CRIW discussion: Measuring intangibles and ICT and their contributions to productivity and growth

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Different parts of the elephant

- Session a mixture of topics related to the measurement of ICT-related intangibles
  - Polder et al.: How does e-commerce activity (*or ICT investment*) affect productivity growth – is it complementary with org and process innovation?
  - Chen et al.: Intangibles (rents) are partly created by ICT – how has their share evolved?
  - Grimm: ICT(-enabled) services are more easily traded internationally than other services. How has this evolved?
- My challenge – how to fit these together in discussion

Outline

- Some thoughts on measurement
- Sources of data for these papers
- Mohnen, Polder, van Leeuwen – innovation & ICT
- Chen, Los, Timmer – global value chains
- Grimm – ICT in services

Uses of economic data measures

- Informing public policy decisions
- Informing private sector decisions
- Forecasting
- Academic research
  - Micro-level information desirable
  - Matches among and between firm and individual data
- Performance assessment and benchmarking

Data collection methodologies

- Passive - lower respondent burden, less gaming:
  - As a by-product of other activities (e.g., accounting data)
  - Via public sources or web-scraping (e.g., patent data)
- Active - higher respondent burden but possibly better targeted:
  - Surveys – government or private

Data quality

- Griliches (1986) – three aspects
  - Extent – scale & scope, time series
  - Reliability – signal-to-noise, repeatability
  - Validity – relevance and representativeness

How do these data sources stack up?

- Polder et al. – survey data from NL: 1) manufacturing/ service sector, 2) CIS, 3) e-commerce (ICT) plus 3/4-digit production statistics
  - Extent – good, but some issues linking across all 3 surveys, so emphasis on larger firms
  - Reliability – signal-to-noise of dummy variables may be low
  - Validity – representative of large firms, some question about e-commerce variable - not precisely a measure of ICT use
- Grimm – trade in ICT and ICT-enabled services from BLS
  - Extent – good, with some suppression (e.g., TM vs franchise)
  - Reliability – as good as the underlying trade statistics
  - Validity – issues with digital goods, charges for IP

How do these data sources stack up?

- Chen et al. – WIOD database; labor from offices of NS by industry; country-industry tangible capital from EU KLEMS
  - Extent - good, time series back to 1996, (How much VA in ROW?); capital breakdown limited to some countries
  - Reliability – unclear to me, may be somewhat variable due to industrial class issues
  - Validity – *(I think)* biggest problem is measuring VA at country leval, as it is contaminated by transfer pricing, leading to misallocation of rents; also why zero real return to tangible capital?

Polder et al.

- Interesting and plausible results – complementarity between increases in e-commerce use and organizational innovation.
- Warning: dummy variables for innovation may be rather imprecise measures
- Innovation dummies also highly correlated; in practice, conditioning on firm size, sector, exports, age, etc., results in even higher correlation among the residuals. That is, some firms are innovative and some are not.
- ICT versus internet-enabled – not quite the same thing

Hall, Lotti, Mairesse (EINT 2012)

- Modified CDM model on Italian data
  - instrumented R&D intensity and ICT intensity have about the same impact on labor productivity (coefficient ~0.1)
  - Complementarity/substitutability among 4 innovation variables:
    - Product
    - Process
    - Org innovation associated with product
    - Org innovation associated with process
  - Result: of 24 tests, only 3 significant (slightly more than expected?). Main finding is that process and org process are substitutes
  - We did not look at complementarity between ICT and innovation

Chen et al.

- Massive data effort, very impressive
- Transfer prices make allocation of (economic) returns across countries difficult
- What's in the residual?
  - Returns to intangibles, and….
  - Market power
- Could you benchmark the magnitude of the returns against some intangible measures (industry-level) to see if there is a relationship?
- Note: some issues with using shares across the value chain to display results, due to forced adding up

Grimm

- Set of interesting tables
- Trade in services - How are sales and spending tracked?
  - International sales by internet of software (Census survey)
  - Software purchase from small international vendor
  - Downloaded music from UK
- Is the relevant classification ICT-enabled or internet and telecomm-enabled?
  - Paper considers a very specific (and important) use of ICT – the ability to provide services from afar
- Transfer pricing/royalties?

ICT investment

- ICT is a general purpose technology so it is pervasive. It consists of
  - Software
  - Computer hardware
  - Telecommunications hardware
- But what about cloud services? Or the internet of things – ICT embedded in other capital goods such as vehicles and robots
- As these things evolve, does it make sense to even try to track ICT separately anymore?
- Suggests that statistical agencies will need to stay informed as the use of ICT evolves in industry

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