Do Australian firms produce knowledge spillovers?

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Why industry policy…?

- Economic theory resists putting public funds into enterprises
  - Not welfare (unlike health ect)
  - Not a clear public good (unlike defence, police etc)
  - Not a clear commons good (unlike roads etc)

- Yet evidence that business success is not random
  - Great Britain 18th-19th C
  - Asian tigers 20th C

- …and govt support matters
  - German chemical industry 19th C
  - DARPA & Silicon Valley 20th C
  - Program evaluations 21st C

Most industry policy limited to

- Promoting competition – strong theoretical reasons

- Legal infrastructure – IP, corporate rules, stock exchange

- Note: can't subsidise exports (against WTO rules)

- Timid support for programs & policies to enhance productivity

Innovation is (only) driver of productivity growth…

- Without new-to-the-world ideas, productivity will plateau and our standard of living will stagnate

- Without new-to-the-firm change, new-to-the-world ideas will not spread - potential unfulfilled

- Competition drives innovation but is this enough?

Productivity success has deep roots & occurs in clusters

- Economists: knowledge spillovers

- Management scientists: national innovation systems

- Sociologists: culture

Economists focus on showing knowledge (R&D) spillovers exist → if knowledge (partial) public good → case for public support.

Theory of 'innovation systems' not clinching but evidence is solid

- Many empirical studies to detect the presence of R&D spillovers between businesses
  - Hall (1996), Griliches (1998), Jaffe (1986), Mansfield et al. (1977), Bernstein and Nadiri (1989), Griffith, Redding and Van Reenen (2004), Boschma (2005), Goodridge et al. (2012), Trajtenberg (1990), Hall, Mairesse and Mohen (2010), Cook et al (2011), OECD (2017)
- About ¾ find the presence of positive spillovers
- No solid studies in Australia – datasets too poor

Large scale business datasets needed

- Surveys – costly, low response rates, mainly large firms
- Pre-BLADE datasets limited to publicly available data (~3000 firms)
- Australia – BLADE
  - 1.5M businesses per year since 2001-02 (population)
  - 5 linked datasets
  - Issues around corporate structure
  - Access under cloak of confidentiality
  - Progress slow and opaque

Model – augmented cobb-douglas

$$Y_{it} \equiv J_{it} K_{it}^{\alpha} L_{it}^{\beta} M_{it}^{\gamma} R_{it}^{\delta} S_{it}^{\theta}$$

- i = firm
- t = year
- Y_{it} = sales
- J_{it} = intangible capital
- K_{it} = accounting value of the tangible capital stock
- L_{it} = employment
- M_{it} = materials
- R_{it} = firm's stock of R&D capital
- S_{it} = stock of spillover R&D i.e. other peer firms

Years 2005-06 to 2011-12. Method= Olley-Pakes

Dep Variable = ln(Sales)	No R&D spillover	R&D spillover source	
Explanatory variable (logs)			
		2-digit	Supplier
Asset (k_{it})	0.085***	0.071***	0.077***
Employment (l_{it})	0.266***	0.311***	0.284***
Materials (m_{it})	0.382***	0.363***	0.349***
Own R&D stock ($r_{i,t-1}$)	0.062***	0.034***	0.068***
External R&D stock			
2-digit ANZSIC ($s^2_{i,t-1}$)		0.127***	
I/O weighted ($s^{IO}_{i,t-1}$)			0.045***
N-firms	1,742,744	1,742,744	1,742,744

Years 2005-06 to 2011-12. Method=Olley-Pakes

Dep Variable = ln(Sales)	R&D spillover source					
Explanatory variable (in logs)	All firms		Large firms (200+)		Extra-large firms (1000+)	
	2-digit	Supplier	2-digit	Supplier	2-digit	Supplier
Own R&D stock ($r_{i,t-1}$)	0.034***	0.068***	0.052***	0.069***	0.056***	0.071***
External R&D stock						
2-digit ANZSIC ($s_{i,t-1}^{2}$)	0.127***		0.071***		0.040***	
I/O weighted ($s_{i,t-1}^{IO}$)		0.045***		0.043***		0.027***
adj-R2	0.784	0.775	0.7857	0.7749	0.7929	0.7755
N-observations	6,615,177	6,615,177	6,615,177	6,615,177	6,615,177	6,615,177
N-firms	1,742,744	1,742,744	1,742,744	1,742,744	1,742,744	1,742,744

What do the elasticities mean?

Own R&D elasticity	Increase sales for every $1 increase R&D
0.04	$4.0
0.05	$5.0
0.06	$6.0
0.07	$7.0

External R&D elasticity	Increase per firm sales for every $1 increase External R&D
0.03	$7
0.06	$15
0.09	$22
0.12	$30

International studies : Average own R&D elasticity ~ 0.06
International studies : Average external R&D elasticity ~ 0.02 – 0.33

Which sectors deliver the most R&D spillovers?

- Preliminary estimates

- Business services – not public services or manufacturing, utilities, construction

- Top source industries - Information media, Telecommunications; Wholesale Trade; Education and training; Construction

What does this mean for policy?

- Neighbour firms have positive effects on each other

- Virtuous circle – success breeds success

- If anything – we have lower sales elasticities with respect to R&D than overseas

- Does this mean we are not absorbing spillovers?

- Should we increase R&D subsidies?
  - Costs of continual program change
  - Other mechanisms may be more effective – encourage collaboration, networks, R&D consortia, de-risking innovation…