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111 Sparks Street, Suite 500
Ottawa, Ontario K1P 5B5
613-233-8891, Fax 613-233-8250
csls@csls.ca

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The Canada-U.S. ICT Investment Gap in 2008: Gains in Communications Equipment and Losses in Computers

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Andrew Sharpe

Prepared for the Information Technology Association of Canada

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Executive Summary

This report is based on an update to 2008 of the Centre for the Study of Living Standards (CSLS) Information and Communication Technology (ICT) database for Canada and the United States. It provides a brief overview of trends in ICT investment in the business sector for both Canada and the United States, focusing on developments in the ICT investment gap in 2008. The report's key findings are the following:

- Measured in domestic currency, nominal ICT investment spending in the Canadian business sector advanced 6.2 per cent in 2008, outpacing that of the United States (4.4 per cent).
- But much faster business sector employment growth in Canada than in the United States (1.0 per cent versus -1.3 per cent) meant that nominal ICT investment per worker actually grew slower in Canada than in the United States: 5.1 per cent versus 5.8 per cent.
- In terms of the comparison of the level of nominal ICT investment per worker in a common currency (adjusted for differences in purchasing power) between Canada and the United States, the slower growth in nominal ICT investment per worker in Canada translated into a fall in the ratio of ICT investment per worker in Canada to 62.1 per cent of that in the United States in 2008 from 62.5 per cent in 2007.
- Investment trends among the three ICT components differed greatly in the two countries. Nominal computer investment fell 10.0 per cent in 2008 in Canada compared to a 2.9 per cent decline in the United States. This translated into a large increase in the Canada-US computer investment per worker gap, from 92.5 per cent of the US level in 2007 (a gap of 7.5 points) to 83.7 per cent in 2008 (a gap of 14.3 points) .
- In contrast, nominal investment in communications equipment was much stronger in Canada in 2008 than in the United States: 16.8 per cent versus 3.0 per cent. This resulted in the fall of the investment ratio for this ICT component, from 61.1 per cent of the US level in 2007 to 67.7 per cent in 2008.

The Canada-U.S. ICT Investment Gap in 2008: Gains in Communications Equipment and Losses in Computers¹

I. Introduction

This report is based on the Centre for the Study of Living Standards (CSLS) Information and Communication Technology (ICT) database for Canada and the United States that has been updated to 2008. The ICT database provides real and current dollar estimates of ICT investment and ICT capital stock in Canada and the United States for 20 North American Industry Classification System (NAICS) sectors, and on a per worker basis.² The data are presented for the three ICT components: computers, communication equipment, and software. The report provides a brief overview of trends in ICT investment in the business sector for both Canada and the United States, focusing on developments in 2008.

II. ICT Investment in Canada and the United States

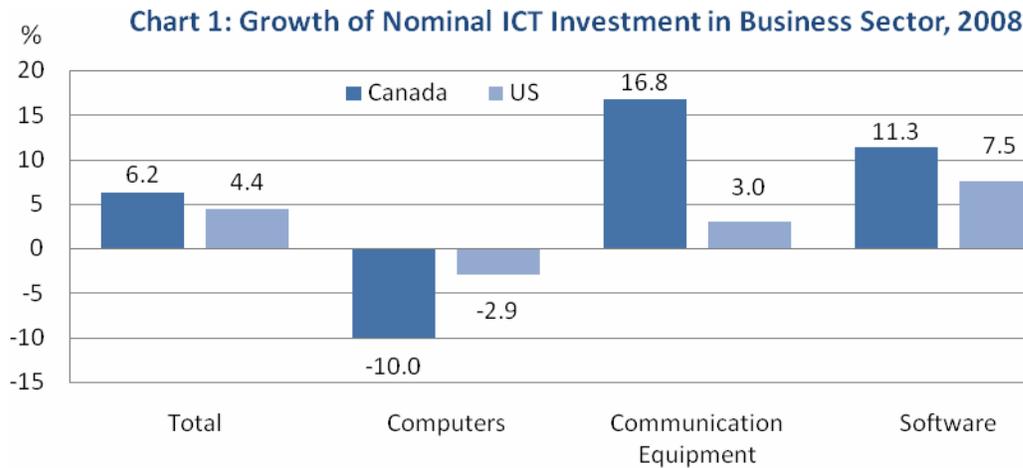
A. Nominal ICT Investment Growth

Nominal ICT investment growth in the business sector in Canada in 2008 surpassed that in the United States: 6.2 per cent versus 4.4 per cent (Chart 1 and Table 1). These growth rates represented a pick-up in ICT investment growth for Canada, from 5.1 per cent in 2007, and a deceleration for the United States, from 6.5 per cent.

In terms of the three ICT investment components, nominal growth in Canada in 2008 exceeded that in the United States for communications equipment (16.8 per cent versus 3.0 per cent) and for software (11.3 per cent versus 7.5 per cent). In contrast, nominal investment fell much more in computers in Canada than in the United States: 10.0 per cent versus 2.9 per cent.

¹ The author would like to thank Eve Tsirolnitchenko and Alex Murray from the Centre for the Study of Living Standards for research assistance and Lynda Leonard from the Information Technology Association of Canada for financial support.

² The database has been constructed from data obtained from Statistics Canada and the US Bureau of Economic Analysis. The database can be accessed at <http://www.csls.ca/data/ict.asp>.

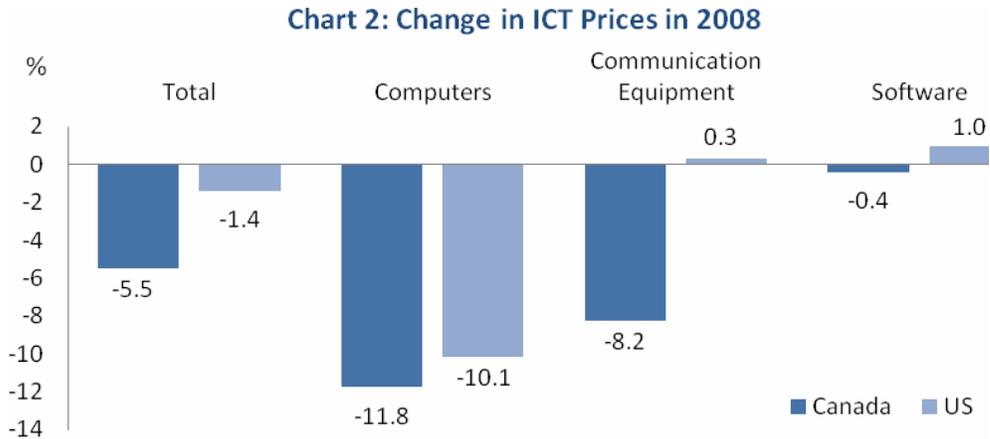


Source: CSLS ICT Database, Tables 1 to 4 and 18 to 21

The average annual growth in nominal ICT investment between 2000 and 2008 for Canada (3.0 per cent) remained higher than that of the United States (1.1 per cent). This situation reflects a better performance in all three ICT components in Canada: a less severe fall in the investment in computers (-0.8 per cent versus -2.4 per cent), an increase in investment in communication equipment in Canada compared to a fall in the United States (1.0 per cent versus -2.6 per cent), and more rapid growth in software (6.9 per cent versus 4.6 per cent).

B. ICT Prices

Prices for ICT investment goods fell 5.5 per cent in 2008, much more than the 1.4 per cent decline in the United States (Chart 2 and Table 1). This difference in price trends between the two countries was largely explained by the much greater decline in communication equipment prices in Canada: -8.2 per cent versus 0.3 per cent. There were relatively small differences in trends in computer prices (-11.8 per cent in Canada versus -10.1 per cent in the United States) and software prices (-0.4 per cent per cent versus 1.0 per cent)



Source: CSLS ICT Database, Tables 17 and 34

The steeper decline in ICT prices in Canada in 2008 can be in part attributed to the continued appreciation (0.8 per cent) of the Canadian dollar against the U.S. dollar, following a rise of 6.1 per cent in 2007 (Table 1). As the pass-through from the stronger dollar to lower prices is not instantaneous, much of the impact of the 2007 appreciation only took place in 2008. Having a stronger currency means that Canadian firms can purchase more ICT goods, at the same level of planned nominal spending, relative to their American counterparts. Price declines attributable to a currency appreciation are more significant for computers and communication equipment than for software as both these components have a larger import share than software.

Table 1: Growth in ICT Investment in the Business Sector in Canada and the United States, 2000-2008

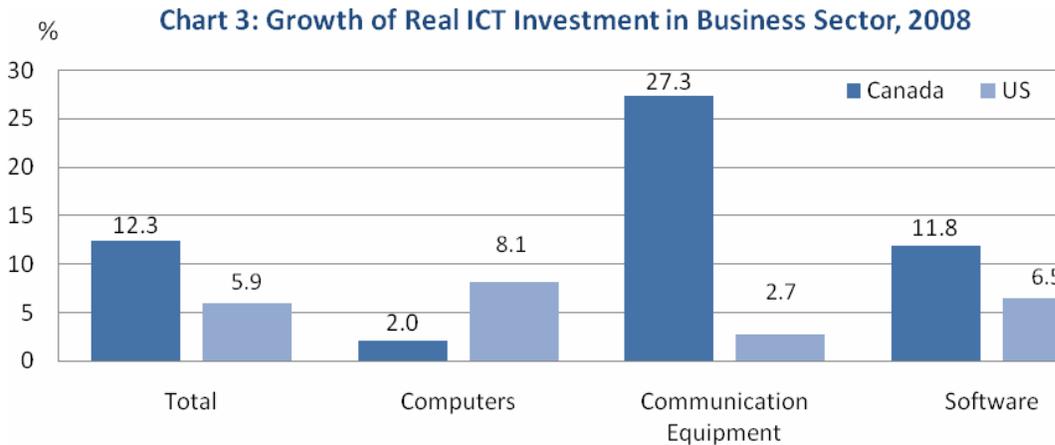
	Canada				United States			
	Total	Computers	Communication Equipment	Software	Total	Computers	Communication Equipment	Software
Nominal ICT investment growth, domestic currencies (annual or average annual, %)								
2007	5.1	-8.4	10.3	12.9	6.5	5.1	6.7	6.9
2008	6.2	-10.0	16.8	11.3	4.4	-2.9	3.0	7.5
2000-2008	3.0	-0.8	1.0	6.9	1.1	-2.4	-2.6	4.6
2005-2008	5.8	-4.9	11.5	10.4	5.9	3.2	6.4	6.6
Nominal ICT investment per worker growth, domestic currencies (annual or average annual, %)								
2007	2.9	-10.3	8.1	10.4	5.7	4.3	5.9	6.1
2008	5.1	-10.9	15.6	9.6	5.8	-1.6	4.4	9.0
2000-2008	1.3	-2.4	-0.6	4.9	1.0	-2.5	-2.7	4.4
2005-2008	4.2	-6.4	9.8	8.3	5.4	2.7	6.0	6.2
Growth in ICT prices (annual or average annual, %)								
2007	-4.1	-9.2	-4.7	-0.1	-4.3	-10.6	-2.0	0.4
2008	-5.5	-11.8	-8.2	-0.4	-1.4	-10.1	0.3	1.0
2000-2008	-6.2	-12.0	-5.4	-2.3	-3.5	-11.7	-2.6	-0.5
2005-2008	-5.6	-10.8	-6.0	-1.8	-3.7	-11.1	-0.9	0.9
Exchange rate appreciation (annual or average annual, %)								
2007					6.1			
2008					0.8			
2000-2008					4.3			
2005-2008					4.5			
Business Sector Employment (annual or average annual, %)								
2007	2.1				0.8			
2008	1.0				-1.3			
2000-2008	1.6				0.1			
2005-2008	1.6				0.4			
Real ICT investment growth, domestic currencies (annual or average annual, %)								
2007	9.6	0.9	15.7	13.0	11.3	17.6	8.9	6.5
2008	12.3	2.0	27.3	11.8	5.9	8.1	2.7	6.5
2000-2008	9.8	12.7	6.8	9.4	4.9	10.6	0.0	5.1
2005-2008	12.1	6.6	18.6	12.4	9.9	16.1	7.4	5.7
Real ICT investment per worker growth, domestic currencies (annual or average annual, %)								
2007	7.3	-1.2	13.3	10.7	10.5	16.7	8.1	5.7
2008	11.2	1.0	26.0	10.7	7.3	9.6	4.1	8.0
2000-2008	8.0	10.9	5.0	7.6	4.7	10.5	-0.1	5.0
2005-2008	10.3	5.0	16.8	10.6	9.4	15.6	6.9	5.3

Source: CSLS ICT Database, Summary Tables

C. Real ICT Investment Growth

A major implication of the decline in ICT prices in Canada is that real ICT investment growth, which is a more relevant measure from a productivity perspective³, has been significantly higher than nominal ICT investment growth. In real terms, total ICT investment grew 12.3 per cent in 2008, reflecting the 6.2 per cent nominal increase and the 5.5 per cent fall in ICT prices (Chart 3 and Table 1). In the United States, real ICT investment advanced a much weaker 5.9 per cent reflecting a 4.4 per cent nominal investment increase and a 1.4 per cent fall in prices.).

Real investment in communications equipment was very strong in 2008 in Canada, up 27.3 per cent (a 16.8 per cent nominal rise and a 8.2 per cent fall in prices). In contrast, the comparable US figure was a meager 2.7 per cent. Real investment was also greater in software in Canada than in the United States (11.8 per cent versus 6.5 per cent), but weaker in computers (2.0 per cent versus 8.1 per cent).



Source: CSLS ICT Database, Tables 13 to 16, and 30 to 33

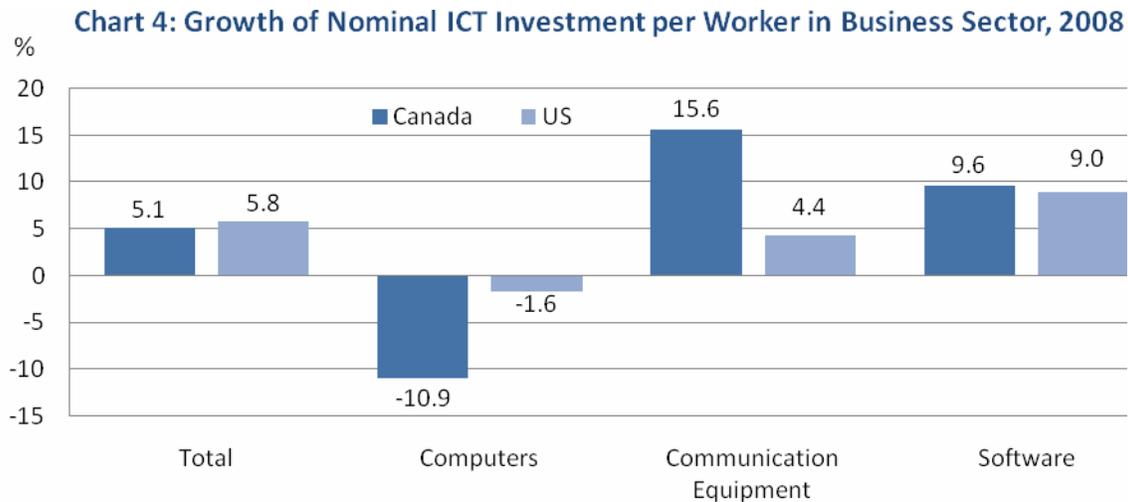
D. Nominal ICT Investment per Worker

Trends in ICT investment per worker are determined by the rate of growth in ICT investment and employment growth. In 2008, nominal ICT investment in Canada advanced 6.2 per cent while employment increased 1.1 per cent, producing a 5.1 per cent rise in ICT investment per worker (Chart 4 and Table 1). In contrast to the positive employment growth in Canada, employment fell 1.7 per cent in the business sector in the United States. This meant that the rate of growth in nominal ICT investment per worker exceeded total nominal ICT investment (5.8 per cent versus 4.4 per cent)

³ The CSLS report “The Relationship between ICT Investment and Productivity in the Canadian Economy: A Review of the Evidence” (2006) provides an analysis of the implications of real ICT investment growth for productivity. The report is available on the CSLS website: <http://www.csls.ca/reports/csls2006-05.pdf>

Reflecting the robust nominal ICT investment growth, nominal communication equipment investment per worker in Canada in 2008 was very strong, up 15.6 per cent, compared to only 4.4 per cent in the United States. In contrast, nominal computer investment per worker plummeted in Canada, down 10.9 per cent, compared to a 5.8 per cent rise in the United States. Nominal software investment per worker was similar in the two countries (9.6 per cent in Canada and 9.0 per cent in the United States).

The average annual growth in nominal ICT investment per worker between 2000 and 2008 in Canada stood at 1.3 per cent, with the positive growth of investment in software (4.9 per cent) outweighing the negative growth rates of investment in computers and communication equipment (-2.4 and -0.6, respectively) (Table 1). Average annual growth in total ICT investment per worker in the United States between 2000 and 2008 was also positive but stood at a lower 1.0 per cent, arising from 4.4 per cent growth in the software category and the negative growth rates of nominal investment per worker in computers and communication equipment (-2.5 and -2.7, respectively). Over the same period, the share of ICT investment spending going to software increased by 13.8 percentage points for the United States, and by 9.4 percentage points for Canada over the 2000-2008 period (Table 2).



Source: CSLS ICT Database, Tables 1 to 4, and 18 to 21

E. Real ICT Investment per Worker

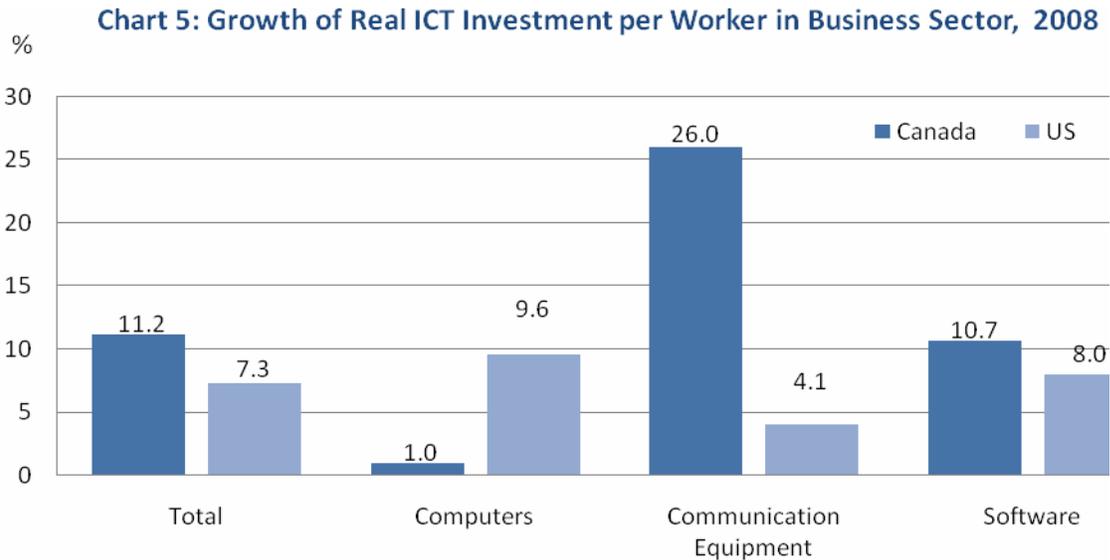
In 2008, real ICT investment in Canada advanced 12.3 per cent while employment increased 1.1 per cent, producing a 11.2 per cent rise in ICT investment per worker (Chart 5 and Table 1). With the 1.7 per cent fall in the business sector in the United States, real ICT investment per worker advanced 7.3 per cent compared to 5.9 per cent for ICT investment

One notes that an assessment of Canada's relative performance in ICT investment per worker is sensitive to whether one looks at nominal or real trends. Canada did worse than the United States for nominal ICT investment per worker in 2008 (5.1 per cent versus

5.8 per cent), but did much better for real ICT investment per worker (11.2 per cent versus 7.3 per cent). This difference reflects the much greater fall in ICT prices in Canada relative to the United States: 5.5 per cent versus 1.4 per cent).

Again reflecting the robust real ICT investment growth, real communication equipment investment per worker in Canada in 2008 was very strong, up 26.0 per cent, compared to only 4.1 per cent in the United States. In contrast, real computer investment per worker plummeted in Canada was much weaker in Canada than in the United States: 1.0 per cent versus 9.6 per cent.

Canada's real ICT investment per worker increased at a higher average annual rate (8.0 per cent) than that of the United States (4.7 per cent) between 2000 and 2008 (Table 1). As the rate of growth of nominal ICT investment per worker was similar in the two countries (1.3 per cent per year in Canada versus 1.0 per cent in the United States), this differential reflected the greater fall in ICT prices in Canada (5.6 per cent versus 3.7 per cent)



Source: CSLS ICT Database, Tables 13 to 16, and 30 to 33

Table 2: Current Dollar ICT Investment Shares in the Business Sector in Canada and the United States, 2000-2008

	Canada				United States			
	Total	Computers	Communication	Software	Total	Computers	Communication	Software
ICT Investment as a share of GDP (level and percentage point change)								
2000	3.16	1.08	0.90	1.18	5.31	1.32	1.60	2.39
2006	2.67	0.91	0.56	1.19	3.92	0.80	0.89	2.23
2007	2.65	0.79	0.59	1.27	3.98	0.80	0.90	2.28
2008	2.82	0.71	0.69	1.42	4.09	0.77	0.91	2.41
Δ 2000-2008	-0.34	-0.37	-0.21	0.24	-1.21	-0.55	-0.68	0.02
Δ 2007	-0.01	-0.12	0.03	0.08	0.06	0.00	0.02	0.04
Δ 2008	0.16	-0.08	0.10	0.14	0.11	-0.03	0.01	0.13
ICT Investment as a share of Total Investment (level and percentage point change)								
2000	20.08	6.85	5.71	7.51	32.62	8.10	9.82	14.70
2006	16.34	5.59	3.45	7.30	27.15	5.55	6.14	15.47
2007	16.43	4.90	3.64	7.89	26.51	5.35	6.01	15.16
2008	16.41	4.15	4.00	8.26	26.82	5.03	5.99	15.80
Δ 2000-2008	-3.67	-2.70	-1.71	0.75	-5.80	-3.07	-3.83	1.10
Δ 2007	0.09	-0.69	0.19	0.59	-0.64	-0.20	-0.13	-0.30
Δ 2008	-0.01	-0.75	0.36	0.38	0.31	-0.32	-0.01	0.63
ICT Component Share of Total ICT Investment (level and percentage point change)								
2000	100.0	34.1	28.5	37.4	100.0	24.8	30.1	45.1
2006	100.0	34.2	21.1	44.7	100.0	20.4	22.6	57.0
2007	100.0	29.8	22.1	48.0	100.0	20.2	22.7	57.2
2008	100.0	25.3	24.4	50.4	100.0	18.8	22.4	58.9
Δ 2000-2008	0.0	-8.8	-4.1	12.9	0.0	-6.1	-7.8	13.8
Δ 2007	0.0	-4.4	1.1	3.3	0.0	-0.3	0.1	0.2
Δ 2008	0.0	-4.6	2.2	2.3	0.0	-1.4	-0.3	1.7

Source: CSLS ICT Database, Summary Tables

F. ICT Investment Shares in Nominal Business Sector GDP

In 2008, ICT investment represented 2.82 per cent of nominal business sector GDP in Canada, well below the 4.09 per cent share in the United States (Table 2). Between 2000 and 2008, ICT investment as a share of nominal business sector GDP declined by 0.3 percentage points in Canada and by 1.2 percentage points in the United States, as nominal ICT investment growth fell well short of GDP growth in both economies. Both computers and communications equipment experienced falls in their share of nominal GDP in both countries over the 200-2008, while the share of software increased slightly in both countries.

G. ICT Investment Shares in Total Nominal Investment

ICT investment as a share of total business sector investment was 16.4 per cent in 2008 in Canada compared to 26.8 per cent in the United States (Table 2) Between 2000 and 2008 the share had fallen 3.7 points in Canada and 5.8 points in the United States Again both computers and communications equipment experienced falls in their share of nominal

investment in both countries over the 200-2008, while the share of software increased slightly in both countries.

III. Canada-U.S. ICT Investment Gap

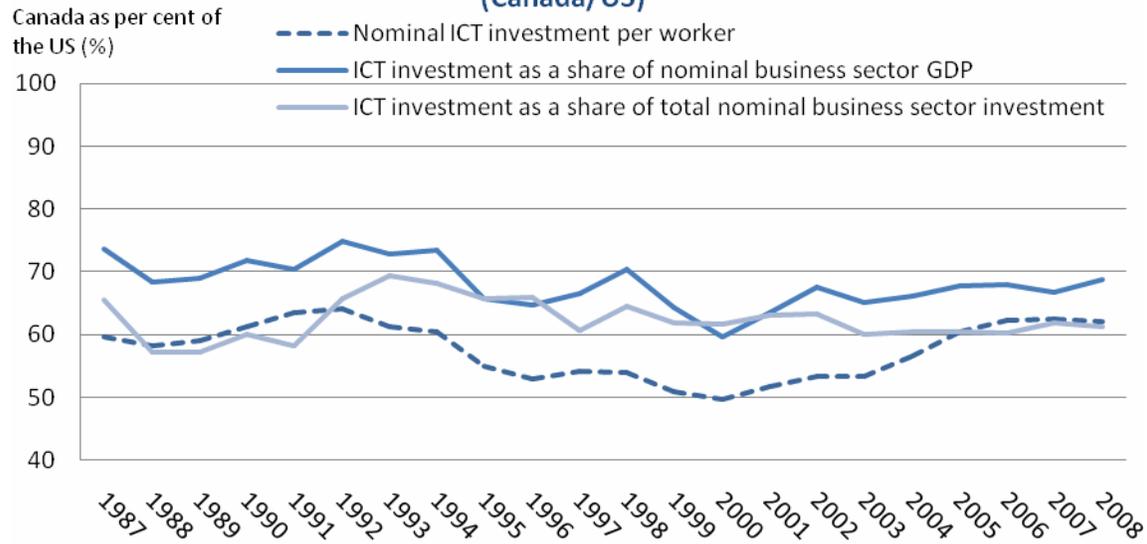
Canada has long had a significant ICT investment gap with the United States and this gap has been identified as a key factor behind Canada's lower level of labour productivity relative to the United States. There are three ways to quantify this gap: 1) ICT per investment per worker in Canada relative to that in the United States, calculated in a common currency with the appropriate purchasing power parities; 2) the ICT investment share of GDP in Canada as a proportion of that in the United States; and 3) the ICT investment share of total investment as a proportion of that in the United States. These three measures can be calculated in terms of both current dollars and constant dollars. As current dollars measures take account of changes in relative prices, their use is preferred to that of constant dollars. They are the measures used in this report.

A. Canada-US ICT Investment per Worker Gap

In 2008, nominal ICT investment per worker in the Canadian business sector was 62.1 per cent of that in the United States (Chart 8 and Table 3). This was down slightly from 62.5 per cent in 2007, but up significantly from 49.7 per cent in 2000.

The Canada-US ICT investment per worker gap varies greatly by ICT component. It is by far the greatest for software. In 2008, software investment per worker in Canada was only 40.6 per cent of that in the United States, although this was up from 32.2 per cent in 2000. The gap is smallest for computers. In 2008, computer investment per worker in Canada was 83.7 per cent of that in the United States, up from 68.3 per cent in 2000, but down from 104.2 per cent in 2006. Communications equipment occupies a middle ground, with Canada's per worker level of communications equipment investment in 2008 67.7 per cent of that in the United States. This represents a major narrowing of the gap from 47.0 per cent in 2000.

**Chart 6: The Canada - United States ICT Investment Gap by Indicator
(Canada/US)**



Source: CSLIS ICT Database, Tables S1, S9 and S13

B. Canada-US ICT Investment as a Share of GDP

In 2008, nominal ICT investment as a share of business sector GDP in Canada was 68.8 per cent of that in the United States, up from 66.7 per cent in 2007 and 59.5 per cent in 2000 (Chart 7 and 9 and Table 3).

Again, the size of the Canada-US ICT investment/GDP share gap varies greatly by ICT component. It is by far the greatest for software. In 2008, software investment/GDP share in Canada was only 58.9 per cent of that in the United States, although this was up from 56.0 per cent in 2007 and 49.5 per cent in 2000. The gap is smallest for computers. In 2008, the computer investment/GDP share in Canada was 92.8 per cent of that in the United States, up from 81.8 per cent in 2000, but down from 113.9 per cent in 2006 and 98.7 per cent in 2007. Communications equipment occupies a middle ground, with Canada's communications equipment investment/GDP share in 2008 75.0 per cent of that in the United States. This represents a major narrowing of the gap from 56.3 per cent in 2000.

C. Canada-US Investment as a Share of Total Investment

In 2008, nominal ICT investment as a share of total business sector investment in GDP in Canada was 61.2 per cent of that in the United States, down from 62.0 per cent in 2007 and 61.6 per cent in 2000 (Charts 7 and 10 and Table 3). In terms of the relative size of the gaps for the three ICT components, the same pattern emerges as for ICT investment as a share of GDP, with the gap largest for software, smallest for computers with communications equipment in the middle. As the share of total investment in GDP was

larger in the United States than in Canada in 2008, the Canada-US ratios for ICT investment as a share of total investment for ICTY and its components are around 10 percentage points below those for ICT investment as a share of GDP.

Table 3: Canada-United States ICT Investment Gap in the Business Sector, 2000-2008

	Total	Computers	Communication Equipment	Software
Nominal ICT investment per worker in Canada as a share of Nominal ICT investment per worker in the United States (%)				
PPP adjusted (%)				
2000	49.7	68.3	47.0	32.2
2006	62.2	104.2	58.0	37.6
2007	62.5	92.5	61.1	40.4
2008	62.1	83.7	67.7	40.6
Percentage points change				
Δ 2007	0.4	-11.6	3.1	2.8
Δ 2008	-0.4	-8.8	6.6	0.2
ICT investment as a share of Nominal GDP in Canada as a proportion of that of the United States (%)				
2000	59.5	81.8	56.3	49.5
2006	68.0	113.9	63.4	53.3
2007	66.7	98.7	65.2	56.0
2008	68.8	92.8	75.0	58.9
Percentage points change				
Δ 2007	-1.3	-15.2	1.7	2.7
Δ 2008	2.2	-5.9	9.9	2.9
ICT investment as a share of Nominal Total Investment in Canada as a proportion of that of the United States (%)				
2000	61.6	84.6	58.2	51.1
2006	60.2	100.8	56.2	47.2
2007	62.0	91.7	60.6	52.0
2008	61.2	82.5	66.7	52.3
Percentage points change				
Δ 2007	1.8	-9.1	4.4	4.8
Δ 2008	-0.8	-9.2	6.1	0.3

Source: CSLS ICT Database, Summary Tables

Chart 7: The Canada-US ICT Gap, Canada as a proportion of the United States, 2008

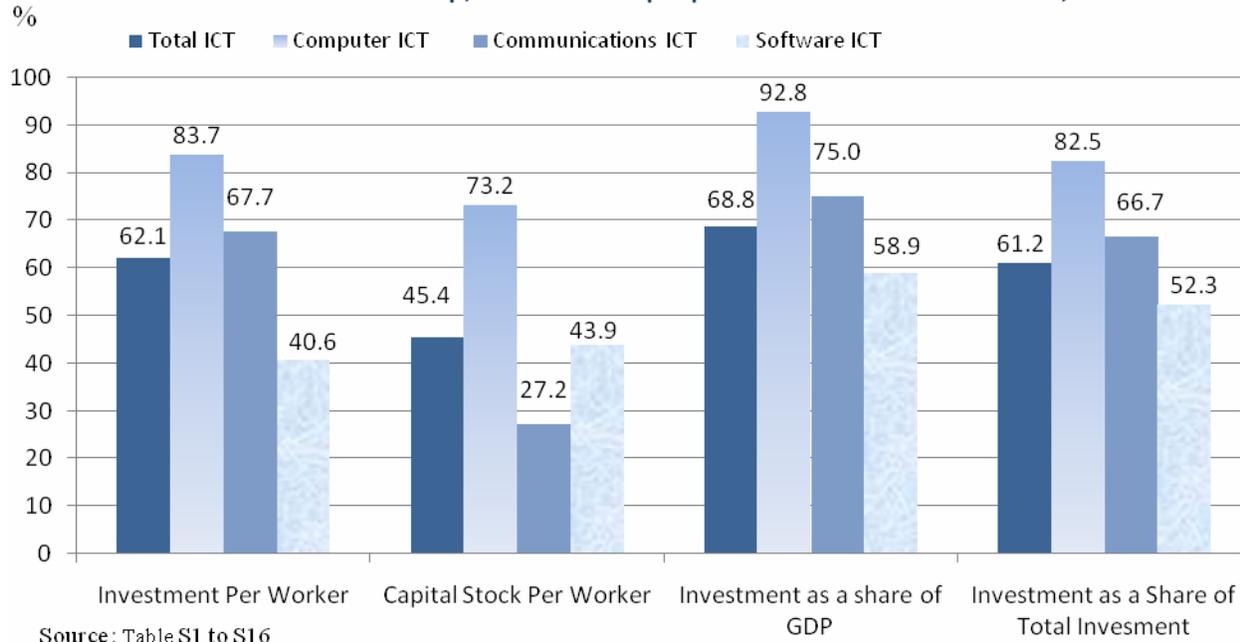
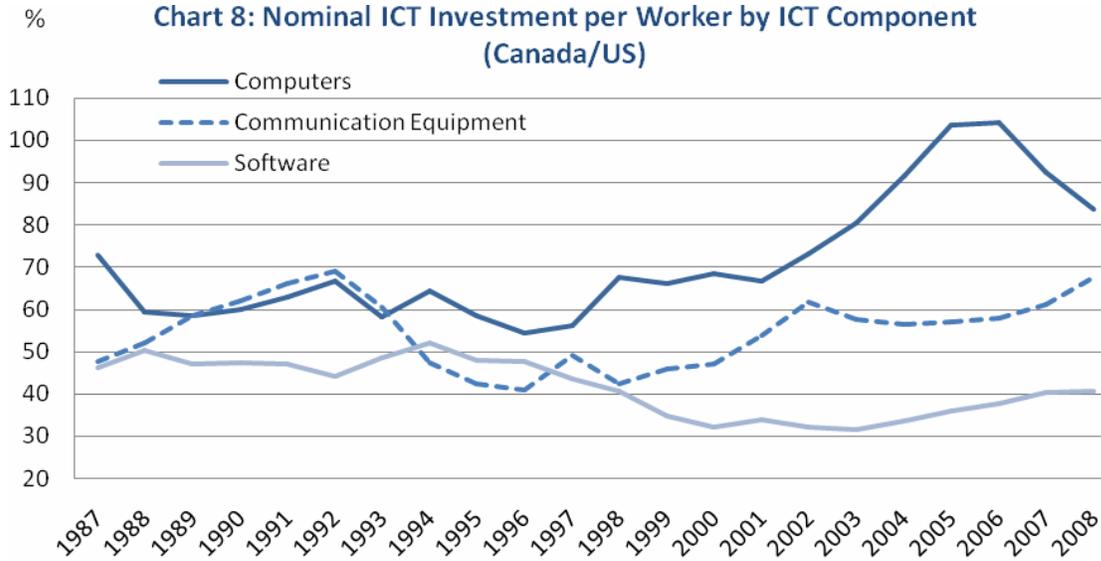
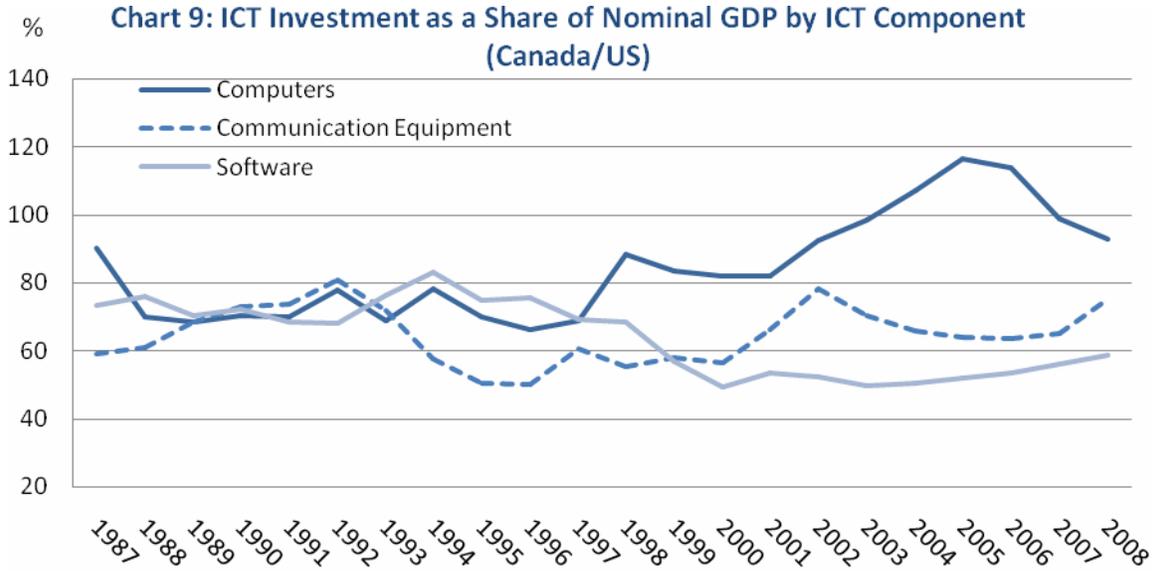
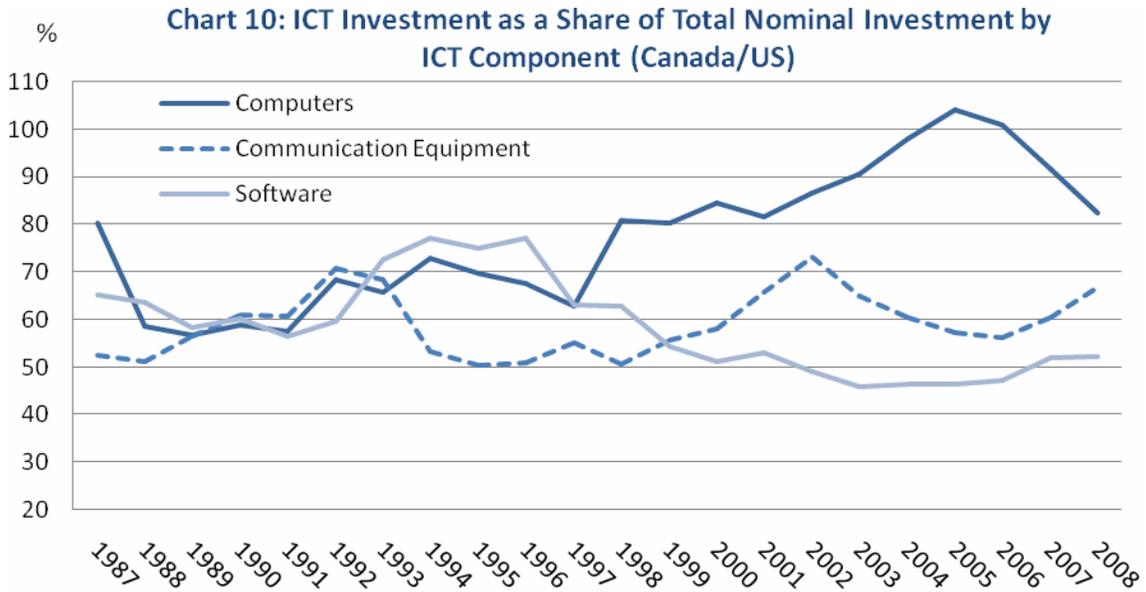


Chart 8: Nominal ICT Investment per Worker by ICT Component (Canada/US)





Source: CSLS ICT Database, Tables S9 to S12



Source: CSLS ICT Database, Tables S13 to S16

IV. Conclusion

In 2008, despite the slowdown in economic growth in Canada, both nominal and real ICT investment in the business sector increased from the rate observed in 2007. This was not the case in the United States when both nominal and real ICT investment growth fell off. In absolute terms, both nominal and real ICT investment growth were stronger in Canada in 2008 than in the United States. Because of the much greater fall in ICT prices in Canada than in the United States, real ICT investment growth was indeed much faster in Canada.

The employment picture differed markedly between Canada and the United States in 2008, with business sector employment up 1.1 per cent in Canada and down 1.7 per cent in the United States. These trends resulted in more rapid growth in the nominal GDP per worker in the United States than in Canada despite the stronger nominal ICT investment growth in Canada.

Given the somewhat slower nominal ICT investment per worker growth in Canada relative to the United States, the Canada-US ICT investment per worker gap increased slightly. Communications equipment investment was very strong in Canada in 2008, but this positive development was largely offset by declines in computer investment.