Comparisons of economic performance: Canada versus Australia, 1983–2000

Although Australia performed better than Canada in terms of productivity growth for the overall economy, the standards of living for both countries grew at the same pace; sources of productivity growth reveal key differences between the two countries

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Productivity performance has been a topic of interest throughout recent decades. Research was directed at issues at different times, depending on the nature of the public policy debate. For example, after 1973, research focused on whether there was a historical slowdown in productivity growth in developed countries. Recently, an issue has focused on whether and how the introduction of information technology is contributing to productivity performance. In addition, the progressive globalization of the world economy, increasing exposure of individual countries to international trade and capital movements, has heightened interest on cross country comparison of productivity performance.

In this context, Canada and U.S. comparisons have long been an important research theme of the Canadian Productivity Accounts program of Statistics Canada. This study expands the international scope of this program to explore productivity growth in Australia; a country that was considered an economic miracle in the 1990s and one that has many similarities to Canada.[1]

How are these countries similar? First, Canada and Australia are both small countries in terms of population, suggesting similar economies of scale at work. Australia has a population of nearly 20 million, compared with approximately 30 million in Canada. (See appendix table A-1 for some key figures on both countries.) Moreover, in 2001, gross domestic product per capita was approximately $28,900 in Canada, compared with $27,300 in Australia, reflecting similar standards of living.

Second, the two countries reflect similar economic structures. Australia, like Canada, is a net importer of production technology. Machinery and transportation equipment represent approximately half of total imports of both countries. The bulk of high tech equipment of both countries is imported from the United States.

Third, both Canada and Australia possess abundant natural resources and the structures of these two economies are dominated by the primary sector: 55 percent of Australia's exports are in the form of raw materials, compared with 46 percent for Canada.

Finally (and this is by no means a negligible factor for cross country comparisons), both countries have a statistical system that lends itself to cross country comparisons in terms of productivity performance.(See appendix exhibit A-1 for the sources and concepts employed by both countries.) Both Canada's and Australia's productivity programs are integrated to their system of national accounts and employ best practice concepts and methods outlined in the *OECD Productivity Handbook*.[2]

This study describes the nature of the Australian economic miracle. It then presents the

major trends in Canadian and Australian standards of living as well as their sources of growth in terms of labor productivity and labor utilization (hours worked per person). It also focuses on labor productivity growth and traces its sources in terms of capital deepening (capital-labor ratio), labor composition, and multifactor productivity performance. These sources help compare and determine how each country performed during the 1983–2000 period.

The Australian 'miracle'?

Australia's economic performance in the 1990s was outstanding. For 9 years, growth averaged slightly less than 4 percent—a performance not seen since the 1960s and early 1970s. The ability to grow so strongly, even in the midst of economic challenges, such as the Asian financial crisis, led some economists and others to label Australia as the 'miracle' economy.[3]

Australia's surge in productivity growth underpinned good performance during the 1990s, which was characterized by:

1. The longest period of continuous increase in productivity on record (9 years)
2. The highest rate of growth in productivity. Multifactor productivity grew at 1.8 percent a year, compared with 0.7 percent a year from the early 1980s
3. Productivity growth that outperformed the Organisation for Economic Co-operation and Development (OECD) average for the first time (Australia had the second highest productivity acceleration in the 1990s)[4]

According to Dean Parham, this was no miracle.[5] The productivity surge was certainly remarkable, but it was more the "predictable" outcome of policy reforms designed to raise Australia's productivity performance than it was simply the result of good fortune:

> Policy reforms were introduced progressively from the mid-1980s and continued through the 1990s. Reforms have included: deregulation of access to finance; floating the currency; market reductions in barriers to trade and foreign direct investment; commercialisation (and some privatisation) of government business enterprises; strengthening domestic competition; and changing institutional arrangements to allow greater labour market flexibility. The hallmark of macro policy has become to rein in budget deficits and to vest the central bank with the clear responsibility to adjust monetary policy setting to target inflation.

Because of its geographic location, Australia has close trade relations with Asian countries, which accounted for about 40 percent of its exports in the 1990s. Despite these strong economic ties, the Australian economy has withstood the financial crisis that gripped its Asian export markets by finding new export markets. In addition, the weaker Australian dollar relative to the U.S. dollar has contributed to the resilience of the Australian economy.

Australia's average annual growth in GDP per capita (2.0 percent) was below the OECD average (2.8 percent) over the post World War II period from 1950 to 1990. Among OECD countries, Australia's ranking on level of GDP per capita (measured on an internationally comparable basis) slipped from 5 to 15 in 1990, mainly due to a lower rate of productivity growth.

However, according to OECD data, Australia's annual average rate of growth in GDP per capita increased to 2.5 percent in the 1990s (up from a previous rate of 1.7 percent during the previous two decades).[6] At 2.3 percent, annual productivity growth accounted for around 90 percent of the 1990s average income growth compared with an average of 65 percent from 1970 to 1990.

Australia was ahead of the OECD average in terms of income and productivity growth in the 1990s—the OECD average being 1.7 percent for GDP per capita and 1.8 percent for productivity. Australia's income and productivity growth were both ahead of U.S. income (2.0 percent) and productivity (1.6 percent) growth. As a result of the strong productivity growth in the 1990s, Australia raised its ranking on GDP per capita to 7 in 2001 (up from 15 in 1990).[7]

By all counts, Australia has performed exceptionally well during the 1990s. How then does Canada compare to Australia?

Canada and Australia compared

Changes in the standard of living. Summary statistics on the two countries indicate that for the year 2000, GDP per capita expressed in terms of purchasing-power parity was $28.9 thousand for Canada, compared with $27.3 thousand for Australia.[8] It is interesting to quantify and compare the long-term changes in this indicator for the two countries and to compute the extent to which productivity growth and labor force utilization have contributed to these changes.

$$\Delta\frac{GDP}{Pop} \equiv \underbrace{\Delta\frac{GDP}{Hours}}_{labor\ productivity} + \underbrace{\Delta\frac{Hours}{Employment^{15+}} + \Delta\frac{Employment^{15+}}{Pop^{15+}} + \Delta\frac{Pop^{15+}}{Pop}}_{labor\ utilization}$$

where:

GDP = Gross domestic product (overall economy)

Hours	=	Total hours at work (overall economy)
Employment15+	=	Number of people aged 15 and older who are employed
Pop15+	=	Working age population (15 years and older)
Pop	=	Total population

Thus, GDP per capita relies on two main sources for its growth: labor productivity and labor utilization. The latter can, in turn, be broken down into three factors that help explain changes in the labor market. These are growth in: average hours at work per job, the employment rate, and the participation rate (that is, the ratio of the labor force population to total population).

Table 1 shows the growth of GDP per capita and its breakdown in terms of productivity and labor utilization for the overall economy between 1983 and 2000, the period for which information is available for both countries. The table also includes the 1983–88 and 1988–2000 subperiods corresponding with the last two economic cycles (specifically 1981–88 and 1988–2000) and 1995–2000, the period marked by the significant impact of information technology on the performance of the economy.

During 1983–2000, GDP per capita increased at an annual rate of 1.9 percent in Canada, compared with 2.4 percent in Australia. This difference in favor of Australia was largely attributable to faster productivity gains (1.7 percent in Australia versus 1.2 percent in Canada). Over the 1983–88 subperiod, GDP per capita advanced at the same pace in both countries, though as a result of different driving forces: Canada outperformed Australia in terms of labor utilization (2.1 percent versus 1.7 percent), but Australia posted faster productivity gains (1.3 percent versus 0.9 percent).

Over the 1988–2000 period, Australia's standard of living increased more rapidly than that of its Canadian counterpart (an average 2.1 percent GDP, compared with 1.4 percent in Canada) as a result of Australia's higher productivity gains (1.8 percent, compared, with Canada's 1.3 percent) and improved labor utilization performance (0.4 percent compared, with 0.1 percent).

The lacklustre Canadian performance during the 1988–2000 period was primarily attributable to its performance over the 1988–95 period. During those 8 years, Canada underwent a major restructuring of its economy, as a result of the implementation of the North American Free Trade Agreement (NAFTA) with the United States and the 1992 recession, making this period less meaningful in terms of economic performance.[9] In the second half of the 1990s, Canada's performance improved, mainly due to the significant growth in labor utilization (1.5 percent for Canada, compared with 0.3 percent for Australia), thus making up some of the productivity gap that favored Australia (2.5 percent, compared with 1.5 percent for Canada).

The gap between the two countries in terms of the productivity performance and the growth of standards of living is primarily attributable to differences in the labor market. To see this, consider first the breakdown of labor productivity in terms of growth of real GDP and hours worked (charts 1 and 2). During the 1983–88 and 1995–2000 periods, Australia slightly outperformed Canada in terms of GDP growth (4.3 percent for Canada, compared with 4.4 percent for Australia between 1983–88 and 3.9 percent compared with 4.4 percent between 1995–2000). In contrast, Canada experienced a consistent, more rapid increase in hours at work (3.4 percent compared with 3.1 percent for Australia between 1983–88 and 2.3 percent for Canada, compared with 1.5 percent for Australia, during 1995–2000).

Consider next, labor utilization, the second component of GDP per capita. (See table 1.) Labor utilization grew more rapidly in Canada than in Australia, mainly driven by the employment rate. During 1983–88 and 1995–2000, Canada advanced more rapidly than Australia in terms of the number of people working (1.6 percent, compared with 0.5 percent for Australia during 1983–88; and 0.9 percent for Canada and no growth at all for Australia during the post-1995 period).

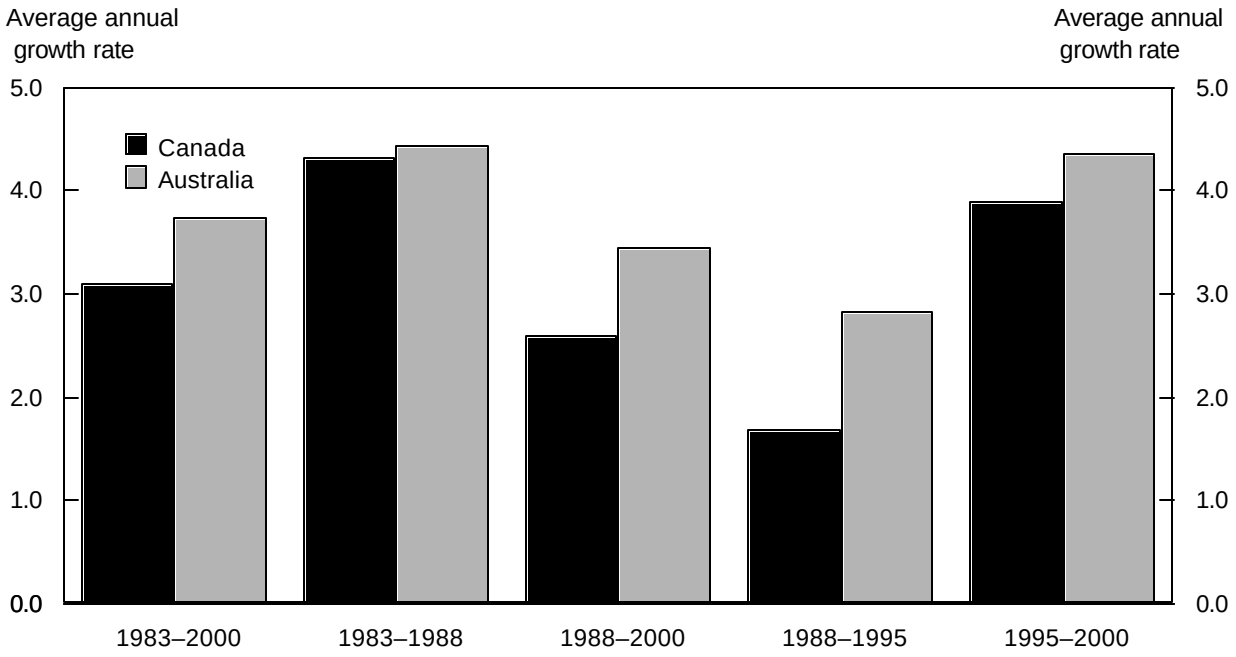
Sources of productivity gains. As illustrated, Australia performed better than Canada in terms of productivity growth for the overall economy. This finding also holds true for that portrayed by the business sector for which the two countries have reliable productivity growth estimates. The portion of

Table 1. Gross domestic product (GDP) per capita and its sources of growth, 1983–2000

[Average annual growth rate in percentage]

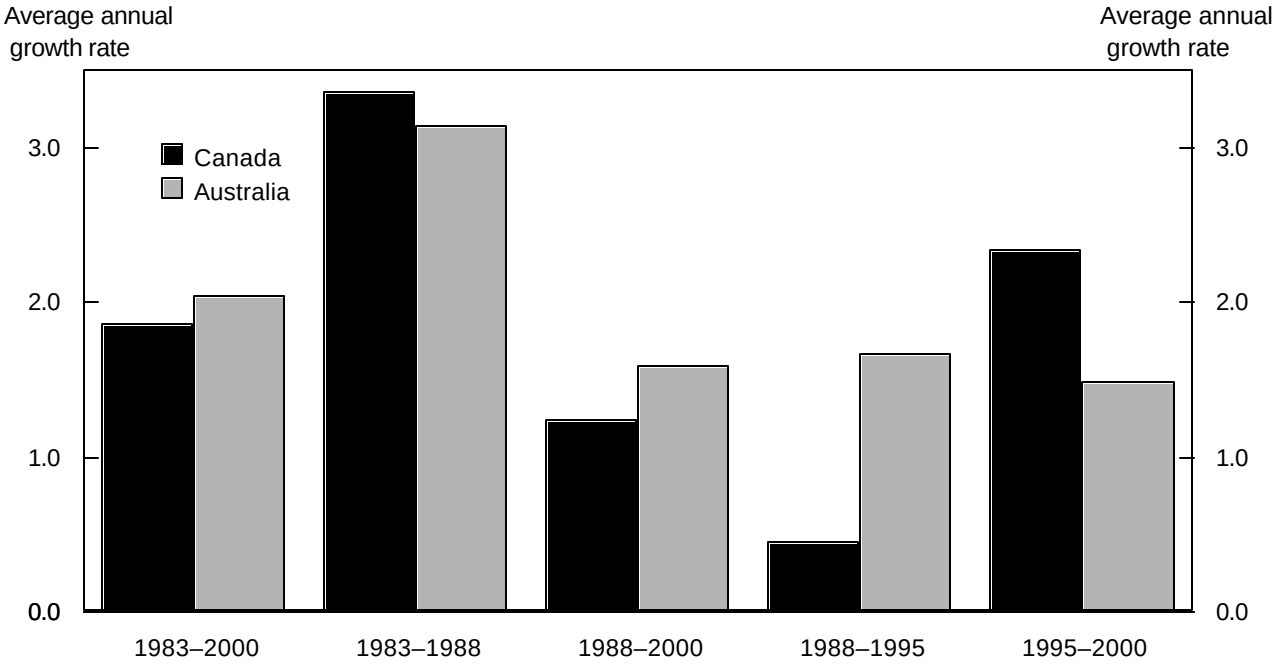
Percent	GDP per capita		Labor productivity		Labour utilization		Average hours		Employment rate		Participation rate	
	Canada	Australia	Canada	Australia	Canada	Australia	Canada	Australia	Canada	Australia	Canada	Australia
1983–2000	1.9	2.4	1.2	1.7	0.6	0.8	0.0	0.2	0.4	0.3	0.2	0.3
1983–88	3.0	3.0	.9	1.3	2.1	1.7	.3	.7	1.6	.5	.2	.5
1988–2000	1.4	2.1	1.3	1.8	.1	.4	–.1	.0	.0	.2	.2	.2
1988–95	.4	1.6	1.2	1.2	–.9	.5	–.3	.0	–.7	.3	.1	.2
1995–2000	3.0	2.9	1.5	2.5	1.5	.3	.2	.0	.9	.0	.4	.3

Chart 1. Real gross domestic product (GDP), total economy, for Canada and Australia, 1983–2000



SOURCE: Statistics Canada and the Australian Bureau of Statistics.

Chart 2. Hours at work, total economy, Canada and Australia, 1983–2000



SOURCE: Statistics Canada and the Australian Bureau of Statistics.

the business sector used in this study does not exactly correspond with the one used in the Canadian productivity accounts. For the sake of comparability with Australia, a portion of the services sector, namely education, health care, professional services to businesses, laundering and dry-cleaning, associations (except religion), and other service industries, has been removed from the Canadian business sector definition. Consequently, the results on productivity growth for the business sector reported in this study are not directly comparable with Statistics Canada's official figures published regularly in *The Daily*.[10]

The following formula is often used to express allocation of labor productivity growth in terms of capital deepening, labor quality improvement, and multifactor productivity growth:

$$\Delta \ell n\left(\frac{Y_t}{H_t}\right) = \bar{s}_{Kt}\Delta \ell n\left(\frac{\tilde{K}_t}{H_t}\right) + \bar{s}_{Lt}\Delta \ell n\left(\frac{\tilde{L}_t}{H_t}\right) + \Delta \ell n(MFP)_t$$

where:

Δln = the change in the natural logarithm of the variable

Y_t = real value added at basic prices

H_t = hours at work

$\bar{s}_{Kt}$ = two-average share of capital in nominal value added

$\tilde{K}_t$ = capital services

$\bar{s}_{Lt}$ = two-average share of labor in nomial value added

$\tilde{L}_t$ = labor services

MFP = multifactor productivity

and:

- *Capital deepening*, $\left(\frac{\tilde{K}}{H_t}\right)$ is the growth in capital services per hour. Increases in capital deepening (also called *capital intensity*) make workers more productive by providing more capital for each hour of work and raise the growth of labor productivity in proportion to the share of capital.
- *Labor quality improvement* $\left(\frac{L_t}{H_t}\right)$ is the difference between the growth rates of labor and hours worked. Reflecting the rising proportion of hours supplied by workers with higher marginal products, labor quality improvement (also called the *labor composition effect*) raises average labor productivity growth in proportion to labor's share.
- *Multifactor productivity* growth (*MFP*) measures the extent to which capital and labor inputs are efficiently employed in the production of goods and services. *MFP* increases labor productivity growth on a point-for-point basis.

Charts 3 and 4 show the results of this breakdown for Canada and Australia for the 1984–2000 period and the subperiods.[11] The height of each column depicts the overall labor productivity growth rate. The difference in labor productivity growth in favor of Australia for the overall economy holds true for the business sector, albeit by a less significant margin. During this period, productivity increased at a rate of 1.8 percent for Canada, compared with 2.1 percent for Australia. Most of this difference appeared between 1995 and 2000, when Australia's labor productivity advanced at 3.2 percent per year, compared with 2.3 percent for Canada.

The difference in the labor productivity growth in favor of Australia during the post-1995 period is mostly due to the growth of capital deepening (0.5 percent for Canada, compared with 1.2 percent for Australia) and, to a lesser extent, multifactor productivity growth (1.6 percent for Canada, compared with 1.9 percent for Australia). Australia's favorable increase in capital deepening stems from a more rapid growth in capital services other than information technology (that is, structures and other machinery and equipment).

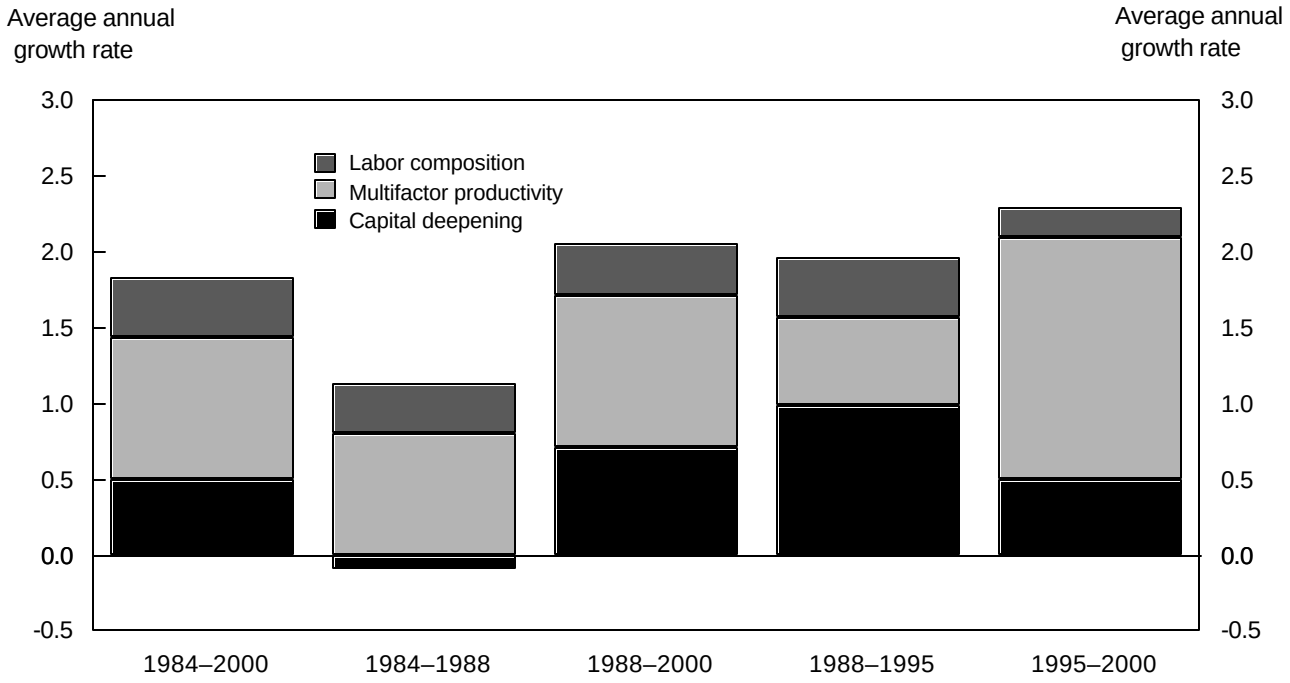
Sectoral sources of productivity growth. So far, the comparison between Canada and Australia in terms of productivity performance has been confined to the overall business sector. This section traces average annual productivity growth by business sector to determine the sources of the aggregate productivity performance in the two countries. Specifically, it investigates the sectoral sources of the aggregate productivity gains.

It is worth noting that this study uses the notion of labor input for the decomposition of labor productivity growth at the business sector level. In contrast, due to the lack of data on labor input for Australian industries, the analysis of the setoral allocation of aggregate productivity growth requires the use of the notion of hours at work. In the latter case, data on hours for both Canada and Australia are directly aggregated across all worker groups and the resulting growth rates that are calculated from this sum do not include the effects of changing labor composition.

Between 1981 and 2000, Canada outperformed Australia in the transportation, wholesale, and retail trade sectors, but Australia performed better in public utility, communications, finance and insurance, construction, and mining—some of these industries were deregulated starting in the mid-80s in Australia. Both countries showed a more or less comparable performance in the agriculture and manufacturing sectors.

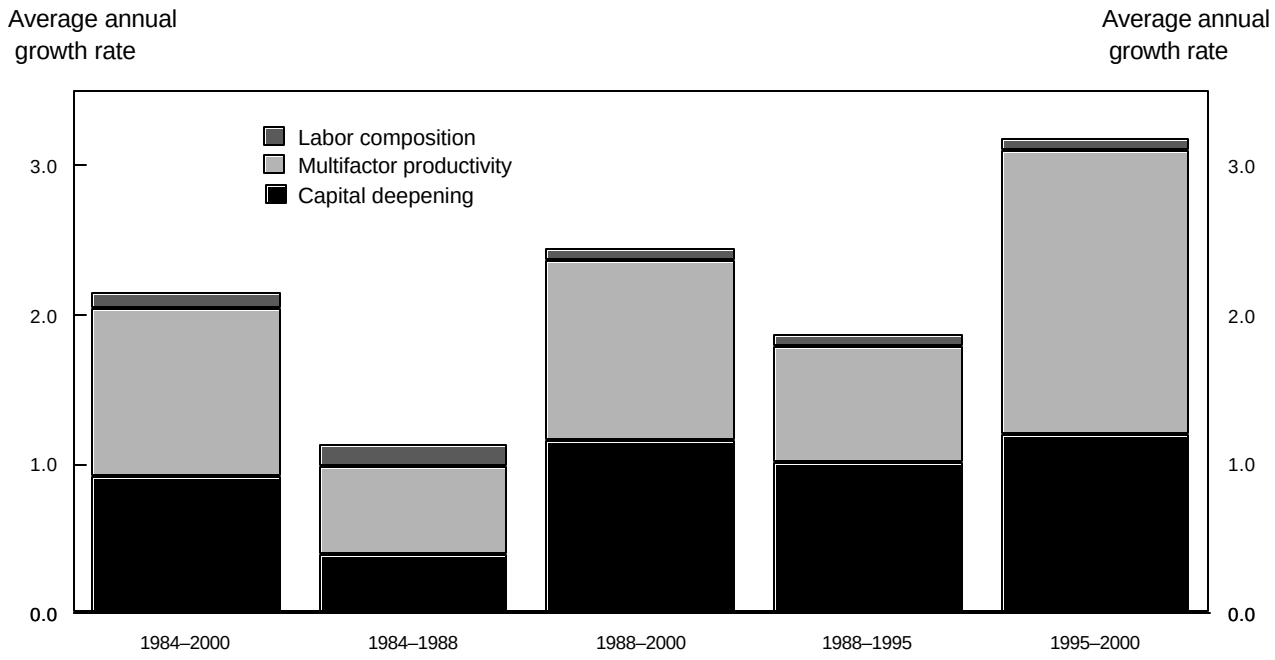
Within the 1981–2000 period, there were marked differences in sectoral labor productivity performance between the two countries During the 1981–88 period, Canada outperformed Australia in 5 of the 12 of the sectors—transportation,

Chart 3. Sources of labor productivity growth, Canadian business sector, 1984–2000



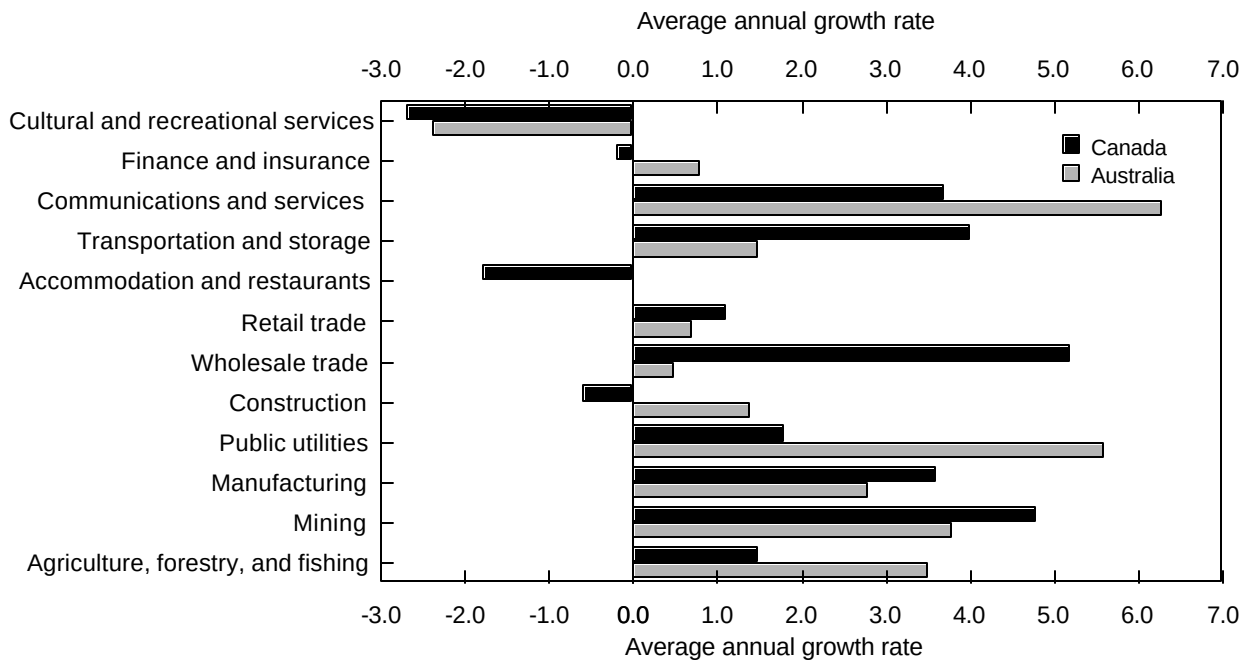
SOURCE: Derived by the authors using the Canadian Productivity Accounts data.

Chart 4. Sources of labor productivity growth, Australian business sector, 1984–2000



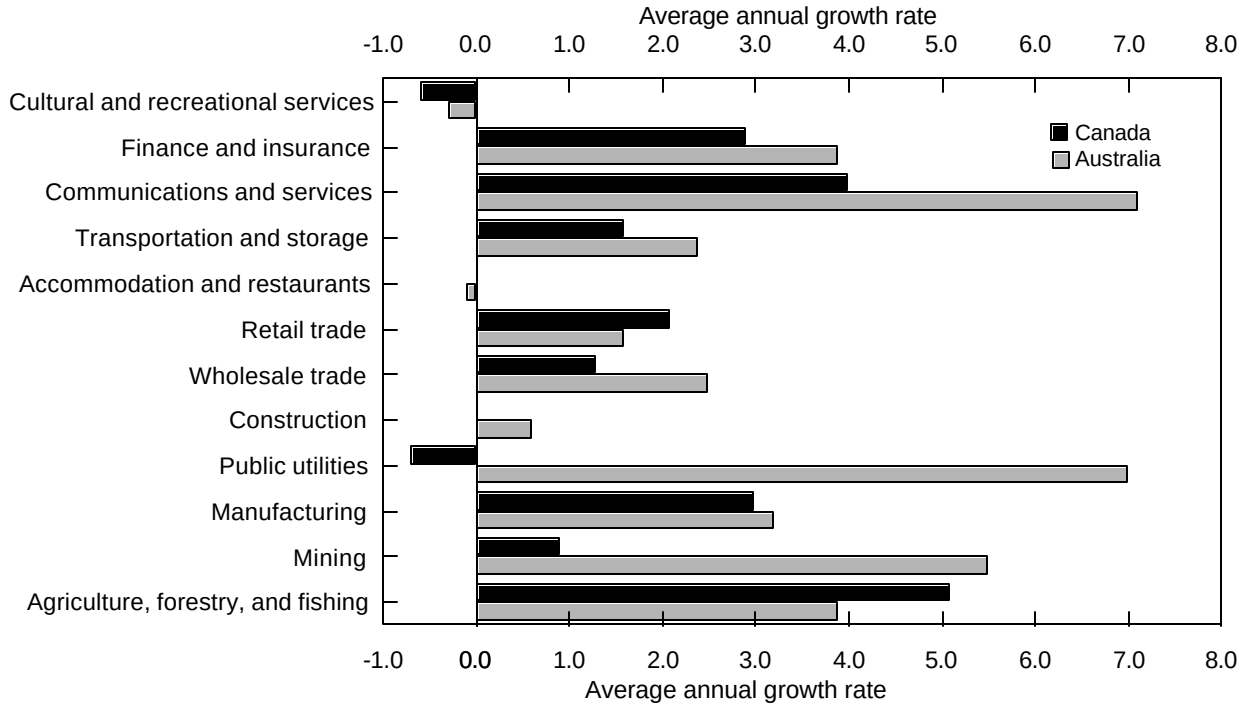
SOURCE: Derived by the authors using the Australian Bureau of Statistics data.

Chart 5. Sources of labor productivity growth by business sector, Canada and Australia, 1981–88



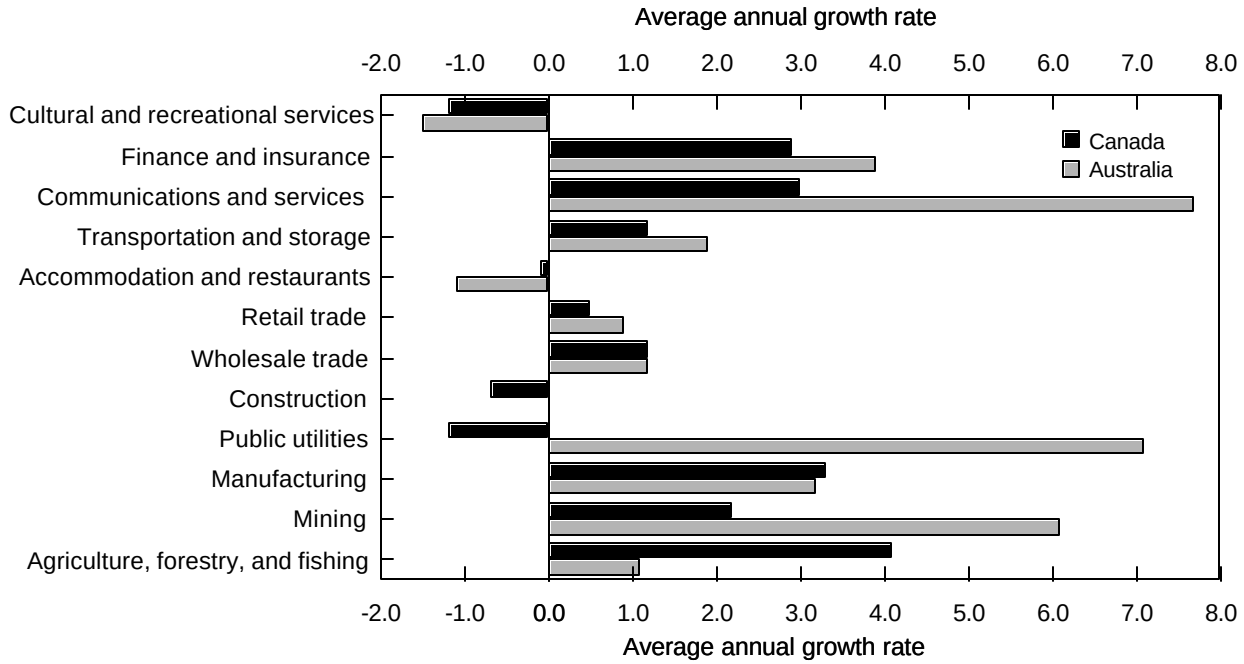
SOURCE: Derived by the authors using the data from the Canadian Productivity Accounts and the Australian Bureau of Statistics.

Chart 6. Sources of labor productivity growth by business sector, Canada and Australia, 1988–2000



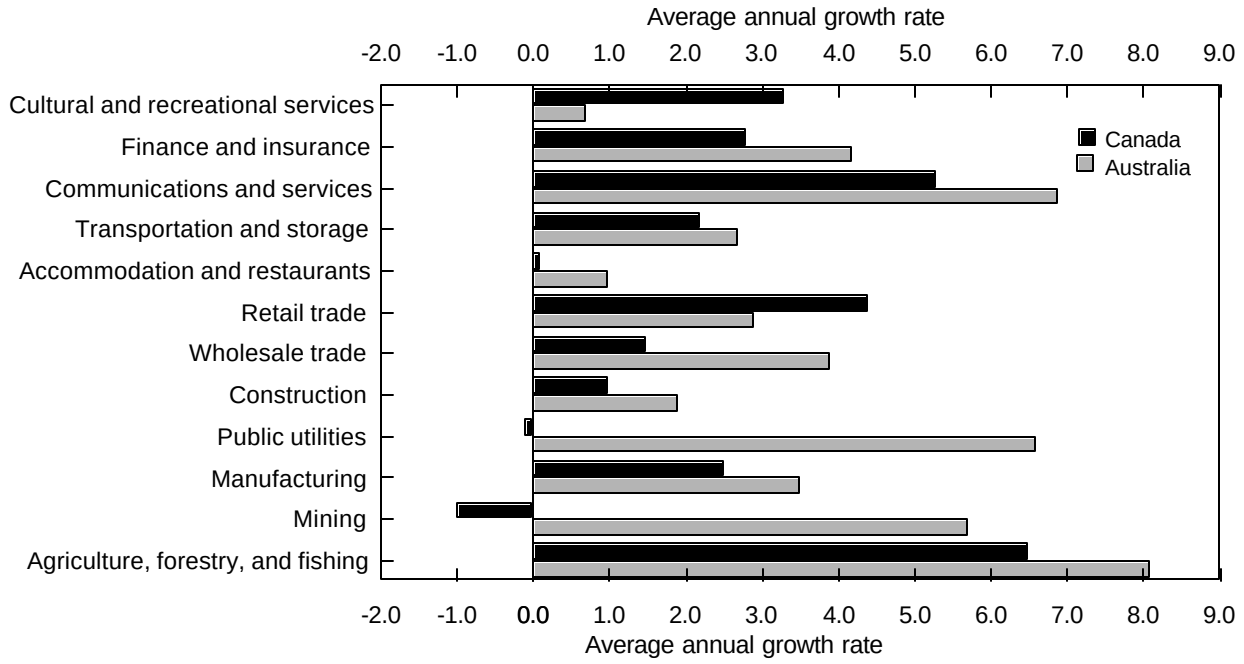
SOURCE: Derived by the authors using the data from the Canadian Productivity Accounts and the Australian Bureau of Statistics.

Chart 7. Sources of labor productivity growth by business sector, Canada and Australia, 1988–95



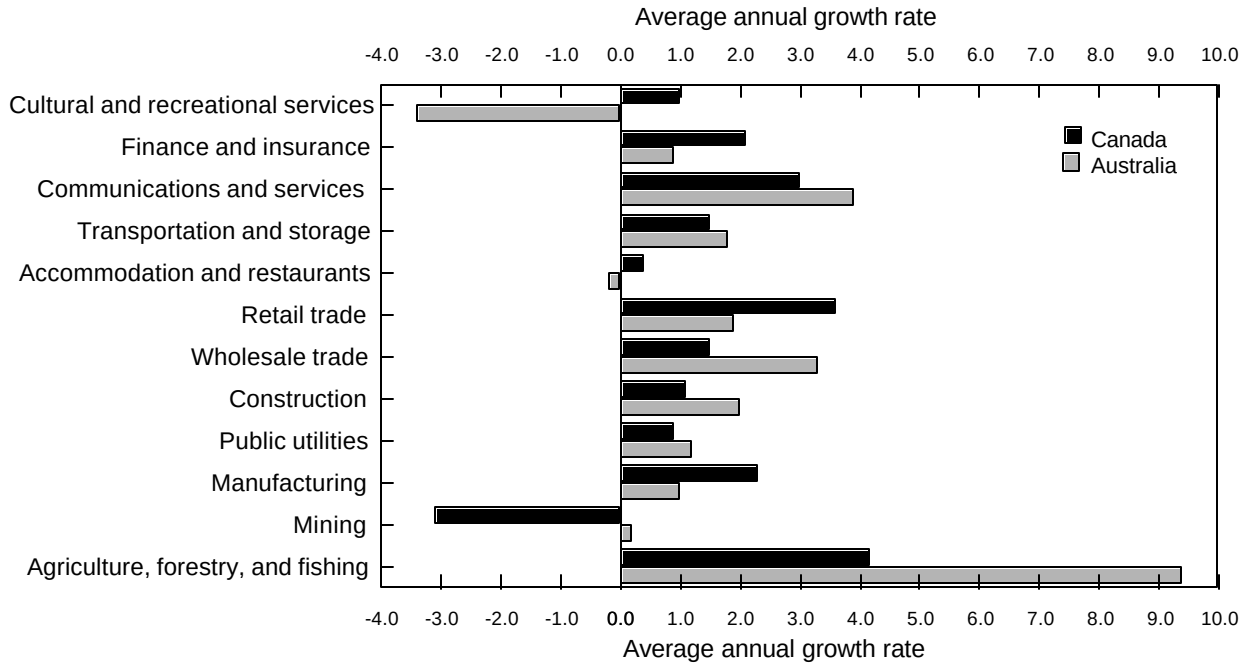
SOURCE: Derived by the authors using the data from the Canadian Productivity Accounts and the Australian Bureau of Statistics.

Chart 8. Sources of labor productivity growth by business sector, Canada and Australia, 1995–2000



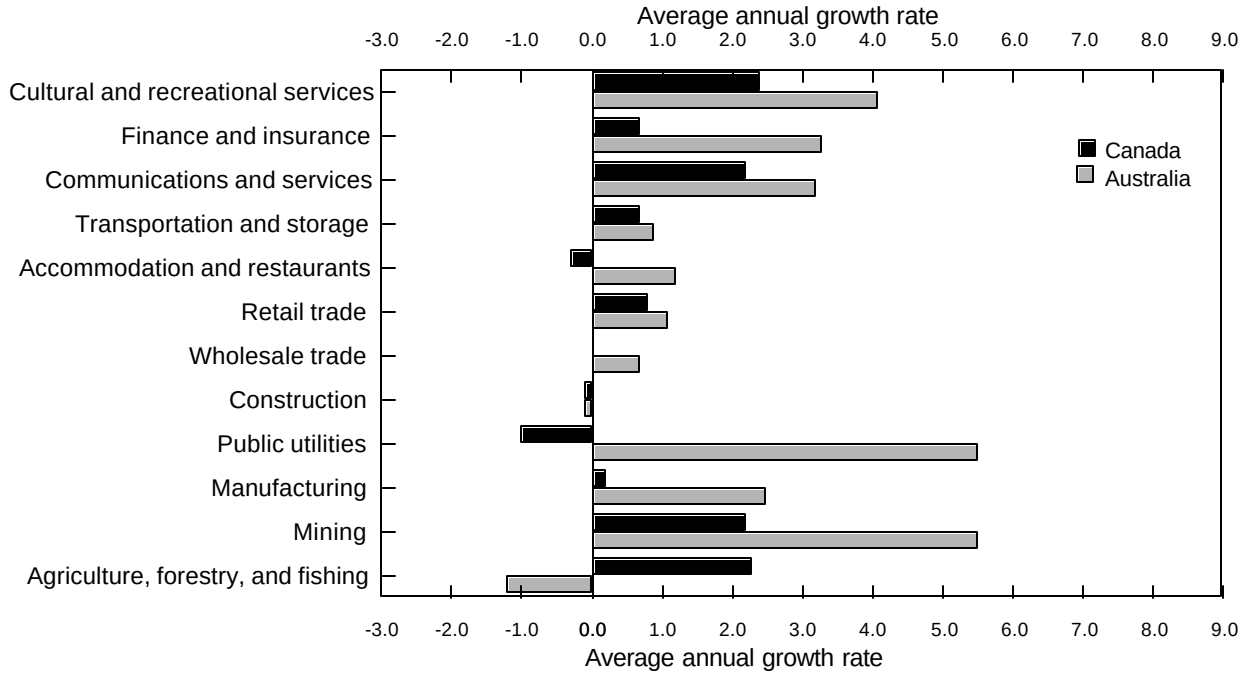
SOURCE: Derived by the authors using the data from the Canadian Productivity Accounts and the Australian Bureau of Statistics.

Chart 9. Sources of multifactor productivity growth by business sector, Canada and Australia, 1995–2000



SOURCE: Derived by the authors using the data from the Canadian Productivity Accounts and the Australian Bureau of Statistics.

Chart 10. Sources of multifactor capital-labor ratio growth by business sector, 1995–2000



SOURCE: Derived by the authors using the data from the Canadian Productivity Accounts and the Australian Bureau of Statistics.

wholesale trade, retail trade, manufacturing, and mining. (See chart 5, page 48.) But Australia performed better in the remaining sectors, in particular, communications, public utilities (electricity, gas and water distribution), agriculture, construction, and finance. (Both countries showed negative growth in cultural and recreational services and accommodation and restaurants during the same period.)

During the 1988–2000 period, Canada's higher productivity was essentially confined to only two sectors: agriculture and retail. (See chart 6, page 48.) This does not, however, mean that Canada performed poorly in the remaining sectors. Canada experienced rapid productivity gains in the finance (3 percent) and communication sectors (4 percent), compared with a modest 1.5-percent increase in transportation and wholesale trade. Although Canada's sectoral labor productivity growth in the 1990s (a 1.5-percent median) was almost as strong as the increase in the 1980s (a 1.7-percent median), it does not come anywhere close to the Australian performance, which grew twice as fast during the 1990s (about a 2.8-percent median).

The relatively weaker productivity growth in the Canadian sectors is evident between 1988 and 1995; a period marked by a severe recession[12] and significant structural changes associated with the implementation of NAFTA. Canada's growth lagged behind Australia in the finance, communications, transportation, retail, public utilities, and mining sectors. However, Canada had about 4 times as much growth in agriculture than the gain in Australia during this period. For the wholesale trade sector, both countries experienced similarly modest gains, and in manufacturing, Canada marked slightly higher increases in productivity growth. (See chart 7, page 49.) But it was mainly in the 1995–2000 period that the Australian sectors outperformed their Canadian counterparts. (See chart 8, page 49.) Australia showed strength in the agriculture sector, increasing by 8 percent, compared with 6 percent for Canada. Australia's public utilities sector maintained stronger growth than Canada in the latter period, as well as communications and finance. Australia outpaced Canada in all of the sectors except two: cultural and recreation services and retail.

Much like the story at the aggregate level, Canada-Australia differences in labor productivity growth in the 1995–2000 period at the sectoral level have been the result of differences in capital deepening and, to a lesser extent, multifactor productivity growth. (See charts 9 and 10.) A more important relative contribution of capital deepening to labor productivity of Australian industries compared with their Canadian counterparts is consistent with the earlier finding that labor intensity grew more rapidly in Canada than Australia. The rapid increase of hours worked by the Canadian workforce has muted the increase of capital deepening, making the labor productivity gains less rapid than those of Australia. While at the aggregate level, the capital deepening gap in favor of Australia has resulted in a similar growth of GDP per person for the two countries, at the industry level, it allowed Australian industries to report a more rapid productivity increase.

Conclusion

This article provided a Canada-Australia comparison of standard of living growth and its underlying sources—productivity and labor utilization during the 1980s and late1990s. These two periods were meaningful for the productivity performance comparison between the two countries because they both contain economic expansions. During these two periods, the evidence suggests that, despite a productivity gap in favor of Australia, the standards of living grew at the same pace in the two countries. This finding then begs the question: How could Canada increase its standard of living as fast as Australia but be less productive?

Canada's performance in terms of growth of real average income owes largely to a significant improvement in the growth of labor utilization—that is, the combination of high average hours worked and a high rate of employment in the total population. In a sense, Canada was rewarded for putting in relatively large amounts of time at work, while the return on each hour worked remains relatively low.

Differences in labor productivity growth between Canada and Australia are less the result of the improvement in the overall efficiency with which capital and labor are transformed into output (multifactor productivity growth) than the contribution of capital deepening effects. During the late 1990s, more than three-fourths of the percentage point productivity gap in favor of Australia was attributable to capital deepening.[13]

Compared with Australia (and the United States), Canada's capital deepening was found to increase less rapidly, possibly for two reasons: Canada was either less effective in the substitution of capital for labor or the upward adjustment of capital formation to the huge increase of hours at work has not yet taken place. By international standards, Canada has experienced a rapid economic growth accompanied by a surge in capital formation. However, capital deepening in Canada did not keep up with the progress made in Australia (or the United States) primarily as a result of the huge increase in hours at work in Canada. For whatever the reason, compared with these two countries, Canada reacted differently to similar forces, such as the global economic expansion of the post-1995 period. □

Notes

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[1] Whereas South Korea, Taiwan, and Singapore were considered miracle economies in the 1970 and 1980s, Finland, Ireland, and Australia are considered as the miracle economies of the 1990s. See Angus Maddison, *The World Economy: A Millennial Perspective* (Paris, OECD Development Centre, 2001).

[2] *OECD Productivity Manual: A Guide to the Measurement of Industry-Level and Aggregate Productivity Growth* (Paris, Statistics Directorate for Science, Technology and Industry, 2001).

[3] See P. Krugman, "I Know What The Hedges Did Last Summer," *Fortune*, available on the Internet at: **http://web.mit.edu/krugman/www/xfiles.html** (1998).

[4] See D. Parham, P. Barnes, and H. Sun, *Information Technology and Australia's Productivity Surge*, Productivity Commission Staff Research Paper (Canberra, Australia, AusInfo, 2001).

[5] D. Parham, "Microeconomic Reforms and the Revival in Australia's Growth in Productivity and Living Standards," Paper presented to the Conference of Economists (Adelaide, Australia, Oct. 1, 2002) p. 6.

[6] *OECD Productivity Manual*, 2001.

[7] See *The New Economy: Beyond the Hype*, The OEDC Growth Project (Paris, OECD, 2001).

[8] See *OECD Economic Outlook*, no. 68 p. 183, 2001.

[9] As a result, this article puts more emphasis on the two expansion periods, 1983–88 and 1995–2000.

[10] *The Daily*, available on the Internet at: **http://www.statcan.ca/english/dai-quo/** (July 12, 2002 and Dec. 16, 2002).

[11] The data on labor quality for Australia are only available from 1984 onward.

[12] During this period, the recession occurred from July 1990 to March 1991, according to the National Bureau of Economic Research on the Internet at: **http://www.nber.org/cycles.html** (Nov. 19, 2004).

[13] These results are somewhat similar to those reported in our Canada-U.S. comparison. See Harchaoui and Tarkhani "Whatever Happened to Canada and U.S. Economic Growth and Productivity?" (Paris. OECD, 2005).

APPENDIX: Additional comparisons between Canada and Australia

Table A–1. Key economic indicators for Canada and Australia

Variable	Australia	Canada
Population in 2000 (million in habitants)[1]	19.2	31.8
Labor force participation rate (1999)[2]	72.9	75.9
Full employment unemployment rate (1999)[3]	6.8	7.7
GDP per capita (2001), thousands of US dollars[4]	27.3	28.9
Net technology importers versus exporters[5]	Net technology importers Main supplier United States	Net technology importers Main supplier United States
Raw materials part of export (percent)[6]	55.4	45.7
Machinery and transportation equipment part of imports (percent)	45.9	55.3
Main trade partners	Japan and United States	United States

[1] OECD *Labor Force Statistics*, 1981–2001, Paris, 2002.

[2] OECD *Labor Force Statistics*, 1978–1999, Paris, 2000.

[3] OECD *Economic Outlook*, no. 68, p. 183, 2000.

[4] *National Accounts of* OECD *Counties, Main Aggregates, Volume 1.*

[5] Australia, OECD *Economic Studies,* Paris, 1999. Canada, OECD Economic Studies, Paris, 2000.

[6] The raw materials to questopn are the primary inputs to production, food, beverages and tobacco, gas and oil.

Exhibit A–1. Comparsion of sources and concepts between Canada and Australia

Total economy	Canada and Australia	Canada	Australia
Total output	Value added at basic price (chained Fisher index)	Cansim table 379–0017	ABS table 5206042
Total labor input	Hours at work	Cansim table 353–0003	ABS table 5206042
Business sector:			
Output	Value added at basic price (chained Fisher index)	Cansim table 379–00171, 62	ABS table 5206042
Capital input	Capital services	Canadian Producitivity Accounts	ABS cat. no. 52040
Labor input	Labor services	Canadian Producitivity Accounts	Unpublished data
Industry:			
Output	Value added at basic price (chained Fisher index)	Cansim table 379–00171, 62	ABS unpublished data
Capital input	Capital services	Canada Productivity Acccounts	ABS unpublished data
Labor input	Hours at work	Cansim table 383–0003	ABS unpublished data

NOTE: Cansim = CANadian Socioeconomic Information Management. ABS = Australian Bureau of Statistics.