

# An Analysis of the Causes of Weak Labour Productivity Growth in Canada since 2000

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## ABSTRACT

Since 2000, business sector labour productivity growth in Canada has averaged 0.95 per cent, 0.60 percentage points below the long-term trend established over the 1973-2000 period (1.55 per cent). In the United States productivity growth has continued to be robust beyond 2000, averaging 2.60 per cent per year. This article argues that Canada's weak productivity growth since 2000 is temporary, and mostly associated with over-hiring and the adjustment costs of moving from a labour surplus to a labour shortage economy. The concentration of weak productivity growth since 2000 in the goods sector, the sector which shouldered the brunt of the structural adjustment, gives additional credence to this explanation. Moreover, most of the increased Canada-US productivity growth gap since 2000 relates to developments south of the 49<sup>th</sup> parallel. Given that the state of the factors driving productivity growth has not deteriorated in Canada relative to the United States in recent years, it is unlikely that long-term productivity growth in Canada and the United States have decoupled. Indeed, the current widening opens more room for convergence. Future productivity growth in Canada is likely to revert to its 1973-2000 trend.

SINCE 2000, GROSS DOMESTIC product (GDP) growth in Canada and the United States has followed a similar path. Business sector GDP growth averaged 2.5 per cent per year between 2000 and 2007 in Canada compared to 2.6 per cent per year in the United States. The similarity in GDP growth, however, obscures the emergence of a 1.6 percentage point annual gap in labour productivity growth since 2000. Between 1973 and 2000, business sector labour productivity, defined as output per hour worked, grew at similar rates in Canada and the United States, averaging 1.55 per cent and 1.71 per cent per year respectively, a 0.17 percentage point differ-

ence. The growth rate difference widened significantly in the post-2000 period, with labour productivity growth in the United States (2.60 per cent per year) more than two and a half times larger than in Canada (0.95 per cent per year). This article explores the possible causes of such a dismal productivity performance in Canada since 2000.

The article has four sections. The first section examines the effect of weak labour productivity growth on the levels of income and leisure of Canadians. The second section reviews post-2000 trends in output, hours worked, labour productivity and productivity elasticities in

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Canada and the United States and compares these developments with those experienced in earlier periods. The third section provides a thorough analysis of the factors behind Canada's weak productivity performance since 2000, both in an historical context and in comparison with the United States. The final section concludes.

### **Canada's Productivity Growth Weakness Since 2000: A Shortfall**

Productivity growth is by far the most important driver of increased living standards for Canadians. This is because real income can only increase in the long run if more real output is produced.<sup>2</sup> While increased productivity growth is generally associated with higher wages, it brings to life a new world of possibilities for Canadians. Increased productivity growth means that Canadians will be better able to meet the fiscal pressures associated with an aging population. It means the possibility of better health care funding. It means that workers will have the option to benefit from increased leisure. In short, productivity growth is vital to the economic success of Canadians.<sup>3</sup>

From this perspective, Canada's weak productivity performance since 2000 represents a massive shortfall. This section explores, for illustrative purposes, what the Canadian economic landscape would have been in 2007 under two scenarios of productivity growth, comparing it to actual developments. In the first scenario, it is assumed that productivity grew in Canada at the same rate as

that experienced in the United States over the 2000-2007 period. The second scenario assumes that productivity grew at the historical trend established over the 1973-2000 period. The impacts on GDP, annual hours worked, GDP per capita and GDP per hour are provided.<sup>4</sup>

### **Canadian Productivity Growth at US Rates**

Over the 2000-2007 period, the United States experienced annual labour productivity growth of 2.60 per cent compared to only 0.95 per cent in Canada. If Canada's labour productivity had increased at the same rate as that experienced in the United States, Canada's GDP would have been 12.0 per cent larger in 2007, representing an additional \$183 billion of output, with Canada's GDP reaching \$1,715 billion instead of its actual level of \$1,531 billion (Chart 1: Panel A). Alternatively, if Canadians had chosen to take these productivity gains as increased leisure rather than income, Canadian workers would work 10.7 per cent fewer hours, or a total of about 3.2 billion hours less in 2007. Keeping the number of workers at its 2007 level of 16.9 million, this would mean that the current level of output could have been achieved with each worker working 189 fewer hours per year less (Panel B). The average worker would have worked 1,579 hours in 2007 instead of the current 1,768 hours. On a weekly basis, this would represent a reduction of 3.6 hours, from 34.0 hours to 30.4 hours worked per week. Other measures provide similar signals: GDP per cap-

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2 Terms of trade can also lead to an increase in real incomes, as has been the case in Canada in recent years due in large part to the sharp increase in commodity prices (Boothe and Roy, 2008). Yet, given the uncertain outlook for commodity prices, the future contribution of terms of trade to income in Canada is not obvious and, unlike productivity gains, terms of trade have the potential to contribute negatively to real income.

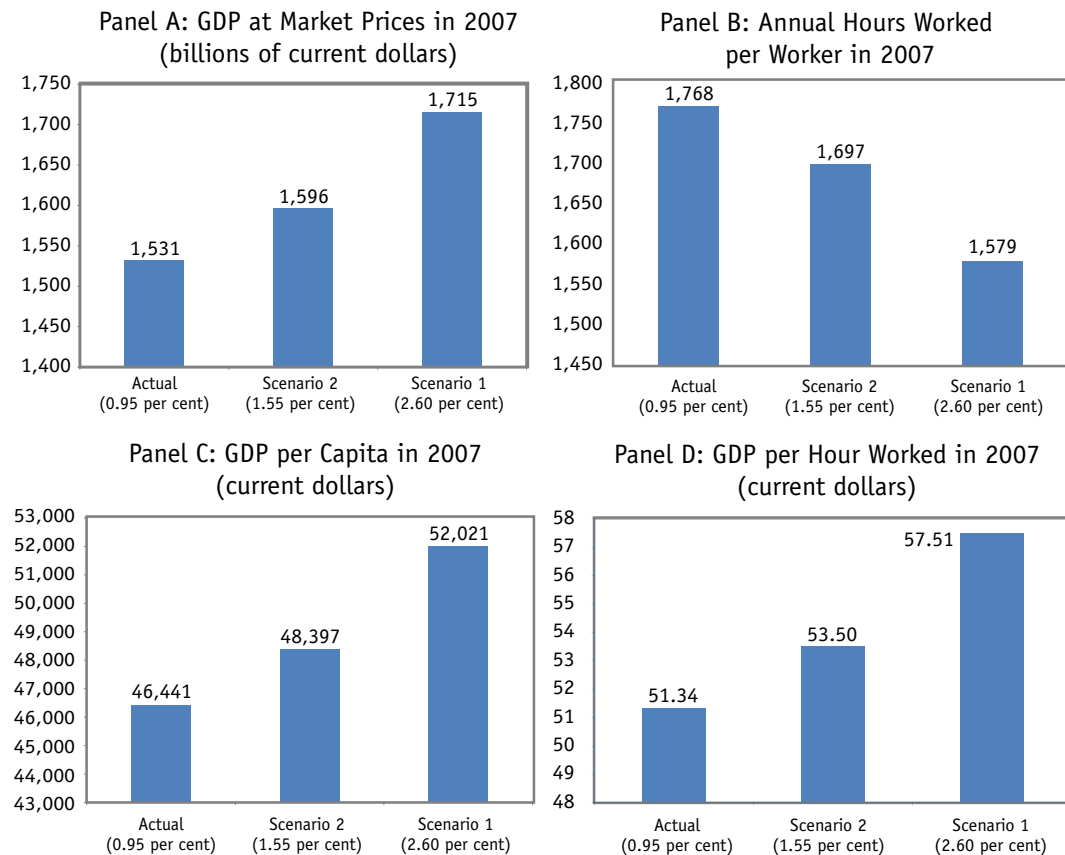
3 See Sharpe (2007) for a discussion of the importance of productivity.

4 To obtain these estimates, we apply the difference in growth rates of business sector GDP labour productivity between the two countries to total economy GDP and hour worked levels in 2007. This exercise is mechanical in nature and ignores how agent's expectations and behaviour would have adjusted to the productivity shock. It is assumed that there is no trade-off between employment and productivity, i.e. that additional productivity growth would have translated into higher output rather than lower employment. While in the long-term there is a one-to-one relationship between labour productivity and income, in the short- and medium-term there may be trade-offs.

## Chart 1

### GDP, Hours Worked, GDP per Capita and GDP per Hour in Canada in 2007

Under Two Scenarios for Productivity Growth in the 2000-2007 Period



\* Scenario 1 assumes labour productivity growth in Canada over the 2000-2007 period of 2.60 per cent, i.e. the annual productivity growth in the United States in 2000-2007. Scenario 2 assumes productivity growth in Canada over the 2000-2007 period of 1.55 per cent, i.e. the annual productivity growth in Canada in 1973-2000.

Sources: Calculations made from Statistics Canada data on GDP at market prices (Cansim Table 380-0030); hours worked (Labour Force Survey); and population (Cansim Table 51-0001).

ita would have been \$5,580 higher in 2007 (Panel C) and GDP per hour would have been \$6.17 higher (Panel D) if Canada's productivity growth had equaled the performance of the United States since 2000.

### Canadian Productivity Growth at 1973-2000 Trend

Assuming that Canada's labour productivity growth could have equaled that of the United States after 2000 may be over-optimistic, even though Canada did outpace its neighbour over

the 1947-1973 period, was just slightly behind in the 1973-2000 period, and actually exceeded the United States in 1996-2000. Moreover, it could be argued that Canada's lower level of productivity should generate greater opportunities for technological catch-up and thus that productivity growth in Canada should in fact be stronger than that of the United States. Nonetheless, even if Canada had reached a much more modest goal, for example to have productivity grow at the same speed as in the 1973-2000 period, the gains would have been substantial.

In 2007, Canada's GDP would be 4.2 per cent larger, a gain in output of \$65 billion. Or else, Canadians could be working 1.2 billion hours less in 2007, representing 71 hours of additional leisure per worker in 2007 or a reduction of 1.4 hours in the average work week. In other words, even in a much more modest scenario, Canada's poor productivity performance cost Canadians the equivalent of about two weeks of additional vacation in 2007.

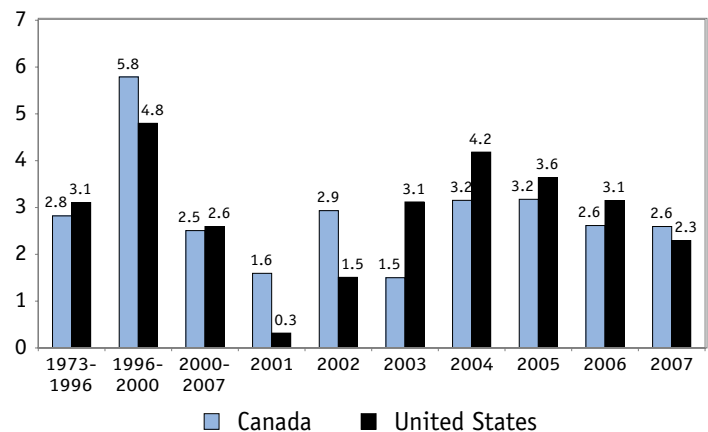
Moreover, GDP per capita could have been \$1,956 higher in 2007 if Canada's productivity growth had equaled the historical trend of the 1973-2000 period. Similarly, GDP per hour would have been \$2.16 higher. These indicators should send a clear message to Canadians: the potential gains from increased labour productivity growth are huge, and equally the consequences of weak productivity growth cannot be ignored.

Canada can ill afford to continue on the path of poor labour productivity growth. In the future, labour productivity growth will be by far the most important driver of increased material living standards for Canadians. Indeed, because of dwindling labour force growth, labour productivity growth will rapidly become the main source of economic growth, potentially accounting for more than 80 per cent of economic growth in Canada over the next twenty years.<sup>5</sup> This is a drastic change from the last 25 years when growth in employment and total hours worked accounted for more than half of Canada's GDP growth. Poor productivity growth in the future will also mean a fall in the economic

**Chart 2**

**Business Sector Output Growth in Canada and the United States**

(average annual rates and annual rates of change, per cent)



Sources: GDP in chained dollars and total hours worked from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada for Canada.

standing of Canada relative to other countries. In fact, if productivity trends observed in Canada and the United States since 2000 continue, Canada's productivity will be half that of the United States by 2031 and, as productivity is the main driver of GDP per capita, Canadian living standards would also be around one-half of those south of the border.

**Recent Economic Trends in Canada and the United States**

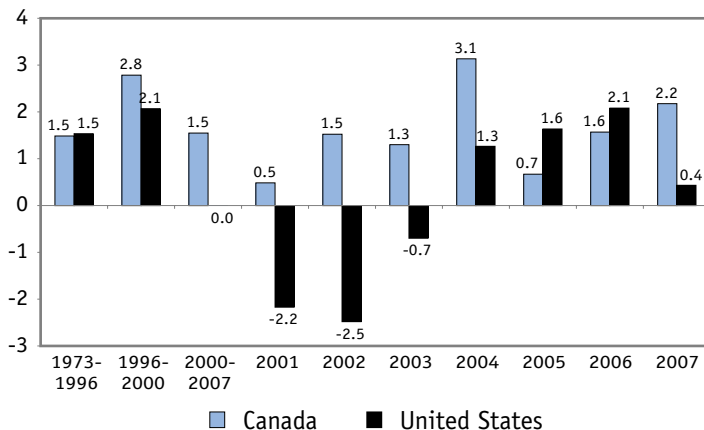
This section reviews recent economic trends in Canada and the United States, starting with a review of output and labour input growth. It fol-

5 The CSLS calculates that over the 2006-2026 period labour productivity will account for 82.8 per cent of GDP growth in Canada, while it accounted for 47.3 per cent over the 1981-2006 period. In these calculations, labour productivity is assumed to grow at 1.5 per cent per year after 2006. Average hours per week are assumed to remain at their 2006 level while employment is assumed to grow at the same rate as the labour force. Labour force growth beyond 2006 is in turn estimated using official projections for population aged 15-64 and by assuming a constant labour force participation rate for both the 15-44 and 45-64 age groups. The estimate of future productivity growth of 1.5 per cent per year in Canada over the 2006-2026 period is slightly conservative compared to forecasts of labour productivity for that period. Sharpe (2006: Exhibit 2) reviews labour productivity forecasts in Canada and finds that out of six forecasters, the four with long-term projections (2006-2025 or 2006-2029) forecast labour productivity of 1.6 or 1.7 per cent per year. The two with even longer time horizons, 2012-2078 for the Office of the Chief Actuary and 2006-2050 for the Centre for Spatial Economics, forecast labour productivity at 1.2 per cent per year. It also finds that according to UK Consensus polls the consensus forecast for labour productivity to 2020 in Canada is 1.5 to 1.6 per cent per year.

**Chart 3**

**Growth in Total Hours Worked in the Business Sector in Canada and the United States**

(average annual rates and annual rates of change, per cent)



Sources: Total hours worked from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada for Canada linked to series v719846 for pre-1981 estimates.

looks with a review of recent trends in labour productivity growth and productivity elasticities.

**Output Growth**

Trends in output growth in the business sector in Canada and the United States have been almost identical since 2000, with annual output growth averaging 2.5 and 2.6 per cent respectively (Chart 2). In both countries, average annual output growth between 2000 and 2007 was only about half that of the 1996-2000 period and was slightly below that of the 1973-1996

period. Canada outperformed the United States in 2001 and 2002, but the United States rebounded and outperformed Canada in 2003 and 2004. Both countries exhibited roughly similar growth over the 2005-2007 period.

Canada's output growth since 2000 was slightly more stable than that of its neighbour, with annual output growth ranging from 1.5 per cent to 3.2 per cent. This reflected the more moderate downturn experienced in Canada compared to the United States in the early 2000s. In the United States business sector output growth reached a trough of 0.3 per cent in 2001 and a peak of 4.2 per cent in 2004.<sup>6</sup>

**Labour Input**

In this article we focus on total hours worked rather than employment as the former is a more accurate measure of labour input.<sup>7</sup> Business sector total hours worked in Canada increased at an average annual rate of 1.5 per cent between 2000 and 2007, identical to the trend observed between 1973 and 2000. Growth in total hours worked in Canada has varied significantly since 2000 (Chart 3). In 2001, weak economic growth translated into a relatively small increase in hours worked (0.5 per cent). In contrast, in 2004 growth in hours worked jumped to 3.1 per cent.

In the United States, business sector hours worked exhibited no growth over the 2000-2007 period. The trend reflected the recession of the early 2000s, with large declines in hours worked

6 Indeed, the standard deviation of the annual rates of growth in Canada over the 2001-2007 period was 0.7, only about half that of the United States (1.33). Growth in hours worked was about twice as volatile in the United States (1.83) as in Canada (0.90). In contrast, labour productivity growth was only slightly more volatile in the United States (1.10) than in Canada (0.83).

7 Total hours worked is determined by trends in employment and average hours worked. While there can be large differences in year-to-year growth rates of employment and total hours worked, these changes tend to be offsetting and there is little difference in the long-term. Average hours worked in Canada have been steadily declining, at about 0.21 per cent per year since 2000, which means total hours growth increased at a slower rate than employment. In the United States, average hours worked decreased 0.32 per cent per year since 2000. These trends are consistent with the long-term decline in average hours worked, declining on average by 0.24 per cent per year since 1973 in both countries. In other words, using employment as a measure of labour input show the same trend as hours worked. It is useful to remember, however, that estimates of productivity growth using hours worked tend to be slightly higher than those based on employment.

in 2001, 2002 and 2003, offset by gains in the 2004-2007 period. The absence of growth in labour input in the United States since 2000 was in sharp contrast to both the 1973-1996 (1.5 per cent) and the 1996-2000 periods (2.1 per cent) when labour input growth was both much stronger and more similar to that experienced in Canada. As the next section will show, with output growing at a similar pace in both countries, the large difference in labour input growth since 2000 led to a divergence in labour productivity growth between the two countries.

### Labour Productivity

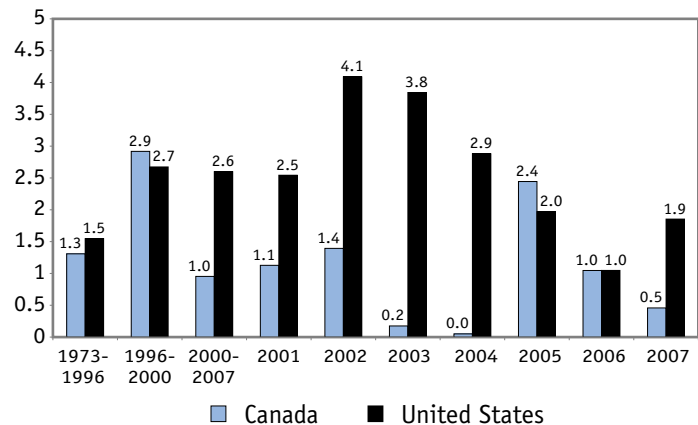
Business sector output per hour growth, which is the official measure of labour productivity produced by both Statistics Canada and the Bureau of Labor Statistics and will be the primary measure used in this article, grew on average 1.0 per cent in Canada over the 2000-2007 period (Chart 4).<sup>8</sup> Canada's performance stands in stark contrast to that of the United States, which recorded labour productivity growth of 2.6 per cent per year over the period. In fact, Canada's productivity growth remained below 1.5 per cent for six of the seven years since 2000, while in the United States it grew by less than 1.5 per cent in only one of those seven years.

Canada's post-2000 productivity performance has been weak by historical standards.<sup>9</sup> It was significantly weaker than between 1996 and 2000

**Chart 4**

### Business Sector Output per Hour Growth in Canada and the United States

(average annual rates and annual rates of change, per cent)



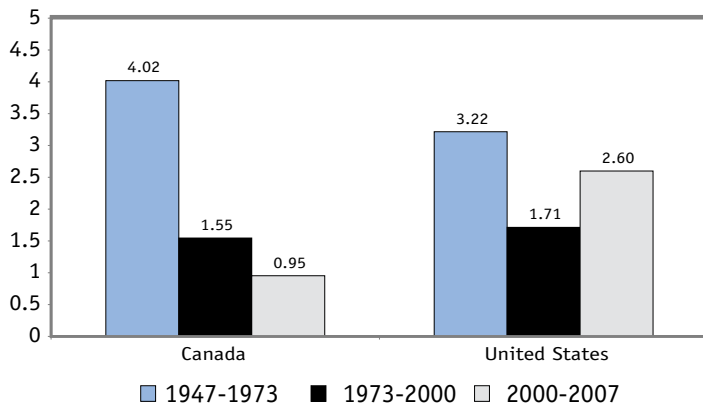
Sources: Labour productivity indexes from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada linked to series v720290 for pre-1981 estimates for Canada.

(2.9 per cent). Moreover, labour productivity growth was below the annual average growth of 1.5 per cent recorded between 1973 and 2000 and below the 4.0 per cent per year recorded during the golden era of 1947-1973 (Chart 5). Canada's post-2000 productivity performance was also weak relative to other G-7 countries. Indeed, the Conference Board/GGDC total economy database places Canada sixth out of seven in terms of labour productivity growth over the 2000-2007 period.<sup>10</sup>

8 Aggregate labour productivity can be measured at the total economy and business sector level. Each measure has strengths and weaknesses. Indeed, the business sector measure suffers from less severe measurement issues than the total economy measure as it excludes non-business sector industries such as education and health where output is generally not marketed. Yet, total economy measures are consistent with GDP per capita and are advantageous for international comparability since, unlike the business sector measures, the definition of what industries are included in the total economy does not differ across countries. In any case, growth in total economy labour productivity in Canada between 2000 and 2007 averaged 0.97 per cent per year, almost identical to the 0.95 per cent growth of business sector labour productivity. Total economy productivity growth averaged 1.44 per cent per year over the 1981-2000 period, compared with 1.59 per cent for business sector. See Smith (2004) for a detailed discussion of issues related to the appropriate measurement of aggregate labour productivity.

9 In fact, it is the slowest rate of labour productivity growth for a non-recessionary seven-year period recorded in Canada, with data going back to 1947. Each of the four overlapping seven year periods running from 1983-1990 to 1986-1993 recorded worse productivity growth, but the weakness observed over these periods was clearly due to the recession of the early 1990s. In fact, only by 1994 had GDP fully recovered and exceeded its 1989 pre-recession level.

**Chart 5**  
**Business Sector Output per Hour Growth in Canada**  
**and the United States Since 1947**  
 (average annual rates, per cent)



Sources: Labour productivity indexes from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada linked to series v720290 for pre-1981 estimates for Canada.

The story is strikingly different in the United States, where productivity growth has continued to be strong beyond 2000. Between 1996 and 2000 it recorded an average annual rate of labour productivity growth of 2.7 per cent. Since 2000, it kept that pace with an average growth rate of labour productivity of 2.6 per cent, only 0.6 percentage points below

its 1947-1973 average and almost a full percentage point above its 1973-2000 average (Chart 5). Of course, it must be acknowledged that a large part of the strong productivity performance in the United States since 2000 can be attributed to the first four years of the decade, and especially to the atypically strong performance in 2002 and 2003 when output per hour growth averaged 4.0 per cent per year. Yet, the trend in labour productivity growth in the United States, even after 2004, remained higher than in Canada.<sup>11</sup>

While Canada's trend productivity growth rate seems to have declined in recent years, its closest neighbour appears to have shifted to higher trend productivity growth.<sup>12</sup> The strong performance during the 1996-2000 period suggested that Canada might follow the path opened by the United States and experience a revival of its labour productivity growth (Chart 6). This, however, did not materialize and the differences in the labour productivity performance of Canada and the United States, particularly since 2000, led to a further widening of the Canada-U.S. productivity gap. In 2007, Canada's business sector output per hour stood at only 73.6 per cent the U.S. level, down from 82.5 per cent in 2000 (Chart 7).<sup>13</sup>

10 Only Italy performed worse, with labour productivity growth of 0.3 per cent per year over the same period. If compared to a larger set of countries, Canada's performance remains sub-standard, with 19 of the 27 EU countries reporting stronger labour productivity growth than Canada over the 2000-2007 period (Conference Board and Groningen Growth and Development Centre, Total Economy Database, January 2008: Summary Statistics Table 3).

11 If we focus on the recent 2005-2007 period, Canada's relative productivity performance is not as bad – 1.3 per cent per year versus 1.6 per cent in the United States, only a 0.3 percentage point difference. Yet, this comparison may be unfair as it includes Canada's best, and the United States' worst, year since 2000 for productivity growth. More importantly, even focusing on such short and somewhat arbitrary periods we still find that Canada has experienced below average productivity growth.

12 Skoczylas and Tissot (2005) identify time breaks in productivity growth in OECD countries. Using capacity utilisation rates in the manufacturing sector as a proxy to remove cyclicalities in business sector productivity, they found that while the United States trend productivity growth increased to 3.00 per cent in the late 1990s (from its 1.25 per cent trend started in the mid 1970s), Canada's trend productivity growth remained at 1.25 per cent, a trend observed since the mid 1970s. Using an HP filter to remove cyclicalities gave slightly different results for Canada, with trend productivity growth increasing to 2 per cent in the late 1990s but falling sharply to naught in the early 2000s.

13 Maynard (2007) shows that these estimates may be subject to a downward bias as a result of differences in the measurement of total hours worked in the two countries. He finds a total economy labour productivity gap of 7 percentage points in 2000 when labour inputs are appropriately measured, compared to 11 and 14 percentage points when other common measures are used.

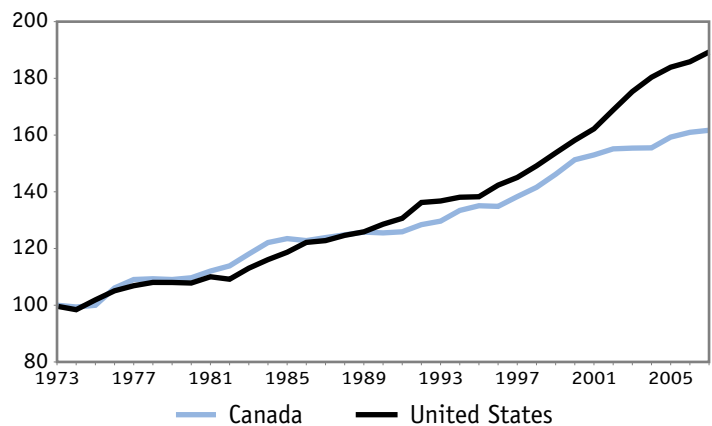
Diverging productivity trends in Canada and the United States are even more puzzling given the similarity of output growth trends. This is probably best exemplified by the behaviour of the productivity elasticity, that is the proportion of output growth arising from productivity growth. Productivity elasticities in Canada and the United States have closely tracked each other in the two long-term periods 1947-1973 and 1973-2000, as well as for the three recent sub-periods of 1973-1989, 1989-1996 and 1996-2000 (Chart 8). Since 2000, however, Canada's productivity elasticity has been relatively low, with only 38 per cent of output growth explained by increased labour productivity, slightly below levels of earlier periods. In contrast, the productivity elasticity in the United States was unity, much higher than historical levels. The gap in labour productivity growth rates is not only the result of unusual developments in Canada, but also largely a consequence of an atypical behaviour of the U.S. economy.

These developments raise three distinct but intertwined questions: (1) why is Canada's productivity growth since 2000 below the trend established over the last quarter of the 20th Century; (2) how did the United States sustain its productivity growth resurgence of the second half of the 1990s beyond 2000; and finally (3) why did Canada not experienced a similar resurgence? As this article's main objective is to explain productivity developments in Canada since 2000, we focus on the first question.

### Examination of Factors Explaining Weak Productivity Growth in Canada Since 2000

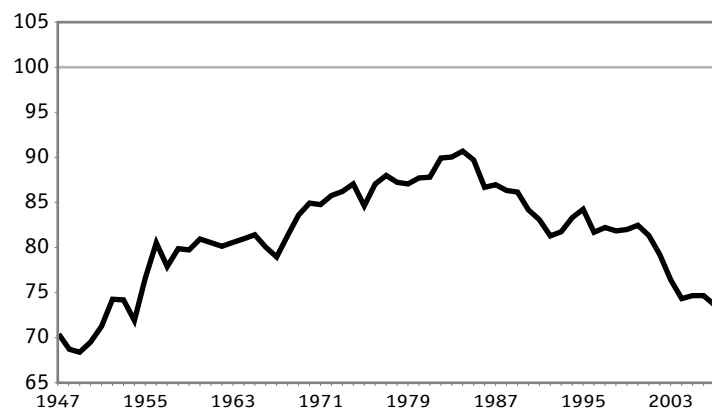
There exists no consensus on the reasons for the weak productivity performance of the Canadian economy since 2000. While many studies have attempted to identify the effect on productivity in Canada of a host of micro-

**Chart 6**  
Trends in Output per Hour in the Business Sector in Canada and the United States, 1973-2007  
(1973 = 100)



Sources: Labour productivity indexes from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada linked to series v720290 for pre-1981 estimates for Canada.

**Chart 7**  
Output per Hour in the Business Sector in Canada as a Percentage of the U.S. Level, 1947-2007  
(United States = 100)



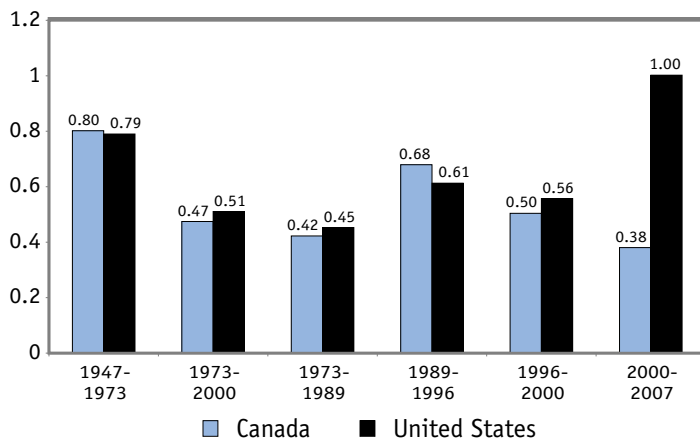
Sources: CSLS Aggregate Income and Productivity Database (<http://www.csls.ca/data/ipt1.asp>), Table 7a.

economic and macroeconomic factors, far fewer studies have focused specifically on the recent productivity performance of Canada.<sup>14</sup>

14 See Dion and Fay (2008) for a review of the recent technical literature on productivity with a focus on Canada. Articles discussing potential reasons for the post-2000 productivity weakness in Canada include Rao, Sharpe and Smith (2005), Gomez (2005), Dion (2007) and Cross (2007).



**Chart 8**  
**Business Sector Productivity Elasticity in Canada**  
**and the United States, Selected Periods**



Sources: Calculation from Indexes from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada linked to series v720290 for pre-1981 estimates for Canada.

In this section, we review factors affecting labour productivity growth in Canada and assess their potential effect on labour productivity growth. We first focus on the gap between Canada's labour productivity growth since 2000 and its trend performance over the 1973-2000 period.<sup>15</sup> We then follow with an examination of the US-Canada differences in labour productivity growth since 2000.

The following analysis assumes that future statistical revisions will not significantly alter the current productivity estimates. This is an important caveat as revisions can significantly alter productivity growth as was the case in the late 1990s.<sup>16</sup>

### Why is Canada's productivity growth since 2000 below the 1973-2000 trend?

Since 2000, the Canadian economy faced two major shocks in the form of rising commodity prices and a rising Canadian dollar. These developments have shaped the post-2000 period. Firms have had to adjust to unprecedented changes in relative output prices, which lead to important employment shifts across industries, especially in the goods sector. Moreover, in the 2000s Canada continued its advance towards an environment of low unemployment rates, mounting skills shortages and high profit margins. Economic theory posits that employment reallocation across industries should translate into higher productivity growth; it suggests that low unemployment and skills shortages should increase labour productivity growth as increasing wages lead to the substitution of capital for labour and; it suggests that higher profit margins should translate into increased investment and thus higher labour productivity growth. During the transition period, however, a number of other factors can dampen the movement towards higher productivity growth.

In this section, we first review the proximate sources of productivity growth by summarizing the results of three productivity growth decompositions: a growth accounting decomposition, an industry decomposition and a provincial decomposition.<sup>17</sup> We then proceed to a behavioural analysis of how recent economic developments in Canada's industrial structure and labour markets may have dampened Canada's

15 The 1973-2000 period is used as a historical benchmark as it is cyclically neutral: initial and end years both were cyclical peaks.

16 In Canada, for example, over the 1997-2000 period, revisions raised labour productivity growth 1.8 points per year between initial and final estimates (Kaci and Maynard, 2005). In the United States, labour productivity growth for the same three years was revised downward by an average of 0.4 percentage points per year between initial and final estimates. In other words, while the initial statistics suggested a large Canada-US labour productivity growth gap in the late 1990s, the final estimates instead showed that labour productivity growth was actually faster in Canada (Chart 5). The magnitude of the Canadian revisions, however, was in large part due to one-time events: the capitalization of software expenditures and the introduction of new surveys. Moreover, as short-term revisions take place over a four-year cycle, current estimates of labour productivity for the early 2000s can be deemed reliable.

labour productivity growth and how this situation may explain the current weakness in relation to the 1973-2000 period.

#### Proximate sources of weak labour productivity growth

A first step in the identification of the proximate causes of Canada's dismal productivity performance since 2000 is to decompose productivity growth into its main components. Such an exercise provides important insights to guide a behavioural analysis of factors affecting labour productivity. Using the neoclassical growth accounting framework and official estimates from Statistics Canada and the Bureau of Labor Statistics (BLS), we first decomposed Canada's business sector labour productivity growth into its main accounting components (Table 1).<sup>18</sup> The key findings are as follows:

- Labour productivity growth between 1973 and 2000 averaged 1.66 per cent per year. The contribution of labour composition, or labour quality, was 0.36 points. The contribution of capital services intensity, which includes both capital stock and capital composition, was 1.15 points. Multifactor productivity (MFP) growth contributed only 0.15 points.
- Over the 2000-2006 period, labour productivity growth was 1.04 per cent, down by 0.61 percentage points compared to 1973-2000.
- Growth in labour composition decreased, with its contribution to labour productivity

**Table 1**  
**Sources of Labour Productivity Growth in the Canadian Business Sector, 1973-2000 and 2000-2006**

	1973-2000	2000-2006	Post-2000 Change
	A	B	B-A
<b>Output and Inputs (Average Annual Rate of Growth)</b>			
Output	3.35	2.51	-0.84
Total hours	1.66	1.45	-0.21
Labour composition	0.60	0.53	-0.07
Capital services	4.65	3.45	-1.20
Capital stock	2.85	2.33	-0.52
Capital composition	1.75	1.10	-0.65
ICT capital services	19.56	9.47	-10.09
Non-ICT capital services	3.52	2.81	-0.72
Capital services intensity	2.94	1.97	-0.97
ICT cap. serv. intensity	17.9	8.02	-9.88
Non-ICT cap. serv. intensity	1.86	1.36	-0.51
<b>Contributions to Labour Productivity Growth (Average Annual Percentage Point)</b>			
Labour productivity	1.66	1.04	-0.61
Labour composition	0.36	0.32	-0.04
Capital services intensity	1.15	0.84	-0.30
Capital stock	0.70	0.57	-0.13
Capital composition	0.43	0.27	-0.16
ICT cap. serv. intensity	0.47	0.31	-0.15
Non-ICT cap. serv. intensity	0.68	0.53	-0.15
Multifactor productivity	0.15	-0.10	-0.25
<b>Contributions to Labour Productivity Growth (Per cent)</b>			
Labour productivity	100.0	100.0	100.0
Labour composition	21.8	30.3	7.2
Capital services intensity	69.1	80.5	49.6
Capital stock	42.3	54.3	21.8
Capital composition	26.0	25.8	26.4
ICT capital serv. intensity	28.2	30.0	25.1
Non-ICT cap. serv. intensity	40.9	50.4	24.6
Multifactor productivity	9.2	-9.6	41.2

Source: CSLs Calculations based on the Canadian Productivity Accounts from Statistics Canada, Cansim Table 383-0021.

17 A detailed discussion of the decompositions is found in an Appendix to this article posted on the CSLs website (<http://www.csls.ca/ipm/ipm16.asp>). It should also be noted that Statistics Canada provides estimates of labour productivity by industry through its quarterly labour productivity program (data going back to 1997 and forward to 2007), its multifactor productivity program (data for the 1961-2006 period) and its quarterly program consistent with input-output tables (data for 1997-2004). While in the long term these different estimates provide similar signals, there are sometimes significant year-to-year differences. For our industry analysis, we use the quarterly labour productivity estimates if 2007 is included. Unless otherwise mentioned, we use the multifactor productivity program estimates for periods which do not include 2007. In earlier sections, business sector estimates for Canada are obtained by linking the quarterly series (back to 1981) to a historical series (back to 1947), which accounts for the minor discrepancy in business sector productivity growth rates in this section and earlier sections for the 1973-2000 period.

18 Baldwin and Gu (2007) have also done a growth accounting decomposition using these data focused on the 1996-2006 period rather than on developments since 2000. Our analysis extends only to 2006 as Statistics Canada KLEMS data for 2007 are not yet available.

**Table 2**  
**Labour Productivity Growth by Industry in Canada,**  
**1973-2000 and 2000-2007**  
 (average annual rates of growth)

	1973-2000	2000-2007	Post-2000 Change
	A	B	B-A
Total Business Sector	1.66	0.95	-0.70
Business sector, goods	2.29	0.71	-1.58
Agriculture, forestry, fishing and hunting	2.68	3.34	0.66
Mining and oil and gas extraction*	-0.29	-3.98	-3.69
Utilities*	0.92	-0.76	-1.68
Construction	1.43	1.41	-0.02
Manufacturing	2.88	0.94	-1.94
Business sector, services	1.50	1.55	0.06
Wholesale trade	2.94	3.22	0.28
Retail trade	2.08	2.88	0.80
Transportation and warehousing	1.55	0.77	-0.77
Information and cultural industries	3.42	3.12	-0.30
Finance, insurance, real estate, renting and leasing*	1.53	0.27	-1.26
Professional, scientific and technical services	0.81	0.41	-0.40
Accommodation and food services	-	0.90	-

Sources: For 2000-2007 data, Statistics Canada Quarterly Indexes of Labour Productivity, Cansim Table 383-0012. For data prior to 2000, Statistics Canada Annual Multifactor Productivity (MFP) Program, Cansim Table 383-0021. Estimates for the business sector before 2000 differ slightly from those presented earlier as they are taken from the MFP program rather than the quarterly program for consistency,

\* Data for 2000-2006 instead of 2000-2007. From the MFP program, Cansim Table 383-0021.

falling marginally by 0.04 percentage points per year (from 0.36 to 0.32 points) between periods. More importantly, both capital intensity growth and MFP growth decreased, and their contribution to productivity growth fell by 0.30 and 0.25 percentage points respectively when compared to the 1973-2000 period.

- The decrease in capital services intensity growth was due both to slower capital stock growth and to slower capital composition growth. Indeed, the shift towards information and communications technology (ICT)

capital has slowed markedly since 2000, driving the slowdown in the contribution of capital composition.

- Weak growth in capital services intensity in Canada since 2000 when compared to the 1973-2000 period is particularly puzzling as the ratio of the price of capital goods to labour fell on average 3.0 per cent per year between 2000 and 2007. In comparison, the ratio decreased only 2.0 per cent per year between 1973 and 2000.
- This growth accounting exercise suggests that the lacklustre productivity performance of Canada since 2000 relative to the 1973-2000 period cannot be attributed to a single factor, but is rather largely the result of slower growth in both capital services intensity and MFP, with the slow growth in capital services resulting equally from lower growth in ICT and non-ICT capital services.

The second decomposition focuses on the industry components of productivity growth in Canada:

- At 1.55 per cent per year, productivity growth in the services sector held up after 2000 as it was 0.06 percentage points higher than in the 1973-2000 period (Table 2). Labour productivity growth in the wholesale (3.22 per cent) and retail trade (2.88 per cent) sectors offset weak growth in finance, insurance, real estate and leasing (0.27 per cent), professional, scientific and technical services (0.41 per cent) and transportation and warehousing (0.77 per cent).
- In contrast, between 2000 and 2007, labour productivity growth has been particularly weak in the goods sector, averaging 0.71 per cent per year. This was a 1.58 percentage-point decline from the 2.29 per cent per year average established in 1973-2000.
- Even though four of the five goods industries reported a decline in labour productivity growth since 2000, compared to the

1973-2000 period, the weakness was concentrated in the mining, oil and gas sector (3.69 percentage points lower) and in manufacturing (1.94 percentage points lower).<sup>19</sup>

The third and final decomposition focuses on the provincial components of productivity growth in Canada between 1981 and 2006. It reveals similar trends as the industrial decomposition, with Ontario (with its manufacturing core) and Alberta (with its booming oil and gas sector) playing a central role in developments since 2000. The key findings are as follows:

- In 2000-2006, labour productivity grew fastest in Newfoundland (2.54 per cent per year) and slowest in Ontario (0.75 per cent).
- British Columbia (0.91 per cent), Quebec (0.98 per cent) and Prince Edward Island (0.91 per cent) also experienced below average productivity growth over the 2000-2006 period.
- In terms of the four large provinces, labour productivity growth slowed after 2000 in Ontario (0.73 points), Alberta (0.46 points) and Quebec (0.05 points). Productivity growth in British Columbia accelerated 0.61 points between periods.<sup>20</sup>

#### Economic turbulence, production decisions and labour markets

The Canadian economy has faced two major shocks in recent years – rising com-

**Table 3**  
**Labour Productivity Growth by Province in Canada, 1973-2000 and 2000-2006**  
(average annual rates of growth)

	1981-2000	2000-2006	Post-2000 Change
	A	B	B-A
Canada	1.37	1.04	-0.33
Newfoundland and Labrador	1.86	2.54	0.68
Prince Edward Island	1.34	0.91	-0.43
Nova Scotia	1.31	1.34	0.03
New Brunswick	1.16	1.52	0.36
Quebec	1.03	0.98	-0.05
Ontario	1.48	0.75	-0.73
Manitoba	1.19	1.24	0.05
Saskatchewan	1.71	1.28	-0.43
Alberta	1.52	1.05	-0.46
British Columbia	0.30	0.91	0.61

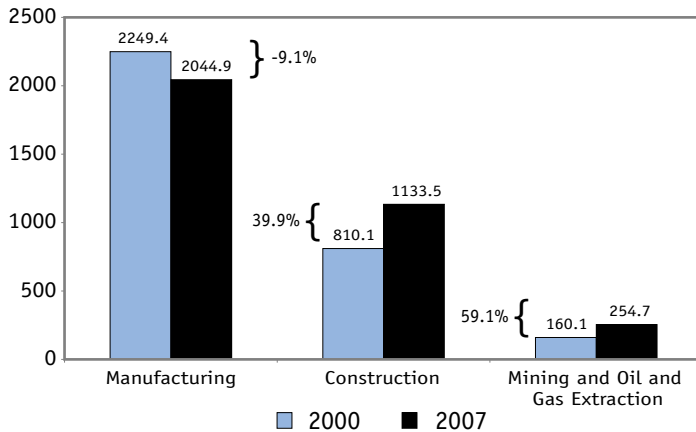
Sources: GDP from Statistics Canada National Accounts, CANSIM Table 384-0002. Hours worked from Statistics Canada Cansim Table 383-0010 for 1997-2006. Labour Force Survey growth rates are used for total hours worked before 1997.

modity prices and the rising value of the Canadian dollar. These shocks contributed to significant employment creation in the mining and oil and gas and construction industries and to a large decrease in manufacturing employment (Chart 9). There were many short-term costs associated with this economic transition.

19 The formal industry decomposition contained in the appendix and using the Tang and Wang (2004) methodology extends only to 2004 as it requires estimates of current dollar GDP by industry which are not yet available beyond that year. The key findings are that: (1) the increase in the relative output prices in the mining, oil and gas sector as well as its increasing share of employment more than offset the negative labour productivity growth in that industry, leading to a positive contribution of the sector to aggregate labour productivity growth over the 2000-2004 period and that (2) negative productivity growth in manufacturing as well as the sector's falling share of total employment meant the industry was by far the main contributor to slower aggregate productivity growth in Canada between 2000 and 2004.

20 The formal provincial decomposition contained in the appendix begins only in 1981 as consistent GDP estimates by province are not available for earlier years. The main findings are: (1) Ontario's weak productivity growth since 2000 was made worse by the decline in its labour input share as that province's contribution to annual productivity growth fell to only 0.01 percentage points between 2000 and 2006, much lower than its 0.62 percentage points contribution to aggregate productivity in Canada between 1981 and 2006 and (2) Alberta's growing share of national employment and increased relative output prices since 2000 outweighed its weak labour productivity growth as the province contributed 0.70 percentage points to aggregate productivity between 2000 and 2006, more than three times its closest rival (British Columbia with 0.18 points) and more than double its annual contribution over the 1981-2006 period (0.31 points).

**Chart 9**  
**Employment in Manufacturing, Construction and Mining and Oil and Gas Industries in Canada, 2000 and 2007**  
 (in thousands)



Sources: Statistics Canada, Labour Force Survey.

#### *Inter-industry shifts*

The reallocation of labour across industries is a natural process which, in the long run, leads to higher levels of productivity. In the short run, however, it can have negative effects on productivity growth due to adjustment costs. Particularly since 2004, the Canadian economy has experienced important employment shifts across industries. Employment estimates calculated on a net basis<sup>21</sup> from the Labour Force Survey suggest a rise in inter-industry labour shifts since 2004,<sup>22</sup> best exemplified by the large decrease in manufacturing employment and the corresponding increase in construction and mining and oil and gas extraction. The rise in inter-provincial migration since 2003 also points to a recent intensification of

labour reallocation (Sharpe, Arsenault, Ershov, 2007).

More importantly, the costs associated with job reallocation are not only a function of the magnitude of such reallocation, but also of its nature.<sup>23</sup> If reallocation occurs in capital-intensive industries, it would be no surprise if short-term labour productivity growth was sluggish as more time and resources are needed to also adjust capital stock levels. For example, unexpected delays in acquiring the necessary capital for large projects in the oil sector has probably led to lower productivity as some newly employed labour was not fully utilized.

In the short run, a slow adjustment process should be reflected in slower MFP growth in contracting industries and lower capital intensity growth in expanding industries. This is indeed what happened, with employment losses in manufacturing associated with a falling MFP while the mining, oil and gas sector experienced a slight drop in capital intensity growth. The latter also experienced an important fall in MFP, but that was most probably due to a more intense exploitation of marginal reserves.

#### *Productivity Weakness in the Goods Sectors*

As noted in an earlier section, the most significant change between 2000 and earlier periods is the weakness of the goods sector. The concentration of the productivity weakness in the goods sector since 2000 relative to 1973-2000 reinforces the view that slower productivity growth is the result

21 Statistics Canada no longer produces gross employment flows, which are the best indicator of labour market churning, as these estimates were deemed too unreliable. Balakrishnan (2008) constructed gross employment flows for Canada using the Longitudinal Employment Analysis Program (LEAP) database which goes back only to 1992 and is available only with a three year lag. He finds that job reallocation of labour in Canada due to sectoral shift fell in the 1999-2004 period compared to the 1993-1998 period. In the United States, gross employment flows by industry can be obtained from the Job Openings and Labor Turnover Survey (JOLTS) and have been published monthly since December 2000.

22 The unweighted standard deviation of growth rates in the five 2-digits NAICS industry of the goods sector between 2001 and 2007, at 5.0 percentage points, was above its 1976-2000 average of 4.2 percentage points. In 2005-2007 alone, it averaged 6.1 percentage points.

23 Dion (2008) argues that adjustment costs for a given level of reallocation may have risen in Canada and that these costs have probably contributed to slower labour productivity growth in recent years.

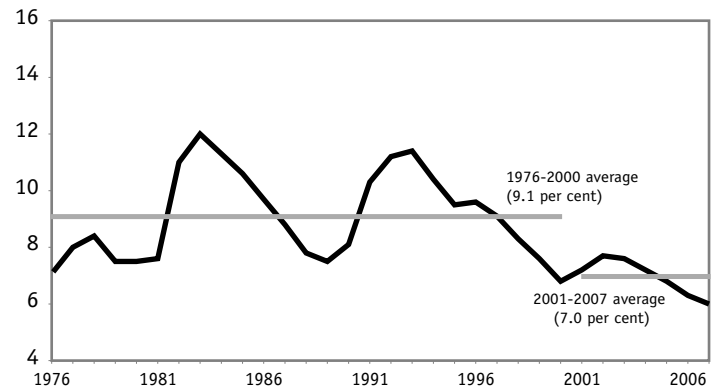
of a structural shift rather the outcome of a weakness in the underlying environment driving long-term productivity growth. Indeed, there was no major shift in policy that could explain a more than 1.5 percentage-point fall in labour productivity growth in the sector. There are, however, plausible sector-specific explanations for the falling productivity growth in both the manufacturing (Box 1) and mining and oil and gas (Box 2) industries.

### The changing reality of the Canadian labour market

Following the major shocks discussed above, Canada's labour market displayed remarkable strength. Indeed, one of the obvious but also most striking stylized facts of Canada's labour market in recent years is the steady fall in the unemployment rate (Chart 10). In 2007, it stood at 6.0 per cent, the lowest level in the official series beginning in 1976. Over the 2001-2007 period, it averaged 7.0 per cent, much lower than in earlier periods (9.2 per cent in 1989-2000, 9.9 per cent in 1981-1988 and 7.7 per cent in 1976-1980). The unemployment rate has now fallen significantly below the level previously believed to be non-inflationary, yet inflation remains near the Bank of Canada inflation target of 2 per cent.

Using the U.S. definition of the labour market status, the rate of unemployment in Canada in 2007 was 5.3 per cent compared to 4.6 per cent in the United States.<sup>24</sup> Given that structural factors, such as higher employment insurance (EI) benefits and more generous social assistance benefits in Canada, are generally believed to contribute to higher unemployment rates in Canada, the Canadian labour market may actually have been as tight, or even tighter, than that of the United States in 2007.

**Chart 10**  
**Unemployment Rate in Canada, 1976-2007**



Sources: Statistics Canada, Labour Force Survey.

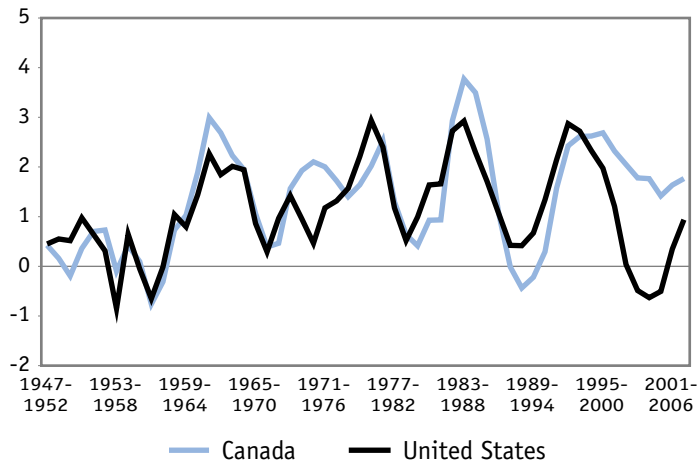
This section examines how the changing reality of the Canadian labour market, a shift from a demand-constrained economy to a supply-constrained economy, has affected productivity growth in Canada since 2000. It begins by assessing the potential contribution of over-hiring to weak labour productivity growth using the concept of productivity elasticity. It then focuses on the impact of lower growth in labour quality and of mounting labour shortages on labour productivity since 2000. Finally, it examines how higher profits might have contributed to lower productivity growth, both through its effect on hiring decisions and through lower incentives for efficiency.

### *Productivity elasticity*

Historically, employment growth and hiring patterns in Canada and the United States were very similar as business cycles coincided. Yet, looking at the five-year moving average of hours worked in Canada and the United States since 1947 reveals an unusual divergence between

24 The official Canadian unemployment rate is not strictly speaking comparable to its US counterpart. The main difference relates to the inclusion of passive job seekers, i.e. persons whose only job search method is looking at job ads, as unemployed persons in Canada, but not in the United States. Statistics Canada produces a supplementary unemployment rate based on U.S. definitions. Unemployment rates approximating U.S. concepts for ten OECD countries are available on the Bureau of Labor Statistics website at <ftp://ftp.bls.gov/pub/special.requests/ForeignLabor/lfcompendium t02.txt>.

**Chart 11**  
**Growth in Total Hours Worked, Canada and the United States, 5-years moving average, 1947-1952 to 2002-2007**  
 (average annual rate of growth)



Source: Total hours worked from the Productivity and Costs Program of the Bureau of Labor Statistics for the United States, and annual averages of quarterly estimates from the Productivity Program Database of Statistics Canada for Canada linked to series v719846 for pre-1981 estimates.

Canada and the United States since 2000, which clearly appears as an historical anomaly (Chart 11). Indeed, explaining strong employment growth when output growth has not been particularly robust, as well as evaluating how the shift towards a lower steady state unemployment rate may have affected productivity growth in Canada, appears to be a key to explaining the recent productivity slowdown in Canada.

Recent hiring patterns in Canada compared to the United States suggest that there may have been over-hiring. Indeed, over-hiring is manifested in Canada's productivity elasticity, which was below its 1973-2000 average in the 2000-2007 period. Indeed, if it had remained at its historical level of 0.47 instead of falling to 0.38 (Chart 8), labour productivity growth would have been 1.19 per cent per year or 0.24 percentage points higher. Thus, stronger employment or total hours worked growth given the rate of output growth, which we can call over-hiring, could explain just under half of the slowdown since

2000 relative to the 1973-2000 period. Assuming the productivity elasticity of the 1973-2000 period obtained after 2000 and assuming no fall in potential productivity growth, the other half of the slowdown can, in an accounting sense, be explained by lower output growth.

### *Labour Quality*

The first channel through which lower unemployment could have contributed to the productivity slowdown is through the employment of more persons on the margin of the labour market. Such workers are normally not the first choice of employers due to their poor work history, limited qualifications or more generally, because they are workers not in their prime (between 25 and 54 years old). Indeed, between 2000 and 2007 the employment rate of prime-age workers increased only 2.3 percentage points (2.9 per cent). In comparison, the employment rate of young workers (15-24) increased 3.2 percentage points (5.7 per cent), that of older workers (54-65) increased 9.0 percentage points (18.7 per cent) and that of elderly workers (65 and over) increased 2.7 percentage points (45.8 per cent). In total, the employment rate of non-prime-age workers increased 4.8 percentage points (13 per cent), more than twice as much as that of prime-age workers (Chart 12).

Of course, at least part of this shift in labour quality may be accounted for in the growth accounting measure of labour composition, which contributed 0.04 percentage points per year less to labour productivity in the 2000-2006 period (0.32 points) than in the 1973-2000 period (0.36 points). Yet, as the proportion of non-prime-age workers and persons on the margin of the labour market was higher among new hires than in the existing labour force, it is also likely that a greater proportion of new hires possessed undesirable unobserved characteristics that might not be captured in the labour composition component of the growth accounting framework.

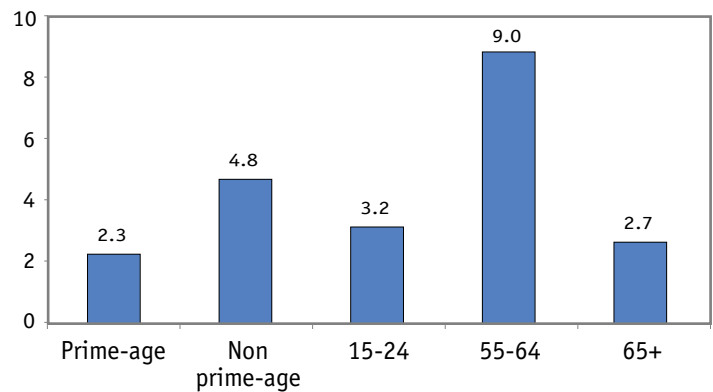
For example, the eroding skills of older workers or their inability or lack of interest in mastering the latest technologies, the additional needs for workplace training and high turnover for young workers and the instability of substance abusers would not be accounted for in the framework.<sup>25</sup> In other words, actual labour quality growth may be lower than measured labour composition growth, underplaying the role of changes in the composition of the labour force in the current slowdown. If the Canadian labour market were to deteriorate, these negative composition effects on productivity growth would be reversed.<sup>26</sup> And even if labour conditions remain unchanged, the negative effects of a falling rate of growth of labour quality on productivity growth would only be transitory as the proportion of low-quality workers can not increase indefinitely.

Training decisions can also be affected when firms react to lower labour quality with increased training. An increase in training would also show up as over-hiring as firms now have additional labour for a given level of output. While training provides positive productivity gains in the medium to long term, it does decrease productive inputs in the short term.

While a fall in the quality of labour due to an increasing proportion of workers with productivity-impeding unobserved characteristics may have contributed somewhat to a productivity slowdown, these workers would still likely represent only a small proportion of the total workforce and their effect on aggregate productivity should be minor. Thus, this effect alone should be considered only as a small contributor to Canada's slower productivity growth since 2000.

**Chart 12**

**Employment Rate Growth in Canada by Age Group, 2000-2007**  
(percentage points)



Source: Statistics Canada, Labour Force Survey.

### *Labour Shortages*

Alongside its potential effect on labour quality, the shift of paradigm in the Canadian labour market also brought about mounting labour shortages (Sharpe, Arsenault and Lapointe, 2008). Indeed, even sectors suffering large employment losses, such as manufacturing, have reported sharp increases in skilled labour shortages in recent years. For example, the proportion of manufacturers reporting skills shortages as a production impediment increased from only 6 per cent in 2004 to 12.5 per cent in 2007 (Chart 13).<sup>27</sup> Increasing skilled-labour shortages means that firms may not have been able to run at full capacity, or worse that they were unable to staff specialized positions that could arguably drive technological or organizational change and in turn boost productivity growth.

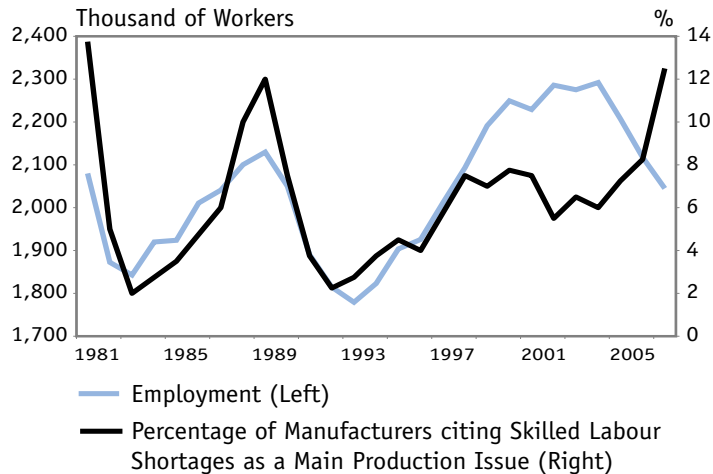
In addition to their direct effect on productivity growth, more labour shortages can significantly alter firms' employment decisions and

25 Using panel data at the provincial level, Tang and Macleod (2006) find that older workers (55 or over) in Canada have on average lower productivity levels and have a negative effect on labour productivity growth.

26 A reversal of fortune in the labour market, however, would lower societal well-being. Indeed, the current situation is an excellent example of a moment where productivity trends do not provide an accurate signal of trends in well-being. When low quality workers enter the workforce, aggregate productivity falls through a composition effect. Yet, society and the individuals concerned are certainly better off because of this integration into the working world. For both societal well-being and the personal well-being of workers on the margin of the labour force, a loss of employment would not be good news even though it might temporarily boost aggregate productivity growth.



**Chart 13**  
**Skilled Labour Shortages and Employment in Manufacturing in Canada, 1981-2007**



Source: Statistics Canada, Labour Force Survey and Business Conditions Survey.

could have been a contributor to the falling productivity elasticity in Canada. For example, firms might be reluctant to lay-off workers when the workload decreases temporarily if they know these workers will find employment elsewhere and will not be available to be recalled at a later date. Cross (2007) points to anecdotal evidence of labour hoarding in the oil sands due to fear of losing employees. Employers may also hire

additional workers in anticipation of future demand if they expect difficulties in hiring workers in a timely manner in the future.

The reported increases in skills shortages also point to a factor that may have become more important for productivity in recent years; the flexibility of workers to adjust their skills and location to changing realities. With employment falling in the manufacturing sector, increased skills shortages were likely due to a mismatch between the skills needed by firms and those offered by workers rather than to a simple lack of available workers. Indeed, with new technology becoming more pervasive and the labour market becoming tighter, it is increasingly important from a productivity perspective that firms find workers with the needed skills, in a timely manner and in the right location. Yet, workers in Canada are less mobile than their U.S. counterparts (Sharpe and Sakir, 2008).<sup>28</sup> The negative effects on productivity may have intensified due to the emergence of the new labour market reality.

#### Corporate Profits

Corporate profits in Canada averaged 12.8 per cent of GDP between 2001 and 2007, well above the 9.6 per cent of GDP recorded on average between 1974 and 2000 (Chart 14).<sup>29</sup>

27 Statistics Canada interprets the results of the Business Conditions Survey as the proportion of firms reporting skills shortages as one of their main production difficulty. However, the survey methodology suggests otherwise. In fact, the percentage given represents the percentage of responses as a percentage of all responses (weighted by the value of the respondent's annual shipments). As respondents are allowed to provide more than one source of production difficulties, the number of responses is not necessarily the same as the number of firms/respondents. Thus, in theory, an increase in the proportion for skilled shortages could be the result of either an increasing number of firms who report skilled shortages as a production impediment, or a decrease in the number of firms reporting other types of production impediments.

28 One important factor is the lower interprovincial mobility of francophones in Quebec. In Canada, the percentage of the population moving between provinces was 1.1 per cent in 2006. In comparison, 1.4 per cent of the population in the United States moved across the nine geographical divisions. This 0.3 percentage-point difference, however, was largely due to the lower interprovincial mobility of Quebec residents. Indeed, only 0.5 per cent of Quebec's population moved from Quebec to another province. Excluding Quebec, the interprovincial migration rate in Canada was 1.3 per cent, almost identical to that in the United States.

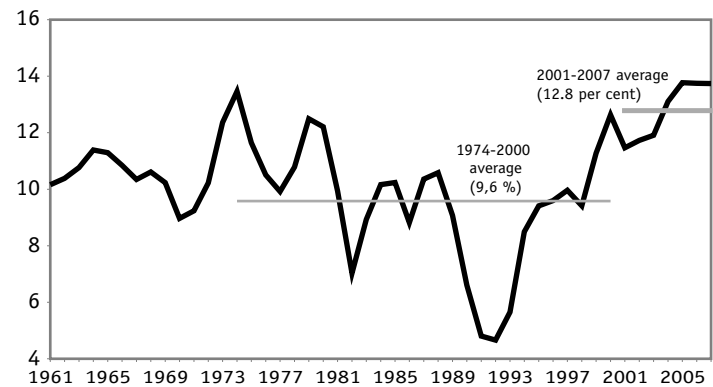
29 The rise in profits in Canada since 2000 was broadly based, and not just concentrated in the oil and gas sector (Statistics Canada: Financial Statistics: Cansim Table 180-0003). To be sure, profits in the oil and gas extraction industry doubled between 2000 and 2006, but this sector accounted for only 17 per cent of the total increase in profits. Other sectors saw even greater profit increases: construction (263 per cent), telecommunications (407 per cent), and professional, scientific and technical services (400 per cent). In contrast, profits in manufacturing fell 29 per cent between 2000 and 2006, with the sector's share of total profits dropping from 42 per cent to only 18 per cent.

High profitability has influenced the behaviour of employers. In general, low profitability prompts firms to undertake cost-cutting measures and workplace reorganizations to improve profit margins. High profitability might also be positive for productivity through the increased availability of internal funds for investment. On the other hand, high profits might not only increase x-inefficiency<sup>30</sup> by breeding firm complacency, but also encourage firms to expand rather than consolidate.

For businesspeople, who aim at maximizing long-term profits, the trade-off between investing time, energy and money into more efficient production processes or into expanding their operations might seem like a fairly balanced one. Yet, from a productivity perspective, while the former provides immediate productivity growth, the latter does not. In fact, the latter can lead to over-hiring as new establishments are set up and new employees are trained. Moreover, it can result in capital widening rather than capital deepening if new investment is directed towards expansion rather than current operations. With profits running high and no recession in the 2000s,<sup>31</sup> it would be no surprise if many businesses favoured expansion over consolidation.

As mentioned earlier, while high profits may benefit productivity through increased investment, they may also have a negative productivity effect due to increased x-inefficiency. Without the short-term pressure to increase profits, managers might be reluctant

**Chart 14**  
**Corporate Profits as a Proportion of National Income in Canada, 1961-2007**  
 (per cent)



Source: Statistics Canada, Cansim Table 380-0016.

\* Corporate profits before taxes, without inventory valuation and capital consumption adjustments.

to undertake risky workplace re-organizations or to expend much energy on improving products or production processes. Moreover, the negative effects of heightened business complacency on productivity growth might have been more important since 2000 than in previous periods as the gains to be realized from investment in intangible capital were arguably larger. Indeed, the complementary nature of workplace re-organization and information and communication technologies (ICT), which is increasingly being recognized among economists,<sup>32</sup> means that failure to invest in intangible capital may have prevented Canadian firms from fully realizing the productivity gains from ICT investment.

30 X-inefficiency is the difference between efficient behavior of firms assumed by economic theory and their observed behavior in practice.

31 Real income growth, which is arguably a better measure of demand conditions than output growth, has grown much faster than GDP in Canada in the 2000s due to trading gains, international investment income and capital consumption. While real GDP per capita increased only 9.6 per cent between 2000 and 2006, real net national income (NNI) per capita increased 15.6 per cent. Moreover, per capita NNI grew more in the six years since 2000 than in the decade of the 1980s (15.0 per cent) and that of the 1990s (12.4 per cent), pointing to strong demand fundamentals since 2000 (Macdonald, 2007).

32 For evidence to this effect, see Gordon (2003), Leung (2004), Turcotte and Whewell Rennison (2004), and Gera and Gu (2004).

## Box 1: Explaining Weak Labour Productivity Growth in the Canadian Manufacturing Sector since 2000

The manufacturing sector has played an important historical role in productivity growth in Canada. Even though the sector's employment and output shares have been falling steadily over the last 30 years, manufacturing has been one of the key engines of labour productivity growth, with productivity growth twice the business sector average over the 1973-2000 period (2.88 per cent versus 1.55 per cent). Yet, its productivity performance since 2000, at 0.56 per cent per year, has been well below its 1973-2000 trend (see Table) and only around one half business sector productivity growth (0.95 per cent). The recession of the early 2000s in the United States significantly affected demand for Canadian manufactured goods, with output falling 3.9 per cent in manufacturing in 2001. Starting in 2003, Canadian manufacturers also had to adjust to steady increases in the value of the Canadian dollar, dampening the potential rebound of demand. In this context, poor productivity in the manufacturing sector was mostly the result of an extended recessionary period in the sector, with output falling on average by 0.4 per cent per year between 2000 and 2006. Large productivity increases are much more difficult to obtain in a context of stagnant or falling demand than when demand is growing.

Capital services intensity contributed only 0.53 percentage points to productivity growth over the 2000-2006 period, down from 0.90 points in the 1973-2000 period. Moreover, the growth accounting framework probably overestimates the contribution of capital deepening to labour productivity since 2000. Indeed, because firms tend to adjust labour faster than capital, capital intensity grows as firms shed labour but keep their capital levels relatively fixed. This adjustment process increases growth in capital services without producing commensurate gains in productivity growth. As the contribution of capital deepening is overestimated, MFP growth is in turn underestimated. This process seems to have played a role since 2000 as falling MFP growth (-0.3 per cent per year between 2000 and 2006, down 1.87 percentage points when compared to the 1973-2000 period) has been by far the main contributor to lower manufacturing productivity growth.

### A Growth Accounting Perspective on Manufacturing in Canada

	1973-2000	2000-2006	2000-2002	2002-2004	2004-2006
Average Annual Rates of Growth					
Output	3.04	-0.39	-1.56	0.65	-0.25
Total Hours	0.15	-0.95	-1.58	0.87	-2.10
Capital Services	2.79	0.24	-1.51	0.50	1.77
Capital Services Intensity	2.64	1.19	0.08	-0.37	3.87
Percentage point contributions to labour productivity growth					
Labour Productivity	2.88	0.56	0.05	-0.25	1.89
Labour Composition	0.39	0.32	0.35	0.25	0.35
Capital Services Intensity	0.90	0.53	0.05	-0.15	1.69
Multifactor Productivity	1.57	-0.30	-0.40	-0.35	-0.15

Source: Cansim Table 383-0021

On the other hand, it could be expected that an increase in the value of the Canadian dollar would lead to additional capital investment through cheaper imported machinery and equipment. Moreover, tougher product market conditions associated with the rising dollar should exercise additional pressure for manufacturers to improve production processes, i.e. fewer "lazy manufacturers", and lead worst performers to bankruptcy. Indeed, a turning point was reached in 2005, with capital services increasing in both 2005 and 2006 after declining over the 2000-2004 period. In the 2004-2006 period, capital services intensity increased 3.87 per cent per year. Finally, Cross (2007) noted that manufacturing firms at the bottom of the value chain have been exiting in larger number in 2006, contributing marginally to higher productivity growth. With incentives to invest on the rise due to the strong dollar and with the brunt of the adjustment process slowly coming to an end, it would not be surprising to see the manufacturing sector record considerably stronger productivity growth in the near future. Already, the sector enjoyed average labour productivity growth of 1.89 per cent per year in 2005 and 2006 and preliminary estimates of 1.9 per cent for 2007 suggest an improved productivity performance of the sector relative to the first four years of the decade.

## Box 2: Explaining Falling Labour Productivity in the Canadian Mining and Oil and Gas Sector since 2000

The falling productivity in the mining and oil and gas sector, unlike the weakness in manufacturing, is rooted in an expansion rather than in a contraction of output. Indeed, with energy and mineral prices increasing since 2000 and particularly since 2003, output in the sector has grown faster than in the 1973-2000 period (see Table).

The increase in commodity prices led to a hiring spree in the sector (Chart 9), with hours worked since 2000 growing at four times the rate of the 1973-2000 period (6.02 per cent per year versus 1.42 per cent). Persistent labour shortages and high profits in the sector meant that companies were eager to build up a pool of employees to meet current expansionary needs and position themselves for future opportunities. With firms rapidly hiring additional workers since 2002, delays in the delivery of machinery and equipment due to limited supply for specialized machinery led to a decline in the contribution of capital services intensity. Finally, the non-renewable nature of the sector's output and high commodity prices means that increasingly harder to extract reserves became profitable ventures and were thus exploited, putting downward pressures on MFP growth (Bradley and Sharpe, 2008). Indeed, between 1973 and 2000, MFP growth was negative despite significant improvement in extraction methods. Since 2000 and especially since 2004, increasing commodity prices have allowed the exploitation of reserves yielding much lower productivity levels. Through a compositional effect, this has led to increasingly negative labour productivity and MFP growth.

### A Growth Accounting Perspective on Mining and Oil and Gas

	1973-2000	2000-2006	2000-2002	2002-2004	2004-2006
Average Annual Rates of Growth					
Output	1.14	1.78	1.74	2.57	1.04
Total Hours	1.42	6.02	1.99	7.42	8.77
Capital Services	3.91	8.11	7.77	7.24	9.35
Capital Services Intensity	2.49	2.09	5.78	-0.18	0.58
Percentage point contributions to labour productivity growth					
Labour Productivity	-0.29	-3.98	-0.20	-4.50	-7.11
Labour Composition	0.14	0.05	0.35	-0.30	0.10
Capital Services Intensity	1.82	1.59	4.48	-0.10	0.45
Multifactor Productivity	-2.20	-5.53	-4.83	-4.14	-7.58

Source: Cansim Table 383-0021

Despite large declines in productivity in the mining and oil and gas sector since 2000, the net effect of the boom in the oil sector on aggregate productivity has likely been positive. Labour from lower-productivity industries has been reallocated to the mining, oil and gas sector, which benefits from much higher productivity levels and rising relative prices. Yet, falling productivity growth in the sector did contribute to the slowdown. If the mining and oil and gas sector had maintained pre-2000 productivity growth rates while still absorbing large amount of new labour and benefiting from higher relative prices, productivity growth in Canada would have been significantly higher. Because the falling productivity of the sector is both the result of a rapid increase of its labour force and of the sudden increase in the exploitation of the oil sands, we may expect future labour productivity performance to be better (even if still negative) as the sector adjusts to its new reality and as the rate of increase in the oil sands share of total production levels falls off. In addition, with the exploitation of oil sands being relatively new and gaining economic importance, the likeliness of important technological improvement in the production processes increases and could be a significant potential source of future productivity growth for Canada. Yet, if oil prices remain high, extraction activities in deeper oil sand deposits might grow significantly and continue to put downward pressure on the sector's productivity growth.

### **Why Has Canadian and US Productivity Growth Diverged Since 2000?**

The previous section examined why labour productivity growth in Canada since 2000 has been 0.60 percentage points below the long-term trend established over the 1973-2000 period. A second question may be why there has been such a large gap between business sector labour productivity growth in Canada and the United States since 2000: 1.65 percentage points based on 0.95 per cent labour productivity growth in Canada and 2.60 per cent in the United States. Even if labour productivity growth in Canada had continued at its trend (1973-2000) rate of 1.55 per cent after 2000, there still would have been an annual 1 percentage-point gap in labour productivity growth rates between the two countries.

It is of course true that labour productivity growth was somewhat weaker in Canada than in the United States before 2000, with a resulting widening of the level gap. But the productivity growth gap was much smaller. For example, between 1984, the year the Canadian business sector labour productivity level was closest to that of the United States (a gap of 9 percentage points) and 2000, the productivity growth gap was 0.6 percentage points (1.95 per cent versus 1.35 per cent), only one-third the size of the post-2000 productivity growth gap.

The 1.65 percentage point Canada-US labour productivity growth gap since 2000 refers to the average for the 2000-2007 period. Within the period, the size of the gap varied greatly. As shown in Chart 5, US labour productivity growth was extremely rapid during the four years after 2000 (2.5 per cent in 2001, 4.1 per cent in 2002, 3.8 per cent in 2003 and 2.9 per cent in 2004). It then fell off significantly, averaging 2.0 per cent in 2005, 1.0 per cent in 2006 and 1.9 per cent in 2007.<sup>33</sup> In other words, US productivity growth fell from 3.3 per cent per year in 2000-2004 to 1.6 per cent in 2004-2007. In contrast, productivity growth in Canada averaged 0.7 per cent per year in 2000-04 and 1.3 per cent in 2004-2007, picking up between periods. The annual Canada-US labour productivity growth gap thus fell from 2.6 percentage points in 2000-2004 to 0.3 points in 2004-2007.

The growth of the Canada-US labour productivity growth gap from only 0.16 points in the 1973-2000 period (1.55 per cent per year in Canada versus 1.71 per cent in the United States) to 1.65 per cent in the 2000-2007 period reflects more the acceleration of productivity growth in the United States by 0.9 percentage points than the deceleration in Canada (0.6 points). From this perspective, to understand the productivity growth gap it is more important to understand why productivity growth accelerated in the United States than why it fell in Canada.<sup>34</sup>

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33 The relatively strong US performance in 2007 suggests that one should be cautious in assessing whether or not the United States will be able to sustain productivity growth at rates similar to those observed over the 1995-2004 period.

34 The reasons behind the strong productivity performance in the United States since 1995 have been the subject of substantial research. Most recently, Bosworth and Triplett (2007) noted that the US productivity resurgence between 1995 and 2005 was largely due a strong productivity performance in services industries. They noted that the 1995-2000 resurgence was primarily driven by IT capital deepening in services and technological advances in IT production while the 2000-2005 period was characterized by strong MFP in a wide array of services industries. Jorgenson, Ho, Samuels and Stiroh (2007:1) produced similar findings, noting that "in 1995-2000 the acceleration in labor productivity growth was due primarily to more rapid IT-capital deepening and secondarily to faster growth in MFP in the IT-producing industries. Other types of capital deepening accelerated further after 2000, but more rapid MFP growth outside of IT production growth emerged as the primary driving force." From a slightly different perspective, Jorgenson, Ho and Stiroh (2008) evaluated whether or not the productivity growth resurgence could be sustained. They project a base case annual total economy US labour productivity growth of 2.4 per cent in 2006-2016, a much more sanguine projection than any current projection for Canada.

## The Contribution of Factors Explaining Level Differences

The level of labour productivity in Canada has always been below that of the United States (Chart 8).<sup>35</sup> There are a large number of factors that have been put forward as explanations for the lower productivity level in Canada. However, these factors do not necessarily account for the widening of the gap (i.e. faster US productivity growth). To account for the widening, it must be shown that the factors responsible for the level difference became even more important since 2000.

It is beyond the scope of this article to provide a comprehensive survey of the literature on the factors behind the Canada-US productivity gap (Sharpe, 2003). Factors cited in this literature include Canada's lower R&D intensity; lower M&E per worker; lower ICT per worker; lower levels of urbanization; less competitive intensity as evidenced by product market and labour market regulation; higher marginal effective tax rates (METRs) on capital; greater tax/GDP share; higher public debt; and lower educational attainment.

It is of course not the relative level in these nine factors that affects the Canada-US labour productivity growth rate gap, but the relative trends in the variables in the two countries. A deterioration in any of these factors in Canada relative to the United States could have contributed to slower productivity growth in Canada. But Canada's relative performance in all nine factors has improved or remained stable since 2000, as evidenced by the points below:

- Over the 2001-2006 period, Canada's R&D intensity, defined as the ratio of gross expenditures on R&D (GERD) to GDP, was on average 76.1 per cent the US rate, up from 59.6 per cent in the 1981-2000 period. Canada's business sector R&D intensity performance, which many believe is more closely linked to productivity growth than non-business sector R&D, was on average 60.9 per cent of the US rate over the 2001-2006 period, up from 45.1 per cent in 1981-1999 (Main Science and Technology Indicators 2007-2 – OECD Database).
- Over the 2001-2007 period business sector M&E per worker in Canada averaged 73.1 per cent of the US level, higher than the 67.3 per cent average of the 1992-2000 period (CSLS, 2007: Summary Table 38).<sup>36</sup>
- Equally, ICT per worker in Canada rose slightly from 54.1 that in the United States over the 1992-2000 period to 54.9 over the 2001-2007 period. (CSLS, 2007: Summary Table 1).<sup>37</sup>
- The level of urbanization in Canada relative to that in the United States has remained stable in the 2000s.
- The extent of labour market regulation, as measured by the OECD, has stayed stable in both Canada and the United States in the 2000s (OECD, 2004: Table 2.A2.4). Canada's extent of product market regulation, as measured by the OECD, has declined between 1998 and 2003, and although slightly higher than in the United States, its level relative to the United States has remained stable (OECD, 2005: Table 24).<sup>38</sup>

35 In fact, even in 1870, the earliest year for which data are available, the level of GDP per hour worked in Canada was estimated to be about 76 per cent the level in the United States (Maddison, 2003: Table E-7). This early estimate refers, of course, to total economy productivity levels rather than business sector productivity levels.

36 Moreover, M&E per worker in Canada rose from 66.7 per cent that in the United States in 2000 to 77.0 per cent in 2007. The relative investment comparisons are made using M&E purchasing power parity estimates from Statistics Canada.

37 Moreover, ICT per worker in Canada rose from 49.0 per cent that in the United States in 2000 to 58.0 per cent in 2007. The relative investment comparisons are made using M&E purchasing power parity estimates from Statistics Canada.

- Canada's marginal effective tax rate (METR) on capital has fallen significantly below the level in the United States in recent years. In 2007, Canada's METR was only 66.6 per cent of the US rate for manufacturing industries and 90.8 per cent for service industries, down from 112.5 and 148.8 per cent respectively in 1999 (Mintz, 1999 and 2007).
- The relative tax burden, defined as tax receipts as a percentage of GDP, has fallen in Canada relative to the United States since 2000, from 119.1 per cent the US level in 2000 to 118.4 per cent in 2007 (OECD, 2007: Table A).<sup>39</sup>
- The government debt/GDP ratio and government balance have improved dramatically in Canada since 2000, in contrast to a significant deterioration in the United States.
- The share of the population aged 25-64 with a university degree in Canada was 79.6 per cent that in the United States in 2007, up from 71.3 per cent in 2000. The share of the population aged 25-64 with at least a post-secondary diploma or certificate in Canada was 149.8 per cent that in the United States in 2007, up from 143.2 per cent in 2000.<sup>40</sup>

## Explaining the Canada-US Labour Productivity Gap since 2000

Given the relative lack of deterioration outlined above for productivity drivers in Canada, what can account for the dramatic widening of the Canada-US productivity growth gap since 2000? A clue may be that over 90 per cent of the widening took place in the 2000-2004 period when US productivity growth exploded. Unlike the productivity surge of the late 1990s where there is consensus on the underlying causes, no such consensus exists on the causes of the strong US productivity growth in the 2000-2004 period (Sharpe, 2005). But most researchers find that that US leadership in the ICT area, both in as an ICT producer and in ICT adoption, is an important part of the story. It is certainly true that the pace of ICT investment and ICT production fell off in the first half of the 2000s compared to the second half of the 1990s and therefore from a growth accounting perspective, ICT contributed less to labour productivity growth.<sup>41</sup> But the United States has the highest level of ICT per worker among OECD countries and a number of economists posit that the productivity-enhancing benefits of ICT are not fully captured through conventional growth accounting. This may be particularly the case in the important services industries such as whole-

38 In 2003, Canada's employment protection regulation (EPL) was at 0.8 on a scale of 0 to 6, with 0 being no regulation. This score was identical to that reported for the late 1980s and late 1990s. The United States had a score of 0.2. Using an alternate scoring system, Canada's EPL scored 1.1 out of 6 in 2003 compared to 0.7 out of 6 for the United States, with no change in either countries between the late 1990s and 2003 (OECD 2004: Table 2.A2.4).

39 Tax receipts in Canada have declined from 35.6 per cent of GDP in 2000 to 33.4 per cent in 2006, a 2.2 percentage-point decrease. The share of tax receipts to GDP only fell slightly relative to the United States as the latter also recorded a 1.7 percentage-point fall from 29.9 per cent in 2000 to 28.2 per cent in 2006.

40 The share of the population aged 25-64 with a university degree in Canada has increased from 19.9 per cent in 2000 to 24.6 per cent in 2007 (Labour Force Survey data), a 4.7 percentage-point increase. In the United States, the increase was smaller at 3.0 percentage point, from 27.9 per cent in 2000 to 30.9 per cent in 2007 (Current Population Survey). The share of the population aged 25-64 with at least a post-secondary diploma or certificate in Canada has increased from 52.3 per cent in 2000 to 60.3 per cent in 2007 (LFS). In the United States, it went from 36.5 per cent in 2000 to 40.3 per cent in 2007 (CPS).

41 Bosworth and Triplett (2007:Table 3) report that the contribution of information technology to non-farm business labour productivity growth in the United States fell from 0.8 percentage points per year in 1995-2000 to 0.5 points in 2000-2005 and that of multifactor productivity growth from computers fell from 0.7 points to 0.3 points.

sale and retail trade, business services, and finance when the United States is a world leader in the development and use of ICT technologies. Indeed, these service industries contributed disproportionately to aggregate labour productivity growth in 2000-2004.<sup>42</sup>

As noted earlier, most of the increased Canada-US productivity gap since 2000 relates to developments south of the 49<sup>th</sup> parallel and not to developments in this country. Moreover, by 2005 US productivity growth has fallen significantly and averaged only 0.3 points above that in Canada over the 2004-2007 period.

This has two implications for productivity developments in Canada. First, if the more recent 2005-2007 period is an appropriate guide, it is unlikely that future US productivity growth will greatly outpace that in Canada. Second, the widening Canada-US productivity gap, at least if it has been driven by the United States leapfrogging ahead technologically, may mean that there is now more room for technological catch-up toward the US level. To the degree that such convergence can take place, productivity growth in Canada has the potential to exceed that in the United States.

## Conclusion

Since 2000, labour productivity growth in Canada has on average grown at a rate 0.6 percentage points below the long-term trend established over the 1973-2000 period. The story is quite different in the United States, where productivity has continued to be strong beyond the year 2000, averaging 2.6 per cent per year.

From a growth accounting perspective, half the slowdown in Canada can be attributed to slower growth in capital services intensity. About 43 per cent was associated with slower MFP growth and the remaining seven per cent was due to slower growth in labour composition.

We argue that Canada's weak productivity performance since 2000 relative to its 1973-2000 trend was the result of the interaction between the rising value of the Canadian dollar, increasing commodity prices and the movement from a labour-surplus to labour-constrained economy. Transitory costs associated with labour reallocation, which were mostly due to an increase in commodity prices and an appreciating currency and which affected primarily the goods sector, contributed to slower labour productivity growth since 2000. This economic turbulence took place in the context of a tighter labour market and high corporate profits, factors that boosted employment and led to a falling productivity elasticity. A slower rate of growth of labour quality and business complacency associated with high profits also contributed to the weakness in productivity growth.

The widening gap in Canada-US labour productivity growth, however, was not only due to Canada's below-trend labour productivity performance since 2000, but also by Canada's inability to follow the United States in what has been coined as the *productivity resurgence*. An analysis of the Canada-US labour productivity growth gap leads us to conclude that much of the increased Canada-US productivity gap since 2000 relates to developments south of the 49<sup>th</sup> parallel and not to developments in this country. Given that the state of the factors driving productivity growth has not deteriorated in Canada relative to the United States in recent years, it is unlikely that long-term productivity growth in Canada and the United States have decoupled. Indeed, the current widening opens more room for convergence.

Future labour productivity in Canada should pick-up compared to its 2000-2007 rate, even though there exists significant uncertainties as to the precise rate of growth

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42 Two other factors suggested by Robert Gordon (2004) that contributed to the very strong US productivity growth of the early 2000s were increased international competition and reduced corporate profitability.



that can be expected. Our analysis suggested that labour hoarding, increased training, high corporate profits and a rise in the Canadian dollar contributed to the slowdown in Canada; these four factors should in the long run lead to more intense use of labour, increased human capital and increased investment. A return to the 1973-2000 trend rate of 1.55 per cent thus appears reasonable. Moreover, with more room for convergence with the United States, it would not be surprising for Canada to exceed its trend rate.

Of course, such projections are not rooted in a firm view of future technological advancement, but rather on an assessment of historical and current productivity performances, as well as a analysis of the factors that have potentially affected these performances. Recent research on productivity growth largely fails to fully explain Canada's low MFP growth compared to that in the United States. As such, to the extent that future labour productivity growth in Canada will rely on MFP growth, any projection of future labour productivity growth must be interpreted as an informed approximation rather than a firm estimation.

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