

Innovation-Performance-Empirics

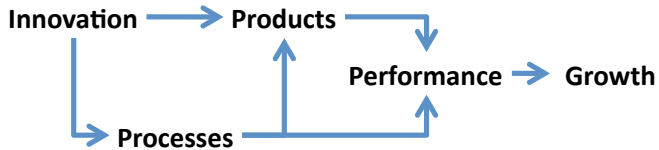
Holy or Unholy trinity?

John Cranfield

University of Guelph

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A big picture view



Three questions to ask

- How do we measure innovation?
- How do we measure performance?
- How do we link innovative ability to performance?

- We often estimate something that looks like this:

$$Performance = f(Innovativeness|\mathbf{X}) + \epsilon \quad (1)$$

- Measures of performance, innovativeness and \mathbf{X} depends on:
 - Question(s) being investigated?
 - Unit of observation
 - Global, regional, national, territorial, or firm
 - Data availability
- Plagued with econometric pitfalls
 - Causation
 - Measurement error
 - Dynamic effects

*Technological innovations comprise **new** products and processes and significant **technological changes in products and processes**. An innovation has been implemented if it has been **introduced on the market** (product innovation) or **used within a production process** (process innovation). Innovations therefore involve a series of scientific, technological, organisational, financial and commercial activities. (OECD, 1992)*

Measuring innovation is surprisingly hard

Degree of difficulty depends on context and questions being asked

- Fundamentally about measuring capacity
 - To create
 - To absorb (diffusion)
 - To act entrepreneurial
- Idiosyncratic = realization of a stochastic process
- Type of innovation (radical-incremental; component-system)
- What is measurable/observable
 - Inputs
 - "Innovation production function"
 - Output
 - What are the inputs and outputs?

What's used to measure innovation?

- R&D Activity (Hamberg 1964; Mansfield 1980; Scherer 1982)
 - R&D expenditures
 - R&D personnel
- Patents statistics (Scherer 1965; Griliches 1990; Carew 2005)
 - Counts, citations, spillovers, networks
 - Patent counts (WWZD?)
 - IP protection modalities
- Innovator or not? (Baldwin and Sabourin 1999)
- Counts of products or processes underdevelopment or on the market (Traore and Rose 2003; Traore 2004; van Moorsel et al. 2006; Herath et al; 2008; Laughland et al. 2009)

Some issues with how we measure innovation

- Availability of data
- Appropriateness as a proxy
 - What is really being measured
 - Correlation with latent variable - innovative capacity
 - Measurement error and estimator
- Intermediate inputs versus new or improved product or process
- No real notion value (e.g. new anti-cancer drug versus new cost-of-production reducing process)
- What's in **X** is important
- How **X** is incorporated and interacts with Innovation is also important

Measures of "market performance"

(see Perloff, Karp & Golan)

- Rate of return
 - Accounting or economic profits (Fisher and McGowan AER 1983)?
- Margins
 - MC not observable
 - Old SCP school: AVC, P-P margins
- Tobin's q
 - Market value to replacement value
 - Replacement value not easily observed, and imprecisely measured (e.g. dynamics, goodwill, etc)

Measures of "market performance", cont

How about using price (of either inputs or outputs)?

- Hedonic price methods?
 - Measurable attributes/characteristics
 - Monopoly power specifically, price distortions generally

BUT

- Need to define extent of the market and have a clear notion of differentiation
- Thin markets? Publicly available? Observable (e.g. transfer pricing)?

Measures of organizational performance

(see Carton & Hofer)

- Accounting
- Profit
- Growth
- Leverage, liquidity & cash flow
- Efficiency
- Operational
- Market based (e.g. Tobin's q & Jensen's α)
- Survival
- Economic value (e.g. EVA)

Impact of innovative activities on performance can be difficult to assess - what is the counter-factual?

- Causal models from the broader social-science literature
 - Propensity score matching
- Quasi or natural experiment methods
 - D-i-D

Issues:

- Observability & measurability
- Data accessibility
- Spillovers, IP "sharing", appropriability, and attribution of innovation on performance
- Devil is in the institutional & governance details

THANK YOU!