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School of Management

# **Innovation Intermediary Impact Assessment: Why It's Difficult and What We Should Do About It**

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**Canadian Science Policy Conference**

**November, 2011**



## The (Tragic) Impact of (Mis)Measurement

Everyone is a genius. But if you judge a fish on its ability to climb a tree, it will live its whole life believing that it is stupid.

-A Einstein





## Why is Impact Assessment Difficult?

- **Every firm is different and so outcomes will vary by firm attributes:**
  - **Stage of development, management capabilities, industry, region, etc.**
- **Time lag between engagement with intermediary and firm outcomes**
  - **Measure too early and effect has not occurred; too late and the association with intermediary activities is difficult to make**
- **Difficult to distinguish between selection and treatment effects**
  - **Does engagement with Intermediary X lead to high firm performance or does Intermediary X engage with high performing firms?**
- **Intermediary activities affect firm inputs (resources and capabilities), but stakeholders may be interested in effects on firm performance**
  - **Data on changes in firm resources and capabilities is hard to come by**
  - **Using data on firm performance requires controlling for other factors that affect firm performance**



## How Innovation Intermediaries Impact Firms

**Intermediary**

**Client or Member Firm**

**Mission**



**Firm performance**



**Activities**



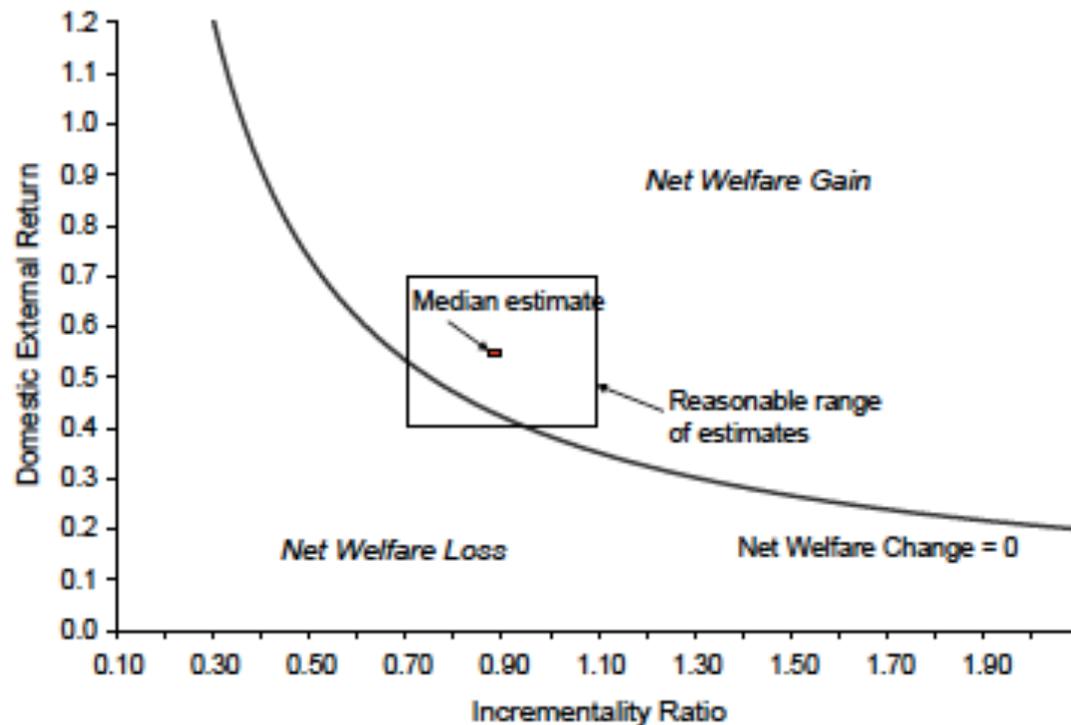
**Firm resources  
and capabilities**





## R&D Tax Credits: Impact on Estimated Net Welfare Positive (Parsons & Phillips, 2007)

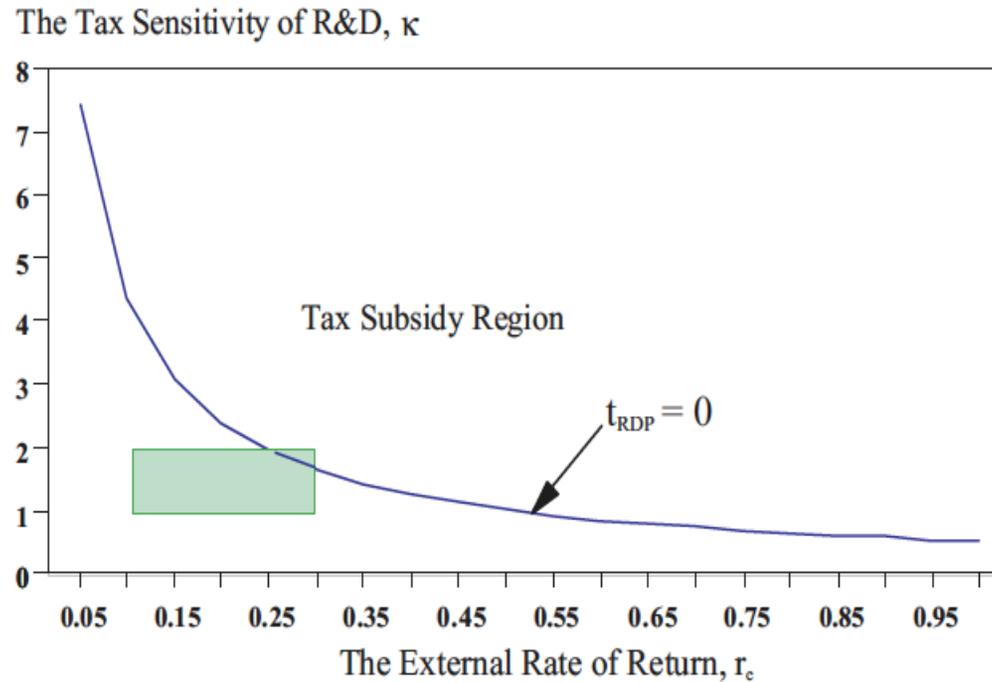
Figure 2: Welfare Effects of the Federal SR&ED Tax Credit



Assumes  $MEB = 0.27$ ,  $t = 0.3$ ,  $s = 0.043$

## R&D Tax Credits: Impact on Estimated Net Welfare Negative (Dahlby, 2005)

FIGURE 2  
Optimal Tax Treatment of R&D When the MCF is 1.40





## SEMATECH:

### Impact on Generic Technology and Industry Infrastructure Positive (Grindley, Mowery & Silverman, 1994)

*This article reviews the experience of SEMATECH as a model for high-technology research consortia. SEMATECH's original aims of developing next-generation manufacturing technology proved hard to achieve, and the program has refocused on generic technology and the equipment industry infrastructure. Though more modest, these new objectives have produced significant tangible results. The study considers the reasons for the change and implications for consortium design. This is contrasted with the history of other major collaborative research programs in Japan, Europe, and the United States.*



## **SEMATECH: Impact on R&D Spending Negative (Irwin & Klenow, 1996)**

Sparked by concerns about their shrinking market share, 14 leading U.S. semiconductor producers, with the financial assistance of the U.S. government in the form of \$100 million in annual subsidies, formed a joint R&D consortium – Sematech – in 1987. Using Compustat data on all U.S. semiconductor firms, we estimate the effects of Sematech on members' R&D spending, profitability, investment, and productivity. In so doing we examine two hypotheses: the 'commitment' hypothesis that Sematech obligates member firms to spend more on high-spillover R&D, and the 'sharing' hypothesis that Sematech reduces duplication of member R&D spending. Whereas the commitment hypothesis provides a rationale for the government subsidies, the sharing hypothesis does not. We find that Sematech induced members to cut their overall R&D spending on the order of \$300 million per year, providing support for the sharing hypothesis.



## **Science Parks: Impact on University Linkages, Employment, and Revenues Positive (Löfsten & Lindelöf, 2002)**

- **Compared the growth of new, technology-based firms on and off science parks in Sweden**
- **Find firms on science parks exhibit better performance in terms of:**
  - **Links with universities**
  - **Employment growth**
  - **Revenues growth**
- **Finds no difference between firms on and off science parks in terms of:**
  - **Patents**
  - **Profitability**



## Science Parks: No Impact on City-Wide High-Tech Employment (Shearmur & Doloreux, 2000)

**Table 9.** Regression results: city size, science parks, and high-tech employment.

Year	Independent variable	<i>t</i>	<i>p</i> (coef) = 0	standardised coefficient	<i>r</i> <sup>2a</sup> (model)	<i>p</i> ( <i>f</i> ) = 0 (model)
<i>Dependent variable: proportion of total employment in high-tech sectors</i>						
1971	ln (city size)	5.063	0.0001	0.73	0.56	0.0001
( <i>n</i> = 27)	dummy for park in 1980s	<u>0.592</u>	<u>0.5591</u>	0.09		
1981	ln (city size)	6.109	0.0001	0.80	0.64	0.0001
( <i>n</i> = 27)	dummy for park in 1980s	<u>0.376</u>	<u>0.7102</u>	0.05		
1991	ln (city size)	5.495	0.0001	0.78	0.57	0.0001
( <i>n</i> = 27)	dummy for park in 1980s	<u>-0.102</u>	<u>0.9198</u>	-0.01		
1996	ln (city size)	4.963	0.0001	0.81	0.54	0.0001
( <i>n</i> = 25)	dummy for park in 1980s	<u>-0.671</u>	<u>0.5093</u>	-0.11		

## Industry Associations: Impact as a Source of Ideas Positive (Dalziel, 2006)

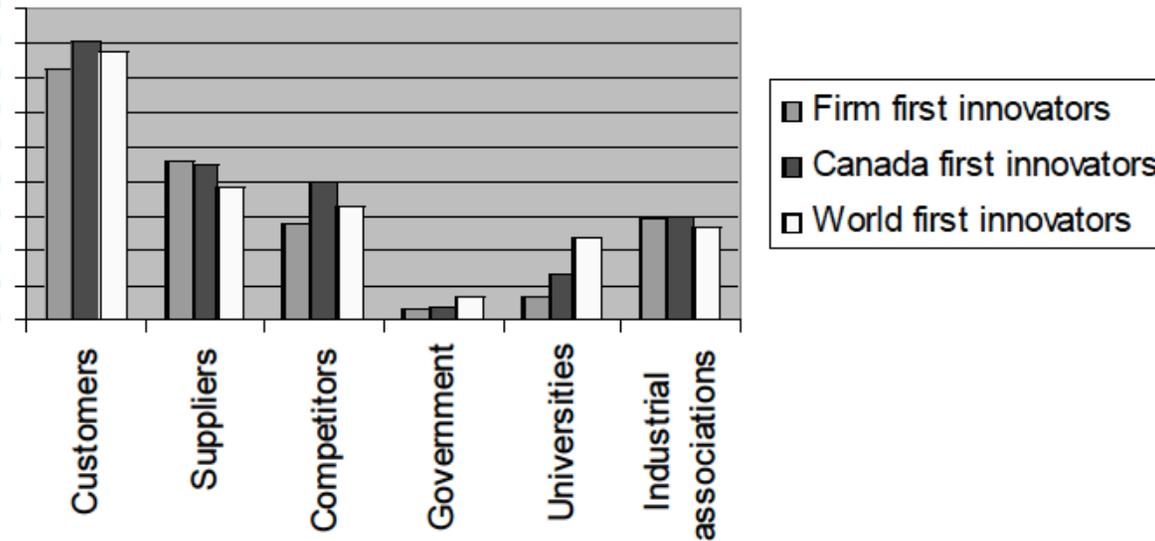


FIGURE 1: IMPORTANT SOURCES OF IDEAS FOR CANADIAN INNOVATORS  
(Statistics Canada, 2003b)



## Industry Associations: Impact on Environmental Performance Negative (King & Lenox, 2000)

### *Improvement*

- |   |  |
|---|--|
| H3. On average, firms that participate in Responsible Care will improve their environmental performance <u>more</u> than non members in the industry. | <u>Not supported</u>                           |
| H4. On average, the chemical industry will more rapidly improve in environmental performance after the inception of Responsible Care.                 | <u>Supported only for non-RC participants.</u> |
| H5. On average, participants in Responsible Care will improve their environmental performance <u>less</u> than non members in the industry.           | <u>Weakly supported.</u>                       |
-



## **SBIR: Impact on Revenues, Employment, Venture Capital Financing Positive (Lerner, 1999)**

- **Compares SBIR awardees to a matched sample of non-awardees**
- **Finds that SBIR awardees:**
  - **Grew significantly faster over a decade in terms of revenues and employment**
  - **Attracted more venture capital financing**
- **But the superior performance of SBIR awardees:**
  - **Was confined to regions with substantial venture capital**
  - **Was pronounced in high-technology industries**



**SBIR:  
No Impact on  
Employment or  
Investment in R&D  
(Wallsten, 2000)**

Table 1

**Regression Results: Awards and Employment**

(Absolute t-statistics in parentheses)

Dependent Variable	OLS	Three-stage least-squares	
	log (employment 1993)	Number of SBIR Awards	log (employment 1993)
Constant	.97 (6.39)	-1.58 (2.66)	.94 (6.27)
Number of SBIR Awards	.02 (3.33)		.01 (.94)
SBIR Budget Instrument (\$millions)		3.91 (17.13)	
log (age)	-.20 (3.39)	.20 (.91)	-.19 (3.46)
log (employment 1991)	.85 (35.85)	.16 (1.86)	.85 (39.99)
Patents 1988-1989	-.0007 (.03)	.29 (4.24)	.004 (.23)
Never applied	-.33 (2.47)		-.32 (2.41)
Minority owned?	-.03 (.51)	.19 (.70)	
Publicly traded?	.46 (5.40)	-.22 (.75)	.45 (5.45)
R <sup>2</sup> 481 observations	.85	.54	.85



## **Lessons from the Literature**

- **Impact may be:**
  - **Positive**
  - **Negative**
  - **Not significant**
- **Findings vary due to:**
  - **Assumptions**
  - **The dependent variable**
  - **The nature of the sample**
  - **The statistical methodology**
- **The closer the measurement to the phenomenon, the more reliable the results**
- **Multiple measures provide a more complete picture of impact**
- **Both primary and secondary data are useful, but exhibit limitations**
  - **The measurement of immediate impact on firms requires primary data**
  - **Secondary data can be used to demonstrate the presence or absence of impact, given multiple years of data, control groups, and methods to distinguish selection from treatment effects**
- **The more susceptible the impact to other influences, the more important it is to control for other influences to attribute the impact to intermediary activities**
  - **Broader, longer term impacts are the consequence of many factors**

## **How Should We Measure Impact?**

- **Measure what's relevant, not what's convenient**
- **Use firm level data to get close to the phenomena of interest and to get useful feedback quickly**
- **Consider multiple dimensions of impact – avoid single measures and attempts to monetize impacts**
- **Leverage the ability of executives to judge the attribution of intermediary impact on specific outcomes**
  - **Failure to distinguish between changes in firm outcomes and changes in firm outcomes that are a consequence of intermediary interventions will result in gross overestimates of impact.**
- **Be efficient in measuring impact; Measuring performance shouldn't detract from achieving performance**
- **Be humble; The science of impact assessment is in its infancy**



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***Thank you!***



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