Boosting Innovation and Productivity in Enterprises: What Works?

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Outline

- Policy Challenge and Key Questions
- Analytical Framework
- International Empirical Evidence
- Irish Empirical Evidence
- Policy Issues
Policy Challenges

- Economic growth and higher employment require more sustainable enterprises

- **Innovation** at enterprise level is essential for
  - productivity
  - competitiveness
  - sustainable growth

- We need effective government policies to cope with tight fiscal constraints
What is Innovation?

“the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace or external relations”.

Oslo Manual (OECD, 2005), third edition, p.46
Context for Innovation

- Innovation takes place in a global context
  - *New players, global networks of innovation*

- Innovation takes place at enterprise level
  - *Enterprise characteristics and performance vary within and between industries*

- Understanding determinants of innovation and productivity at enterprise level is key to designing effective innovation policies
Key Questions

- Is innovation linked to higher productivity?
- Which types of enterprises invest in innovation?
- Which enterprises have higher innovation investment per employee?
- Which types of enterprises are more likely to innovate successfully?
- What is the government’s policy role in enhancing enterprise innovation?
Methodology

- Develop the analytical framework
- Review recent international/national econometric evidence on enterprise innovation and productivity
- Generate new evidence about Irish indigenous enterprises
- Derive key policy messages and explore them in the context of current policies
Analytical Framework

Enterprise size, market power and innovation

Innovation systems

R&D investment, knowledge spillovers and productivity growth

International trade with heterogeneous enterprises
Analytical Framework

- **Industrial organisation**: Schumpeter (1942); Sutton (1998)
  - Firm size, market structure and R&D; R&D and firm growth

- **Endogenous growth**: Griliches (1984); Romer (1990); Aghion and Howitt (1998)
  - Productivity growth is endogenous; private R&D investment and knowledge spillovers affect productivity growth; government can foster innovation and growth

- **Innovation systems**: Freeman (1987); Lundvall (1992); Nelson (1993)
  - R&D and non-R&D influences on innovation
  - Role of institutions and organisations
  - Role of interactive learning
  - Role of interactions between agents

- **Firms and global trade**: Bernard and Jensen (1995); Melitz (2003); Helpman et al (2004)
  - Low productivity firms serve only domestic markets; most productive firms export and invest abroad
Empirical Evidence

- Explores links between innovation investment, innovation outcomes and productivity

- Based on an econometric framework developed by Crépon, Duguet and Mairesse (1998) - the CDM model

- Use of Community Innovation Surveys – from developed European countries
  - Large countries: France, Germany, Italy, Spain, United Kingdom
  - Small countries: Austria, Belgium, Denmark, Finland, Ireland, Luxembourg, the Netherlands, Norway, Sweden, Switzerland
Innovation and Productivity: Empirical Framework: CDM* Model

1st stage: Innovation investment
Selection equation and innovation investment function

2nd stage: Innovation production function
Product output
Product, process, organisational, innovative sales intensity

3rd stage: Augmented production function
Productivity
Sales/employee

Based on the Crépon-Duguet-Mairesse (1998)
International Evidence: Is Innovation Linked to Higher Productivity?

- Innovation output at enterprise level is positively linked to productivity – robust country evidence

Main Channels
- New and/or improved goods and services
- Efficiency improvements due to process and organisational changes
International Evidence: Which Enterprises Invest in Innovation?

**Investment Propensity**

Larger enterprises

Smaller enterprises

**Investment Intensity**

With export markets

With higher innovation capability

With formal and strategic protection of intellectual property

Receiving public funding
International Evidence: Which Enterprises Innovate Successfully?

- Larger enterprises
- With higher R&D/innovation expenditure per employee (mainly for product innovation)
- Engaged in co-operative innovation activities
Irish Evidence

- **Ireland’s Dualistic Economy:**
  - Indigenous and FDI enterprises
  - Modern and traditional sectors
  - Exporting and non-exporting

- **Focus on Indigenous Sector**
  - Market and systemic failures more likely
  - Essential to productivity, competitiveness, sustainable growth
  - Crucial to strengthening national innovation system
% of Firms with Innovation Activities, Ireland

Any innovation: 59.2 (All firms), 53.8 (Irish), 74.6 (Foreign)
Product innovators: 37.7 (All firms), 32.3 (Irish), 53.3 (Foreign)
Process innovators: 34.3 (All firms), 30.1 (Irish), 46.3 (Foreign)
Organisational innovators: 40.0 (All firms), 35.8 (Irish), 51.9 (Foreign)

% of Irish Firms with Innovation Activities

- Any innovation: 71.7%
- Product innovators: 53.5%
- Process innovators: 44.4%
- Organisational innovators: 47.3%

Irish exporters and Irish non-exporters

Data Source: CSO, Community Innovation Survey, 2004-2006
% of firms engaged in co-operation for innovation

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% of Irish firms engaged in co-operation for innovation

Data Source: CSO, Community Innovation Survey, 2004-2006
Innovation and Productivity in Indigenous Enterprises

- Link between productivity and innovation especially process and organisational innovation
- Evidence supports government focus on innovation at enterprise level

Policy Issue
- Innovation supports should be cost-effective
Which Indigenous Enterprises Invest in Innovation?

- Larger enterprises
- Exporters

Key Policy Instruments:
- Stimulation grants for SMEs
- Equity for high-potential start ups
- Export and Development supports

Policy Issue
- Multiple supports raise evaluation issues
Which Indigenous Enterprises Have Higher Investment Rates?

- Size is not crucial
- Enterprise innovation capacity matters

**Key Policy Instruments:**
- R&D grants for expanding innovation activities
- Contribution to Irish VC funds

**Policy Issue**
- Enterprises need innovation capacity
Which Indigenous Enterprises Innovate Successfully?

- Larger enterprises (process/organisational)
- Smaller enterprises (product innovation sales)
- Exporters (process/organisational)
- Enterprises that cooperate in innovation activities

Policy Issues

- Product innovation appears weak
- Appropriate metrics and methodologies needed to measure innovation outcomes
# Focus of Policy Interventions

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What can government policy do to promote innovation?

- Improve ‘framework conditions’
  e.g., competition and regulation

- Deal with market failures
  e.g., knowledge spillovers

- Address systemic failures
  e.g., suboptimal networking

- Avoid government failures
  e.g., overly complex interventions
Improve Framework Conditions

- Stable macroeconomic environment
- Openness to international trade and investment
- Competitive local product/service markets
- Flexible labour markets
- High level of financial development
- Well-performing education system
- High-performing infrastructure
- Protection of intellectual property rights

OECD (2010)
Address market and systemic failures

- To address market failures
  - Externalities - knowledge spillovers
  - Static and dynamic economies of scale
  - Information asymmetries

- To address systemic failures
  - Incompatible incentives for market/non-market institutions
  - Institutional rigidities, communication gaps
  - Lack of networking and mobility of personnel
  - Capability failures
  - International dimensions of STI

But market failures may not justify government intervention OECD 2010b
Innovation Policy Mix: Policies to support Science, Technology and Innovation

**Private Sector**

- Support investment in private sector STI
  - R&D grants, R&D tax credits, etc.

- Enhance innovation competencies of enterprises
  - Training grants, mentoring supports, etc.
Innovation Policy Mix: Policies to support Science, Technology and Innovation 2

● **Public Sector**

● Support investment in public sector STI
  - Supports for Infrastructure, competitive funding and strategic funding

- Supports for the HE sector
- Supports for publicly-funded research centres
Innovation Policy Mix: Policies to support Science, Technology and Innovation 3

**System**

- Strengthen linkages within innovation system
  - Supports for inter-enterprise linkages, inter-institutional linkages, business-higher education linkages
  - Supports for international linkages
Conclusions

- Early stage of research based on micro data
- Ireland broadly in line with international evidence
- Important to collect data to monitor performance

Key Policy Messages

- Enabling policies are important
- Enterprises’ capacities to absorb new knowledge need enhancement
- Account needs to be taken of innovation complexity and policy mix in evaluations