

An Intangible Research Agenda

Eric Bartelsman*

*Vrije Universiteit Amsterdam, Tinbergen Institute and IZA;
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Overview of Possible Research Areas

- Measuring Intangibles with SOG (GA) methodology
- Rethinking characteristics of intangibles and theoretical framework
- Empirical work on firm-level intangible investments and performance
- Tracing micro to macro effects

Growth Accounting

- Comprehensive framework integrating national accounts and production theory
 - National income accounts
 - Industry (product) accounts
 - Consumption, investment, (intermediates)
 - Production accounts
 - flows of productive services
 - Flows of factor payments
 - Capitalized investments providing service flow

CHS framework

- Ongoing efforts to measure all components
- Effort to expand/refine classifications
- Depreciation rates
- Deflators

Rethinking Intangibles

- Non-synchronous in production
 - To capitalize or to expense
- Non-rival in production
 - How to model
 - How to measure and account
 - Private vs social incentives
- Risk or uncertainty
 - Diversifiability
 - Ex-ante vs ex-post
 - Informational asymmetry, moral hazard, adverse selection

Capitalization and GDP

– $GDP=C+I$

- Welfare is $\text{pdv } C$
- If $GDP=C$, fluctuations in C that are meant to optimize/smooth, show up as changes in GDP
- So, we treat investment goods differently from intermediate goods
- If we reduce C to invest in 'N' then similar reasoning

– Practical/empirical issues

- How smooth is I (in cross section and over time)
- How long-lived is K

Intermediates

$$Y = f(L, X)$$

$$X = sY \text{ and } C = (1-s)Y$$

$$Y = f(L, sf(L, sf(L, \dots)))$$

$$Y = g(L; s)$$

$$ex: Y = L^{(1-\alpha)} X^\alpha \rightarrow Y = Ls^{(\alpha/(1-\alpha))}$$

$$or: Y = L + \alpha X \rightarrow Y = L \frac{1}{1 - \alpha s}$$

Technology and taste determinate allocation

if 'marginalist' then also determine distribution of income

Capital

$$Y = f(L, X)$$

$$X = \int_{-\infty}^{\infty} \Phi(sY)$$

$$Y = f(L, \int_{-\infty}^{\infty} \Phi(sY))$$

$$Y = g(\int_{-\infty}^{\infty} \Omega(L; s))$$

Technology and taste determinate allocation

if 'marginalist' then also determine distribution of income

return to capital over and above payments to stored labor

This is 'return' to intangible 'production technology'

(where did it come from, how is it paid for?)

Non-rival in production

- Problem at the margin
 - dY depends on dL and dK , not on dA
- GA: agents investing in N must expect average return, even if it is too complicated for economist to model all the non-convexities
- Ex-post, return may not be realized. How to determine ex-post distribution of income
- (link between asset prices and expected returns may have ‘bubbles’)

Non-rival in production

- Modelling the role of non-rival asset
 - Parameters of production function
 - Specialization patterns
 - Transactions technology
 - Study matching functions
 - Quality of traditional inputs
 - Quality of output
 - Technical change
- A non-rival asset does not provide a ‘flow’ of services!
 - It provides a discrete change in some parameter

Risk

- The riskiness of stream of returns matters for its current asset price
- Cross-sectional risk may be diversifiable
 - Take care of default risk, which should raise the rate seen in transactions (Wang, Basu, Fernald))
- What about ‘uncertainty’
 - The parameters of the distribution are unknown
 - (not the known unknowns, but the unknown unknowns)

	Non-Synchro	Non_rival	risk
Comput Information			
software	yes	yes	medium
databases	yes	yes	low
Innovative property			
R&D	yes	yes	med/high
Mineral exploration	yes	no	high
copyright licence	no?	no	low
financial inovation	yes	yes?	low/med
architectural and engineering design	no?	yes/no	low/med
Economic competencies			
Brand equity	no?	no	low
human capital	no?	no	low
organizational capital	yes?	yes?	med/high

Macro accounting

- Axiomatic approach and prod fn approach give standard GA formulation
- While practical, does it get the role of intangible investment correct?
- Compare:

$$K_t = (1 - \delta)K_{t-1} + I_{t-1}$$

$$(1 + \psi)\dot{A} = N^\lambda A^\varphi \quad (\text{Jones and Williams})$$

- How to adjust GA to account for imperfect comp, irts, non-convexities, etc?

Micro measures

- Intangible investments and firm performance
 - Rival investments (eg worker training) are similar to tangible
 - With non-rival asset the return comes from combined productivity and scale growth
- Measurement of firm performance must consider not only product quality or productivity, but also changes in scale made possible by the intangible (non-rival) investment

Growth and innovation (CDM)

- Innovative activity
- Knowledge production and externalities (spillovers from ‘frontier’)
- Production Factors

$$y_i = F(A_i, X_i)$$

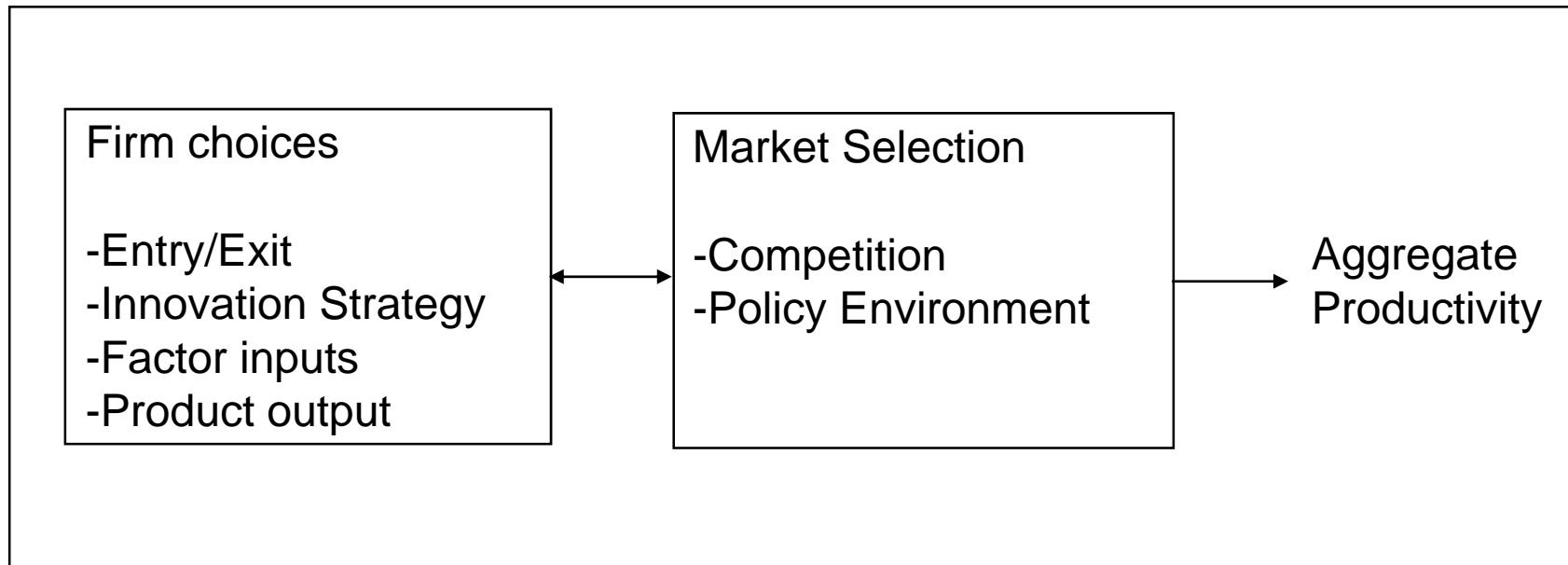
$$\Delta A_i = G(I_i, A_i, \bar{A})$$

$$I_i = H(Z_i)$$

Models of Firm Dynamics

- Heterogeneous agents at micro level
 - Diversity in firm-level (innovation) strategies
 - Frictions, uncertainty, expectations
- Market selection
 - Sales and input growth, conditional on productivity and economic 'environment'
- Combination of firm-level productivity impact and market share evolution gives total impact on industry productivity

Models of Firm Dynamics



Models of Firm Dynamics

$$S_i \in \{N, E, C\}$$

conditional on C:

$$y_i = F(A_i, X_i), \text{ where } i \in C$$

$$\Delta A_i = G(I_i, A_i, \bar{A})$$

$$I_i = H(Z_i)$$

and aggregate productivity

$$\bar{A} = \sum_{i \in C} A_i + \sum_{i \in C} (\phi_i - \bar{\phi})(A_i - \bar{A})$$