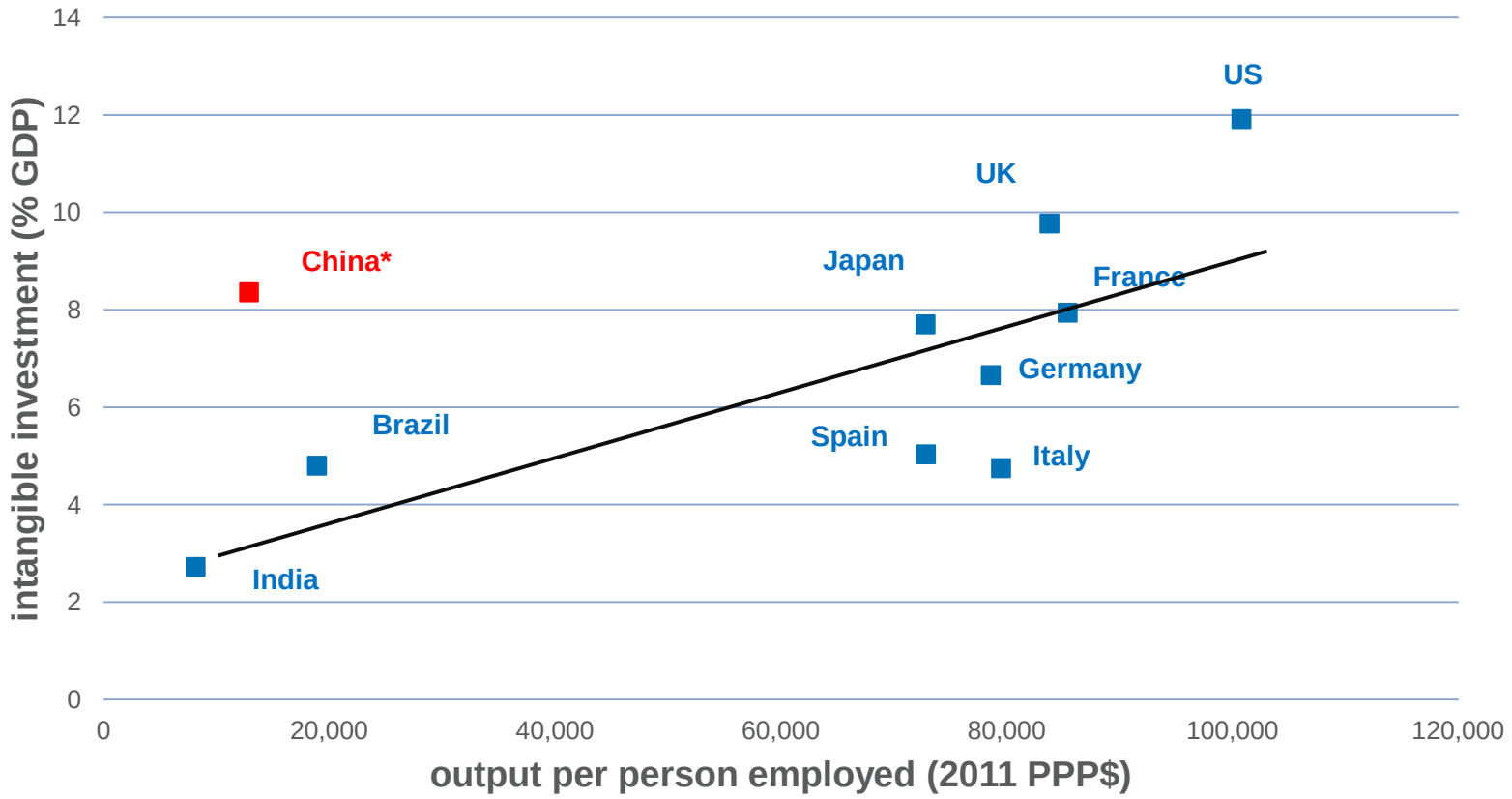
- GDP (and gross saving and investment rates) are 5 to 10 percentage points higher when intangibles are classified as investment compared with when they are excluded
- Intangible investment overtook tangible investment in some countries (UK and US) by the late 1990s **
- For the US and certain others,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

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



Excludes housing.

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



SOURCE—The Conference Board, based on its Total Economy Database (2012) and estimates reported in INTAN-Invest (Corrado et al. 2012), Dutz et al. (2012), Fukao, Hisa and Miyagawa (2012), Hulten and Hao (2012), and Hulten, Hao, and Jaeger (2012).
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.

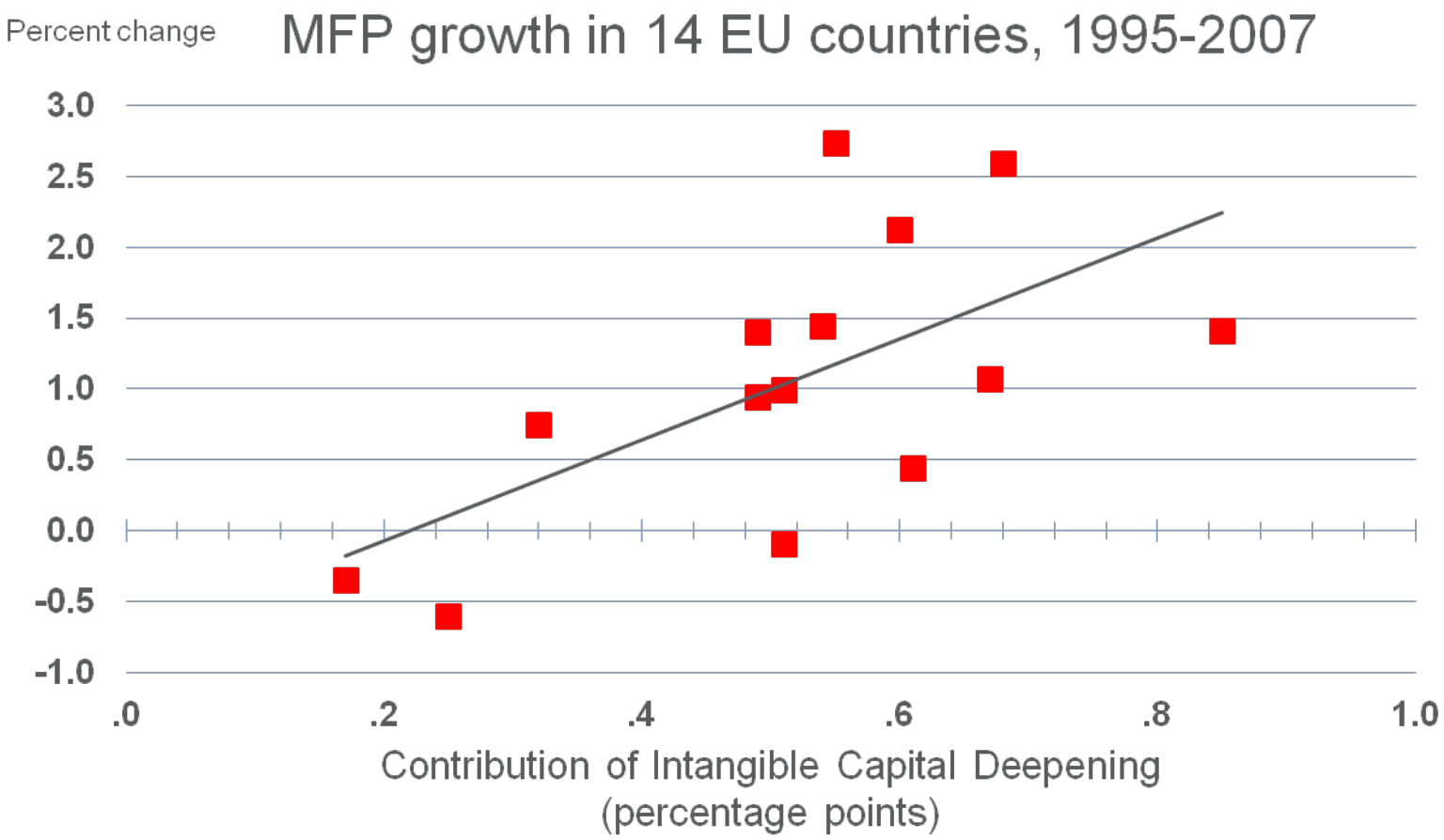
Correlations insufficient for policy analysis

- 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, Corrado, Haskel and Jona-Lasinio (2012) find evidence for spillovers from intangible assets in EU countries (i.e., after controlling for endogeneity)
  - ✓ spillovers refers to a estimated output elasticity of an input that is in excess of its conventionally-calculated factor share
- CHJ-L 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

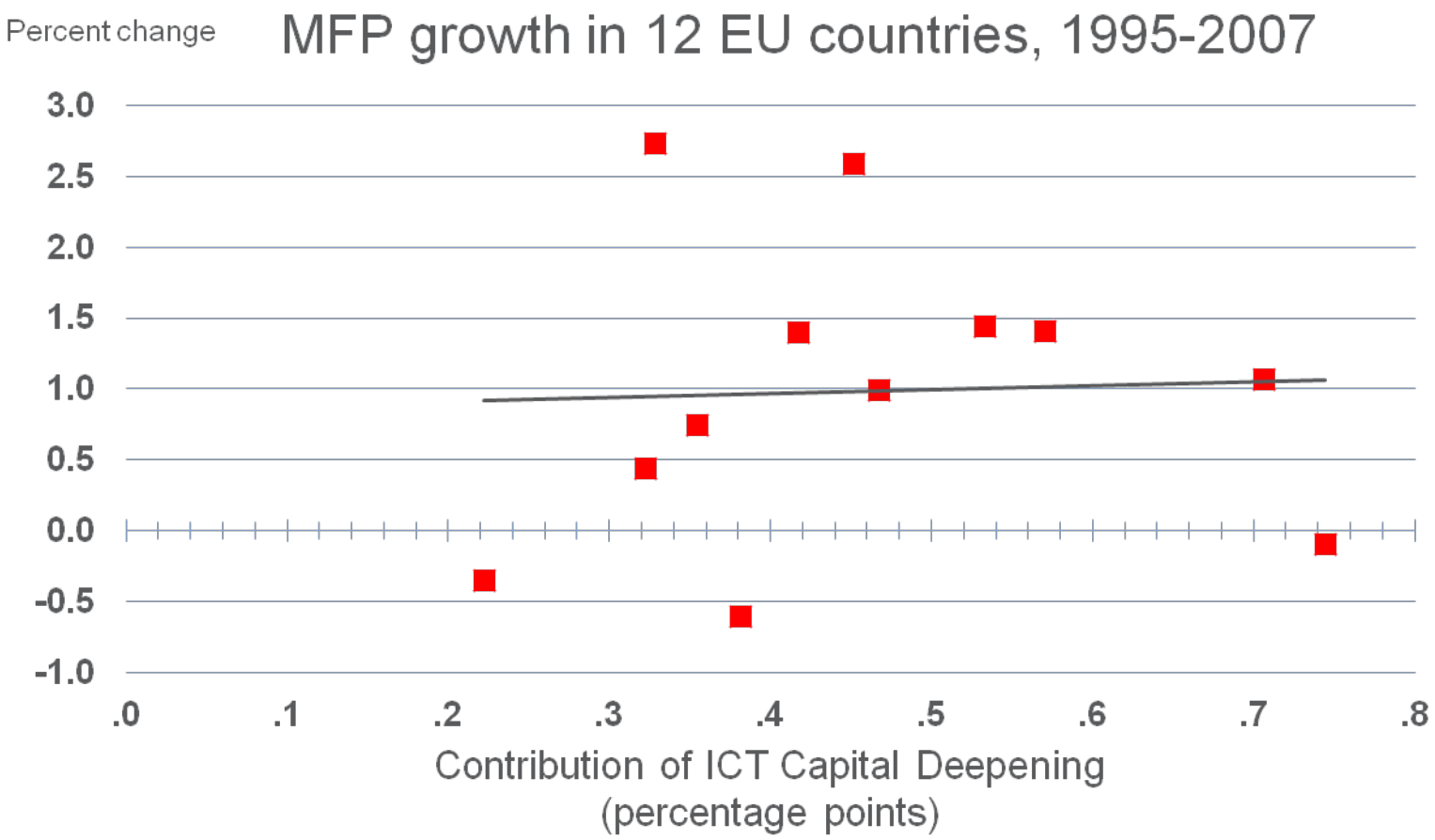
INTAN-Invest productivity results—EUKLEMS with an extended asset boundary

- Growth accounting for 14 countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Slovenia, Spain, Sweden, and United Kingdom)
- Break-out of ICT for 12 countries (above less Belgium and Ireland)

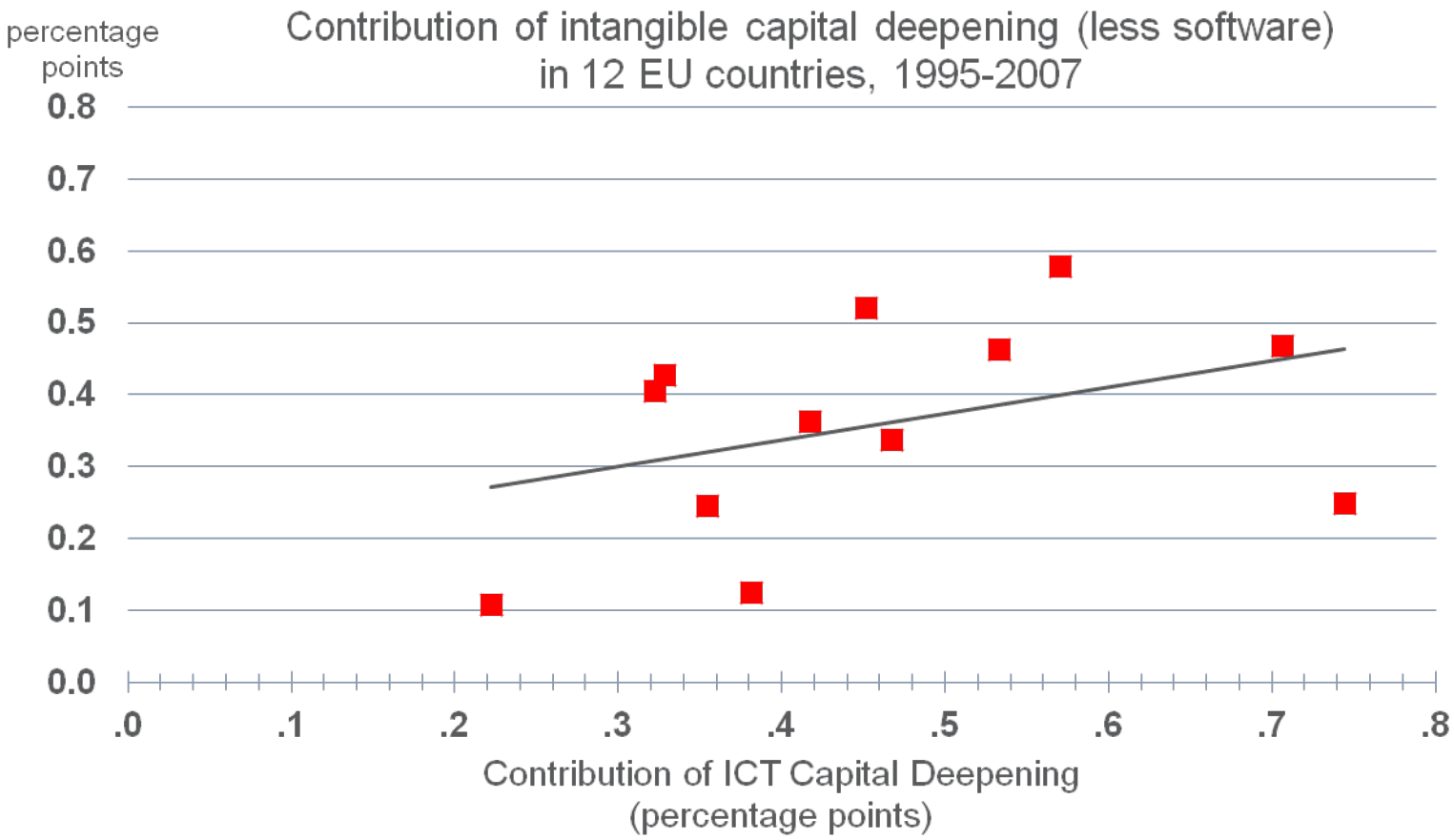
The inspiration for our econometric work



No spillover relationship for ICT capital deepening (ditto for non-ICT capital and LC, too)



Intangibles (ex software) and ICT exhibit a complementary relation in EU productivity data



More on complementarities (from econometric work)

- Within intangibles components, the ICT complementarities are strongest for R&D, training, and organizational capital
- R&D has a complementary relation with design and advertising

Lessons and conclusions

- Innovation is more than ICT
- Intangible investments include more than R&D
- IPRs fit into the intangible investment framework, but not in a one-to-one fashion
- Much progress has been made on measurement!
- Completing the spillovers and complementarities picture (and policy analysis more generally) requires estimates of public intangibles and private intangibles at the industry level
- MNCs and internationalization of intangibles an important area of study

Thank you.

Back up slides follow.

Intangible investment as firms' strategic investments

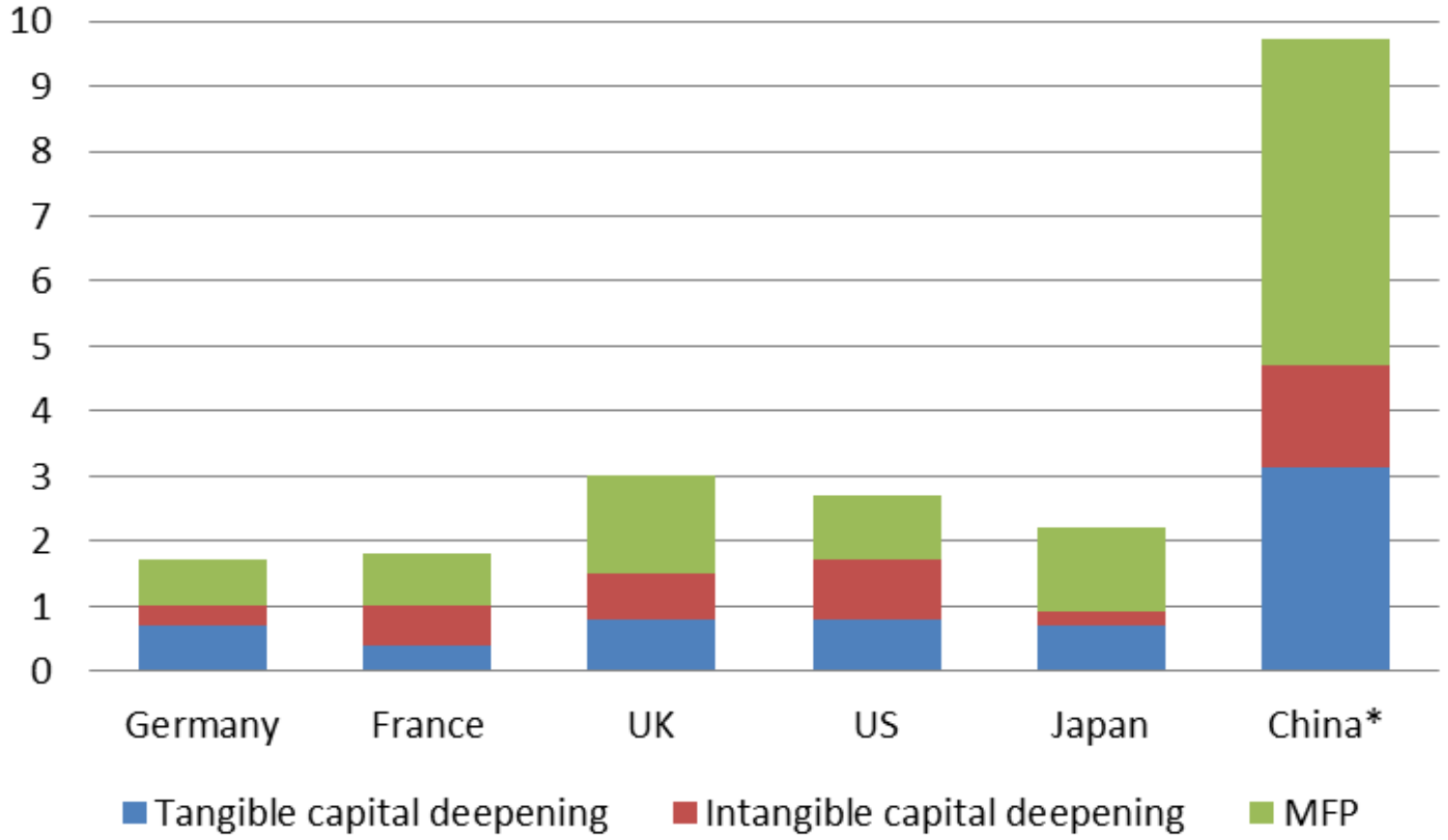
- …. involves recognizing that they derive value from the options they may open or create (or do not rule out) down the road.
- A literature and practice of "real" options and risk-adjusted R&D project evaluation has emerged
  - ✓ Only special circumstances give rise to the situation in which the value of R&D is equal to conventionally calculated NPV based on expected cash flows (i.e., the basis for rental equivalence/user cost)
  - ✓ NPV ignores the strategic value (that, option values) of the flexibility of R&D assets to respond to changes in the marketplace or technology outlook
  - ✓ Findings from this literature:
    - Real asset value = NPV of estimated cash flows + OptionValues
    - Case studies of "medium" risk projects: real asset values double after factoring in option values.

Implementation and Measurement (much progress!)

Type of Investment (☑ in US NAs)	Comment
• Software ☑ • Databases ☑ **?**	• Model for estimation (o-o + purch.) • Indicators are emerging, reassess NA position that is included
• Science-based (i.e., formal) R&D **[soon!]** • Mineral exploration ☑ • Entertainment and artistic originals **[soon!]** • New financial product development • Design (other than above)	• Official now includes social sci. R&D • Exploration vs. drilling/mining itself • New work by BEA • Method revised in Corrado et al 2012 • Purch. only in CHS, now UK survey
• Brand and reputation ✓ Market research ✓ Communication spending • Firm-specific human capital • Organizational capital	• Purchased only in CHS ✓ Customer equity ✓ Brand equity (product and corporate) • Reflects firm return above wage paid • Broad category, not bound by geo.

Contribution to the Growth of Labor Productivity

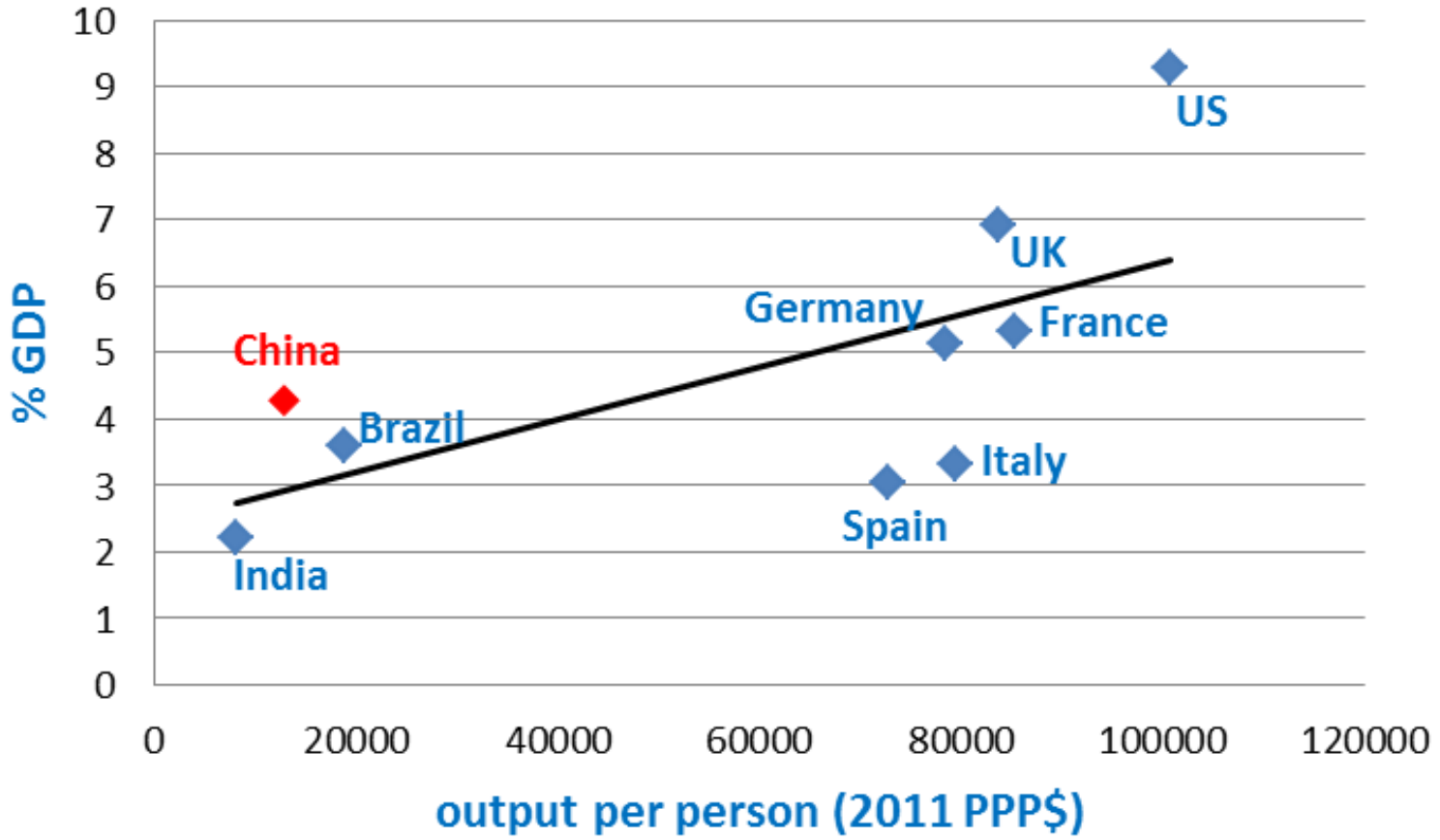
(annual percent change, 1995-07)



SOURCE—The Conference Board, based on estimates reported in Corrado et al. (2012), Fukao, Hisa and Miyagawa (2012), and Hulten and Hao (2012).

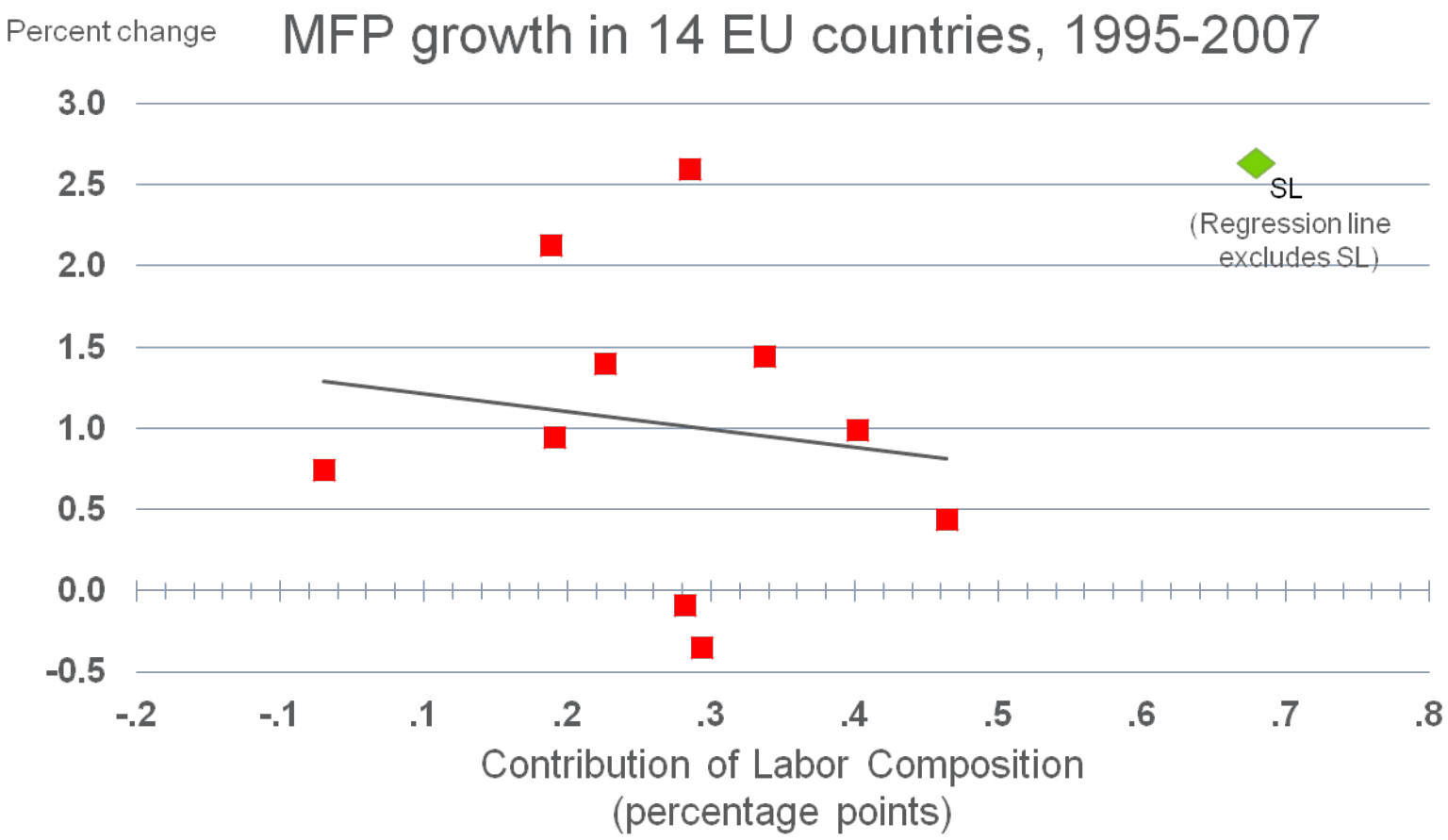
NOTE—China estimates are from 2000 to 2008.

Intangible Investment (excl. Software and Design) as % of GDP, 2008



Sources: The data source of labor productivity is Total Economy Database (2012). The data source of intangibles in China is Hulten and Hao (2012), in India is Hulten, Hao and Jaeger (2012), in Brazil is Dutz et. al. (2012), and the source of the rest of the countries is Corrado et. al. (2012). Note: Intangible investment in China and India are for the total economy, while investment in the rest of the countries are for the market sector.

… ditto for labor composition, too



Correlations with innovation indicators

- Early stage venture: the higher the venture investment-to-GDP ratio, the higher the intangible investment-to-GDP ratio
- Barriers to entrepreneurship: the higher the barriers (as measured in OECD Going for Growth), the lower is the intangible investment-to-GDP ratio
  - ✓ Ditto for product market regulation
  - ✓ Ditto for employment protection
- Supporting evidence for “crowding in” wrt direct public funding of business R&D (discussed in David, Hall and Toole)

e.g., Venture indicators seem to be correlated with intangible investment

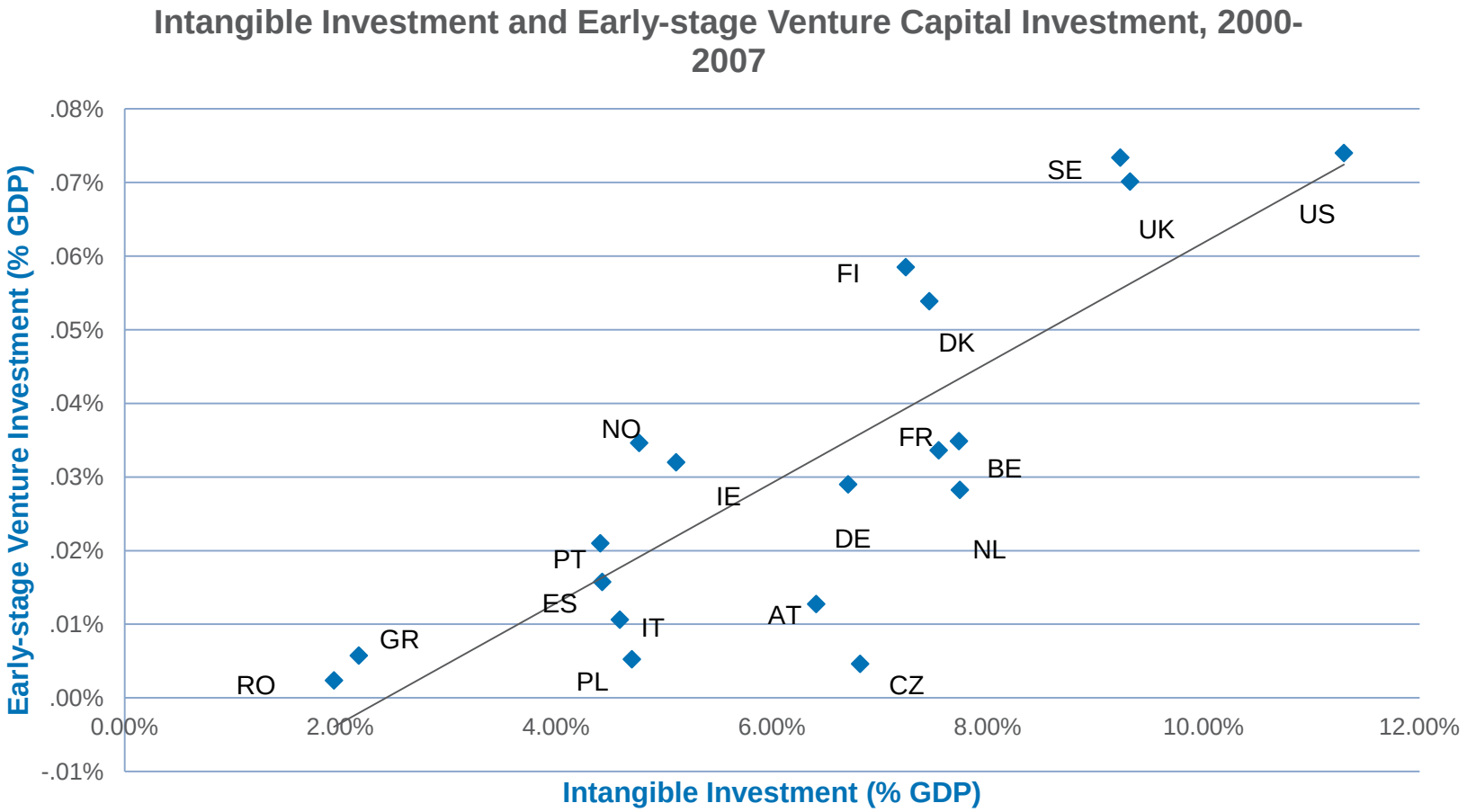


Chart source: Corrado, Haskel, Jona-Lasinio, and Iommi (2012*) "Intangible Capital and Growth in Advanced Economies: Measurement Methods and Comparative Results."*

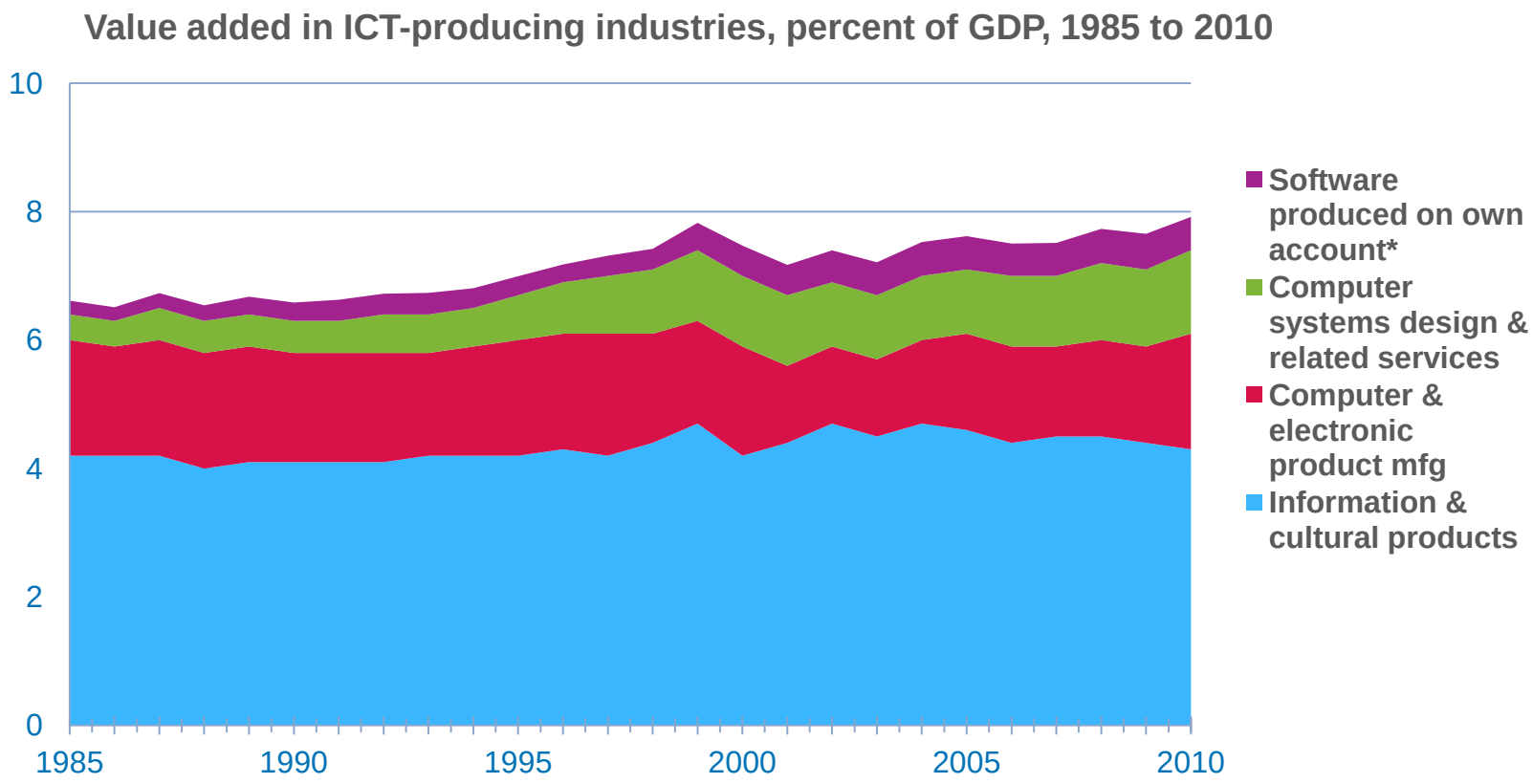
Why build a national innovation account?

- Accounts tend to be comprehensive and grounded in theory, more so than an indicator or collection of indicators
  - ✓ A corollary is that a national innovation account can help improve our understanding of indicators

Why build a national innovation account? (continued)

- Policies aimed at the creation of new knowledge and innovation (science policies, education policies, energy policies) lack generally accepted measures for their uptake and diffusion in an economy.
  - ✓ Measures of energy productivity, R&D productivity, on-the-job training productivity etc. are natural by-products of innovation accounting
- Illustrate underlying processes behind economic growth trends
  - ✓ e.g., U.S. productivity growth currently is very weak: The usual footprints of a prolonged and deep recession—or the economy's innovation processes grinding to a halt?

Full impact would take into account creation of value not now captured by GDP (impact on time use)



Source: Authors' own elaboration of data issued by BEA.
* Excludes production in industries separately shown.