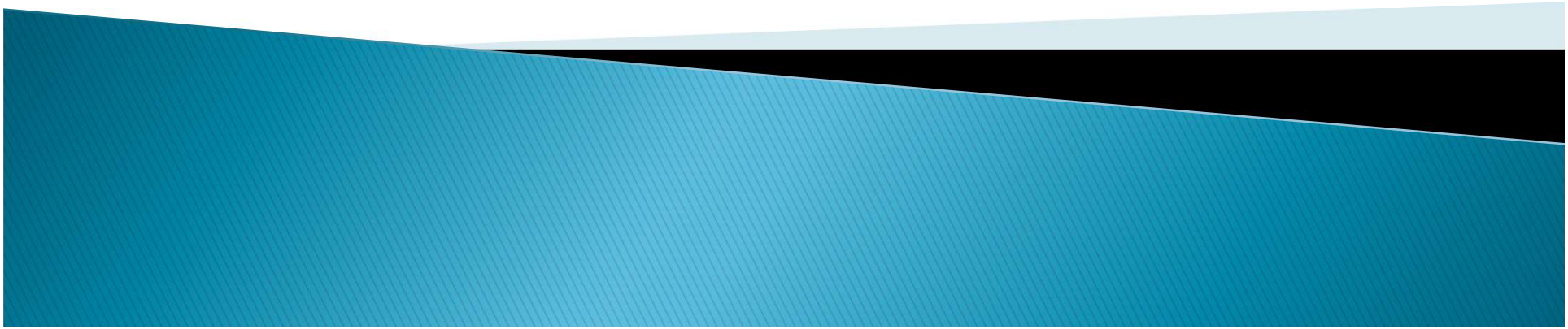
Canada's Industrial R&D Performance

Fred Gault
UNU-MERIT / TUT-IERI

The Ninth Annual Re$earch Money Conference, Ottawa, March 25, 2010



Outline

- The big picture – where Canada fits
- Slowly moving variables
  - Can they be influenced?
- Variables that are moving, but not quickly
  - How are they being influenced?
- Fast moving variable
  - What does it mean?
- Questions for discussion

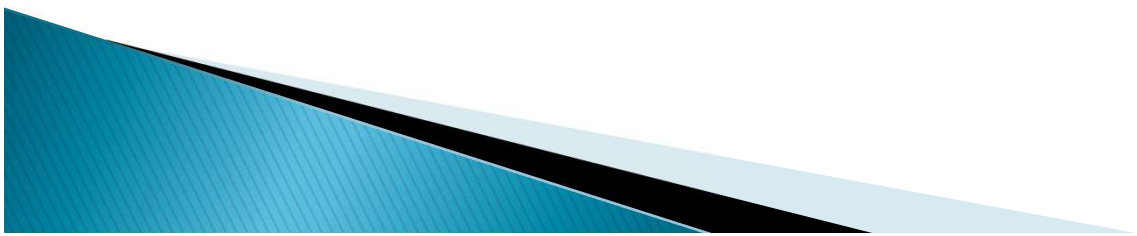
- A talk about **R&D**. It is not a talk about **innovation**

The Big Picture

- GERD (2007) $29, 170 million
- GERD/GDP (2007) 1.90 %
- Performance as a percentage of GERD by
- **Business** **54**
- Higher Education 35
- Governments 10

Sources: Statistics Canada 88-202 and OECD(2010), MSTI 2009/2 Tables

Statistics Canada Summary Tables, www.statcan.gc.ca



Slowly Moving Variables

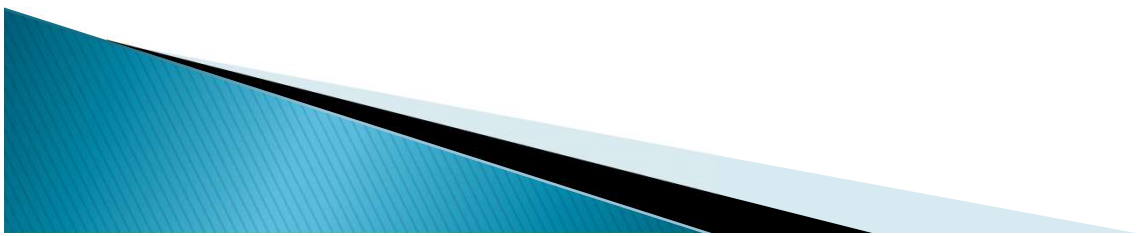
BERD as per cent of GDP for 15 OECD Countries

	Year					
	2007	**2006**	**2005**	**2004**	**2003**	**1995**
Japan	2.68	2.63	2.54	2.38	2.40	1.90
Sweden	2.66	2.79	2.62	2.67	2.86	2.43
Finland	2.51	2.46	2.47	2.42	2.42	1.43
Korea	2.18	2.29	2.49	2.65	2.00	1.75
United States	1.93	1.89	1.83	1.79	1.84	1.77
Austria	1.81	1.73	1.70	1.53		
Germany	1.77	1.77	1.72	1.74		1.45
Denmark	1.66	1.66	1.68	1.69	1.78	1.04
Iceland	1.50	1.59	1.43		1.46	0.49
Luxembourg	1.36	1.43	1.35	1.43	1.47	
France	1.31	1.32	1.30	1.36	1.36	1.39
Belgium	1.29	1.30	1.25	1.29	1.31	1.19
Australia		1.15	1.07	0.97	0.92	0.84
United Kingdom	1.15	1.08	1.06	1.06	1.13	1.24
Canada	**1.05**	**1.11**	**1.15**	**1.19**	**1.16**	**0.99**
OECD	**1.59**	**1.56**	**1.51**	**1.48**	**1.51**	**1.37**

Source: Statistics Canada 88-202/OECD

BERD and GDP

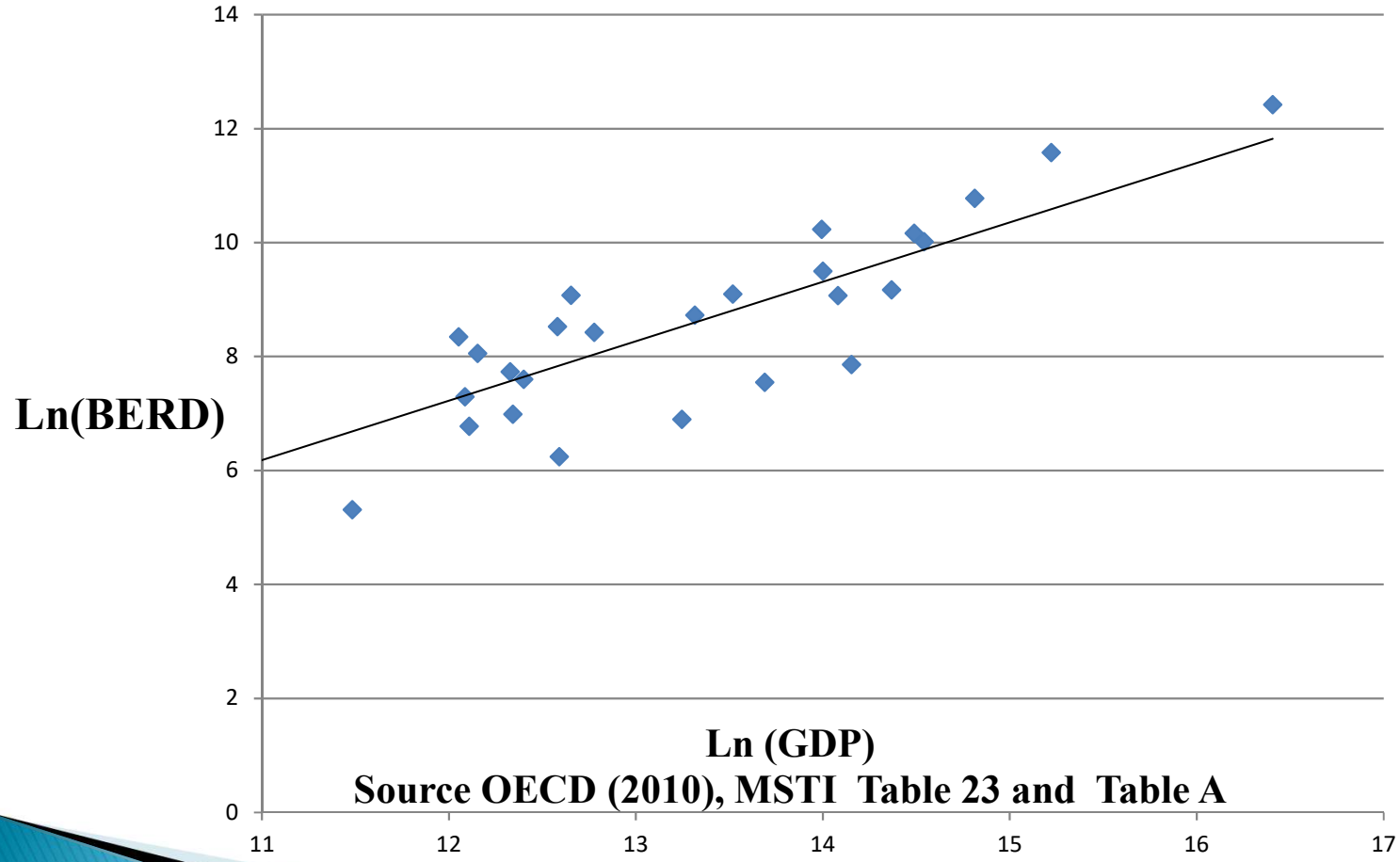
- How does BERD relate to a country's GDP?
- BERD = a*(GDP)**b
- ln(BERD) = A + b*ln(GDP)
- What does the relationship look like?
- What about structural differences?
- Two cases
  - Available data for 2006
  - Available data for 2006, and BERD/GDP >= 0.5
    - Countries with BERD/GDP < 0.5 are likely to be developing economies



Ln(BERD) vs Ln (GDP)

$y = 1.0432x - 5.2938$

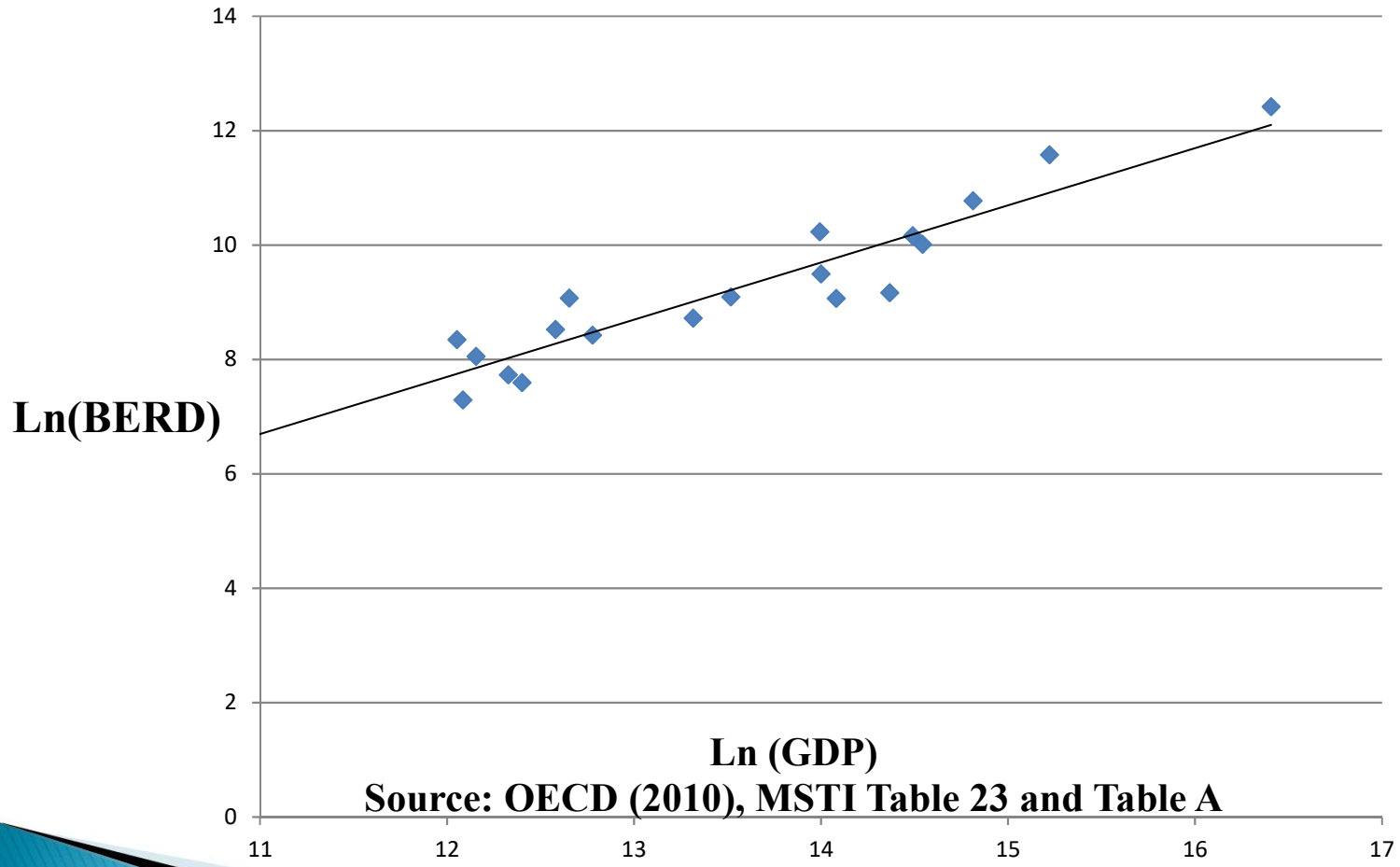
$R^2 = 0.76$



Source OECD (2010), MSTI Table 23 and Table A

Ln(BERD) vs Ln (GDP)
Excluding BERD/GDP < 0.5

$y = 0.9998x - 4.3013$
$R^2 = 0.9295$

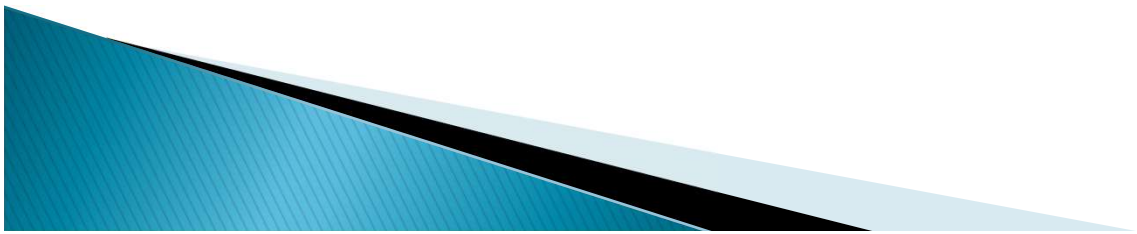


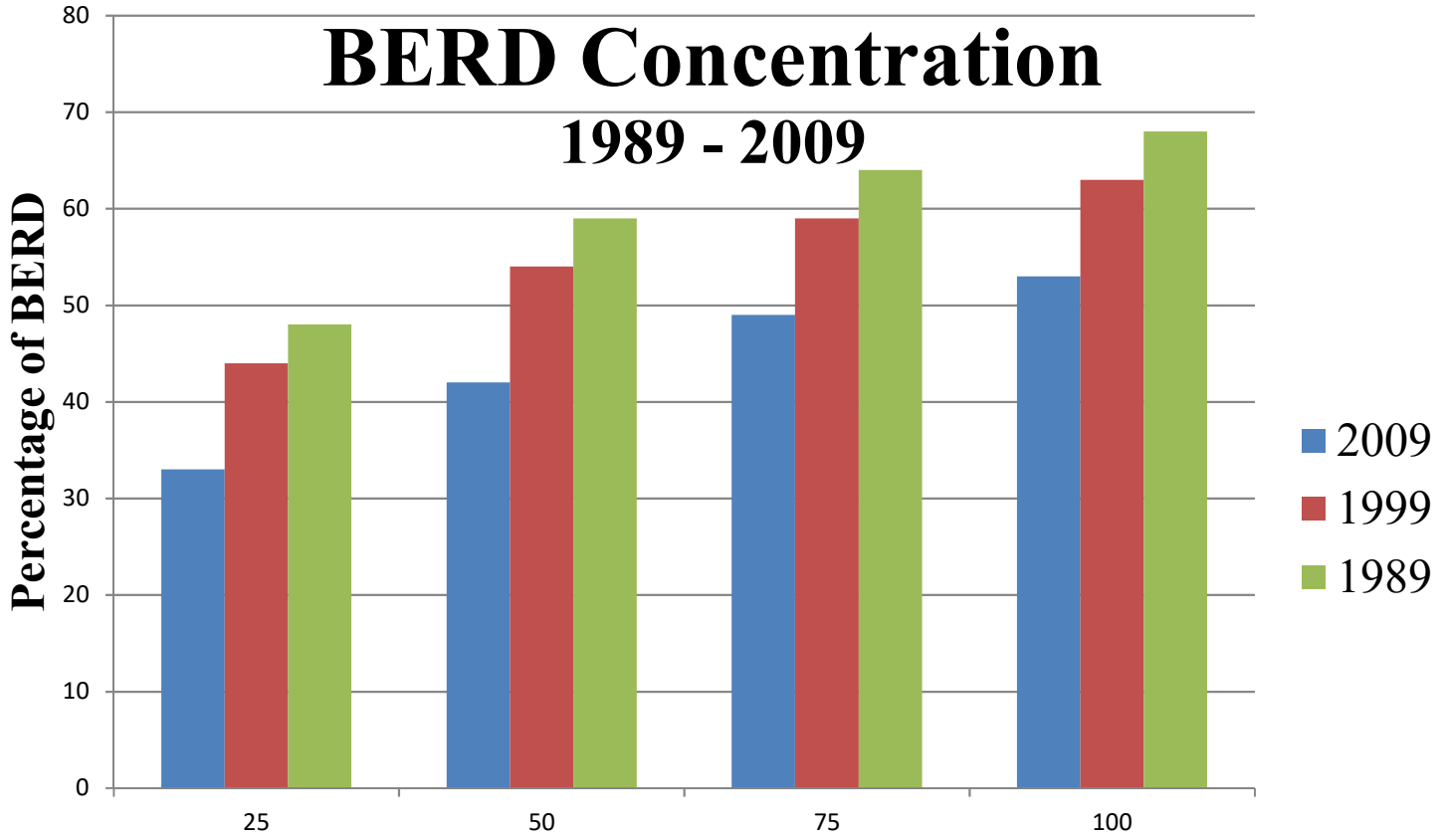
Source: OECD (2010), MSTI Table 23 and Table A

Moving Variables

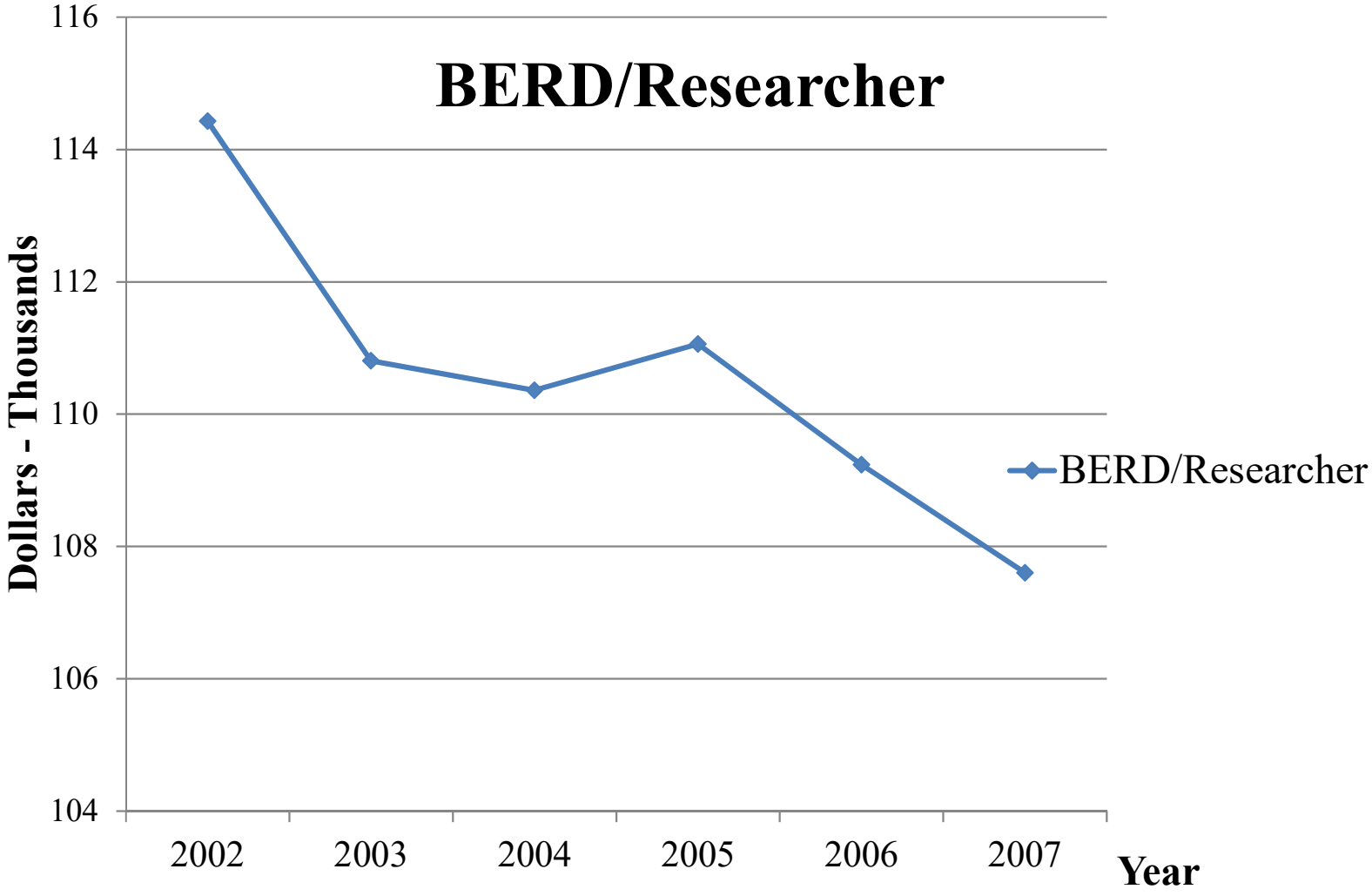
Moving Variables

- BERD is highly concentrated
  - But becoming less so
- BERD is increasing, $16,146 million (2009)
  - BERD in Services is increasing
    - Structural difference 40% 2004 – 42% 2009
    - A decade ago, in the 30+% range
- R&D Personnel is increasing, 147,599 FTEs (2007)
- Ratio of BERD to Personnel?
- Observations on size of firm





Source Statistics Canada (2010) 88-202


BERD/Researcher
Dollars - Thousands
116
114
112
110
108
106
104
2002
2003
2004
2005
2006
2007
Year
BERD/Researcher

BERD by Size Class	Firms with fewer than 50 employees	Firms with 50 to 249 employees	Firms with fewer than 250 employess
Japan	0.0	6.4	6.4
Germany (2005)	2.4	7.5	9.8
United States (2006)	**5.9**	**9.0**	**15.0**
France (2006)	6.7	11.2	17.8
United Kingdom	6.3	11.9	18.2
Sweden	6.5	11.8	18.3
Finland	9.7	10.3	20.0
Switzerland (2004)	8.0	12.4	20.5
Italy (2006)	7.3	15.0	22.3
Korea	10.7	12.2	22.8
Slovenia (2006)	9.1	17.6	26.7
Netherlands (2005)	9.0	18.1	27.1
Luxembourg (2005)	10.3	17.9	28.2
Austria (2006)	9.3	18.9	28.2
Denmark (2005)	15.0	14.0	29.0
Hungary	18.3	10.8	29.1
Czech Republic	9.6	22.5	32.1
Australia (2006)	18.7	13.9	32.6
Poland	5.3	27.9	33.3
Canada (2006)	**18.5**	**17.6**	**36.1**
Portugal	12.3	26.2	38.5
Belgium (2006)	16.0	22.7	38.7
Ireland (2006)	20.4	25.8	46.2
Spain (2006)	21.2	27.7	48.8
Norway	18.8	30.8	49.6
Slovak Republic	11.2	45.5	56.8
Greece (2005)	33.8	26.0	59.7
New Zealand (2005)	45.9	27.3	73.3

Source OECD STI Scoreboard 2009

Fewer than 50 employees: For the U.S., 5-49 employees; for Luxembourg, the Netherlands and Sweden, 10-49 employees;

50 to 249 employees: [illegible] fewer than 299 employees.

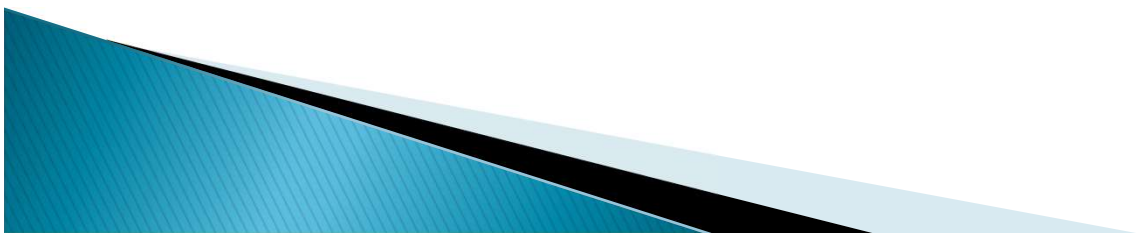
Moving BERD

R&D Support

- For BERD
  - Money for research
    - SR&ED
    - ICT tax credits
    - Strategic Aerospace and Defence Initiative (SADI)
  - Money and advice for research
    - IRAP
- For Business
  - Business Development Bank (will help with SR&ED)
  - Export Development Canada
  - Provincial and municipal programmes

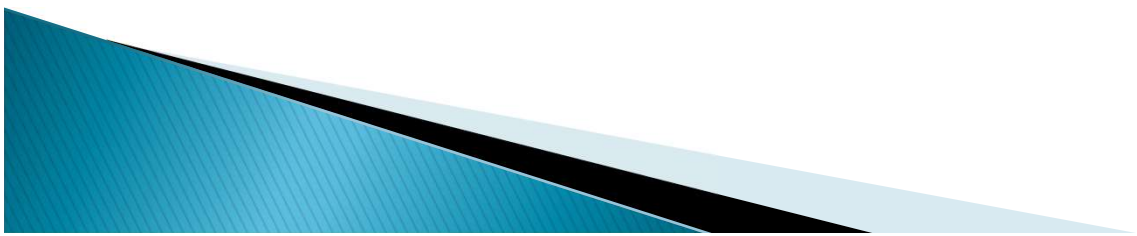
R&D Priorities of Government
with STIC Sub-categories

- Environment
  - Water: health; energy; and security
  - Cleaner methods of extracting, processes and utilizing hydrocarbon fuels, including reduced consumption of these fuels
- Natural Resources and Energy
  - Energy production in the oils sands
  - Arctic: resource production; climate change adaptation; monitoring
  - Biofuels, fuel cells and nuclear energy



R&D Priorities

- Health and Life Sciences
  - Regenerative medicine
  - Neuroscience
  - Health in an aging population
  - Biomedical engineering and medical technologies
- Information and Communication Technologies
  - New media, animation and games
  - Wireless networks and services
  - Broadband networks
  - Telecom equipment



OECD STI Outlook 2008

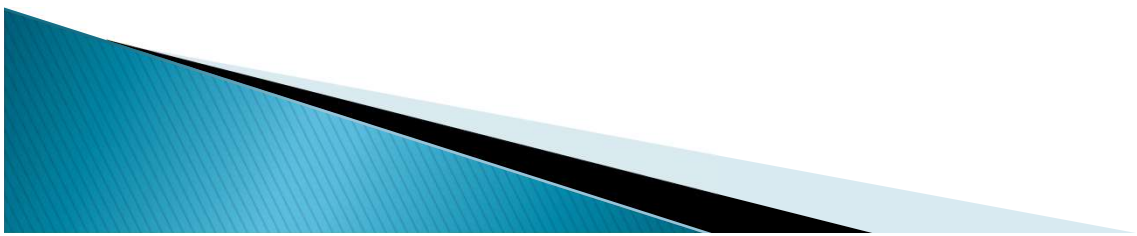
	Costs of fiscal incentives	Direct government funding of BERD
	2005 or last year available	
	% GDP	% GDP
United States	**0.04**	**0.18**
France	0.05	0.12
United Kingdom	0.05	0.09
Spain	0.03	0.08
Norway	0.06	0.07
Belgium	0.10	0.07
Australia	0.05	0.04
Ireland	0.04	0.03
Netherlands	0.07	0.03
Japan	0.12	0.03
Canada	**0.21**	**0.02**
Portugal	0.03	0.02
Mexico	0.04	0.01

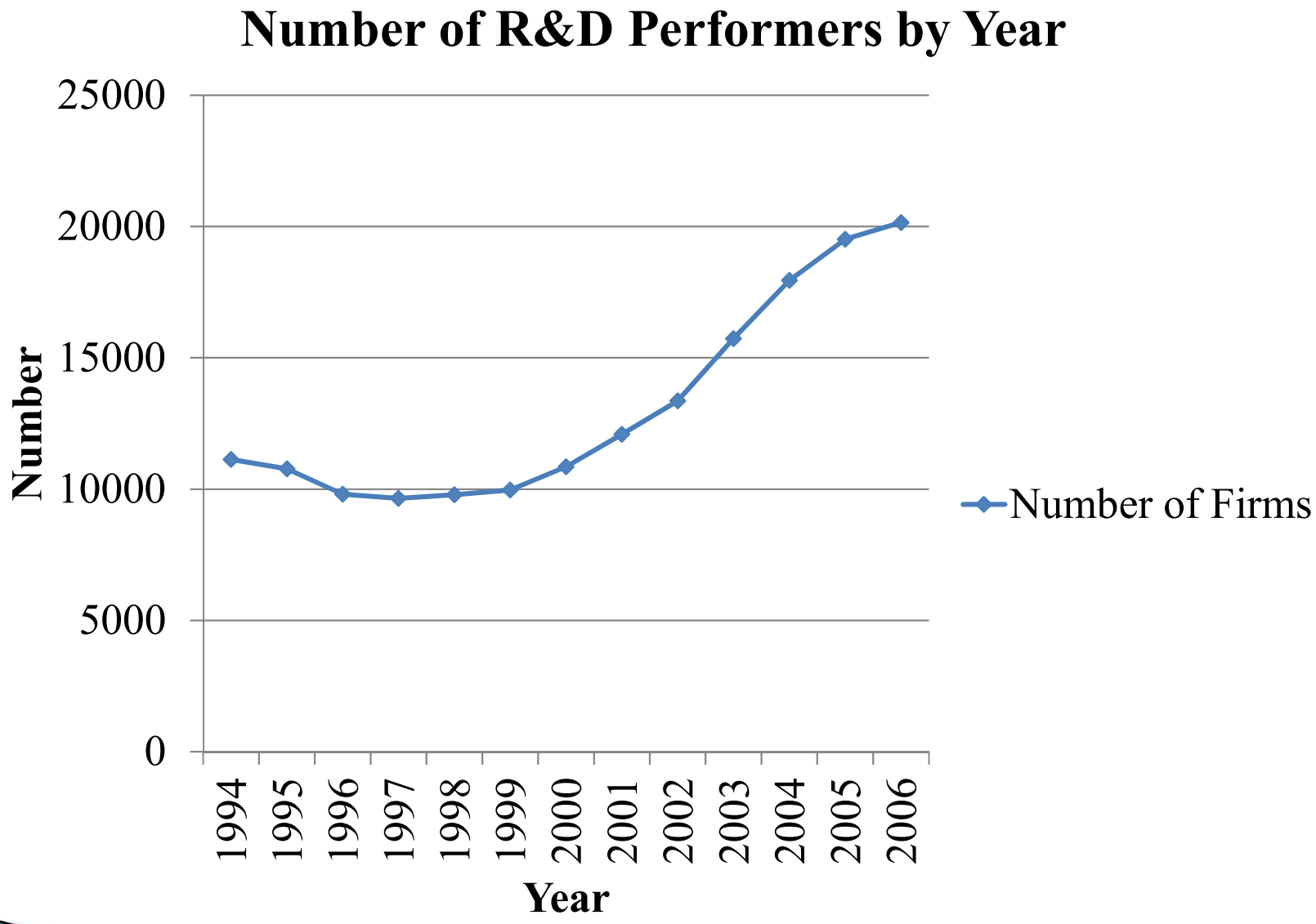
Source: OECD, based on national estimates, (NESTI R&D tax incentives questionnaire), some of which may be preliminary.

Rapid Movement

Firms Performing R&D

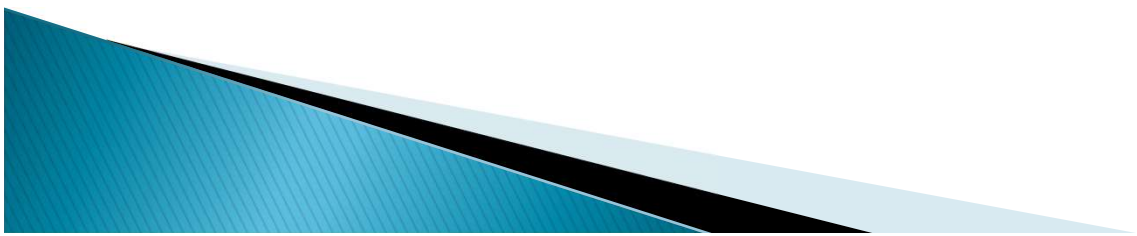
- Number of firms performing R&D in Canada
  - Doubled between 1999 and 2007
- Why?
  - Large firms collapsing and small firms appearing?
  - More firms want to do R&D?
  - More firms are discovering the SR&ED and provincial programmes?
  - Mix of all of the above?




Number of R&D Performers by Year
25000
20000
15000
10000
5000
0
Number
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
Year
Number of Firms

Questions for discussion

- Is Canada really lagging?
- Does Canada need more business R&D in
  - STIC priorities
  - Or?
- Is Canada taking advantage of the global economy?
  - R&D in niche markets
  - Value chain participation



Sources

- Gault, Fred (2010), *Innovation Strategies for a Global Economy, Development, Implementation, Measurement and Management*, Edward Elgar and IDRC
- Lynch, Kevin (2010), 'Canada's Innovation Deficit', *Policy Options*, March 2010, 30-33.
- OECD
  - (2010), *Main Science and Technology Indicators*, *2009/2*
  - (2009), *OECD Science, Technology and Industry Scoreboard 2009*
  - (2009), *Innovation in Firms, A Microeconomic Perspective*
  - (2008), *OECD Science, Technology and Industry Outlook 2008*
- The Impact Group (2005),*The Demographics of Industrial Research in Canada: 1994-2000*, Toronto: The Impact Group
- Statistics Canada
  - (2010), *Industrial Research and Development: Intentions,* 88-202
  - Schellings, Robert and Fred Gault (2006), *Size and Persistence of R&D Performance in Canadian Firms, 1994 to 2002*, Catalogue no. 88F0006XIE-No. 008, Ottawa: Statistics Canada.
  - www.statcan.gc.ca

- Gault@merit.unu.edu or Fred.Gault@OECD.org