

Future Productivity Growth in Canada: The Role of the Service Sector

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Productivity growth has increased markedly in Canada since 1996. What will be the productivity performance of Canada over the coming decades? Instead of turning to a crystal ball, one may want to look back and carefully examine recent data and analyses to obtain some insight on likely future developments. This is the approach used in this paper. We examine recent empirical evidence on productivity growth emerging from aggregate and industry data for Canada and the United States. We also examine briefly the evidence for other OECD countries.

A survey of the available evidence suggests that the productivity resurgence in Canada and the United States during the second half of the 1990s resulted to a large extent from improved performance of the service sector — mainly wholesale and retail trade. The service sector invested heavily in information and communication technologies (ICT) over many years, leading to a pick-up in total factor productivity growth. While there is no evidence of a similar adjustment in other G-7 countries, productivity growth increased in ICT-intensive service industries in many smaller OECD countries.

While this leads us to conclude that the increase in Canada's labour productivity growth reflects structural changes, the continuation of

this performance will depend to a large extent on the ability of the service sector to continue to use and efficiently embody ICT, and machinery and equipment more generally, in their production and management processes. We argue that, in the long run, the role of the service sector in determining the productivity performance of the economy in Canada, and elsewhere, will only grow given historical trends and population ageing.

Evidence from Aggregate and Industry Data in Canada and the United States

It is well known that labour productivity growth has increased significantly in the United States starting in 1995. A similar acceleration also occurred in Canada starting in 1996. As a matter of fact, data up to 2001 suggest that the pick-up in labour productivity growth has been as remarkable in Canada as in the United States (Table 1).¹ For the whole economy, labour productivity growth, defined as GDP per hour, increased to about 2 per cent per year, an acceleration of almost 1 percentage point from the post-1973 performance in both countries.

Is this improvement cyclical or structural? While there have been debates on this issue,

there is now a consensus emerging in the literature according to which the U.S. productivity resurgence is to a large extent structural.² While there is much less literature that has examined Canadian data, results reported in Robidoux and Wong (2003) also point in that direction.

What is the source of this structural improvement in productivity growth? This is an important question because it may help in the assessment of whether the increase in productivity growth is sustainable. For example, while an increase in capital deepening may be difficult to sustain, a higher rate of total factor productivity (TFP) growth may bode better for productivity prospects despite the higher degree of ignorance concerning the determinants of this source of growth.³

A number of studies have examined the source of the acceleration in productivity growth in the United States using the growth accounting framework at the *aggregate level* — i.e. for the overall business sector. They concluded that a large increase in TFP growth in ICT-producing industries, together with an increased use of ICT capital in the rest of the economy accounts for most of the U.S. productivity resurgence. However, these studies did not find much evidence of a pick-up in TFP growth outside the ICT sector. This was particularly the case for a recent paper by Stephen Oliner and Daniel Sichel that looks at the 1995-2001 period.⁴

In Canada, the evidence emerging from aggregate growth accounting exercises suggests a rather different story where ICT plays a more muted role — both because the ICT sector is smaller and the run-up in ICT use has been less prevalent — and TFP growth (outside of the ICT-producing sector) is the major source of the improved productivity performance.⁵

However, aggregate growth accounting studies have their limitations, one of which is their lack of industry detail. A recent analysis by Faruqi et al. (2003) fills some of that gap by calculating labour

Table 1
Labour Productivity Growth
(average annual rate of change)

	(1)	(2)	(3)	(3)-(2)
	1973-1989	1989-1996	1996-2001	Change
Canada				
Business Sector	1.3	1.2	2.3	1.1
Total Economy	1.4	1.2	2.0	0.8
	(1)	(2)	(3)	(3)-(2)
	1973-1989	1989-1995	1995-2001	Change
United States				
Business Sector	1.5	1.4	2.4	1.0
Total Economy	1.2	1.1	1.8	0.7

Sources: Labour productivity corresponds to real GDP per hour. For the business sector: Statistics Canada and Bureau of Labor Statistics labour productivity series. For the total economy: real GDP from National Accounts divided by hours from Statistics Canada (LFS) and BLS (unpublished). The BLS hours series is constructed from both the Current Population Survey and Current Establishment Survey.

productivity growth at the *industry level* for both Canada and the United States in a consistent manner. The results show that labour productivity growth increased in the manufacturing sector in the United States after 1995, essentially reflecting productivity improvement in the ICT sector, while it remained roughly unchanged in Canada. However, the more striking result from that study is the large acceleration in labour productivity growth in the service sector.⁶ In both countries, productivity growth in the service sector increased from about 1 per cent in the early 1990s to almost 2.5 per cent in the late 1990s (Table 2). Since the service sector is much larger than the manufacturing sector, this means that the service sector accounted for most (about 80 per cent) of the productivity resurgence since the mid-1990s in Canada as well as in the United States.

Are service sector productivity gains widespread or concentrated in a small number of industries within the sector? Data suggest that in the United States most of the gains originate in the wholesale and retail trade sectors and, to a lesser extent, in finance, insurance and real estate

Table 2
Sectoral Labour Productivity Growth, Canada and the United States
(average annual rate of change)

	Canada			United States		
	1987-1996	1996-2000	Change*	1987-1996	1996-2000	Change*
Business Sector	1.0	2.2	1.2	1.5	2.6	1.1
Sectoral Breakdown						
Primary	3.1	5.2	2.1	2.7	3.9	1.2
Construction	-0.7	0.4	1.1	0.2	-1.0	-1.2
Manufacturing	2.1	1.9	-0.2	2.6	4.6	2.0
Services	0.7	2.3	1.6	1.1	2.3	1.2

* Percentage points.

Source: Faruqi et al. (2003), U.S. figures are adjusted for statistical discrepancies. Labour productivity is defined as real GDP per hour.

Table 3
Labour Productivity Growth in the Service Sector, Canada and the United States
(average annual rate of change)

	Canada			United States		
	1987-1996	1997-2000	Change*	1987-1995	1995-2000	Change*
Service	0.7	2.1	1.4	0.9	2.4	1.5
Transportation	1.7	1.7	0.0	1.3	1.9	0.6
Communication	3.3	-	-	4.8	2.1	-2.7
Other Utilities	-0.8	-	-	2.5	2.5	0.0
Wholesale Trade	1.7	3.5	1.8	2.7	5.8	3.2
Retail Trade	0.5	3.0	1.5	1.6	5.3	3.7
FIRE	1.2	3.3	2.1	1.8	2.9	1.1
Other Services	-0.4	-	-	-0.6	0.0	0.5

* Percentage points.

Sources: Annex tables from unpublished and unabridged version of Faruqi et al. (2003), except for detailed service sectors over the 1997-2000 period for Canada that are from Statistics Canada and correspond to GDP at basic prices per hour worked.

(FIRE).⁷ While consistent time-series productivity data by industry are still not available for Canada at that level of detail, available output and hours data suggest that a very similar story holds true for Canada as well (Table 3).

Are service sector productivity gains linked to ICT use? One may suspect so since the industries that use ICT most intensively are located in the service sector. As a matter of fact, there is now widespread evidence that the acceleration in productivity growth has been primarily located in industries that use more intensively ICT, namely service industries. This view is supported by raw data presented in Table 4 as well as by a

number of empirical analyses (Stiroh, 2002; van Ark et al., 2002, 2003; Gu and Wang, 2003).

One important point, however, is that these analyses differ from the aggregate growth accounting studies noted above because they look at the effect of the (past) level — not the growth — of ICT capital on labour productivity growth. So, these studies are implicitly testing the impact of ICT on productivity growth in an endogenous growth framework rather than in the exogenous growth framework and hence tend to support the view that ICT is more a general-purpose technology rather than just another type of capital.⁸

Table 4
Labour Productivity Growth by Industry and ICT Intensity,
Canada and the United States⁹
(Average annual rate of change)

	Canada			United States		
	1987-1996	1997-2000	Change	1987-1995	1995-2000	Change
Business Sector	1.1	1.8	0.8	1.0	2.1	1.1
ICT-intensive	1.9	3.5	1.7	1.8	3.8	2.0
Less ICT-intensive	0.5	0.5	0.0	0.0	0.0	-0.1
Manufacturing Sector	2.7	1.7	-1.0	3.2	3.4	0.2
ICT-intensive	4.8	10.7	5.9	4.5	6.9	2.3
Less ICT-intensive	2.6	0.7	-1.8	2.2	0.3	-1.9
Service Sector	0.7	1.8	1.1	0.4	2.0	1.6
ICT-intensive	1.7	3.2	1.5	1.1	3.4	2.1
Less ICT-intensive	-0.5	-0.4	0.1	-1.0	0.1	1.0

Sources: Labour productivity corresponds to real GDP at basic prices per worker (Statistics Canada) and gross product originating per full-time equivalent employees (Bureau of Economic Analysis). See footnote 9 for more details.

So, after all, is the impact of ICT on service sector productivity growth the result of a faster accumulation of ICT capital in the late 1990s or an improvement in total factor productivity growth caused by a successful incorporation of ICT in the production and management processes in the 1980s and early 1990s? No direct industry growth accounting evidence is available for Canada but all indirect evidence noted above points in the direction of the latter explanation. For the United States, a recent study by Jack Triplett and Barry Bosworth concludes that most of the improvement in service sector productivity growth came from a pick-up in TFP growth: *“With respect to the post-1995 acceleration of labour productivity, however, MFP is the dominant factor in the acceleration, because IT capital deepening was as prominent a source of labour productivity growth before 1995 as after.”*¹⁰ Moreover, industry details provided in their analysis indicate that the improvement has been particularly important in large service sectors such as wholesale trade, retail trade and finance.¹¹

Overall, this suggests that the productivity resurgence in Canada and the United States has

similar roots: service sectors that have invested heavily in ICT over many years, leading to a pick-up in total factor productivity growth during the second half of the 1990s. This also suggests that the marked fall in ICT investment in the last downturn and the modest recovery since then may not lead to a fall in productivity growth as suggested implicitly by aggregate growth accounting studies. In this respect, the continued solid productivity performance in 2002 supports the view that TFP growth in the service sector has increased during the 1990s both in the United States and Canada.

International Evidence

If ICT were effectively a “general purpose technology” that could be used to improve productivity growth, in the service sector in particular, one would expect an increase in productivity growth not only in Canada and the United States, but also in other countries. This is, after all, what happened in the early 1970s when the productivity growth slowdown was widespread

Table 5
International Evidence on Labour Productivity Growth
(Average annual rate of change)

	Total Economy			Business Service Sector		
	1973-1989	1996-2001	Change*	1973-1989	1996-2001	Change*
United States	1.2	1.8	0.5	0.7	3.4	2.7
Australia	1.5	1.9	0.5	0.8	2.7	1.9
Canada	1.4	2.0	0.7	0.6	2.4	1.8
Norway	3.3	1.9	-1.4	1.2	2.8	1.6
United Kingdom	2.1	1.6	-0.5	1.3	2.3	1.0
Denmark	2.4	1.8	-0.6	0.8	1.6	0.7
Sweden	1.5	1.7	0.3	1.0	1.6	0.6
Belgium	2.8	1.6	-0.5	1.7	1.3	-0.4
Spain	3.3	-0.5	-3.8	0.9	0.3	-0.6
Finland	2.4	2.5	0.2	2.3	1.6	-0.8
Germany	2.3	1.3	-1.0	1.9	1.1	-0.8
Italy	2.8	0.9	-1.9	1.0	0.2	-0.9
France	3.0	1.8	-1.2	2.4	-0.0	-2.4
Japan	3.1	1.5	-1.6	4.4	1.4	-3.1

* Percentage points.

Note: Australia (1974-1989), France (1978-1989), Japan (1981-1989), Spain (1980-1989), Sweden (1980-1989 and 1996-2000) and United States (1977-1989).

Sources: OECD Economic Outlook and STAN database, Statistics Canada, BEA and BLS. For the total economy, labour productivity corresponds to GDP per hour. For the business service sector, labour productivity corresponds to value-added per worker.

among industrialized countries, perhaps as the application to the production process of previous general purpose technologies matured.

However, when looking at other countries there is not much evidence of a pick-up in productivity growth similar to that experienced in Canada and the United States. While productivity growth picked up significantly in Australia,¹² and probably earlier than it did in the United States, it slowed or remained unchanged in many European countries in the second half of the 1990s.¹³ However, this aggregate picture hides productivity improvement in ICT-intensive service sectors in some European countries. Van Ark et al. (2002) find that labour productivity growth in ICT-intensive service sectors increased significantly in six European countries between the first and second half of the 1990s.¹⁴

Most recent data on labour productivity growth from the OECD database presented in

Table 5 are in line with the results of van Ark et al. (2002). Productivity growth in the service sector, and in some cases in the overall economy, increased in a number of small European countries in the late 1990s compared to the 1973-1989 period. The most striking result from these data, however, is the lack of any evidence of a pick-up in productivity growth in the service sector or the overall economy in large European countries as well as in Japan. Among the G7 countries, the United Kingdom is the only country aside from Canada and the United States where productivity growth in the service sector increased, but its overall productivity growth performance deteriorated. Overall, this suggests, albeit tentatively, that the successful incorporation of ICT in the production of services is also underway in other countries, which may lead to better productivity growth performance in coming years.¹⁵

Concluding Remarks

Using aggregate growth accounting technique, Robidoux and Wong (2003) concluded that total-economy trend labour productivity (GDP per hour) growth for Canada increased steadily in the 1990s, reaching about 2 per cent per year in recent years. The examination of the broader empirical evidence discussed above supports this conjecture.¹⁶ But, it also suggests that Canada's productivity performance will depend to a large extent on the ability of the service sector to continue to use and efficiently incorporate ICT, and machinery and equipment more generally, in production and management processes.

Furthermore, the role of the service sector in determining the aggregate productivity performance of the economy in Canada and elsewhere in the world will not abate but rather grow in importance. Despite the rise in the prices of services relative to those of goods, aggregate demand has shifted towards services in recent decades and is likely to continue to do so in coming decades.¹⁷ This process is indeed likely to accelerate with population ageing over the coming decades. In effect, an increase in the proportion of elderly in the population is likely to shift aggregate demand towards services, such as health services.

Although the positive impact that ageing may have on physical and human capital deepening is well documented,¹⁸ the impact changes in the composition of aggregate demand may have on TFP growth seems to have been neglected in the literature. On the positive side, research and development and ensuing innovations are probably endogenous to the composition of final demand and will surely adjust over time to this new reality. However, bumps in the road have to be expected given the non-linear processes behind research and innovation. And, this does not account for the possibility that certain innovations may lead service-sector industries to

experience productivity gains that are not accurately measured.

Notes

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- 1 Following Robidoux and Wong (2003) who advocate that each country should be examined according to its own breakpoint, we consider the change in labour productivity growth starting in 1995 in the United States, but 1996 in Canada. We also exclude data available for 2002 and the first half of 2003 because productivity data tend to be revised significantly. More importantly, in recent years revisions were not white noises on both sides of the border: most of the time productivity growth was revised downward in the United States, while the opposite occurred in Canada. In any event, including 2002 would not change significantly the relative Canada-U.S. picture provided in Table 1 as long as the total economy is used as benchmark.
 - 2 See Gordon (2002, 2003), Basu et al. (2001), Stiroh (2002) and Oliner and Sichel (2002).
 - 3 This is to say that, unlike labour productivity growth attributable to capital deepening, TFP growth reflects a not particularly well-understood process that combines the influence and interaction of many factors.
 - 4 Oliner and Sichel (2002). See also Jorgenson and Stiroh (2000), and Oliner and Sichel (2000).
 - 5 See Robidoux and Wong (2003), Armstrong et al. (2002), Khan and Santos (2002) and Muir and Robidoux (2001).
 - 6 The key role of the service sector in the U.S. productivity revival has been first mentioned by Sharpe (2000) and Baily and Lawrence (2001).
 - 7 This is based on results from Faruqui et al. (2003) that are reproduced in Table 3. Similar but more detailed results were reported earlier by Baily and Lawrence (2001). These more detailed results show that the improvement in FIRE mainly originated from the finance sector, while some notable increases in productivity growth occurred within "other services" for personal, business, and health services.
 - 8 While the differences between endogenous and exogenous growth models is often exaggerated (Temple, 2003), the former type of model assumes that the level of capital affects the level of productivity contemporaneously, while the latter type of models assume that the level of growth drivers, which may include physical capital, affect, often

with lags, not the level but the rate of growth of productivity.

- 9 We thank Julie Turcotte and Yves Fontaine for kindly providing these data. For Canada, productivity growth by industry is constructed from Statistics Canada's data on output and employment. Within a sample of 13 industries, ICT-intensive industries are defined as industries that have an ICT capital stock to non-residential capital stock ratio greater than the private sector ratio. For the United States, labour productivity is defined as gross product originating divided by full-time equivalent employment from the BEA. A total of 57 industries were divided according to their ICT investment-to-output ratio in 1996 such that about 50 per cent of output originates from ICT-intensive industries. Stiroh (2002) and van Ark et al. (2002) show that the general results are not sensitive to the measure used to define the ICT-intensive industries. Note that the results for the manufacturing sector should be interpreted carefully since ICT-intensive industries include ICT-producing industries.
- 10 Triplett and Bosworth (2002: 25). See Triplett and Bosworth (2003) for a shorter version. Basu et al. (2003) obtain similar results, while Jorgenson et al. (2002) used a different data set and find a larger role for ICT capital deepening. Note, however, that labour productivity growth falls in the second half of the 1990s in the wholesale trade sector in Jorgenson et al. (2002), while it increases in Basu et al. and Triplett and Bosworth.
- 11 Gross output instead of value-added is used when calculating labour productivity. Triplett and Bosworth have also some concerns about data quality in the security, commodity brokers and service industry, which shows the largest increase in productivity among all service industries, but their results are not qualitatively changed when this industry is removed from the sample.
- 12 See Parham (2002) for a discussion of the Australian productivity revival.
- 13 Ireland is a notable exception.
- 14 These countries are Denmark, Finland, Ireland, the Netherlands, Sweden and Switzerland.
- 15 See Basu et al. (2003) and van Ark et al. (2002) for analyses that support that optimistic view for the United Kingdom and Europe, respectively.
- 16 A similar conclusion is reached by Macklem (2003).
- 17 See Mohnen and ten Raa (2000) for an analysis of trends in the Canadian service sector.
- 18 See Mérette (2002) and Scarth (2002) for a general exposition of the potential impacts of ageing on labour productivity.

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