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**CENTRE FOR THE
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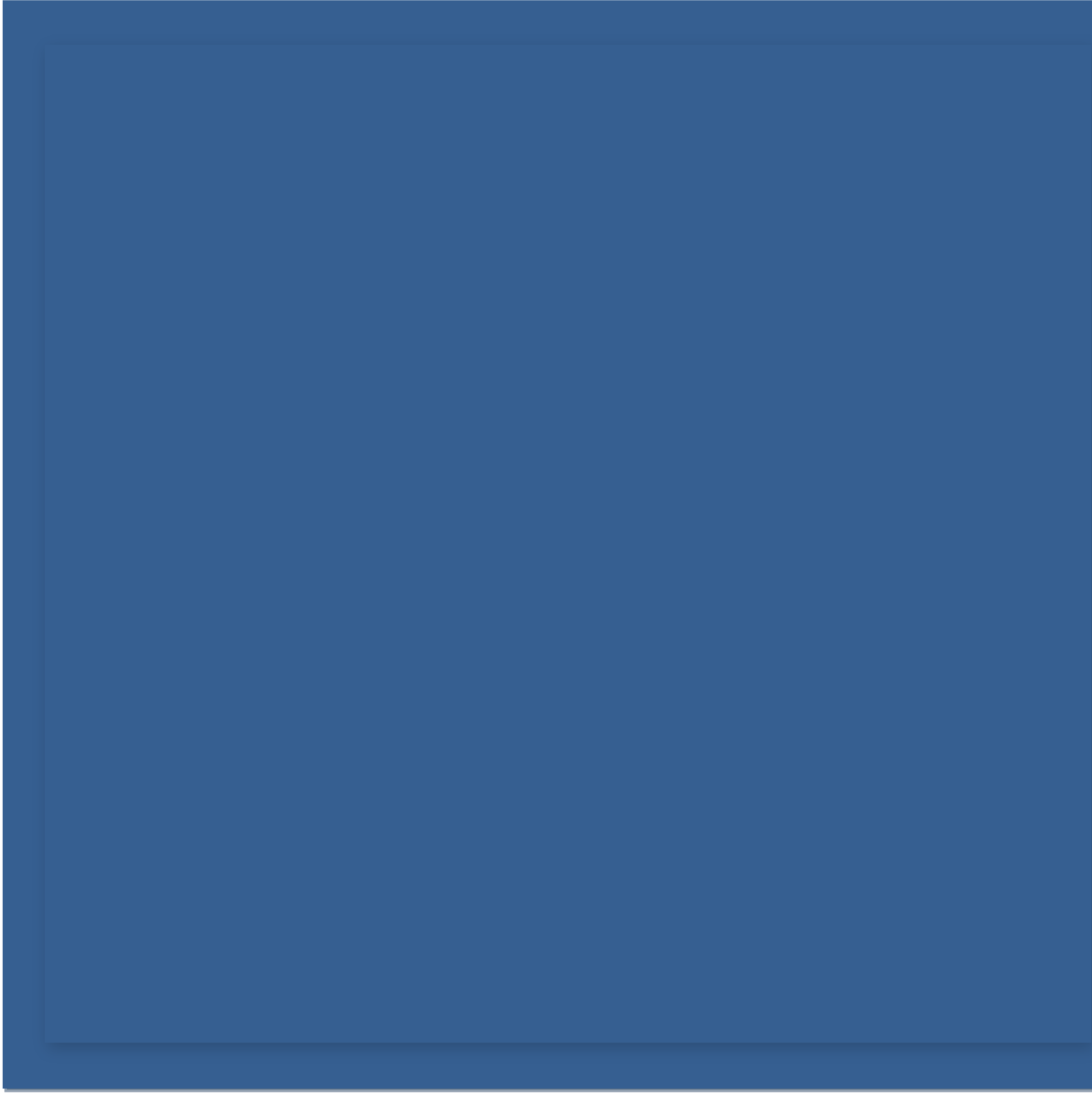
OVERVIEW OF DEVELOPMENTS IN ICT INVESTMENT IN CANADA, 2012

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An Overview of ICT Investment in Canada, 2012

Executive Summary

This report examines developments in information and communication technology (ICT) investment in Canada in 2012 in the context of the 2000-2012 period, based on an updating of the Centre for the Study of Living Standards (CSLS) ICT database for 2012. This report focuses on nominal and real ICT investment growth in the total economy and how the three components of ICT investment - computers, communication equipment, and software - have contributed to this growth. The following summary highlights the key findings of this report:

- In 2012, nominal (current dollar) total ICT investment spending in Canada rose 3.3 per cent to \$43.4 billion; this rate of growth was identical to the 2011 rate (3.3 per cent) and below the 2010 rate (4.2 per cent). Nominal total ICT investment growth was tepid in the 2008-2012 period relative to the 2000-2008 period. In fact, nominal total ICT investment grew at a compound annual average rate of 1.1 per cent during the 2008-2012 period, half of compound annual average rate experienced over the 2000-2008 period (2.8 per cent).
- Nominal total ICT investment was up 2.6 per cent in the business sector to \$33.7 billion in 2012, while it grew 5.9 per cent to \$9.7 billion the non-business sector. The business sector contributed 2.0 percentage points to the growth of nominal total ICT investment in the total economy, while the non-business sector contributed 1.3 percentage points.
- In 2012, nominal computer ICT investment grew by 1.7 per cent to \$12.7 billion, nominal communication equipment ICT investment grew by 5.4 per cent to \$8.8 billion, and nominal software ICT investment grew by 3.4 per cent to \$21.9 billion. Of the total 3.3 per cent growth in nominal total ICT investment in 2012, software contributed the most (1.7 percentage points), followed by communication equipment (1.1 percentage points) and computers (0.5 percentage point).
- Prices of ICT investment goods decreased by 1.6 per cent in 2012. The drop in total ICT investment prices was completely driven by declining computer ICT investment prices (-8.6 per cent), as software and communication equipment ICT prices rose (1.3 per cent and 1.9 per cent, respectively).
- Total ICT investment grew faster in real (2007 chained dollar) terms than it did in nominal terms in 2012 (5.0 per cent versus 3.3 per cent) due to falling total ICT prices; this has been the case in all years over the 2000-2012 period, excluding 2009.

- In 2012, real total ICT investment growth in was weak relative to its past performance; it was below the 2010 rate (11.2 per cent), the 2011 rate (9.5 per cent) and the compound annual average growth rate for the 2000-2008 period (8.8 per cent). In fact, real total ICT investment growth was weak over the 2008-2012 period compared to the 2000-2008 period, growing at a compound annual average rate of 3.7 per cent from 2008 to 2012.
- Moderate ICT investment growth in the business sector put downward pressure on the total economy ICT investment growth, but the non-business sector's solid ICT investment growth partially offset the non-business sector's weaker performance. Real total ICT investment grew more quickly in the non-business sector than in the business (6.4 per cent versus 4.6 per cent), causing the non-business sector's contribution to real total ICT investment growth in the overall economy to be disproportionately large. Of the total 5.0 per cent growth in real total ICT investment in 2012, the business sector contributed 3.5 percentage points and the non-business sector contributed 1.4 percentage points.
- Overall, the slowdown in real total ICT investment growth in 2012 was caused by declining investment growth for all ICT components. In 2012, real computer ICT investment growth dropped to 11.3 per cent from 19.8 per cent in 2011 and 20.1 per cent in 2010. Similarly, real communication equipment ICT investment grew by only 3.5 per cent in 2012, compared to growth rates of 9.5 per cent in 2011 and 15.7 per cent in 2010. Real software ICT investment growth also experienced a slowdown; it fell from 4.5 per cent in 2010 and 3.7 per cent in 2011 to 2.0 per cent in 2012.
- Computer investment contributed the most to real total ICT investment growth in 2012 (3.2 percentage points), followed by software (1.0 percentage point) and communication equipment (0.7 percentage point). Since all ICT investment components experienced declining growth rates between 2011 and 2012, their percentage point contributions to real total ICT investment growth also fell. It is also interesting to note that the contribution of computer ICT investment to real total ICT investment (65.0 per cent) was much larger than its contribution to nominal total ICT investment (15.6 per cent) due to rapidly falling computer ICT prices.

An Overview of ICT Investment in Canada, 2012¹

The aim of this report is to provide an overview of recent developments in information and communication technology (ICT) investment in Canada with special attention paid to 2012 in the context of the 2000-2012 period. The analysis is based on an updating of the ICT database for Canada - developed and maintained by the Centre for the Study of Living Standards (CSLS) - for 2012.² This report builds on and extends earlier CSLS work on ICT investment trends.³ Compared to previous CSLS reports on ICT investment, however, this report focuses on quantifying the contribution of the three components of ICT investment - computers, communication equipment, and software - to nominal (current dollar) and real (chained 2007 dollar) ICT investment growth in the total economy.

This report is divided into three main sections. The first section reviews trends in nominal ICT investment in Canada. More specifically, we perform the following: a comparison of nominal ICT investment to nominal total fixed, non-residential investment; an investigation of the contribution of the business and non-business sectors to nominal total ICT investment; an examination of the contribution of each ICT component to nominal total ICT investment; and a discussion of the growth of nominal total ICT investment per worker. The second section briefly reviews developments in ICT investment prices by ICT component. Finally, the third section analyzes the major developments in real ICT investment, focusing on the same dimensions examined under the first section.

1. Nominal ICT Investment

1.1 Total Nominal ICT Investment

In 2012, nominal (current dollar) total ICT investment spending in Canada rose to \$43.4 billion, up 3.3 per cent from \$42.0 billion in 2011 (Chart 1). The rate of growth of nominal total ICT investment in 2012 was identical to the 2011 rate (3.3 per cent) and below the 2010 rate (4.2 per cent). Nevertheless, the 2012 nominal total ICT investment growth rate was slow relative to the 2010 rate because the 2010 rate represented a recovery after the crash in nominal total ICT investment caused by the 2009 recession.

¹ This report was prepared by Evan Capeluck, under the supervision of Andrew Sharpe, for the Information Technology Association of Canada (ITAC). We would like to thank Lynda Leonard, Senior Vice-President of ITAC, for her support. For comments, please email andrew.sharpe@csls.ca or evan.capeluck@csls.ca.

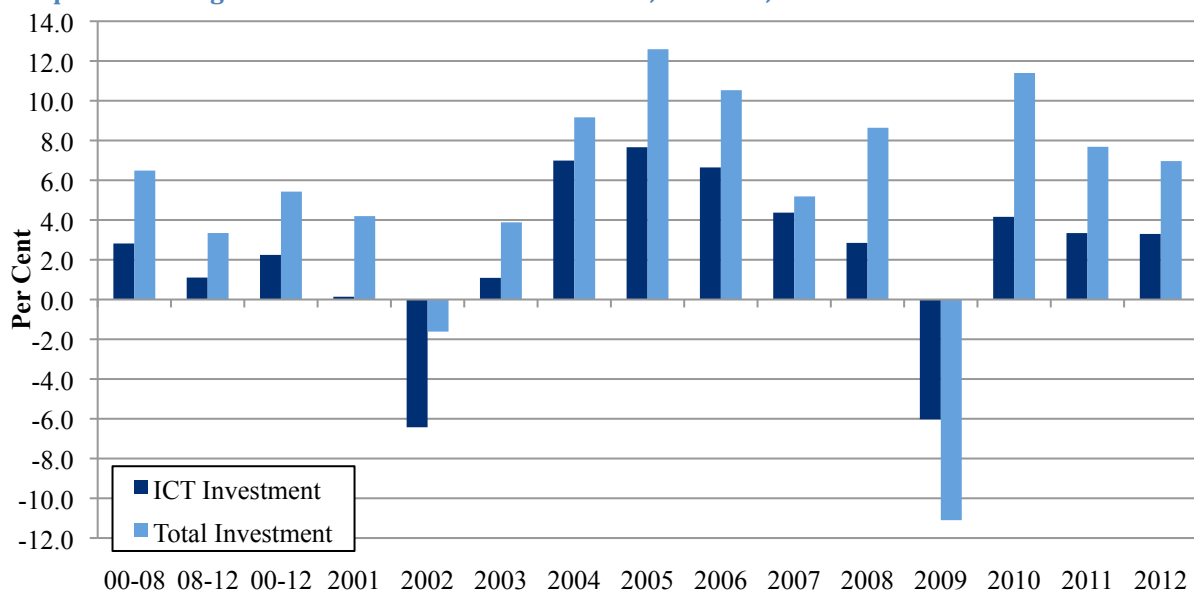
² The [database](#) provides comparable estimates of ICT investment and ICT capital stock in Canada and the United States for twenty two-digit NAICS industries for the 1987-2012 period. All estimates are expressed in both nominal terms and real terms, are available on a per worker basis, and are broken down by the three ICT components (computers, communications, and software).

³ Earlier CSLS reports on ICT investment include: Sharpe, 2005, 2006 and 2010; CSLS, 2008; Sharpe and Arsenaault, 2008a and 2008b; Sharpe and de Avillez, 2010; Sharpe and Moeller, 2011; Sharpe and Andrews, 2012; Capeluck, 2012; Capeluck, 2013; and Sharpe and Rai, 2013.

Due to the lowered expectations concerning the profitability of investments and the difficult borrowing conditions brought upon by the recession, nominal total ICT investment fell by 6.0 per cent in 2009. Because of the magnitude of the damage caused by the recession, nominal total ICT investment only regained its 2008 peak by 2011. Nonetheless, nominal total ICT investment was 4.5 per cent above its 2008 peak by 2012. Nominal total ICT investment growth has been tepid over the 2008-2012 period relative to the 2000-2008 period, with compound average annual growth rate of 1.1 per cent and 2.8 per cent, respectively.

Nominal total fixed, non-residential investment has grown more rapidly than nominal total ICT investment over the entire 2000-2012 period. Between 2000 and 2012, nominal total fixed, non-residential investment grew at a compound annual average rate of 5.4 per cent per year, considerably faster than nominal total ICT investment growth in the same period (2.2 per cent). Nominal total ICT investment growth has slowed dramatically since the dot-com bubble burst in 2000. From 1981 to 2000, nominal total ICT investment was growing at a much faster rate than nominal total fixed, non-residential investment. As a result, ICT's share of nominal total fixed, non-residential investment grew from 8.6 per cent in 1981 to 19.8 per cent in 2000. Between 2000 and 2012, however, nominal total fixed, non-residential investment has grown more rapidly than nominal total ICT investment. Consequently, ICT's share of nominal total fixed, non-residential investment fell by 6.1 percentage points from 19.8 per cent in 2000 to 13.7 per cent in 2012. ICT's falling share of nominal total fixed, non-residential investment gives a misleading impression of the state of ICT investment in Canada: even though nominal total ICT investment has grown much more slowly since 2000, real total ICT investment growth has remained strong due to continuously falling ICT investment prices. Trends in real total ICT investment will be discussed in more detail in the third section of this report.

Chart 1: Nominal Total ICT Investment and Nominal Total Investment (Fixed, Non Residential), Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

1.2 Nominal ICT Investment in the Business and Non-Business Sectors

The total economy can be divided into the business and non-business sectors. The business sector represents approximately four-fifths of total economy GDP and includes industries whose outputs are marketed. The non-business sector, on the other hand, includes industries and activities whose outputs are generally not marketed. This report uses the CSLS ICT database's definitions for the business and non-business sectors, which are taken from Statistics Canada's Fixed Capital Flows and Stocks program. The CSLS ICT database defines the non-business sector as the aggregate of the three two-digit NAICS industries (i.e., public administration, healthcare and social assistance, and educational services) and defines the business sector as the aggregate of the remaining two-digit NAICS industries.

In 2012, the increase of 3.3 per cent in nominal total ICT investment in the Canadian economy was driven by an expansion of nominal total ICT investment in both the business and non-business sectors. In 2012, nominal total ICT investment was up 2.6 per cent in the business sector to \$33.7 billion, while it grew 5.9 per cent to \$9.7 billion in the non-business sector (Appendix Chart 1). The business sector contributed 2.0 percentage points to the growth of nominal total ICT investment in the total economy, and the non-business sector contributed the remaining 1.3 percentage points (Chart 2).⁴ In 2012, the non-business sector's contribution to nominal total ICT investment growth in the overall economy (39.0 per cent) was disproportionately large relative to its share of the level of nominal total economy ICT investment (22.2 per cent). The non-business sector contributed a disproportionately large amount to total economy nominal total ICT investment growth, because nominal total ICT investment in the non-business sector grew much faster than in the business sector in 2012.

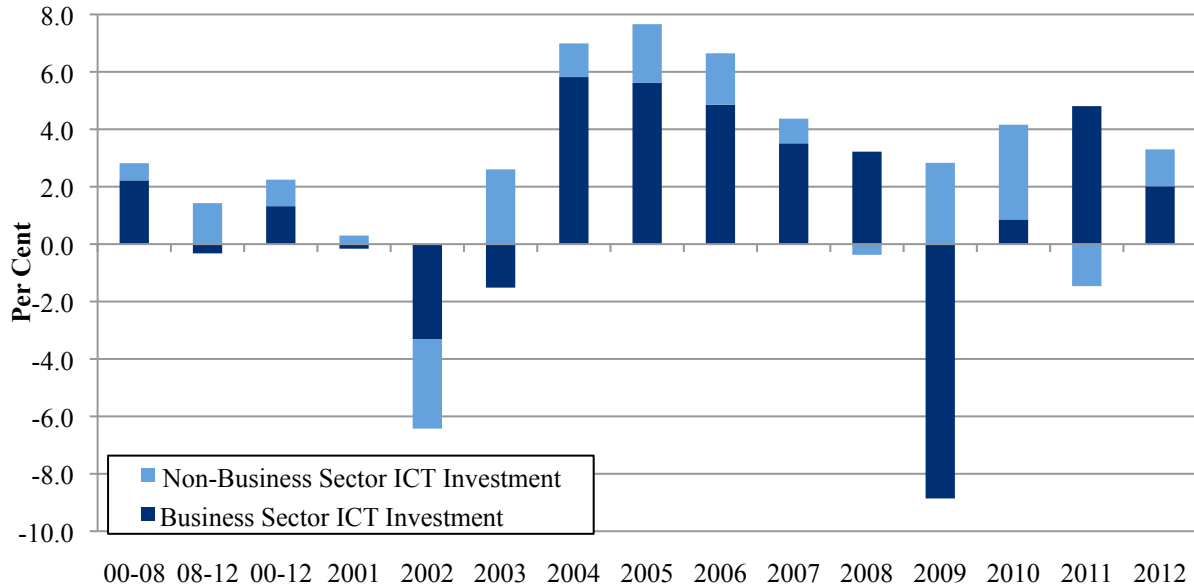
Over the 2000-2012 period, the business sector accounted for 1.3 percentage points (or 58.9 per cent) of the overall 2.2 per cent compound annual average growth of nominal total ICT investment, while the non-business sector accounted for 0.8 percentage points (or 41.1 per cent). Relative to the business sector's contribution to the growth of nominal total ICT investment in the total economy for the 2000-2008 period (78.7 per cent), its contribution for the 2008-2012 and 2000-2012 periods was small. The business sector had a relatively poor performance over the 2008-2012 and 2000-2012 periods because these periods include the impact of the 2009 recession, which had a much more detrimental effect on the business sector than on the non-business sector.

Unlike nominal total ICT investment growth in the business sector, nominal total ICT investment growth in the non-business sector was countercyclical in 2009, growing 16.2 per cent compared to a 10.7 per cent decline for the business sector. In addition, nominal total ICT investment grew more rapidly in the non-business sector than in the business sector in 2010 (5.9 per cent versus 2.6 per cent, respectively). Consequently, the non-business sector positively

⁴ To calculate the percentage point contribution of *each* ICT component to nominal *total* ICT investment growth between two years, we multiplied the percentage change in nominal *total* ICT investment between those two years by *each* ICT component's share of the absolute change in nominal *total* ICT investment between those two years.

contributed to nominal total ICT investment growth in 2009, and it accounted for the lion's share of nominal total ICT investment growth in 2010 (79.4 per cent). It is probable that the strength of non-business sector nominal total ICT investment in 2009/2010 was partially due to the Canadian governments' countercyclical policies.

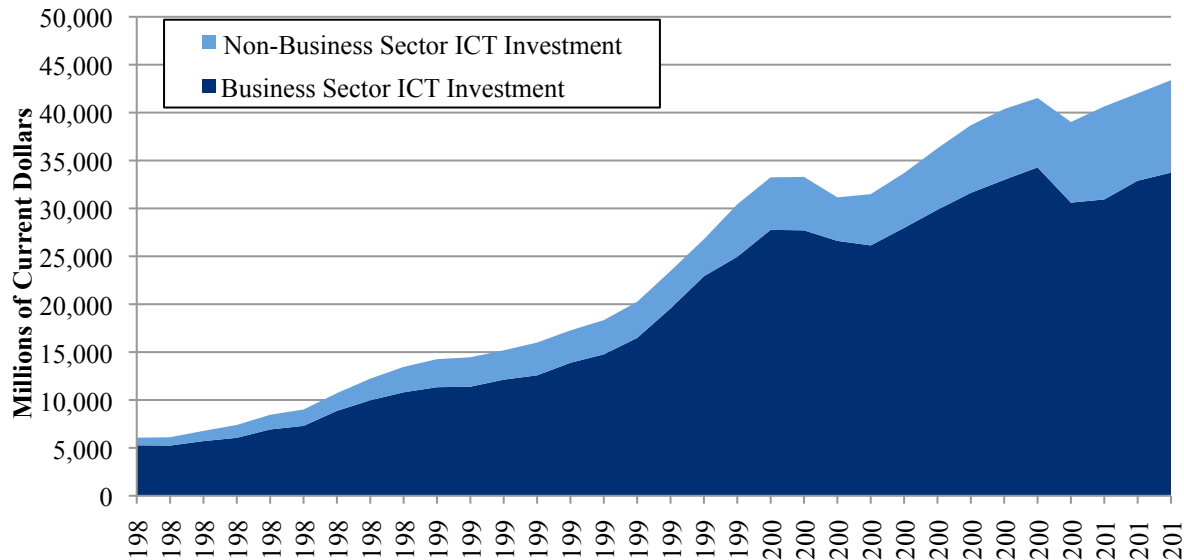
Chart 2: Contribution of the Business and Non-Business Sectors to Nominal Total ICT Investment Growth, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

In 2012, the level of non-business sector nominal total ICT investment (\$9.7 billion) was much smaller than the level of business sector nominal total ICT investment (\$33.7 billion); this was not a historic anomaly, as nominal total ICT investment was much more important in the business than in the non-business sector over the entire 1981-2012 period (Chart 3). Nonetheless, the business sector's share of nominal total ICT investment in the total economy has fallen from 86.9 per cent in 1981 to 77.8 per cent in 2012, which implies that non-business sector nominal total ICT investment is becoming a more important source of ICT investment growth.

Chart 3: Contribution of the Business and Non-Business Sectors to Nominal Total ICT Investment Levels, Millions of Current Dollars, 1981-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

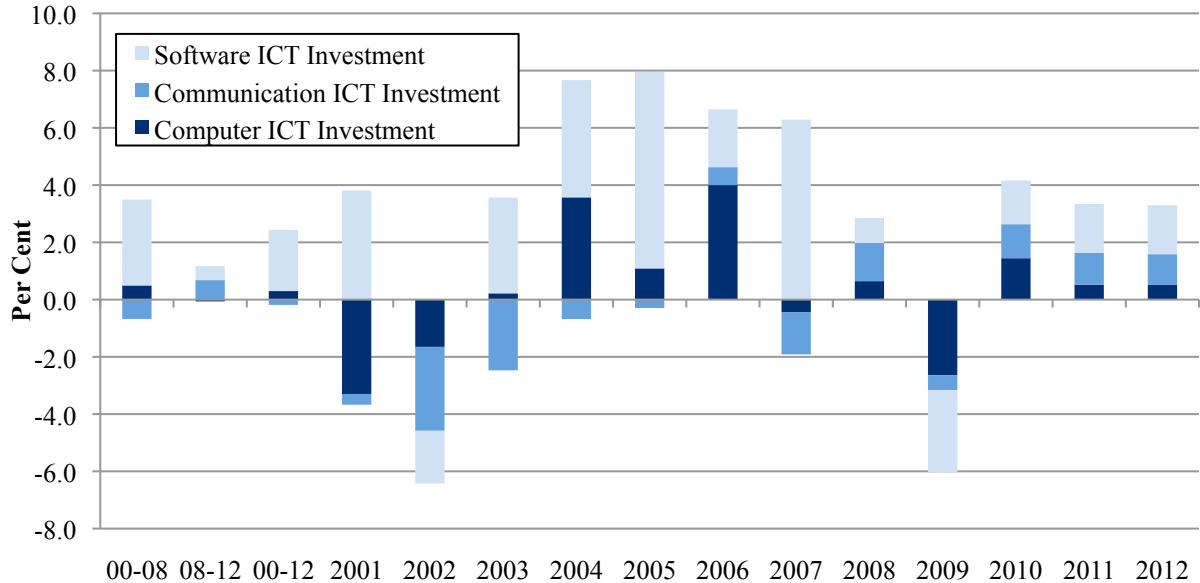
1.3 Nominal ICT Investment by Component

Total ICT investment consists of three components: investment in computers, investment in communication equipment, and investment in software. In 2012, nominal computer ICT investment grew by 1.7 per cent to \$12.7 billion, nominal communication equipment ICT investment grew by 5.4 per cent to \$8.8 billion, and nominal software ICT investment grew by 3.4 per cent to \$21.9 billion (Appendix Chart 2). Of the total 3.3 per cent growth in total nominal ICT investment in 2012, software ICT investment contributed the most (1.7 percentage points or 51.9 per cent), followed by communication equipment ICT investment (1.1 percentage points or 32.5 per cent) and computer ICT investment (0.5 percentage point or 15.6 per cent) (Chart 4).

These numbers differ from the pattern established during the 2000-2012 period, when nominal investment in communication equipment fell by an average of 1.7 per cent per year (and therefore contributed -0.2 percentage point to nominal total ICT investment growth). Even though communication equipment ICT investment dragged down on nominal total ICT investment growth in most years between 2001 and 2009, it was robust and accounted for approximately one-third of the nominal total ICT investment growth for every year between 2010 and 2012. In 2012, nominal software ICT investment's contribution to nominal total ICT investment growth was weak relative to its 2000-2008 compound annual average (3.0 percentage points) and its 2000-2012 compound annual average (2.1 percentage points). Between 2010 and 2012, nominal software ICT investment consistently contributed a historically small amount to nominal total ICT investment growth. Conversely, the contribution of nominal computer ICT investment to nominal total ICT investment growth in 2012 (0.5 percentage point) corresponded to its 2000-2008 compound

annual average (0.5 percentage point) and its 2000-2012 compound annual average (0.3 percentage point).

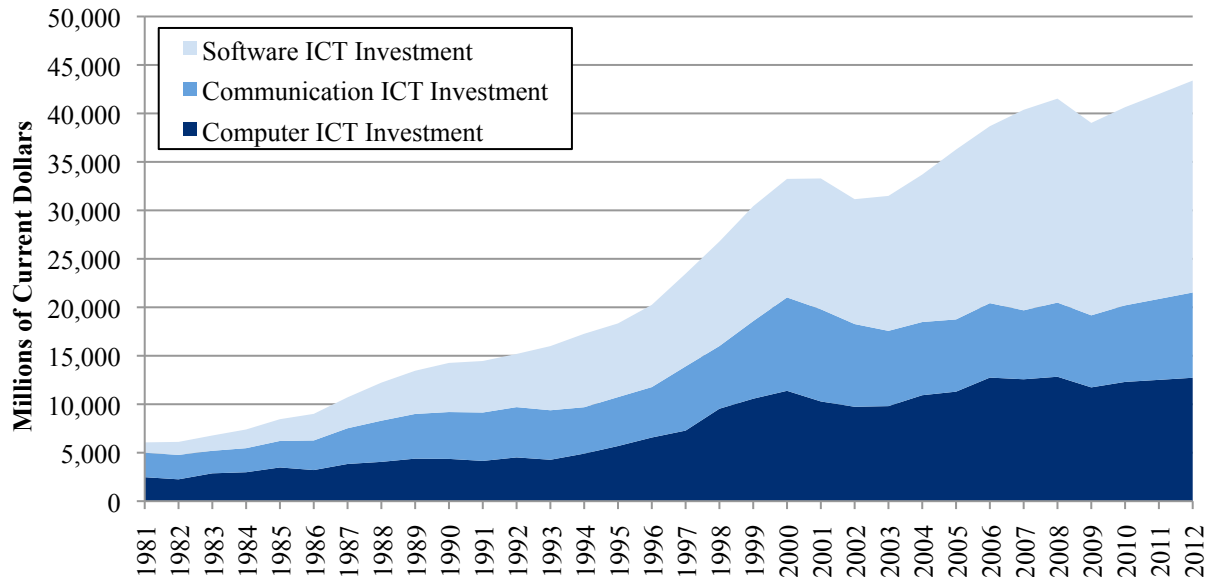
Chart 4: Contribution of ICT Components to Nominal Total ICT Investment Growth, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

In 2012, nominal software ICT investment was by far the biggest ICT investment component at 50.4 per cent of nominal total ICT investment, followed by nominal computer ICT investment (29.3 per cent) and nominal communication equipment ICT investment (20.3 per cent) (Chart 5). Software was not always the most important component of nominal total ICT investment. In fact, nominal software ICT investment accounted for only 17.7 per cent of nominal total ICT investment in 1981, while nominal computer ICT investment accounted for 40.8 per cent and nominal communication equipment ICT investment accounted for 41.5 per cent. Relative to its 1981 share of nominal total ICT investment, software's importance grew as nominal software ICT investment grew to 20.4 times its 1981 value by 2012 while nominal communication equipment ICT investment was merely 3.5 times its 1981 value by 2012 and nominal computer ICT investment's 2012 value was only 5.1 times larger than its 1981 value.

Chart 5: Contribution of ICT Components to Nominal Total ICT Investment Levels, Millions of Current Dollars, 1981-2012

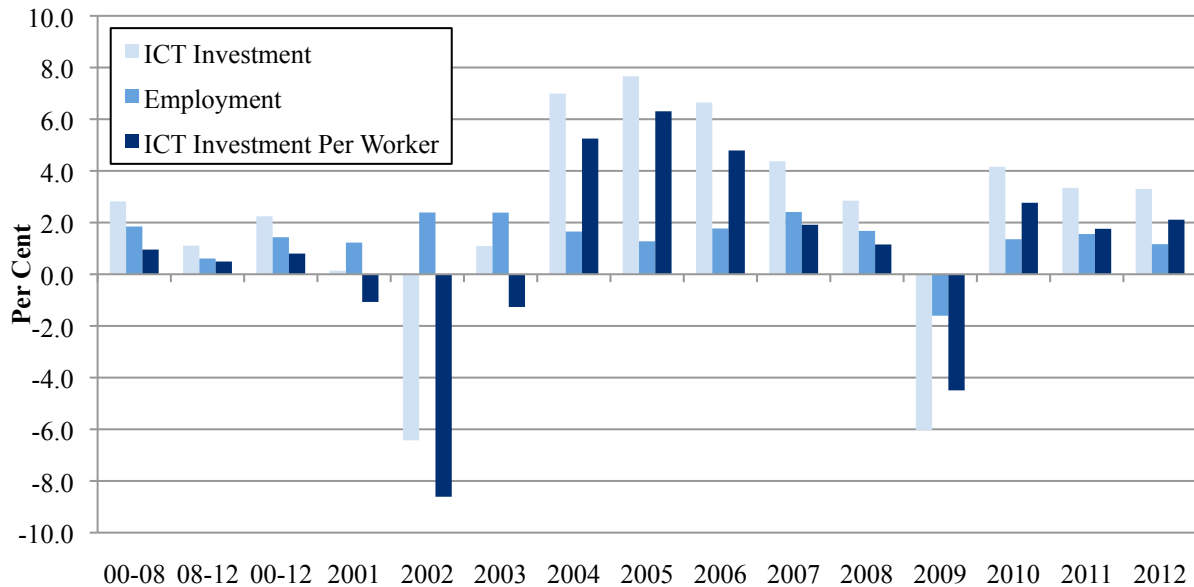


Source: CSLS ICT Database, which was built using Statistics Canada data.

1.4 Nominal ICT Investment Per Worker

Nominal total ICT investment intensity is defined as nominal total ICT investment divided by the number of persons employed. In 2012, nominal total ICT investment increased by 3.3 per cent and the number of people employed increased by 1.2 per cent (Chart 6). This resulted in a 2.1 per cent increase in nominal total ICT investment per worker, more than double the average annual growth rate for the 2000-2012 period (0.8 per cent) and for the 2000-2008 period (1.0 per cent). Nominal total ICT investment intensity reached \$2,478 in 2012. Even though nominal total ICT investment growth was the same in 2011 and 2012 (3.3 per cent), nominal total ICT investment intensity grew slightly faster in 2012 due to slower employment growth. Nominal total ICT investment intensity growth in 2012 was weaker than the growth experienced in 2010 (2.8 per cent), but represented a major improvement from the decline in 2009 (-4.5 per cent). Overall, growth in total ICT investment per worker has been volatile between 2000 and 2012, with negative growth from 2001 to 2003, significant increases between 2004 and 2008, and moderate increases since the 2009 recession. The percentage contributions of each ICT investment component to nominal total ICT investment per worker growth are not discussed in this section, because they are identical to the contributions discussed in the preceding section.

Chart 6: Nominal Total ICT Investment Per Worker and Nominal Total Investment (Fixed, Non Residential) Per Worker, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

2. ICT Prices

By dividing the nominal (current dollar) estimates of ICT investment by the real (2007 chained dollar) figures, it is possible to obtain implicit price indices for computer, communication equipment, software and total ICT investment.⁵ In 2012, prices of total economy ICT investment goods decreased by 1.6 per cent, which was a mild decrease compared to the 2000-2012 period when ICT prices decreased on average 4.5 per cent per year (Chart 7). The 2012 rate was much lower than the 5.6 per cent decline in 2011 and the 6.3 per cent decline in 2010. The price decrease in 2012 represents a continuation of the usual trend of falling prices, as total ICT investment prices fell to their lowest level to date.

The fall in total ICT investment prices in 2012 was completely driven by falling computer ICT investment prices (-8.6 per cent), as software and communication equipment ICT prices rose (1.3 per cent and 1.9 per cent, respectively). In 2012, the fall in computer ICT investment prices (8.6 per cent) was far less than the 2011 rate (15.1 per cent) and the 2010 rate (12.7 per cent). The decline in computer ICT investment prices in 2012 was also small compared to the compound annual average decrease during the 2000-2012 period of 10.5 per cent. Communications equipment and software ICT investment prices also deviated far from trend in 2012. During the 2000-2012 period, communication equipment ICT investment prices experienced a compound annual average decrease of 3.5 per cent and software ICT investment prices experienced a compound annual average decrease of 1.0 per cent.

⁵ Price series for the business and the non-business ICT investment (and its components) were also calculated, but since the price movements of the two sectors were very similar, they will not be discussed in detail. Between 1981 and 2012, ICT prices fell by 81.4 per cent for the business sector and by 82.1 per cent for the non-business sector.

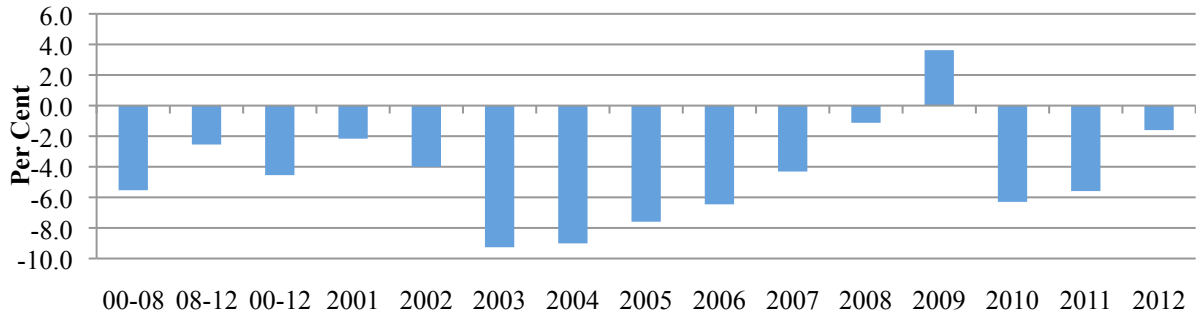
Comparing the compound annual average price changes for the ICT investment components between 2000 and 2012 reveals three key facts: (1) prices of all ICT components have declined substantially since 2000; (2) computer ICT investment prices have by far fallen the most, followed by communication equipment ICT investment prices which have also fallen by a significant amount; and (3) software ICT investment prices show little trend and only declined modestly between 2000 and 2012.

Tracking price movements when dealing with nominal figures is vital, because nominal figures capture both price and volume effects. In order to understand changes in volume of ICT investment, the nominal figures must be adjusted for changes in ICT investment prices to produce real figures. In fact, continually dropping prices caused total economy ICT investment to grow faster in real terms than in nominal terms. The relative importance of the three ICT investment components to total ICT investment growth are very different in real terms than in nominal terms, because the ICT components experienced divergent trends in their price levels. As we shall see, real computer ICT investment growth differs the most from its nominal equivalent as computer ICT investment prices experienced the biggest declines (Chart 8).

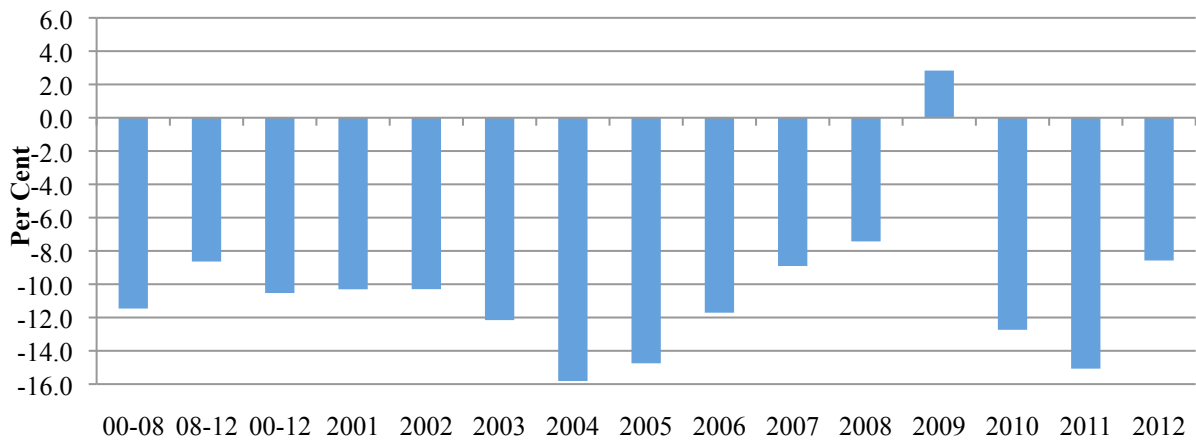
It is important to note that the decline in the price of ICT investment goods during the 2000-2012 period embodies both the decline in the absolute price of the components and the increase in their quality. Prices are adjusted for changes in the quality of ICT investment goods to reflect the fact that firms can now purchase much more powerful products for lower levels of investment. Hence, increases in the level of real ICT investment can be the result of (1) an increase in the quantity produced/purchased, (2) an increase in the quality of the ICT investment goods, or (3) an increase in both quantity and quality. In general, an increase in real ICT investment is the result of both an increase in the quantity of goods purchased and an increase in the quality of goods purchased.

Chart 7: ICT Prices by Component, Compound Average Annual and Annual Growth Rates, 2000-2012

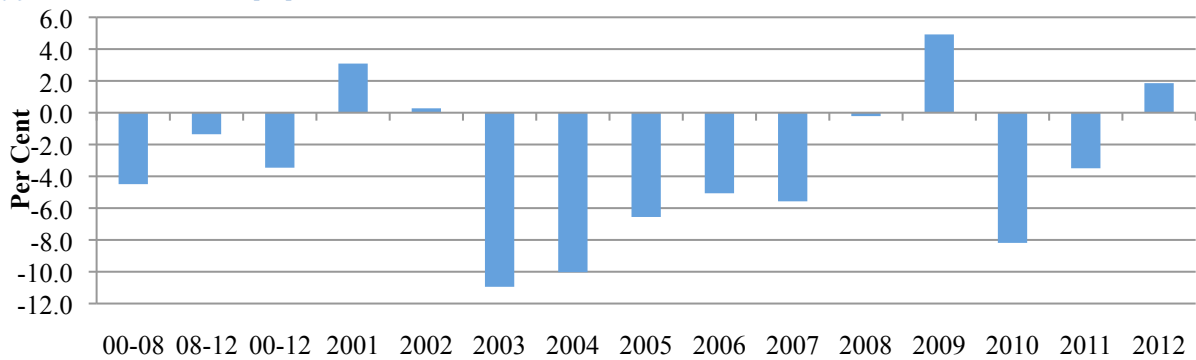
(a) Total ICT Prices



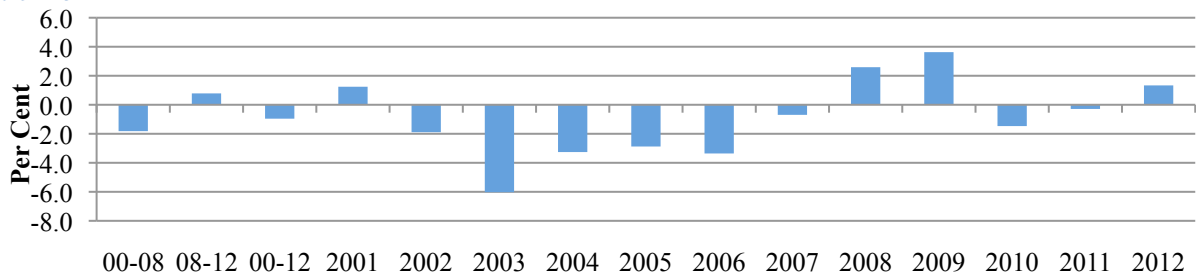
(b) Computer ICT Prices



(c) Communication Equipment ICT Prices

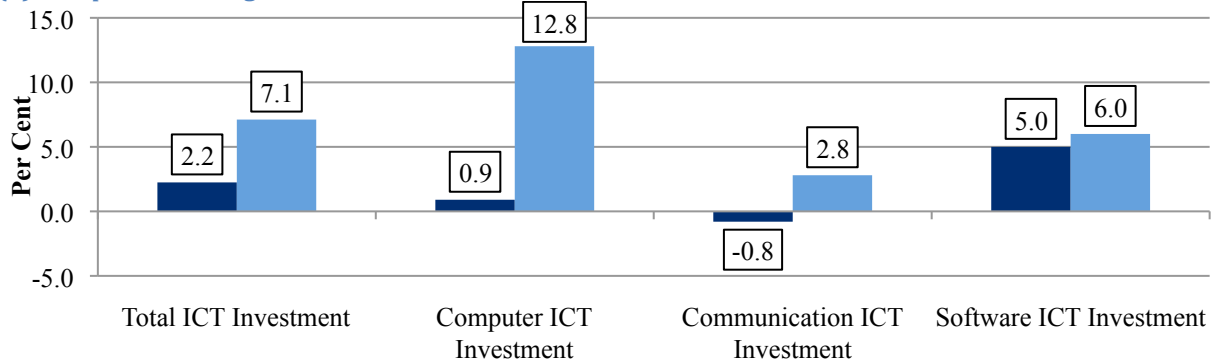


(d) Software ICT Prices

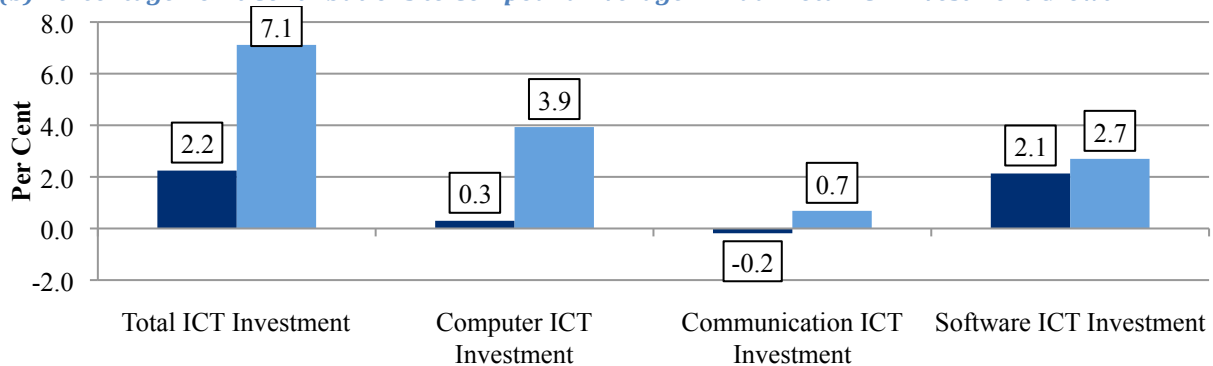


Source: CSLS ICT Database, which was built using Statistics Canada data.

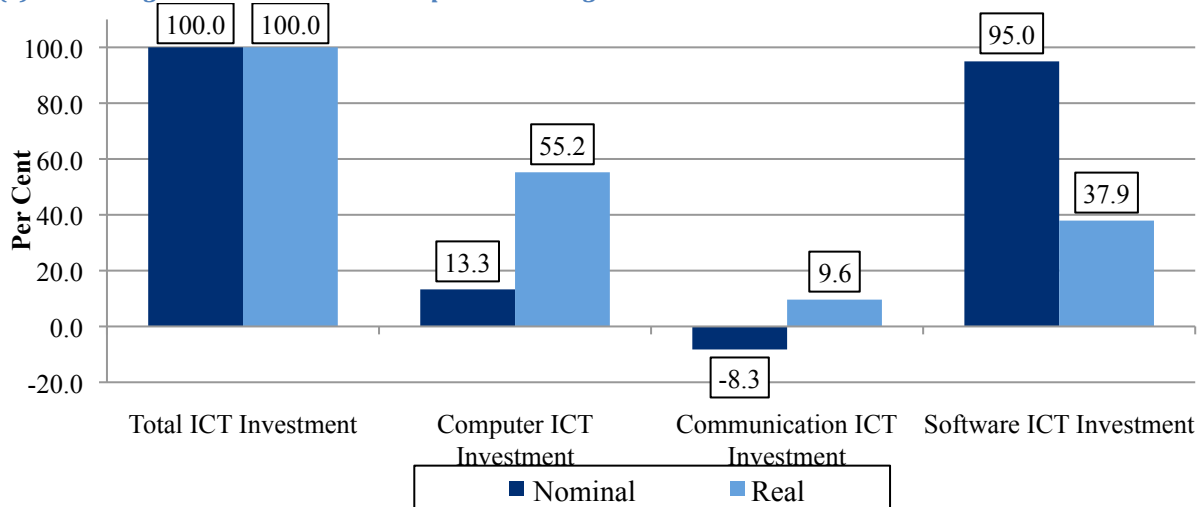
Chart 8: The Difference Between Nominal and Real ICT Investment Figures by Component, 2000-2012
(a) Compound Average Annual Growth Rates



(b) Percentage Point Contributions to Compound Average Annual Total ICT Investment Growth



(c) Percentage Contributions to Compound Average Annual Total ICT Investment Growth



Source: CSLS ICT Database, which was built using Statistics Canada data.

3. Real ICT Investment

3.1 Total Real ICT Investment

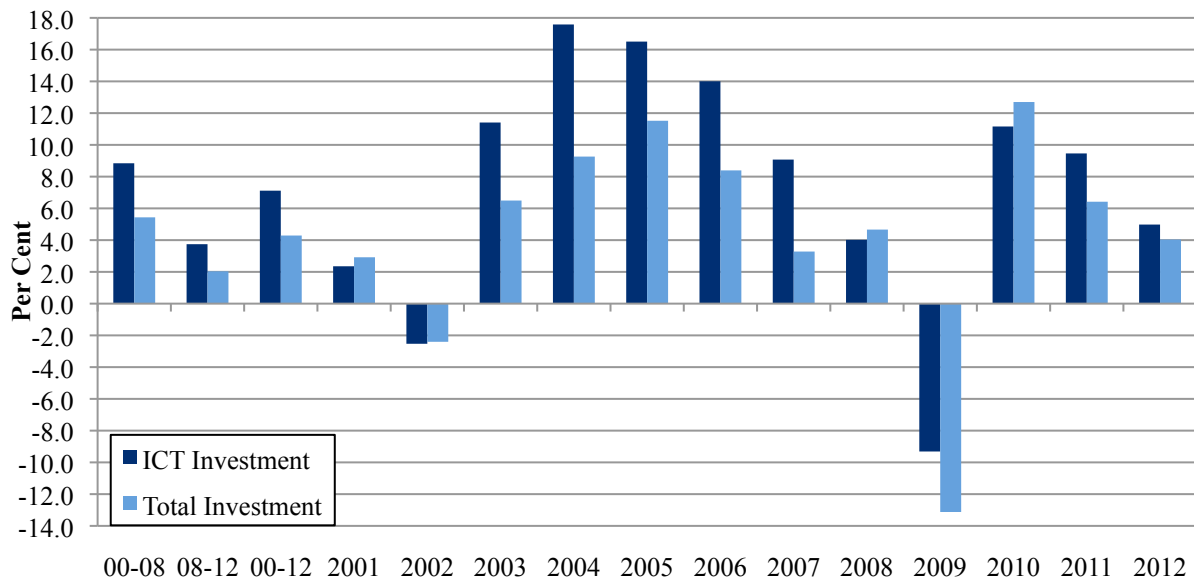
When evaluating the state of ICT investment in Canada, it is important to focus on developments in real (2007 chained dollar) figures, because they represent changes in the quantity of goods purchased and changes in the quality of goods purchased. Nevertheless, it is vital to

investigate trends in nominal (current dollar) ICT investment figures and ICT investment prices in order to understand developments in real ICT investment.

In 2012, real (2007 chained dollar) total ICT investment growth was quite weak compared to its past performance. Total economy real total ICT investment rose 5.0 per cent in 2012, below the compound annual average growth rate for the 2000-2012 period (7.1 per cent), the 2011 rate (9.4 per cent) and the 2010 rate (11.2 per cent) (Chart 9). Total ICT investment grew faster in real terms than it did in nominal terms in 2012 (+5.0 per cent versus +3.3 per cent) due to the decline in total ICT investment prices (-1.6 per cent); this was true for all years between 2001 and 2012, excluding 2009 when ICT investment prices increased.

Even though total fixed, non-residential investment growth surpassed total ICT investment in nominal terms, the difference between nominal and real total ICT investment growth was so large (due to rapidly falling ICT prices) that total ICT investment exceeded total fixed, non-residential investment in real terms. In 2012, real total ICT investment growth (5.0 per cent) outperformed real total fixed, non-residential investment growth (4.0 per cent) by 1.0 percentage point, even though nominal total ICT investment growth was 3.7 percentage points lower than nominal total fixed, non-residential investment growth. Real total ICT investment growth has been consistently faster than the growth of nominal total fixed, non-residential investment over the entire 2000-2012 period. Between 2001 and 2012, real total ICT investment grew at a compound annual average rate of 7.1 per cent, considerably faster than real total fixed, non-residential investment growth in the same period (4.3 per cent).

Chart 9: Real Total ICT Investment and Real Total Investment (Fixed, Non Residential), 2007 Chained Dollars, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



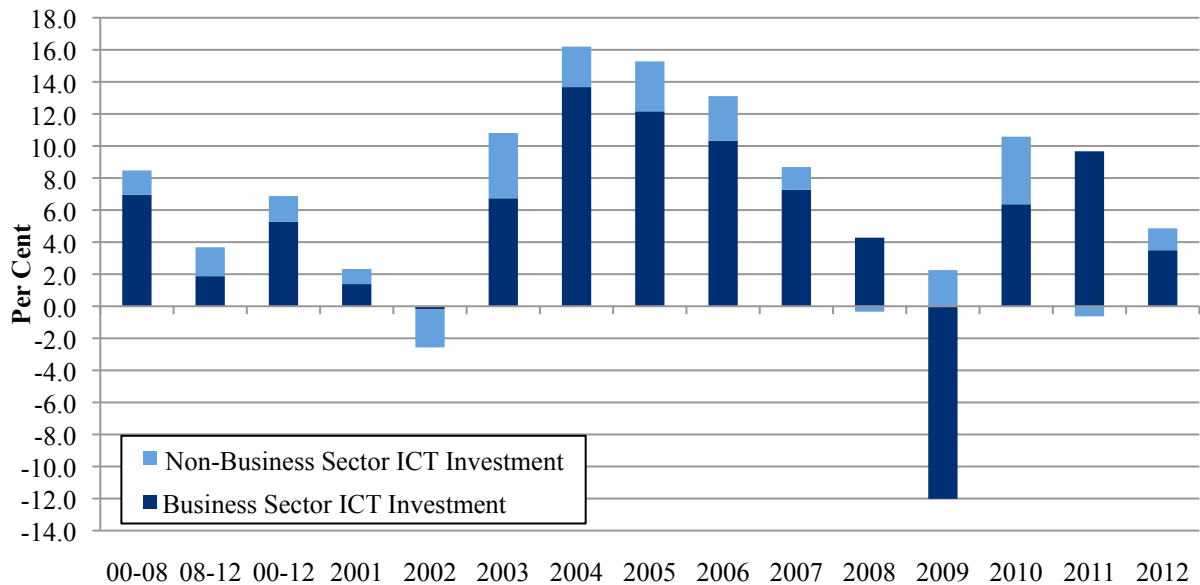
Source: CSLS ICT Database, which was built using Statistics Canada data.

3.2 Real ICT Investment in the Business and Non-Business Sectors

In 2012, business sector real total ICT investment contributed 3.5 percentage points to real total ICT investment growth in the overall economy, while the non-business sector contributed 1.4 percentage points (Chart 10). The non-business sector's contribution to real total ICT investment in the overall economy was disproportionately large given its relatively small share of total economy ICT investment; this was due to the fact that non-business sector real total ICT investment grew more quickly than business sector real total ICT investment in 2012 (6.4 per cent versus 4.6 per cent) (Appendix Chart 3).

In general, the relative contributions of the business and non-business sectors to total economy ICT investment was the same in real terms as it was in nominal terms over the 2000-2012 period, because the ICT price movements were very similar for the two sectors. Business sector total ICT investment contributed the most to real total economy ICT investment growth due to its higher share of total economy ICT investment, but the non-business sector often contributed a more-than-proportional amount to total economy real ICT investment growth since it grew faster than business sector real total ICT investment in most years.

Chart 10: Contribution of the Business and Non-Business Sectors to Real Total ICT Investment Growth, 2007 Chained Dollars, Average Annual and Annual Growth Rates, Per Cent, 2000-2012



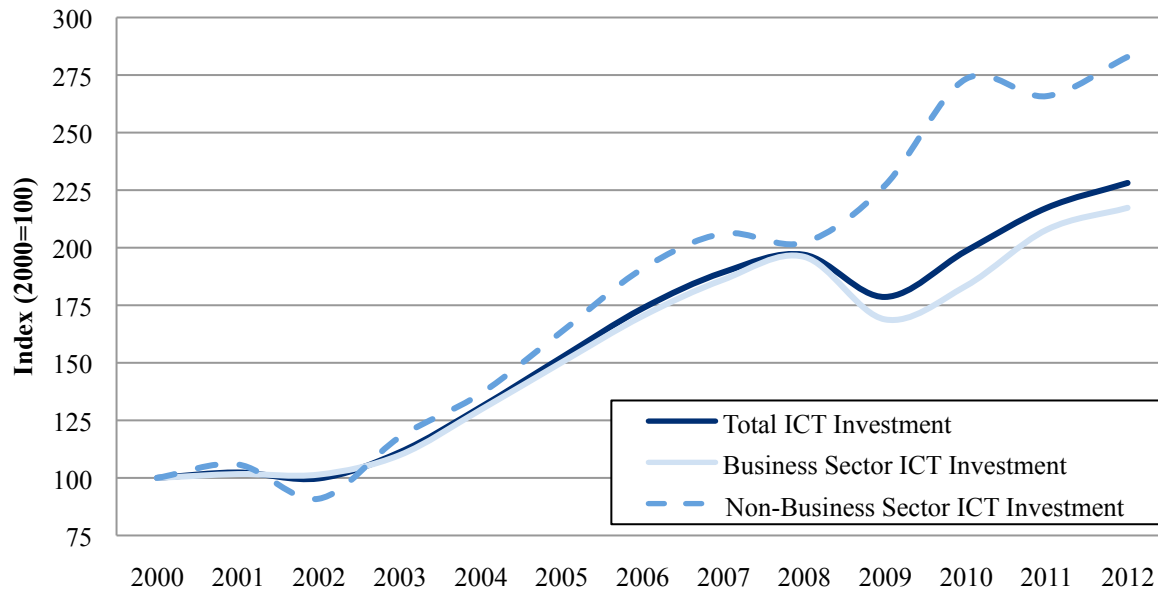
Source: CSLS ICT Database, which was built using Statistics Canada data.

Note: The contribution of the business and non-business sectors to real total ICT investment in the total economy was calculated using the Törnqvist index. In addition, the period averages are averages of annual growth rates, not compound average annual growth rates.

The non-business sector's comparatively high contribution to total economy real ICT investment growth over the 2000-2012 period is also demonstrated by Chart 11. Non-business sector real total ICT investment grew much quicker than business sector real total ICT investment between 2000 and 2012, and, therefore, the index line for the non-business sector was above the

index line for the business sector. The business sector's index line was actually below the index line for total economy real ICT investment, which was raised by the high real total ICT investment growth experienced by the non-business sector. In fact, non-business sector real total ICT investment was 2.7 times higher than its level in 2000 by 2012, compared to 2.1 for the business sector real total ICT investment and 2.2 for the total economy real ICT investment. Further research is required to fully understand the real total ICT investment growth gap between the business sector and the non-business sector experienced during the 2000-2012 period.

Chart 11: Trends in Real Total ICT Investment by Sector, Chained 2007 Dollars, Indexed to 2000=100, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

3.3 Real ICT Investment by Component

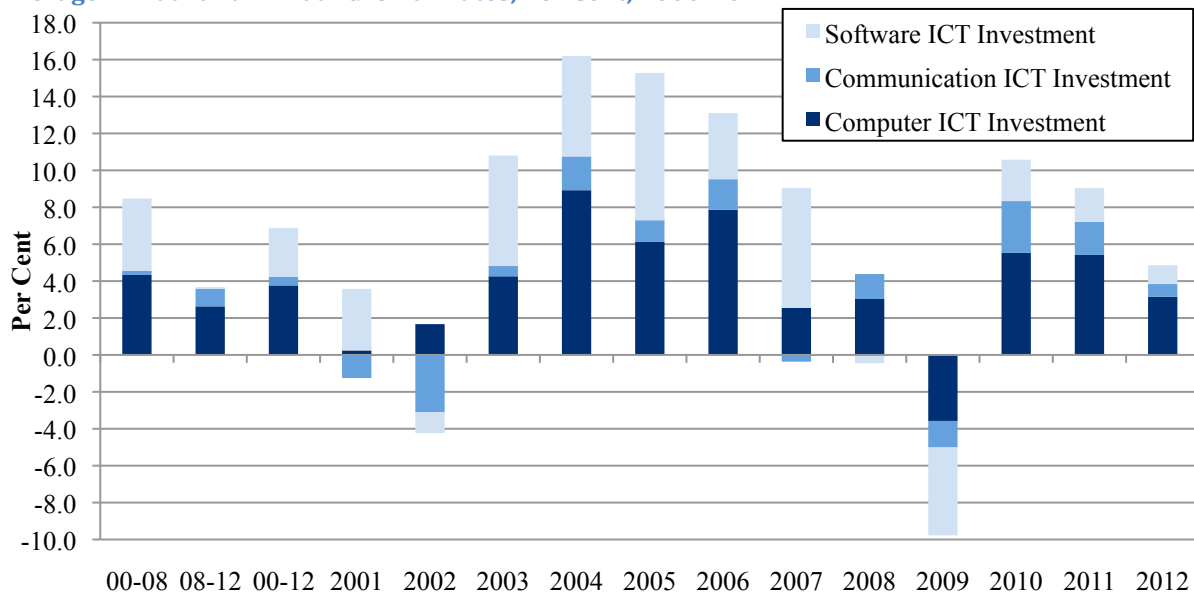
Real ICT investment growth slowed for every ICT component in 2012. In 2012, real computer ICT investment increased by 11.3 per cent, below its growth rate of 19.8 per cent in 2011 and 20.1 per cent in 2010 (Appendix Chart 4). Real communication equipment ICT investment and real software ICT investment performed much worse than real computer ICT investment in 2012, rising only 3.5 per cent and 2.0 per cent respectively. Real communication equipment ICT investment growth and real software ICT investment growth slowed down greatly from 2011 (when they grew by 9.5 per cent and 3.7 per cent, respectively).

Real computer ICT investment growth in 2012 was almost entirely driven by falling computer ICT prices (-8.6 per cent), as nominal computer ICT investment only increased by 1.7 per cent. Nominal communication equipment ICT investment increased by 5.4 per cent in 2012, but mounting communication equipment ICT prices (1.9 per cent) resulted in smaller increase in real terms. Similarly, nominal software ICT investment growth (3.4 per cent) was largely offset by growing software ICT prices (1.3 per cent) in 2012.

In 2012, investment in computers - which contributed 3.2 percentage points to real total ICT investment growth - was the largest force behind real total ICT investment growth in Canada (Chart 12). On the other hand, real communication equipment ICT investment and real software ICT investment merely contributed 0.7 percentage point and 1.0 percentage point (respectively) to real total ICT investment growth in 2012, because these two ICT components experienced slow real investment growth. The slowdown in real total ICT investment growth in 2012 was caused by declining investment growth for all ICT components: the contribution of computers, communication equipment and software to real total ICT investment growth in 2012 was lower than in the previous two years.

In most years over the 2000-2012 period, real computer ICT investment contributed the most to real total ICT investment growth, followed by real software ICT investment which made significant contributions between 2003 and 2007. It is important to note that real computer ICT investment growth was not driven by high nominal growth rates, but by falling prices over our reference period. Real communication equipment ICT investment, on the other hand, was a relatively insignificant contributor to real total ICT investment growth from 2001 to 2012.

Chart 12: Contribution of ICT Components to Real Total ICT Investment Growth, 2007 Chained Dollars, Average Annual and Annual Growth Rates, Per Cent, 2000-2012



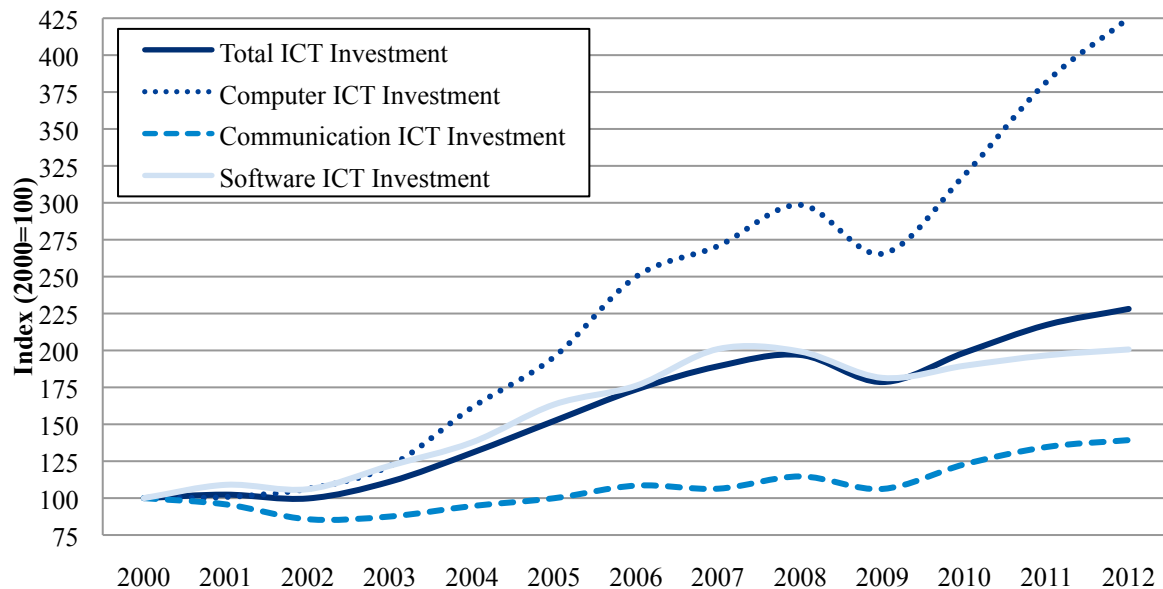
Source: CSLS ICT Database, which was built using Statistics Canada data.

Note: The contribution of the three ICT investment components to real total ICT investment was calculated using the Törnqvist index. In addition, the period averages are averages of annual growth rates, not compound average annual growth rates.

The three ICT investment components experienced very different growth rates over the 2000-2012 period (Chart 13). Real computers ICT investment has grown at a much quicker rate than both real communication equipment ICT investment and real software ICT investment over the entire 2000-2012 period. Real communication equipment ICT investment has grown at a particularly slow rate between 2000 and 2012. In fact, real computer ICT investment was 4.2

times higher than its level in 2000 by 2012, compared to 2.0 for the real software ICT investment and 1.4 for the real communication equipment ICT investment. Despite the fact that the three ICT components have had dissimilar growth rates, each has experienced the same general trend: a reduction in real investment in 2002, followed by growth from 2003 to 2008, a large drop in investment in 2009, strong growth in 2010 and 2011, and a slowdown in investment in 2012.

Chart 13: Trends in Real ICT Investment by Component, Chained 2007 Dollars, Indexed to 2000=100, 2000-2012

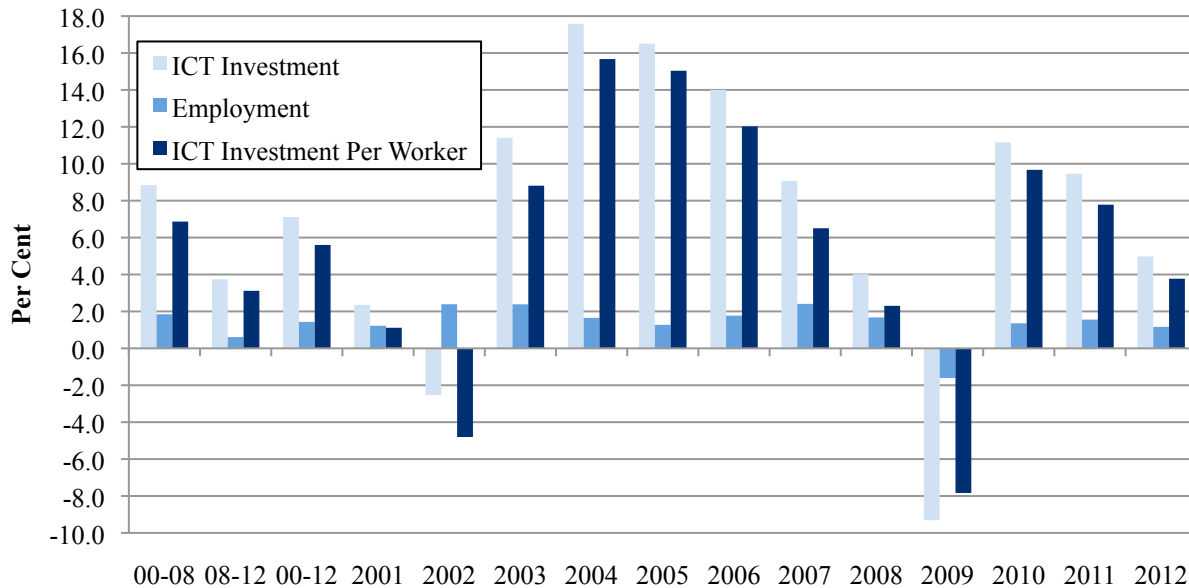


Source: CSLS ICT Database, which was built using Statistics Canada data.

3.4 Real ICT Investment Per Worker

Real total ICT investment intensity is defined as real total ICT investment divided by the number of persons employed. In 2012, real total ICT investment increased 5.0 per cent and the number of people employed increased by 1.2 per cent (Chart 14). This resulted in a 3.8 per cent increase in real total ICT investment per worker, well below the average annual growth rate for the 2000-2012 period (5.6 per cent). Real total ICT investment intensity growth in 2012 was weaker than the growth experienced in 2011 (7.8 per cent) and 2010 (9.7 per cent), but represented a major improvement from the decline in 2009 (-7.8 per cent). Overall, growth in total ICT investment per worker has generally been strong and positive between 2001 and 2012, despite the negative growth experienced in 2002 and 2009. It is important to note that the percentage contributions of each ICT investment component to nominal total ICT investment per worker growth are identical to the contributions discussed in the preceding section.

Chart 14: Real Total ICT Investment Per Worker and Real Total Investment (Fixed, Non Residential) Per Worker, 2007 Chained Dollars, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

Conclusion

After two years of robust growth in 2010 and 2011, following the 2009 collapse, ICT investment growth slowed in 2012. Real total ICT investment growth fell to 5.0 per cent in 2012 from 9.5 per cent in 2011 and 11.2 per cent in 2010. Recent trends in overall ICT investment in total economy can be broken down in two ways: (1) by ICT investment component (i.e., computers, communication equipment, and software); and (2) by sector (i.e., the business and non-business sectors).

Total ICT investment growth slowed for every ICT component in 2012. In 2012, real computer ICT investment growth fell to 11.3 per cent, from 19.8 per cent in 2011 and 20.1 per cent in 2010. Similarly, real communication equipment ICT investment grew by only 3.5 per cent in 2012, compared to growth rates of 9.5 per cent in 2011 and 15.7 per cent in 2010. Real software ICT investment growth also experienced a slowdown; it fell from 4.5 per cent in 2010 and 3.7 per cent in 2011 to 2.0 per cent in 2012.

Computer investment contributed the most to real total ICT investment growth in 2012 (3.2 percentage points), followed by software (1.0 percentage point) and communication equipment (0.7 percentage point). Since all ICT investment components experienced declining growth rates between 2011 and 2012, their percentage point contributions to real total ICT investment growth also fell.

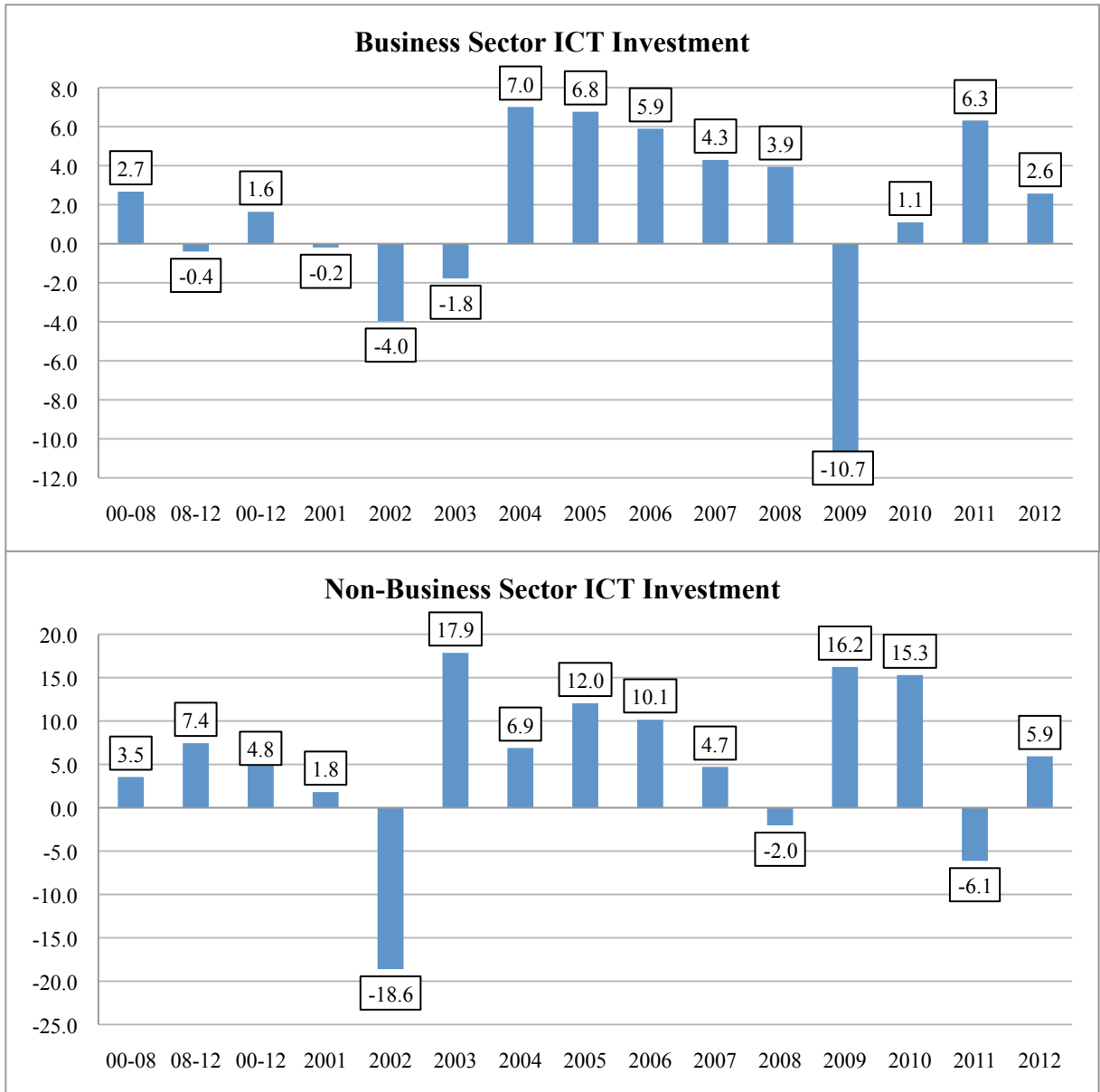
Tepid ICT investment growth in the business sector put downward pressure on total economy ICT investment growth in 2012, but the non-business sector's solid ICT investment growth offset the non-business sector's poor performance. In 2012, real ICT investment in the business sector grew by 4.6 per cent, down from a 13.3 per cent increase in 2011. Conversely, real ICT investment in the non-business sector increased by 6.4 per cent in 2012, up from a 2.7 per cent decline in 2011. Nonetheless, the business sector still contributed more to total economy real ICT investment growth in 2012 than the non-business sector (3.5 percentage points versus 1.4 percentage points), because the business sector is much larger than the non-business sector.

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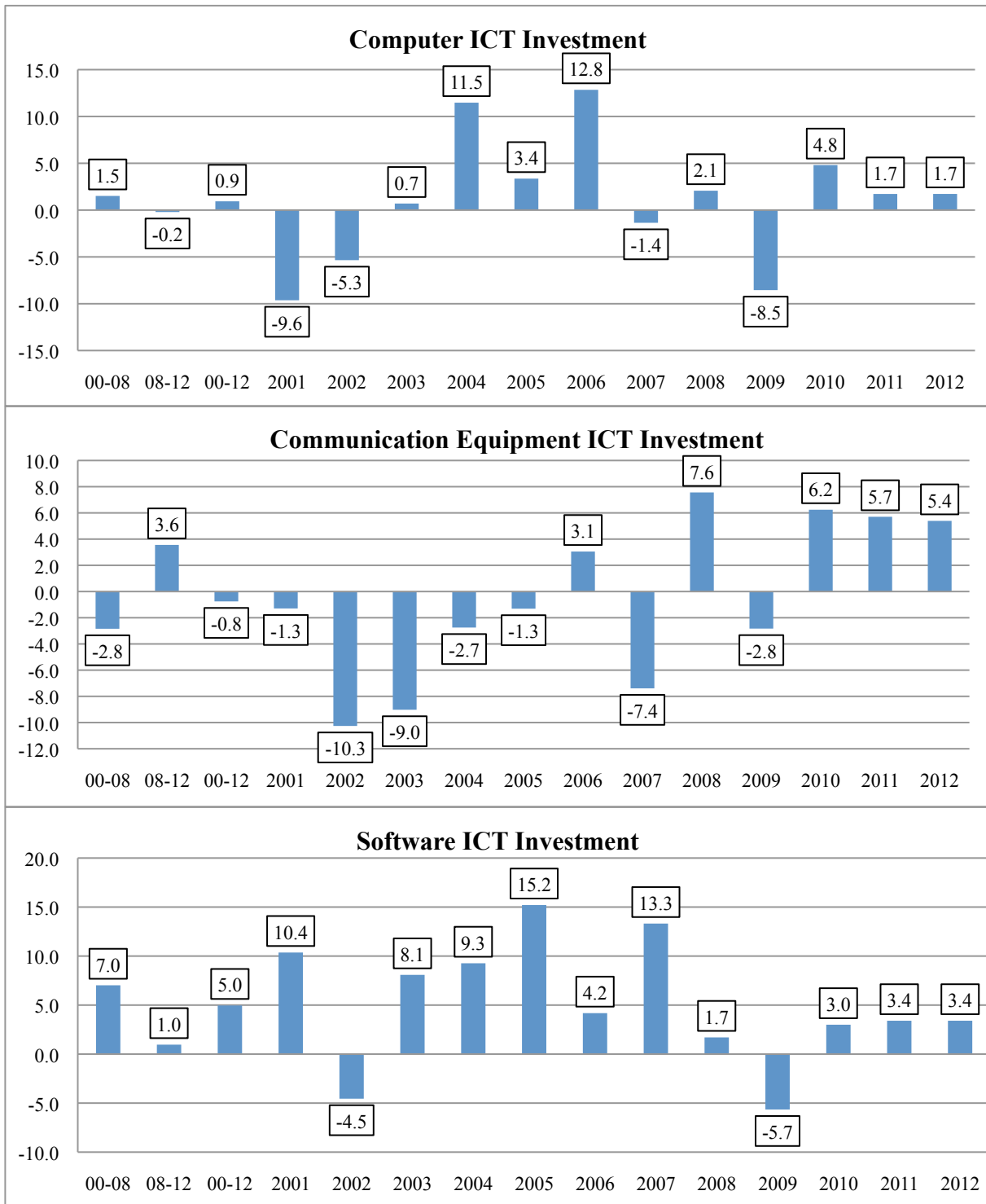
Appendix

Appendix Chart 1: Trends in Nominal ICT Investment by Sector, Current Dollars, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



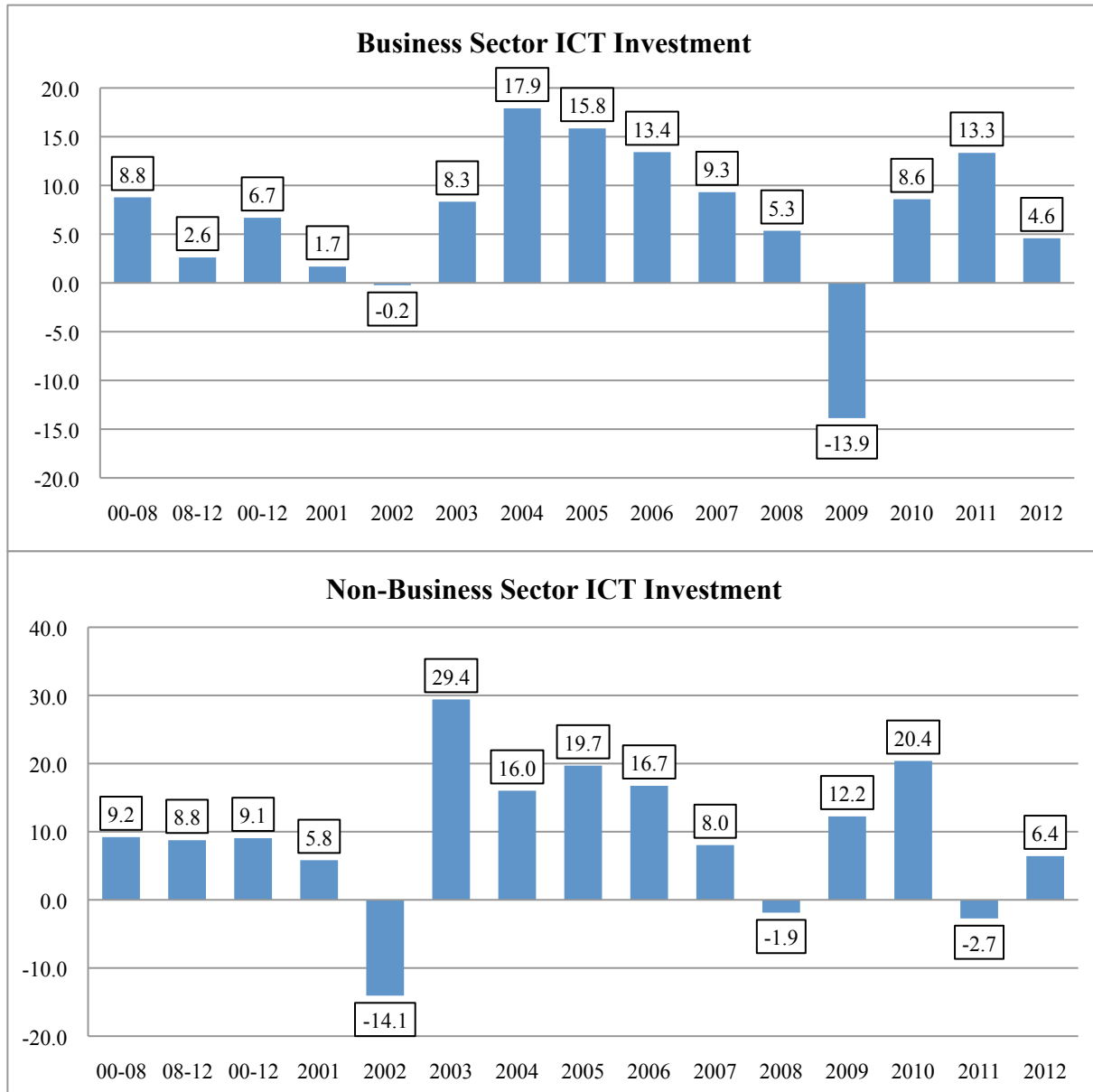
Source: CSLS ICT Database, which was built using Statistics Canada data.

Appendix Chart 2: Trends in Nominal ICT Investment by Component, Current Dollars, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



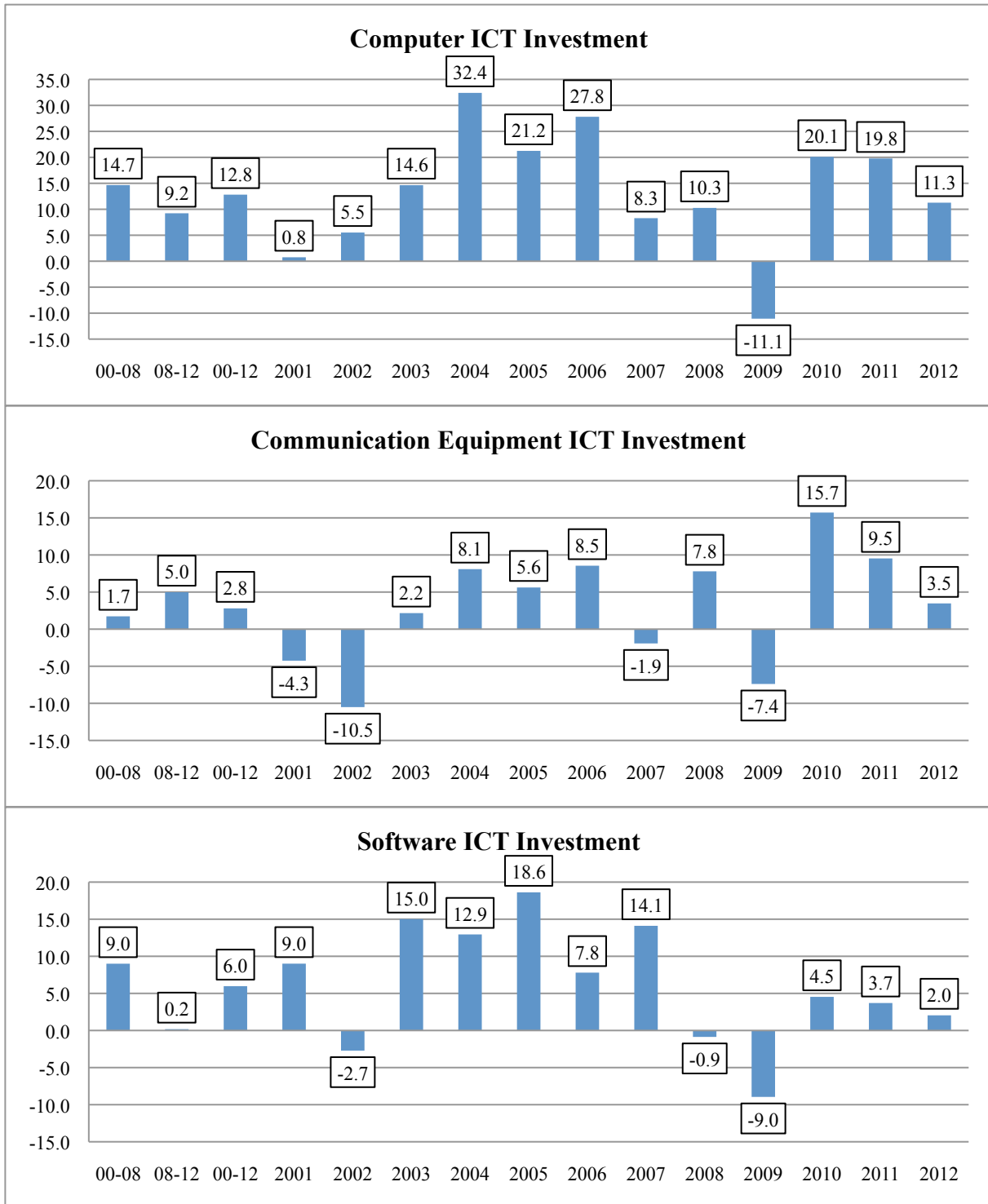
Source: CSLS ICT Database, which was built using Statistics Canada data.

Appendix Chart 3: Trends in Real ICT Investment by Sector, 2007 Chained Dollars, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.

Appendix Chart 4: Trends in Real ICT Investment by Component, 2007 Chained Dollars, Compound Average Annual and Annual Growth Rates, Per Cent, 2000-2012



Source: CSLS ICT Database, which was built using Statistics Canada data.