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CANADA'S INNOVATION GAP
ESTIMATING ITS SIZE; EXPLAINING ITS CAUSES

by
Peter J. Nicholson, President
The Council of Canadian Academies

Presentation to
Socio-Economic Conference 2009
Gatineau, QC
5 May, 2009

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- Six assessments completed; two more nearing completion

$30M FEDERAL GRANT SUPPORTS CORE OPERATIONS THROUGH 2015

OUTLINE

- INTRODUCTION & SUMMARY
- MEASURING THE BUSINESS INNOVATION GAP
- INNOVATION AS BUSINESS STRATEGY
- FACTORS THAT INFLUENCE INNOVATION AS STRATEGY
- SOME BROAD PUBLIC POLICY IMPLICATIONS

INTRODUCTION

QUESTION: "If innovation is good for business, why is Canadian business less committed to innovation than most policy-makers believe it should be?"

- Panel of 18 chaired by Bob Brown – majority were senior business people but also included members from labour, academia and NGO communities.
- Panel was asked for a diagnosis, not a policy prescription
- Panel's perspective was long-term, covering many decades, so conclusions remain relevant despite current crisis
- Panel analyzed innovation as an economic process, not simply as an S&T activity

INNOVATION IS NEW OR BETTER WAYS OF DOING VALUED THINGS

REPORT IN A NUTSHELL

1. **Canada's long-standing productivity growth problem is due to weak business innovation.**

2. **Business innovation is driven by business strategy.**

3. **The productivity issue needs to be reframed to focus on the factors that influence businesses to choose – or not to choose – innovation as a key competitive strategy.**

4. **Public policy has an important role, but the primary challenge is for business to adopt innovation-oriented strategies.**

NEW PARADIGM LINKING PRODUCTIVITY, INNOVATION AND BUSINESS STRATEGY

OUTPUT, PRODUCTIVITY, INNOVATION

OUTPUT PER CAPITA GDP/Population = **GDP/Hours Worked** x Hours Worked/Population

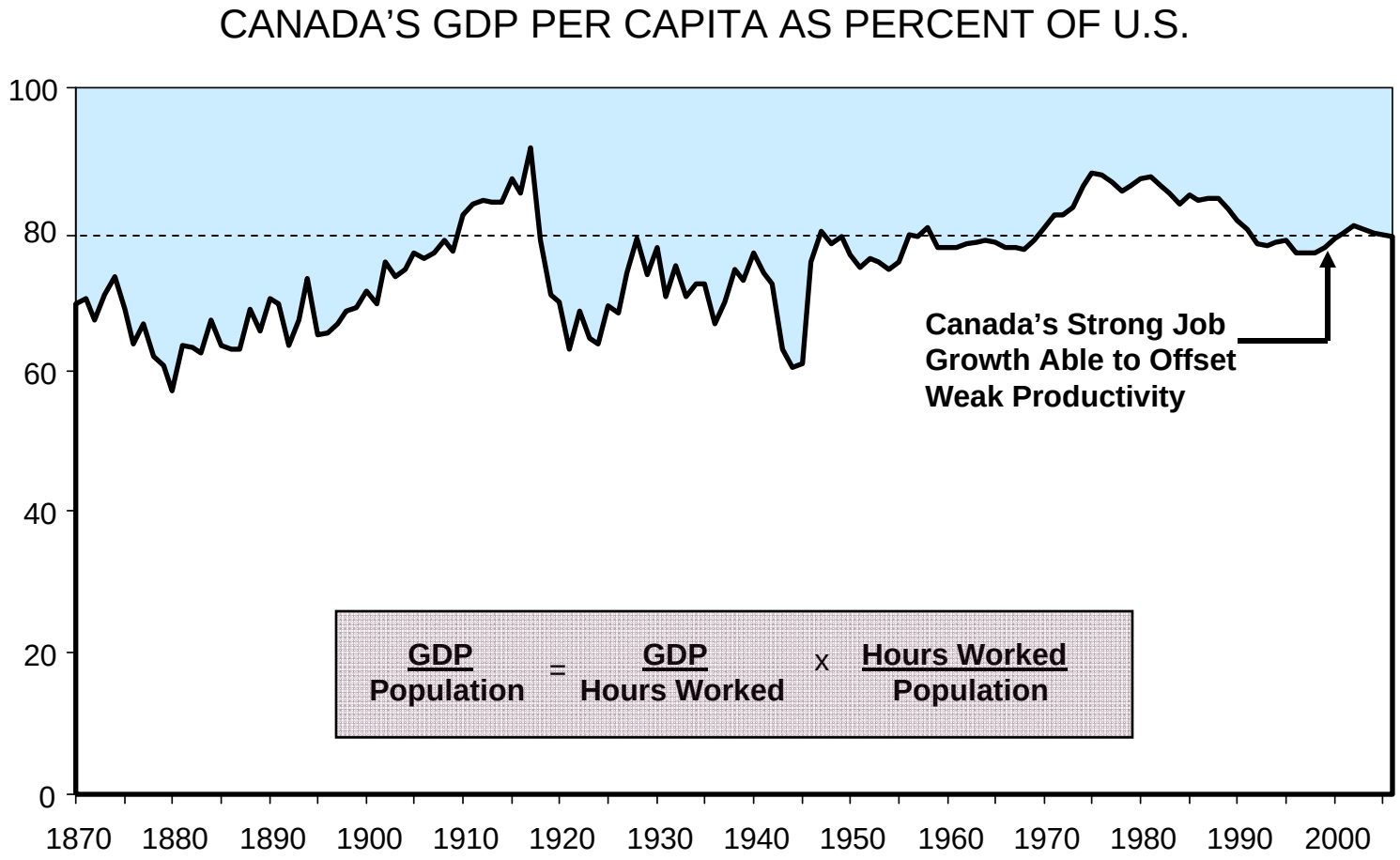
LABOUR PRODUCTIVITY Workforce Composition, **Capital Intensity, Multifactor Productivity**

INNOVATION

- **Insights of entrepreneurs**
- **Payoff from R&D**
- **Improved business models**
- **Efficient work practices**
- **Continuous improvement**
- **Application of leading-edge technology**

REPORT FOCUSES ON INNOVATION BY BUSINESS AND AS BROADLY INTERPRETED

THE U.S. – CANADA GAP IN PER CAPITA OUTPUT SINCE 1870

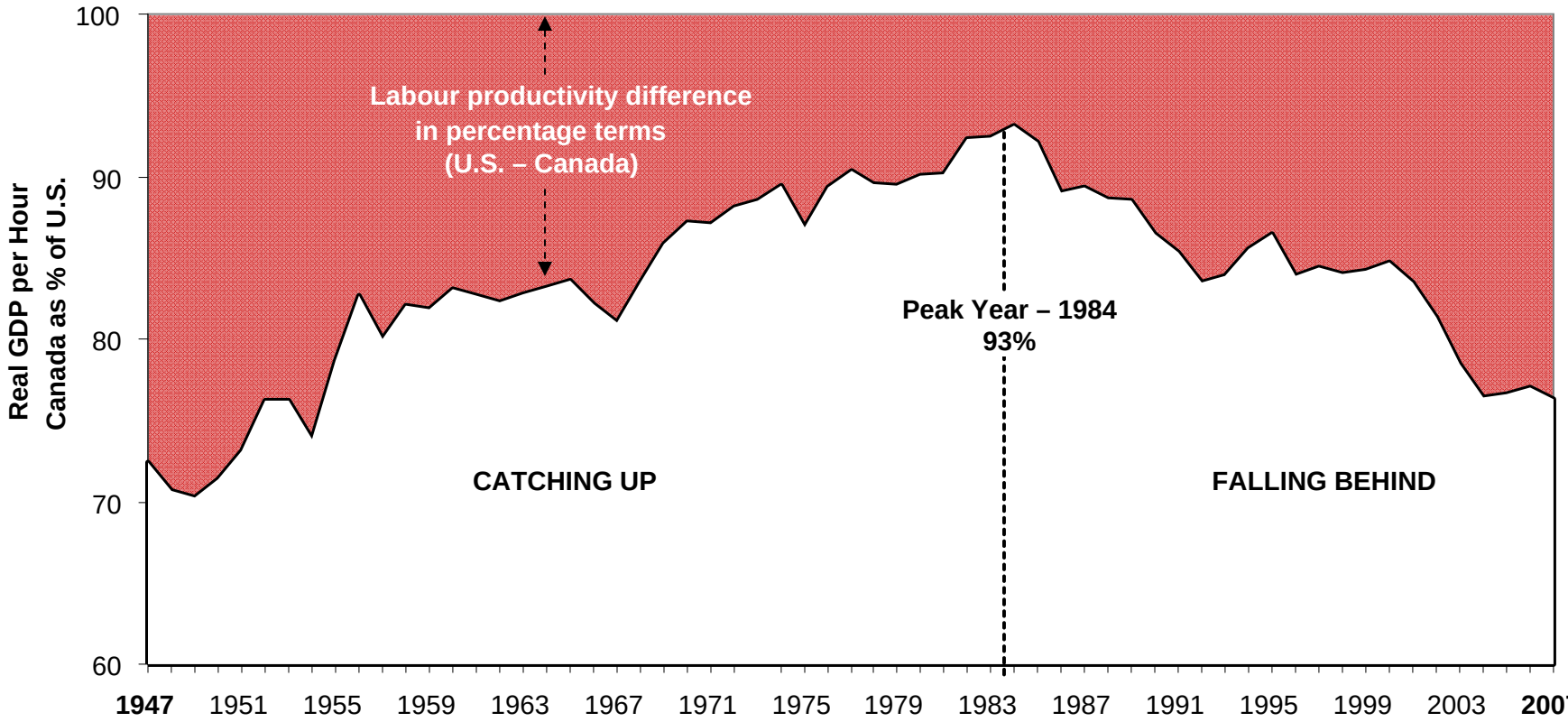


Data Sources: Conference Board & Groningen Growth and Development Centre, 2008; Maddison, 2008

ECONOMIES IN CANADA AND THE U.S. HAVE EVOLVED IN TANDEM

CANADA'S RELATIVE PRODUCTIVITY SLIDE

PRODUCTIVITY IN THE BUSINESS SECTOR - CANADA AS % OF U.S. SINCE 1947

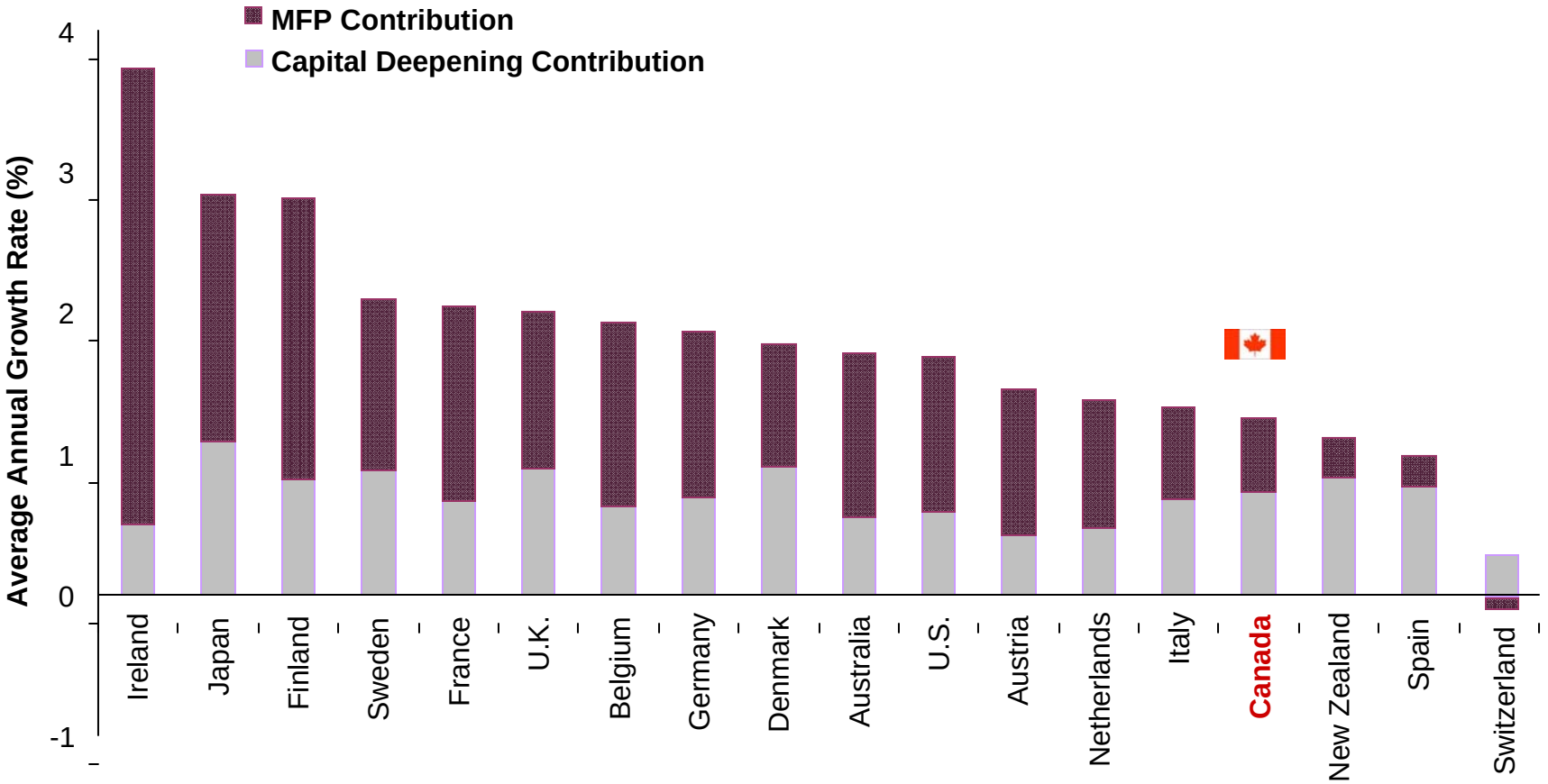


Data Source: CSLS, 2008a

CANADA'S PRODUCTIVITY GROWTH HAS ALSO LAGGED MOST OECD PEERS

CANADA'S PRODUCTIVITY GROWTH LAGS OECD PEERS

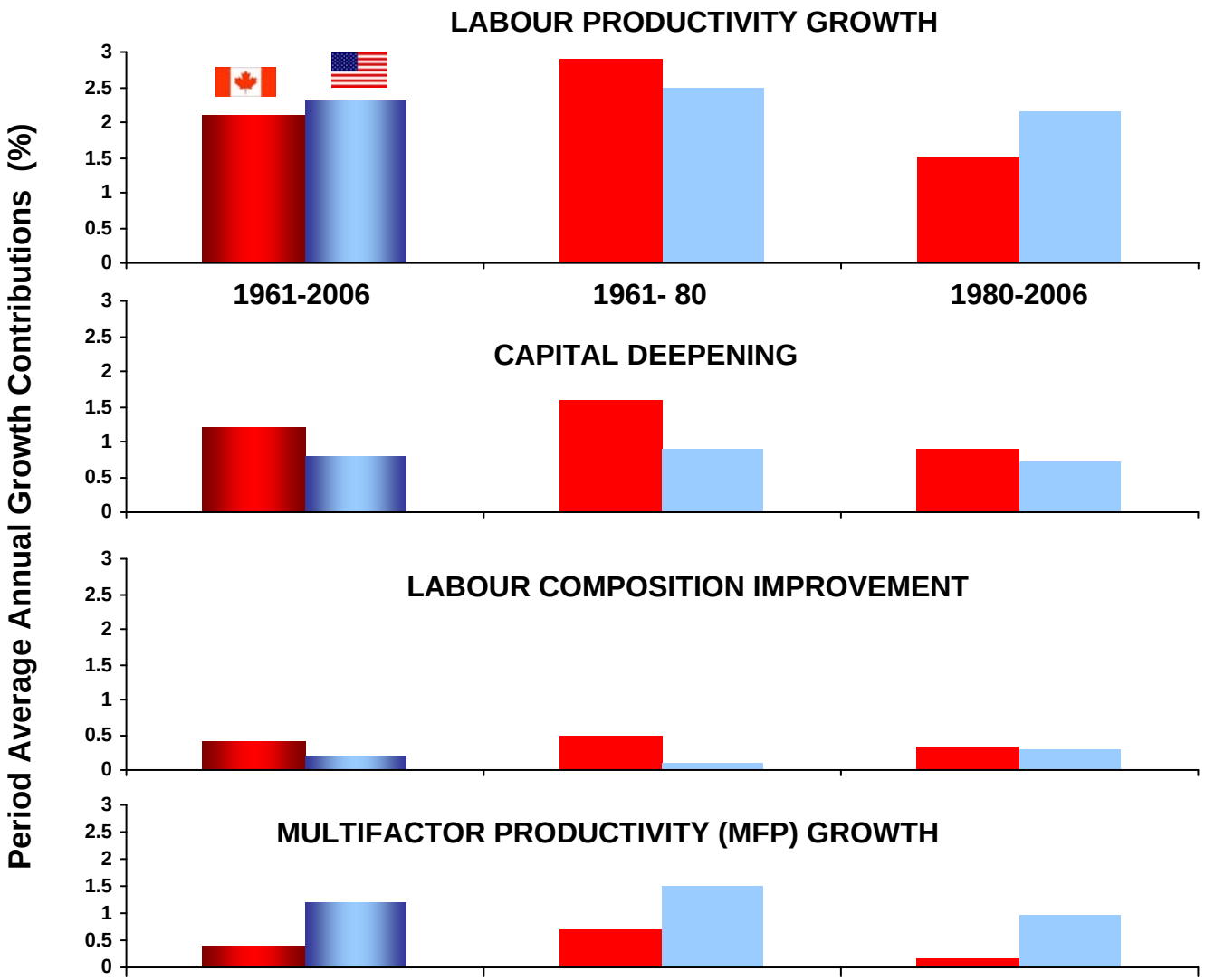
LABOUR PRODUCTIVITY GROWTH : 1985-2006



Source: OECD, 2008a

WEAK MFP GROWTH IS RESPONSIBLE FOR CANADA'S LOW RANKING

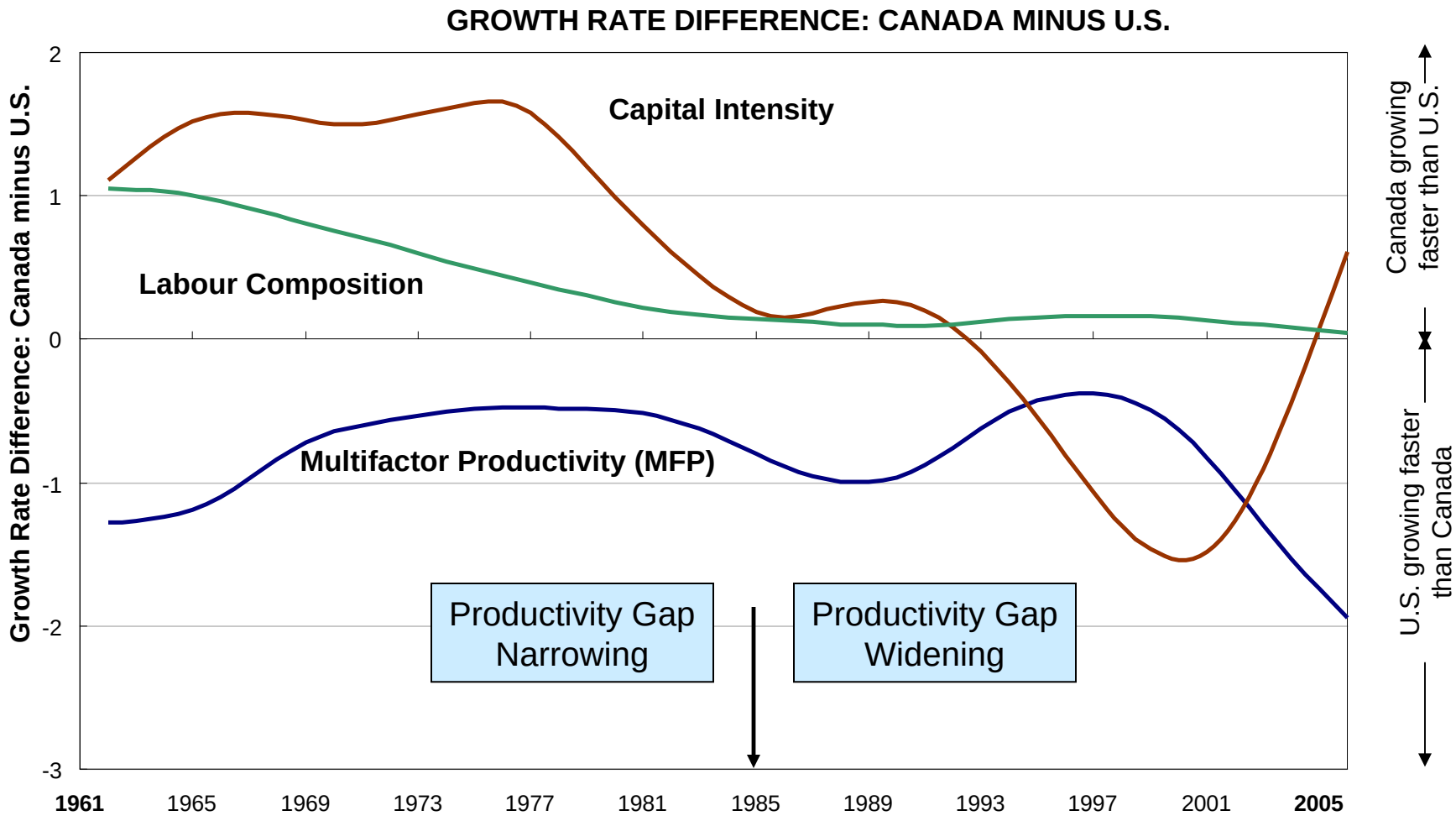
ACCOUNTING FOR PRODUCTIVITY GROWTH DIFFERENCES



Data Source: Baldwin & Gu, 2007

CANADA'S MFP GROWTH HAS LAGGED U.S. FOR AT LEAST 45 YEARS

SMOOTHED COMPONENTS OF LABOUR PRODUCTIVITY GROWTH



HP filter (Lamda = 100)

Data Source: Statistics Canada, 2007a

CAPITAL AND LABOUR QUALITY NO LONGER OFFSETTING CANADA'S WEAK MFP

WHAT IS "MULTIFACTOR PRODUCTIVITY"?

MFP = The part of GDP per Hour that is NOT explained by Capital Intensity and Workforce "Quality"

EXAMPLES OF INNOVATION-BASED MFP GROWTH:

- **Double stacking rail containers**
- **Installing a Drive-thru window in a fast food outlet**
- **Equipping a sales force with BlackBerries**

THOUSANDS OF INNOVATIONS, LARGE & SMALL, DRIVE PRODUCTIVITY GROWTH

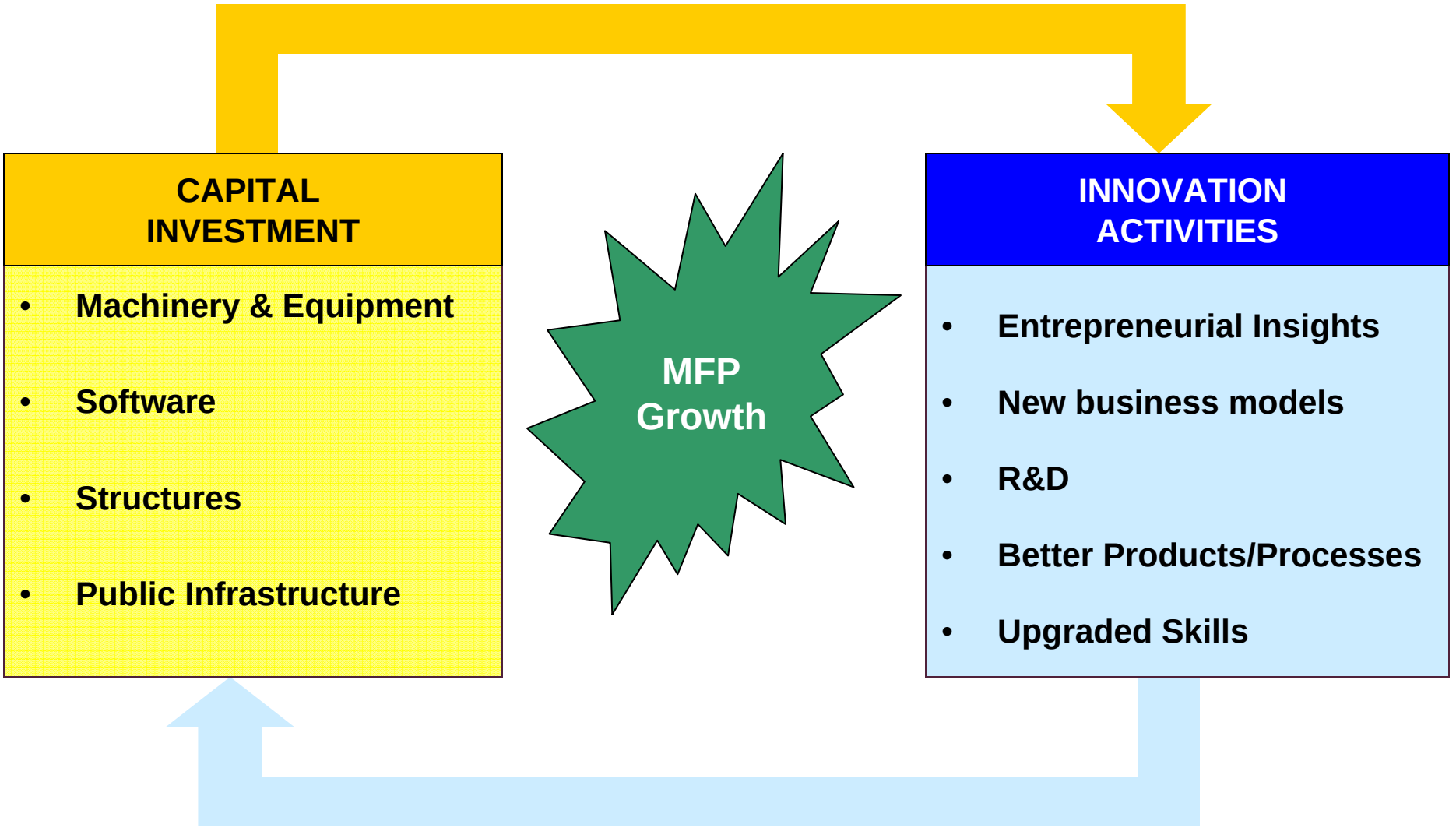
IS MFP GROWTH THE "STATISTICAL SIGNATURE" OF INNOVATION?

The innovation "signal" in MFP comes mixed with a lot of noise.

CONFOUNDING FACTORS	IMPACT ON CANADA-U.S. MFP GROWTH DIFFERENCE
❑ Economic Cycle	Averages out over 1961-2006
❑ Economies of Scale	Changes since NAFTA should have helped Canada
❑ Public Infrastructure	Effects likely to be broadly similar in U.S., Canada
❑ Slowly-varying Factors	Little impact on growth rate differences
❑ Measurement / Model Errors	Common methodology should minimize effect

LONG-RUN MFP GROWTH RATE IS A GOOD MEASURE OF BROAD INNOVATION

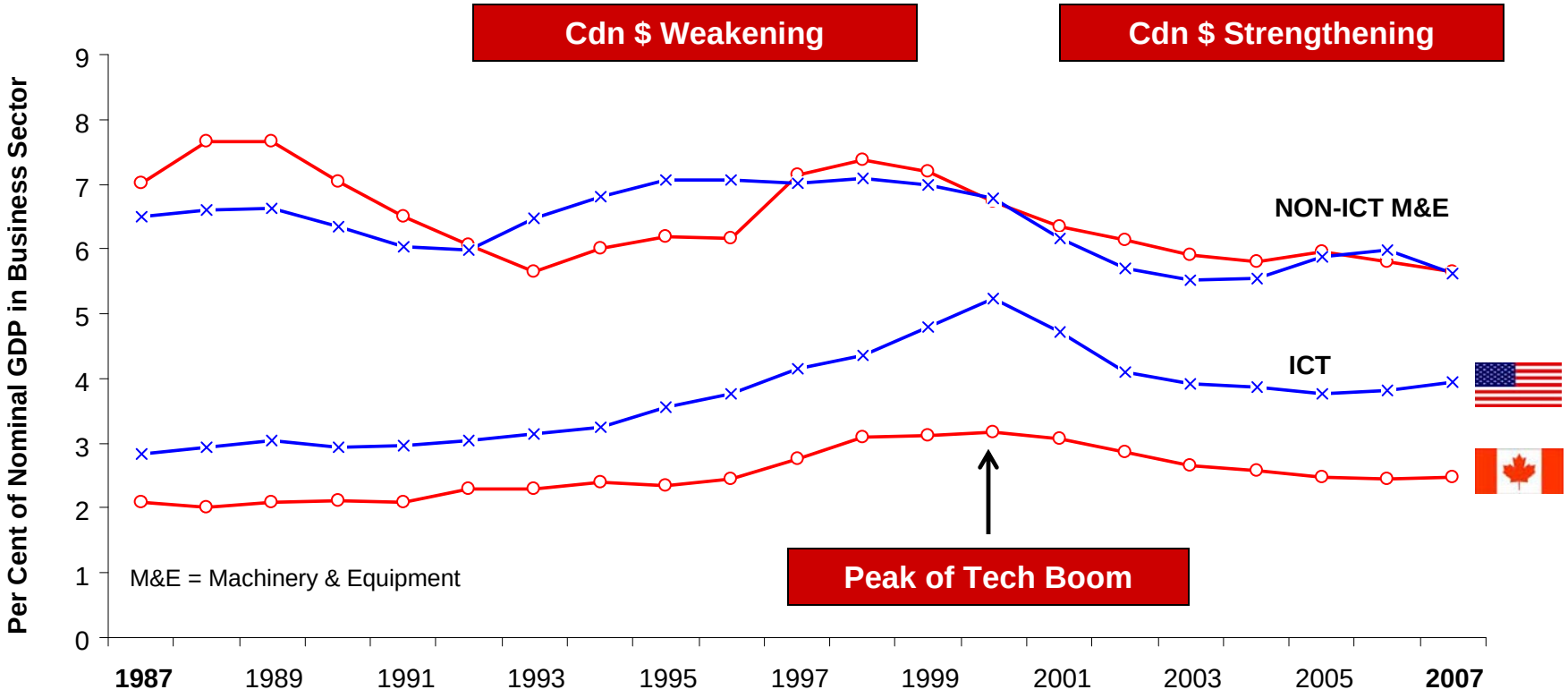
INTERACTION OF MFP AND CAPITAL INVESTMENT



DISTINCTION BETWEEN MFP GROWTH AND CAPITAL DEEPENING IS SOMEWHAT ARTIFICIAL

ICT DRIVES U.S.-CANADA INVESTMENT GAP

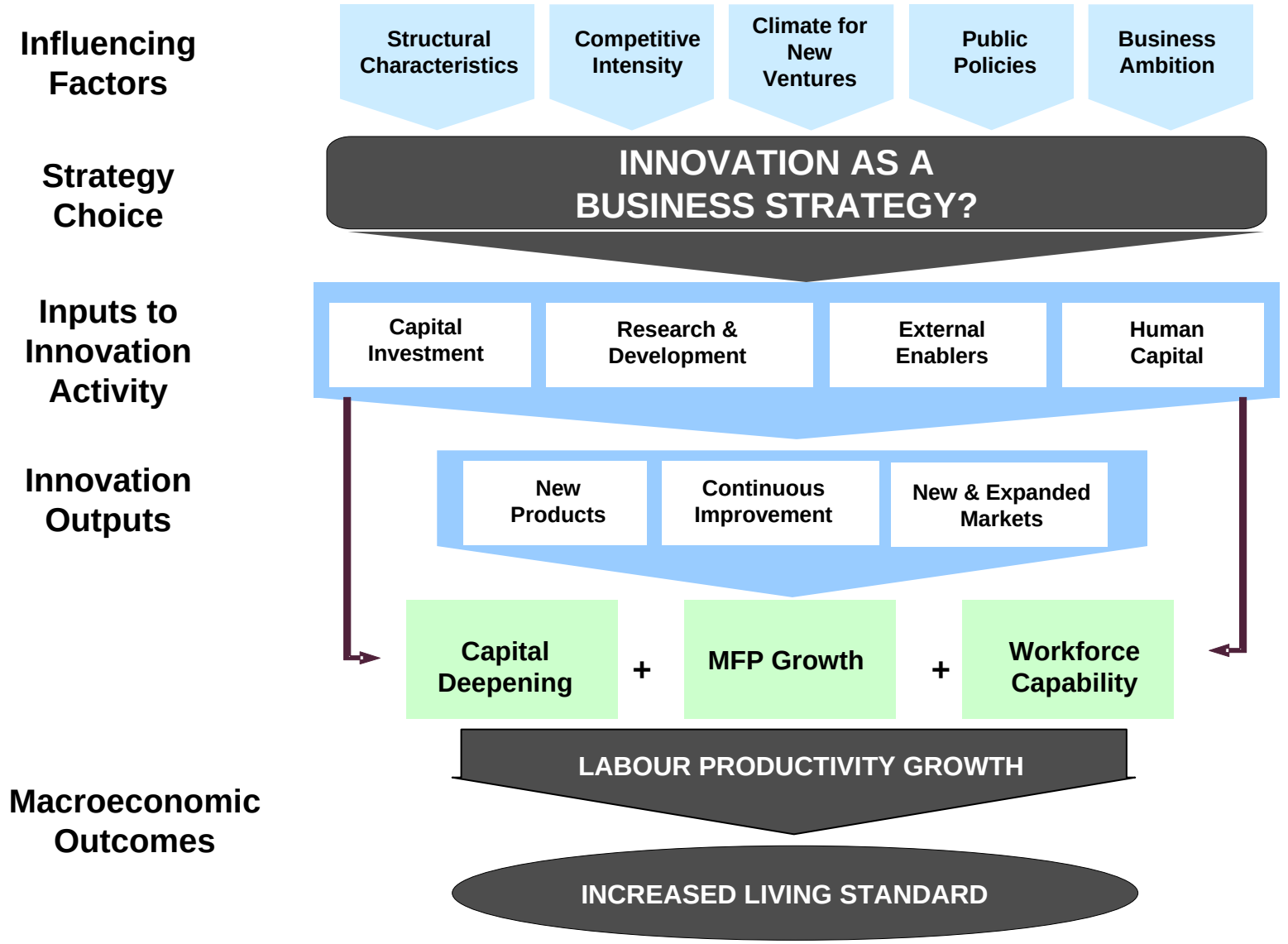
M&E ANNUAL INVESTMENT INTENSITY SINCE 1987



Data Source: CSLS, 2008b

ICT HAS BEEN A KEY DRIVER OF MFP & PRODUCTIVITY GROWTH IN U.S.

INNOVATION THROUGH THE LENS OF BUSINESS STRATEGY



REFRAMING THE ANALYSIS OF CANADA'S WEAK PRODUCTIVITY GROWTH

ROOTS OF CANADA'S INNOVATION WEAKNESS

"UPSTREAM" ROLE IN NORTH AMERICAN VALUE CHAINS

Comparative advantage and history imply:

- Commodity supplier
- Little contact with "end customer"
- Foreign control in many tech- intensive sectors
- Comfortable and profitable niche in North America

SMALL AND FRAGMENTED DOMESTIC MARKET

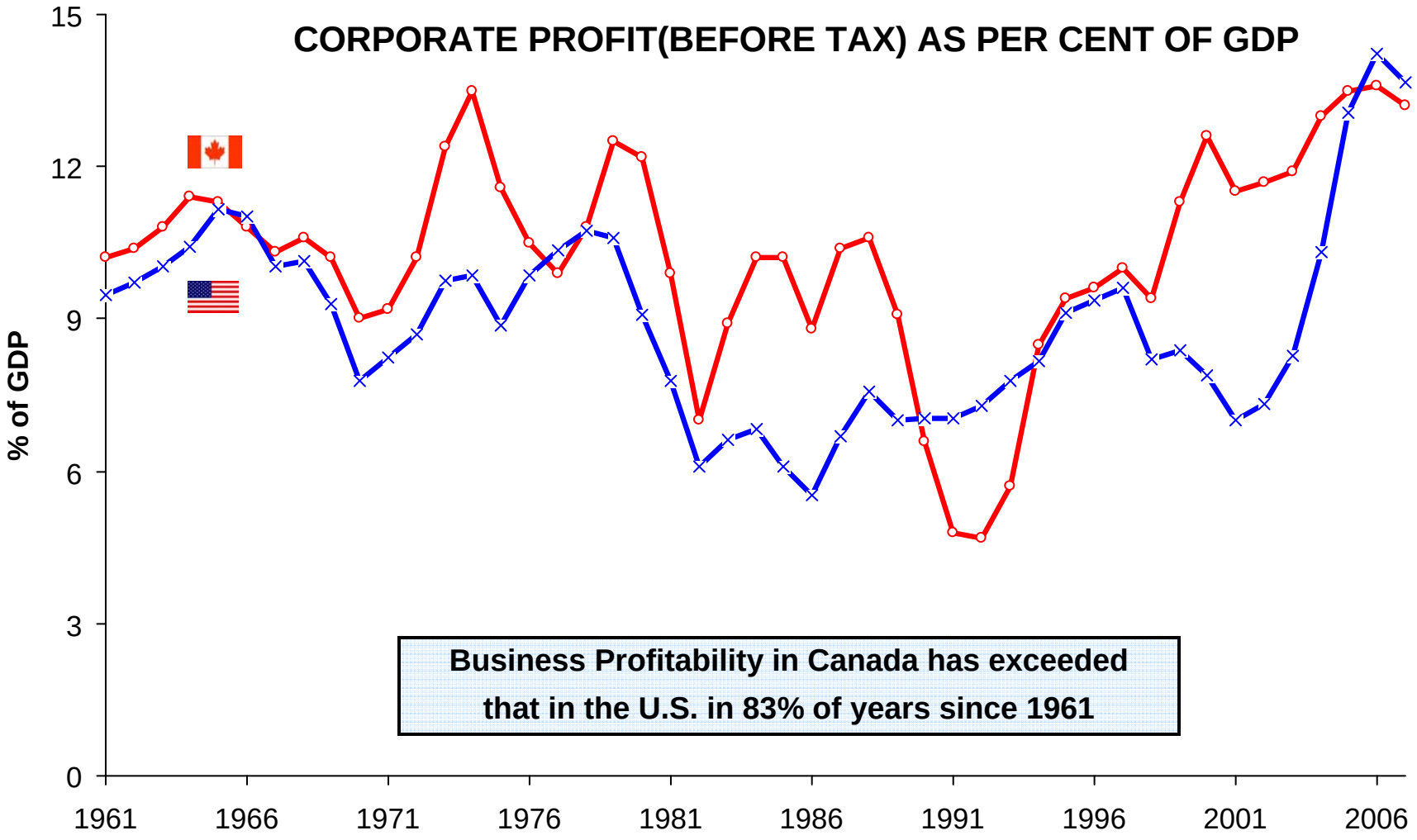
Smaller markets tend to provide:

- Less reward for innovation risk
- Less attraction for competitors from the outside, and thus . . .
- Less pressure to innovate

But success of Finland and Sweden shows importance of innovation-driven export focus

CANADIAN BUSINESS HAS ADAPTED PROFITABLY TO THESE CONDITIONS

BUSINESS PROFIT HEALTHY DESPITE WEAK INNOVATION



Data Source: Statistics Canada, 2007

STRONG AVERAGE PROFITABILITY TENDS TO CONFIRM STATUS QUO STRATEGY

KEY FACTORS THAT INFLUENCE INNOVATION STRATEGY CHOICE

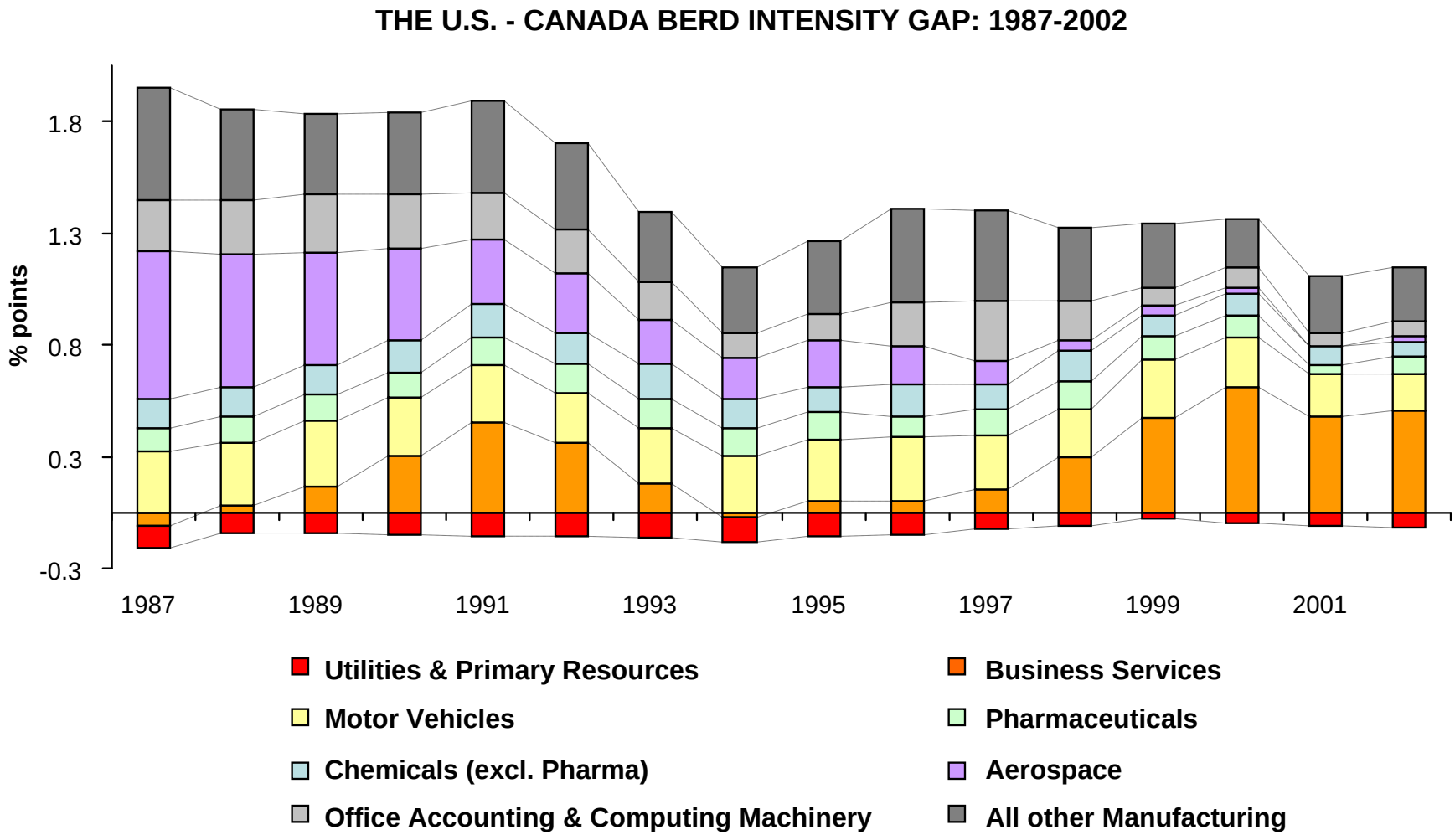
- **STRUCTURAL CHARACTERISTICS**
- COMPETITIVE INTENSITY
- CLIMATE FOR NEW VENTURES
- PUBLIC POLICIES
- BUSINESS AMBITION

Analyzed in Context of R&D

- **Sector Mix**
- **Foreign Ownership**
- **Firm Size Distribution**

INNOVATION ANALYSIS CONVENTIONALLY FOCUSES ON STRUCTURE AND R&D GAPS

SECTORAL EVOLUTION OF THE U.S.-CANADA R&D GAP

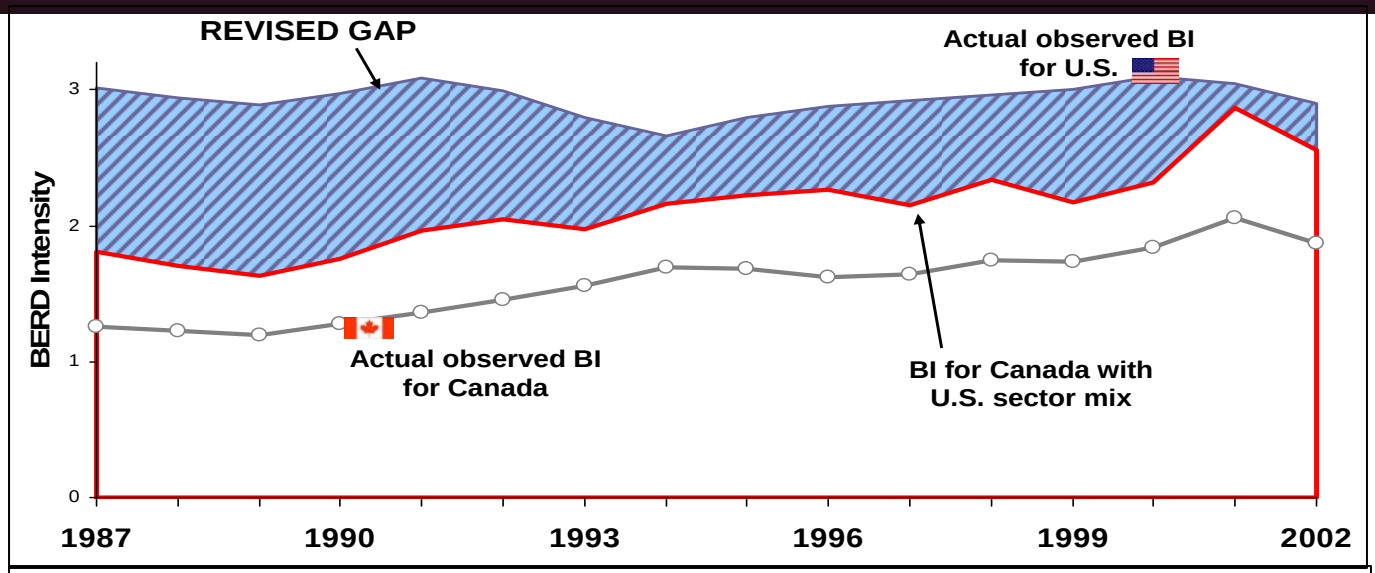


Data Source: Panel calculations based on OECD's STAN database

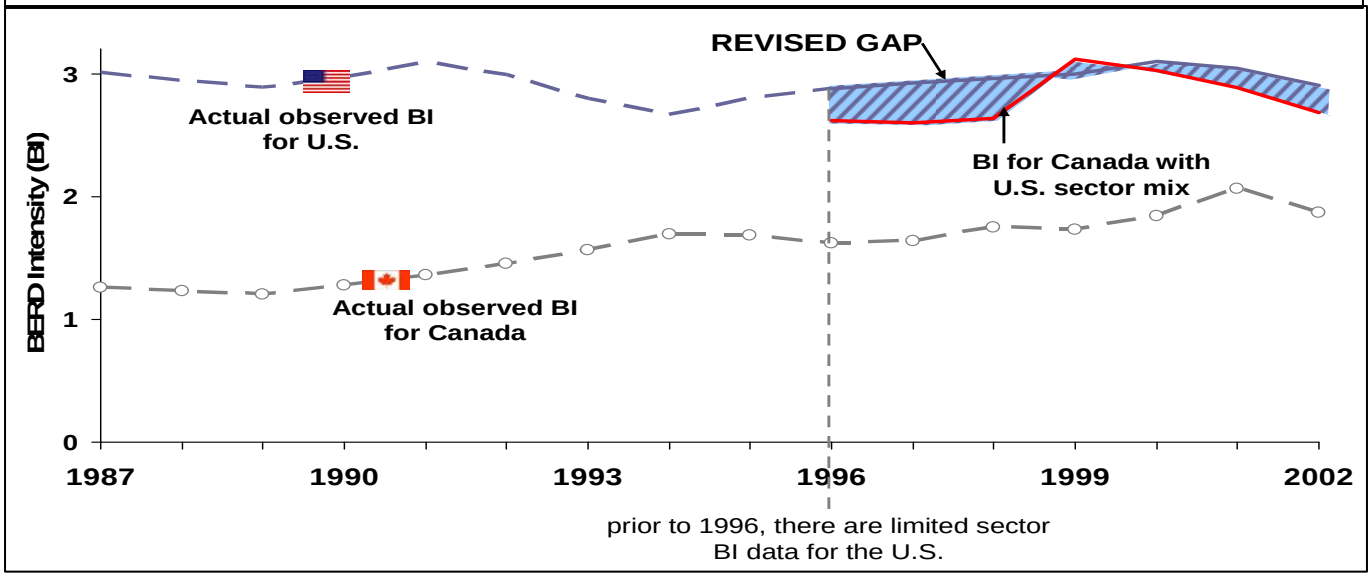
GAP HAS NARROWED FOR MANUFACTURING BUT GROWN FOR SERVICES

"MIX" & "INTENSITY" EFFECTS ON THE R&D GAP

GAP IF CANADA HAD U.S. SECTOR WEIGHTS



GAP IF CANADA HAD U.S. SECTOR R&D INTENSITY

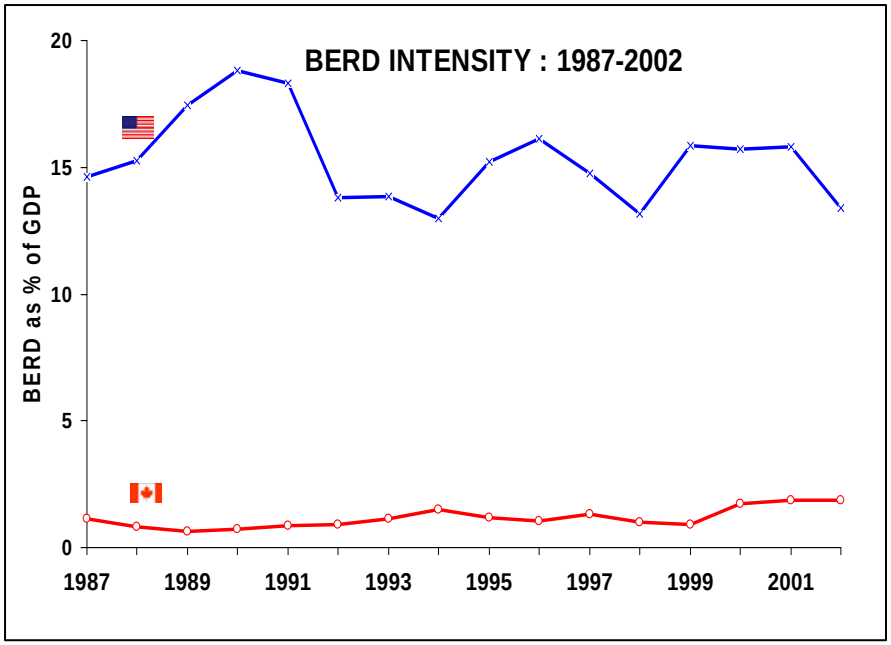


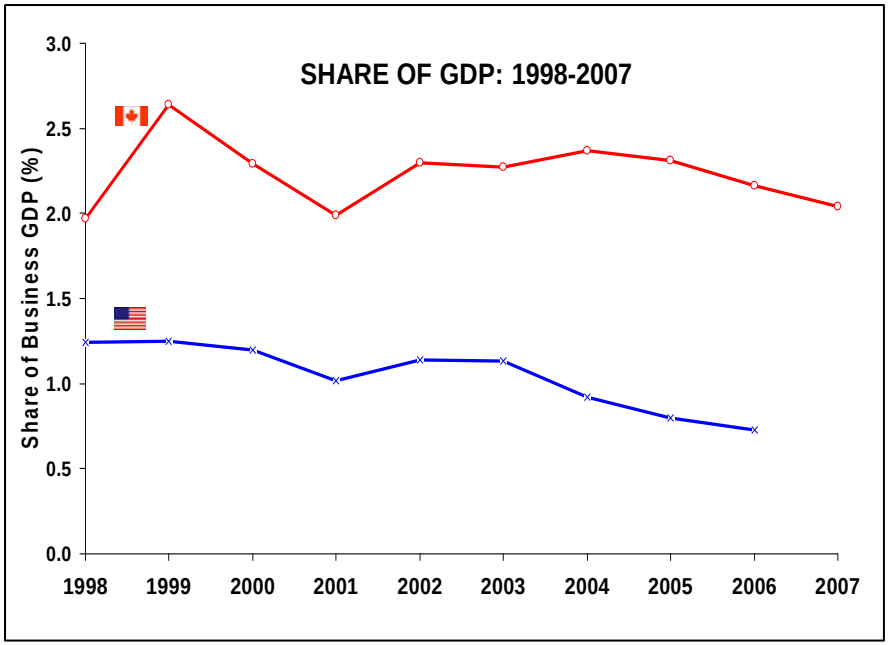
Data Source: Panel Calculations based on OECD STAN Database

LOWER R&D SECTOR INTENSITY IN CANADA EXPLAINS MOST OF THE GAP

IMPACT OF FOREIGN OWNERSHIP (I)

R&D AND OUTPUT SHARES IN THE AUTO INDUSTRY



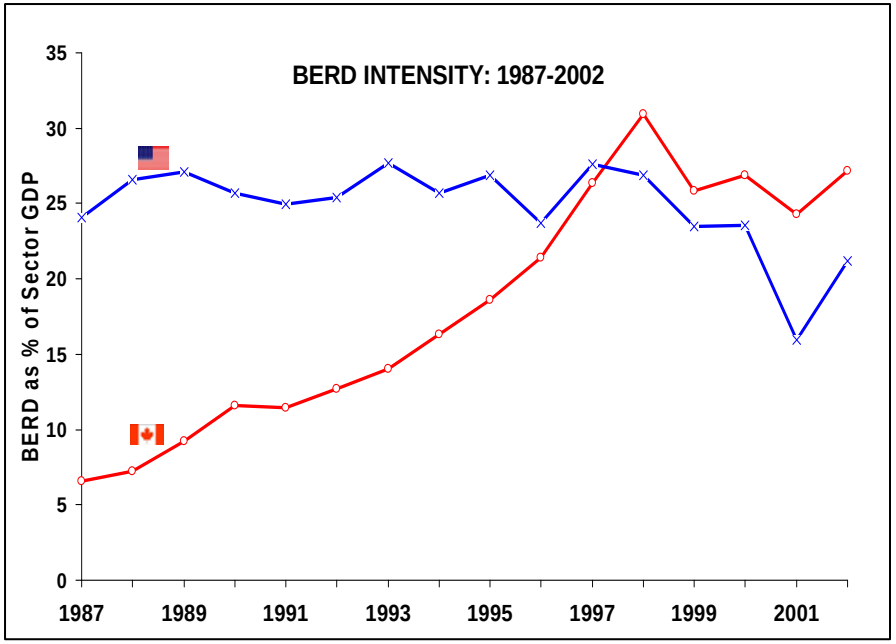


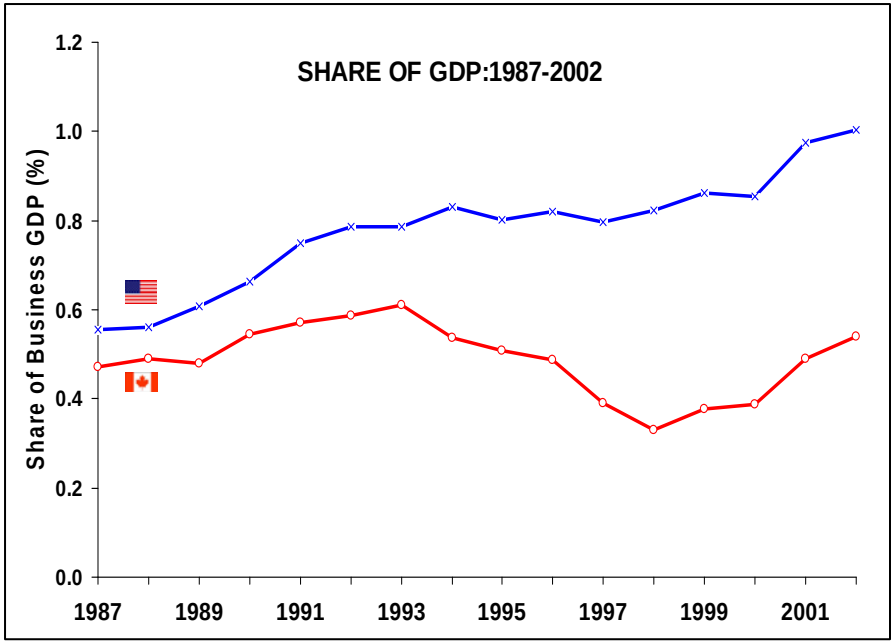
Data Source: OECD, 2008b

AUTOMOTIVE PRODUCTIVITY HIGH IN CANADA DESPITE LOW R&D

IMPACT OF FOREIGN OWNERSHIP (II)

R&D AND OUTPUT SHARES IN PHARMACEUTICALS

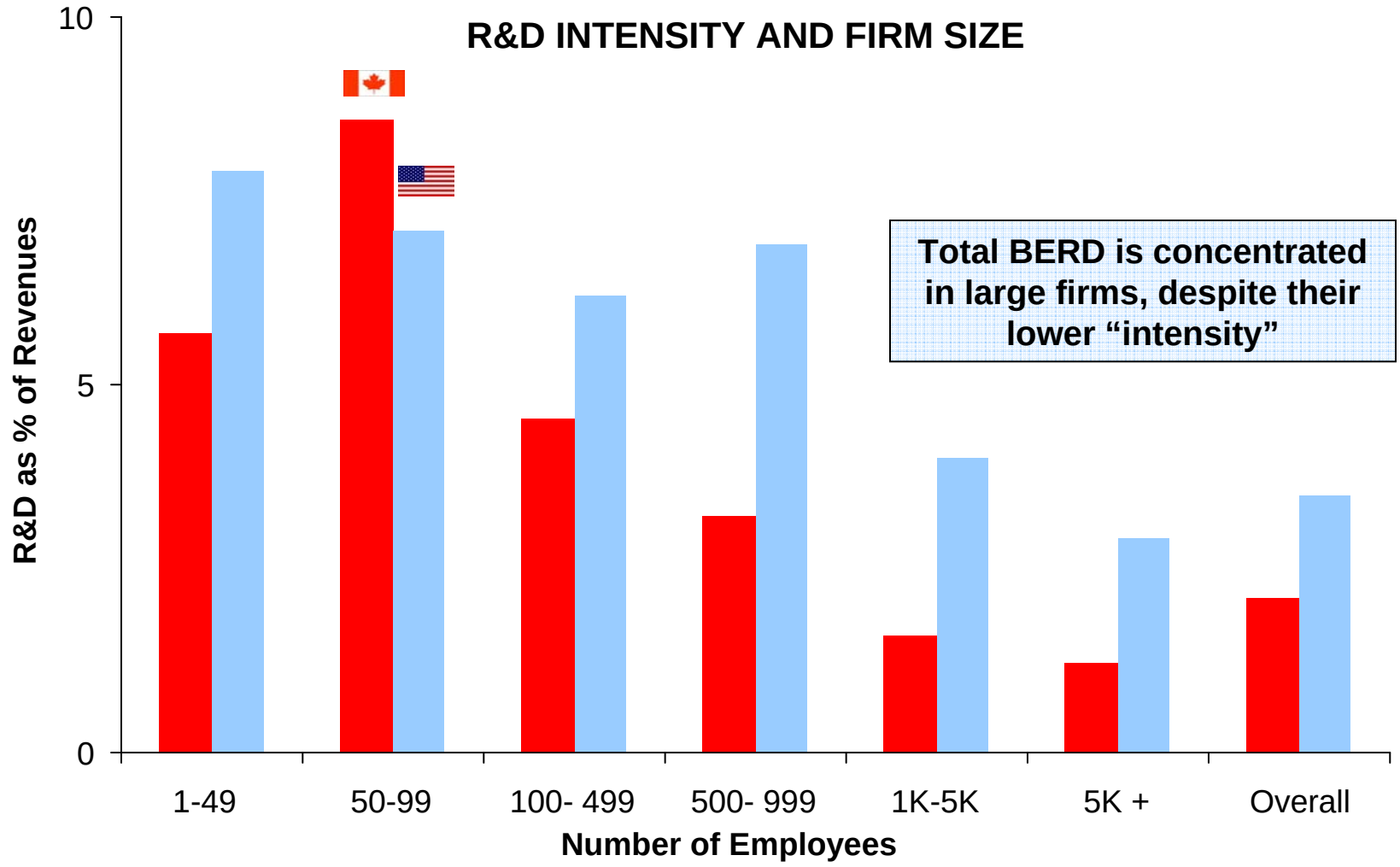




Data Source: OECD, 2008b

HIGH R&D IN CANADA HAS NOT PRODUCED STRONG OUTPUT GROWTH

FIRM SIZE DISTRIBUTION AND THE R&D GAP



Data Sources: Statistics Canada, 2006

U.S.-CANADA R&D GAP IS CONCENTRATED IN LARGEST COMPANIES

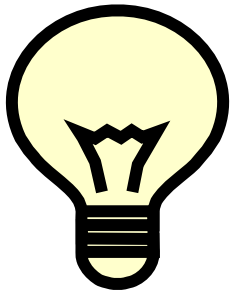
KEY FACTORS THAT INFLUENCE INNOVATION STRATEGY CHOICE

- STRUCTURAL CHARACTERISTICS
- **COMPETITIVE INTENSITY**
  - **Competition spurs innovation**
  - **Small markets less attractive to competitors**
  - **Export vs domestic markets**
  - **Regulation**
- CLIMATE FOR NEW VENTURES
- PUBLIC POLICIES
- BUSINESS AMBITION

KEY FACTORS THAT INFLUENCE INNOVATION STRATEGY CHOICE

- STRUCTURAL CHARACTERISTICS
- COMPETITIVE INTENSITY
- **CLIMATE FOR NEW VENTURES**
  - **Early-stage financing**
  - **Innovation from university research**
  - **Geographic clusters**
- PUBLIC POLICIES
- BUSINESS AMBITION

MULTI-STAGE FINANCING OF NEW VENTURES



"Valley of Death"

Family & Friends

Angel Investors & Mentors

Multi-Stage Venture Capital

Buy Out

Go Public

Lots of Canadian early-stage start-ups

Critical shortage of successful tech entrepreneurs (except in ICT)

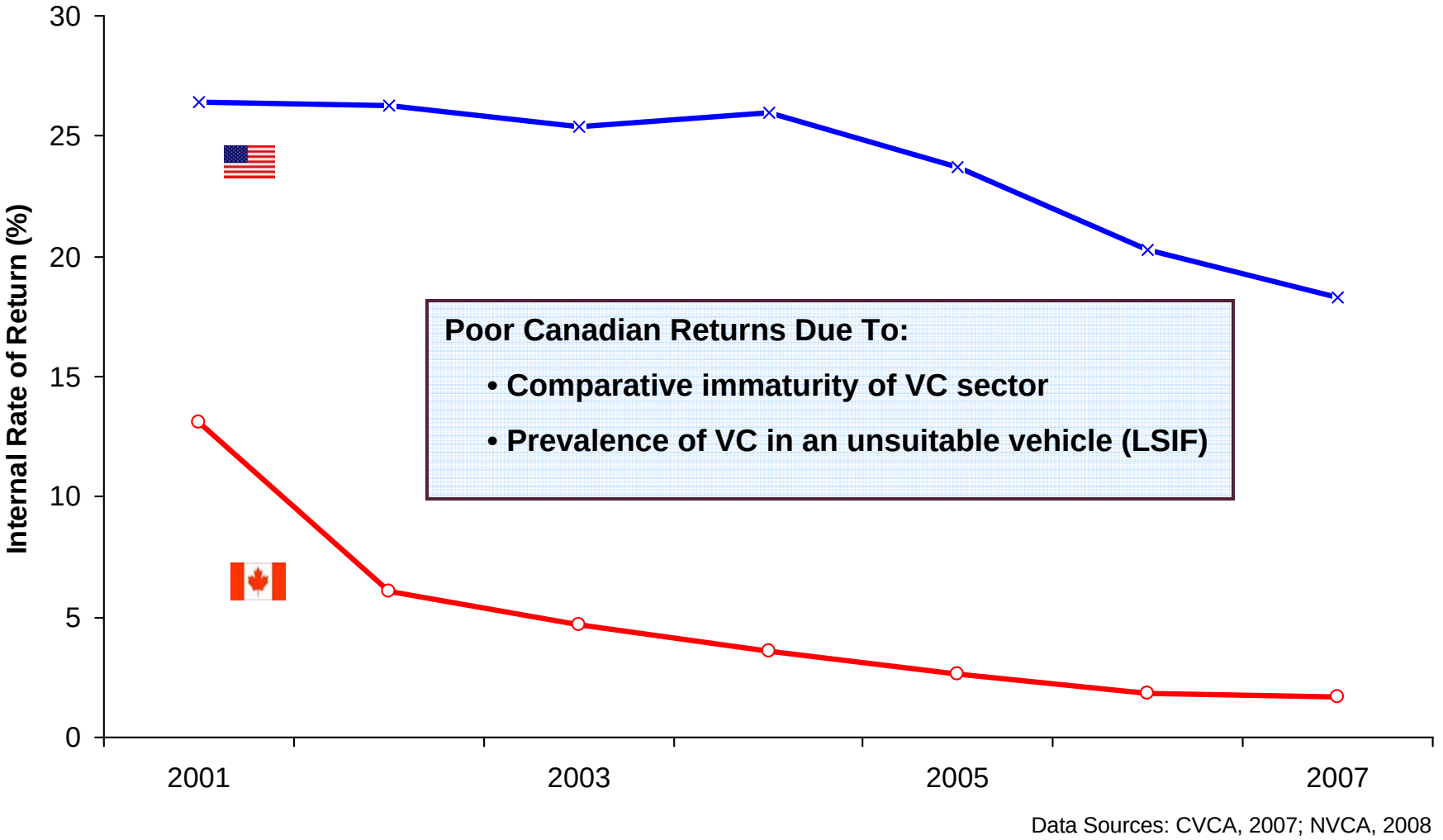
VC in Canada tends to be small, lacking tech experience

Too few firms grow to sustainable scale in Canada

SUCCESS CREATES 'ANGELS' WHO THEN HELP GENERATE MORE SUCCESS

AVERAGE RETURNS ON VC IN CANADA NOT COMPETITIVE

VENTURE CAPITAL PERFORMANCE – NET RETURN ON PREVIOUS 10 YEARS



Data Sources: CVCA, 2007; NVCA, 2008

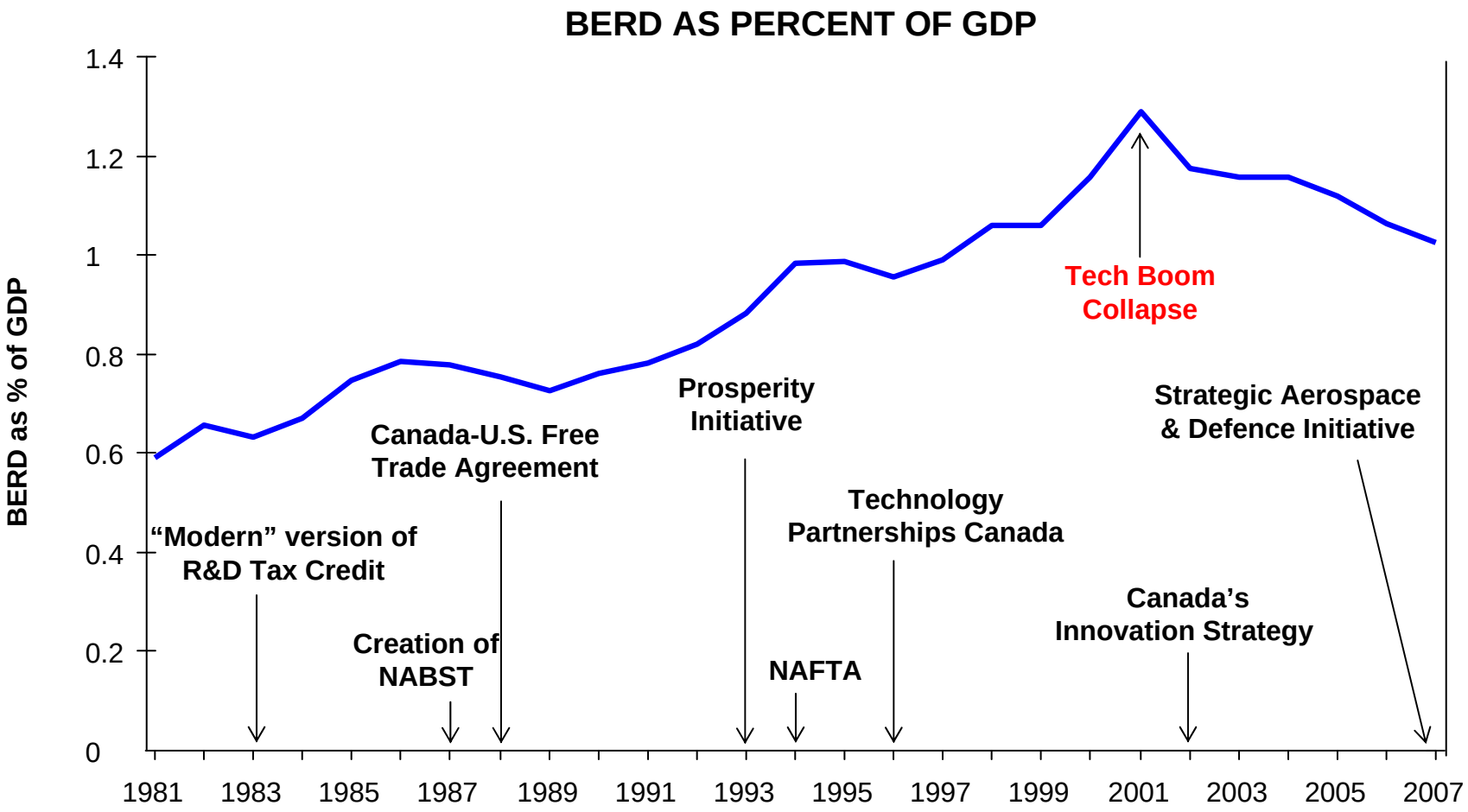
NO QUICK FIX, BUT MARKET PEFORMANCE WILL BE THE SUCCESS CRITERION

KEY FACTORS THAT INFLUENCE INNOVATION STRATEGY CHOICE

- STRUCTURAL CHARACTERISTICS
- COMPETITIVE INTENSITY
- CLIMATE FOR NEW VENTURES
- **PUBLIC POLICIES**
- BUSINESS AMBITION

- **Macroeconomic Policies**
- **Human Capital**
- **Trade Liberalization**
- **Regulation**
- **Taxation (esp. SR&ED)**
- **Sector Strategies**
- **OECD "Menu"**

THE MACRO CONTEXT FOR BUSINESS EXPENDITURE ON R&D

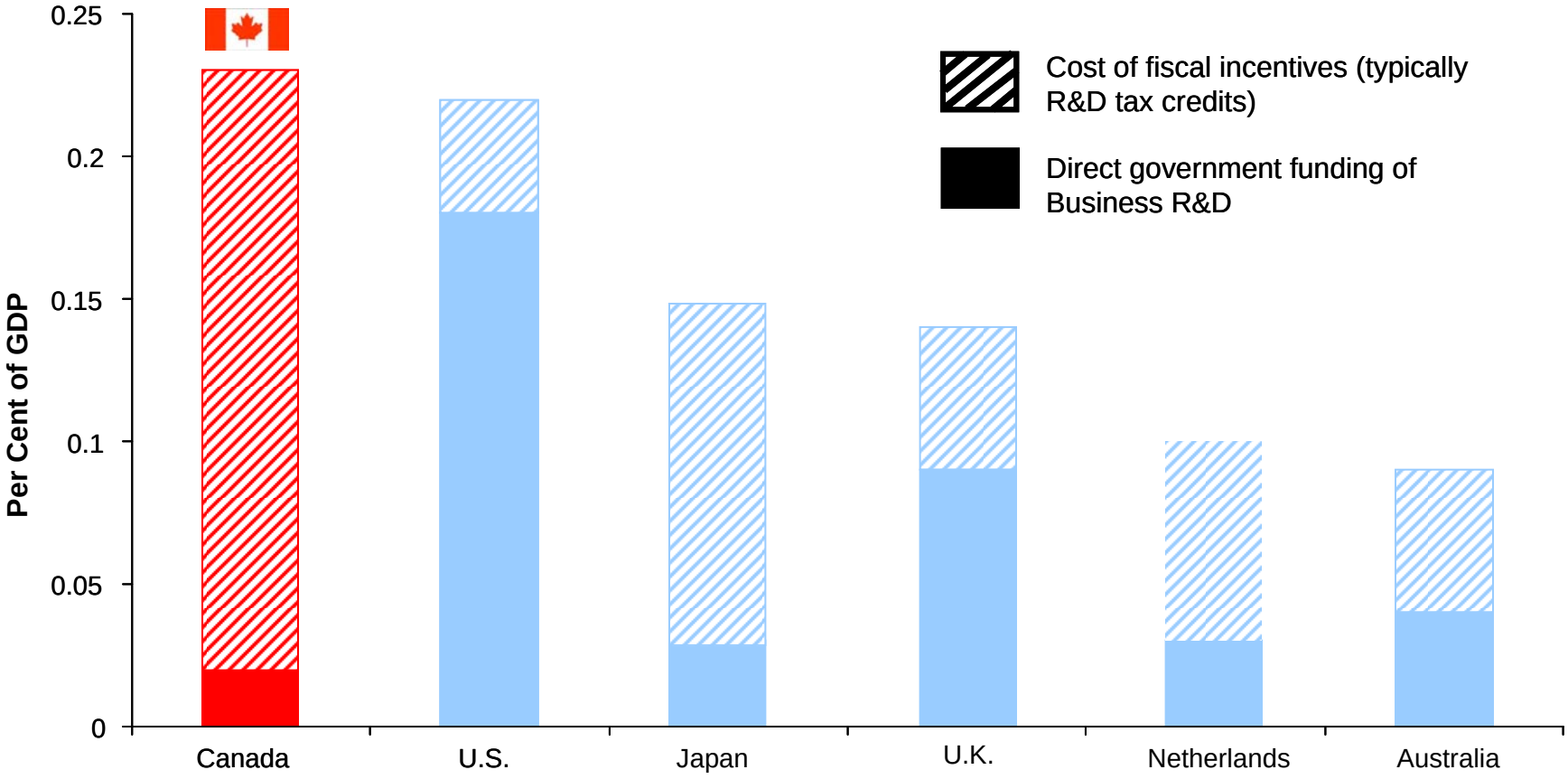


Data Source: OECD, 2008c

ONLY THE TECH BOOM / COLLAPSE HAS HAD MAJOR IMPACT

GOVERNMENT FUNDING OF BUSINESS R&D

(2005 OR LATEST YEAR)



Data Source: OECD, 2008d

CANADA IS AN 'OUTLIER' IN TERMS OF RELIANCE ON TAX-BASED INCENTIVES

INNOVATION POLICY - SUMMARY

- Canada has implemented most of the productivity-enhancing measures recommended as a result of OECD analysis.

- Business taxes – especially on capital – have been high, but are now competitive and declining.

- SR&ED tax credit - $4B incentive in 2007 – is among world's richest and is by far the largest program of government support for innovation.

- Concerted national strategy to "back winners" is difficult – not simply because governments have not been good at picking winners, or dropping losers – but because of Canada's diverse and regionally-oriented political economy works against concerted action.

CANADA'S INNOVATION POLICIES HAVE RELIED PRINCIPALLY ON MARKET FORCES

KEY FACTORS THAT INFLUENCE INNOVATION STRATEGY CHOICE

- STRUCTURAL CHARACTERISTICS
- COMPETITIVE INTENSITY
- CLIMATE FOR NEW VENTURES
- PUBLIC POLICIES
- **BUSINESS AMBITION**

INTANGIBLES OF "BUSINESS CULTURE" IS THE RESIDUAL FACTOR

DOES CANADIAN BUSINESS LACK "AMBITION"?

Why might Canadian businesses be less ambitious than the Americans?

- **Arguments often advanced include:**
  - **Canada's historical dependence on foreign initiative**
  - **Less competition in Canada's domestic market**
  - **Canadian priorities / values are less commercially focused**

- **The issue is hotly debated:**
  - **Are Canadian and U.S. "attitudes" all that different?**
  - **Most panelists believed that business ambition was a key differentiator.**

- **Evidence is largely anecdotal based on experience of those who have worked in both U.S. and Canada.**

MANY INTERNATIONAL SUCCESS DEMONSTRATE CANADA'S INNOVATIVE POTENTIAL

NEW FACTORS AT PLAY FOR CANADA

RESOURCE DEPENDENCE

- Volatile
- Unevenly-distributed
- Environmentally-challenged

US MARKET

- Increasing vulnerability of access
  - Protectionism
  - National security

EMERGING MARKETS

- Where the BIG growth will be
- Increasingly sophisticated competitors
- Broad spectrum of opportunities

NEW BUSINESS LEADERS

- Less captives of old mindset
- More at home in the world

CHALLENGES AND OPPORTUNITIES SHOULD MOTIVATE INNOVATIVE RESPONSES

SECTOR "CASE STUDIES" OF BUSINESS INNOVATION

There is no one-size-fits-all solution to the innovation puzzle.

- **AUTO SECTOR:** "Weak R&D But Strong Productivity"
- **LIFE SCIENCES:** "Great Promise – Mixed Results"
- **BANKING:** "Balancing Stability vs Radical Innovation"
- **ICT:** "A Catalytic Role for Government"

GOVERNMENT NEEDS TO (RE)DEVELOP DEEP SECTOR EXPERTISE

BROAD POLICY IMPLICATIONS OF THE ANALYSIS

- **TECHNOLOGY INVESTMENT –** Encourage investment in advanced M&E and ICT in particular

- **COMPETITION & EXPORTS –** Increase exposure to competition and promote an export orientation, especially “downstream” in value chains.

- **NEW VENTURES –** Focus on early-stage financing and generation of potential “angels” to be investors and mentors.

- **BACKING OPPORTUNITIES –** Develop sector strategies to catalyze areas of opportunity.

- **DEEPER UNDERSTANDING –** Increase support for Statcan’s leading-edge work on innovation and productivity.

BOTTOM LINE: NEED TO GET BUSINESS STRATEGY FOCUSED ON INNOVATION

EXPERT PANEL ON BUSINESS INNOVATION

BUSINESS	Robert Brown (Chair)	CAE; Bombardier*, Montreal
Services	Guthrie Stewart	Edgestone Capital*, Montreal
	John Thompson	TD Bank, IBM*, Toronto
ICT	Savvas Chamberlain	DALSA, Waterloo
	Brian McFadden	Prestige Telecom; Nortel*, Montreal
	Jim Roche	CMC*; Tundra Semiconductor*, Ottawa
	Alexandre Taillefer	Stingray Digital, Montreal
Life Sciences	Nathalie Dakers	CDRD (at UBC), Vancouver
	André Marcheterre	Merck-Frosst*, Montreal
Resources	Walter Mylnaryk	Kruger Inc., Montreal
	Charles Ruigrok	Syncrude*, Calgary
Consulting	Marcel Côté	SECOR, Montreal
	David Pecaut	The Boston Consulting Group, Toronto
LABOUR	Jim Stanford	CAW, Toronto
NGO	Andrew Sharpe	CSLS, Ottawa
ACADEMIC	Meric Gertler	University of Toronto
	Bronwyn Hall	UC Berkeley (US) ; Maastricht (Netherlands)
	Arthur May	Memorial University*; NSERC*, St. John’s

DATA SOURCES FOR FIGURES

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