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

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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 or 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

<table>
<thead>
<tr>
<th>Broad category</th>
<th>Type of Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computerized Information</td>
<td>• Software&lt;br&gt;• Databases</td>
</tr>
<tr>
<td>Innovative Property</td>
<td>• R&amp;D&lt;br&gt;• Mineral exploration&lt;br&gt;• Entertainment and artistic originals&lt;br&gt;• Other new product development costs (e.g. design)</td>
</tr>
<tr>
<td>Economic Competencies</td>
<td>• Branding and reputation (mkt. research and advertising)&lt;br&gt;• Firm-specific human capital (training)&lt;br&gt;• Organizational capital (business process investment)</td>
</tr>
</tbody>
</table>
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)

<table>
<thead>
<tr>
<th>Type of Investment¹</th>
<th>Legal Forms</th>
<th>Tacit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IPR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Patents</td>
<td>Copyright</td>
</tr>
<tr>
<td>Software</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Databases</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Science R&amp;D</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>E&amp;A originals</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Design</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Market research and communication spending</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Business process</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Training</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

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

**Graph:**
- **X-axis:** Output per person employed (2011 PPP$)
- **Y-axis:** Intangible investment (% GDP)
- Countries: India, Brazil, Spain, Italy, Germany, France, UK, US, China

**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 an 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

MFP growth in 14 EU countries, 1995-2007

Percent change

Contribution of Intangible Capital Deepening (percentage points)
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.

Carol Corrado, OECD-MIT workshop, National Academy of Sciences, December 3, 2012
# Implementation and Measurement (much progress!)

## Type of Investment (☑ in US NAs)

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

Carol Corrado, OECD-MIT workshop, National Academy of Sciences, December 3, 2012
... 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

Intangible Investment and Early-stage Venture Capital Investment, 2000-2007

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)

Value added in ICT-producing industries, percent of GDP, 1985 to 2010

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