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What Explains the Canada-US ICT Investment Intensity Gap?

Executive Summary

This report attempts to answer the question of why Canadian firms invest less in ICT, defined to include computers, communications, and software, than their US counterparts. Given the disappearance of labour productivity growth in the business sector in Canada in 2003 and 2004 and the large gap in labour productivity levels between Canada and the United States, lagging ICT investment has been identified as a possible cause of both this weak growth and large gap. In addition, higher rates of ICT adoption have been pointed to as means of improving Canada's productivity performance. An understanding of the causes of the Canada-US ICT investment gap is thus crucial for the correct diagnosis of Canada's productivity problem and the development of effective policies to reverse this situation.

This report is divided into two main parts. The first part provides an overview of trends in ICT investment in Canada, relative to the United States, and relative to OECD countries. Given that the United States is by far Canada's largest trading partner, a US-centric approach is appropriate. But it is also important to situate Canada within a broader international perspective. This section also discusses the consistency between ICT investment estimates and the actual use of ICT in this country.

The second part of the report provides a detailed discussion of possible causes of the Canada-US ICT investment gap. The explanations are divided into four main areas: statistical and methodological differences, differences in economic structure, cultural and behavioural differences, and macroeconomic differences. This part also includes a discussion of the literature on the factors influencing ICT adoption.

In terms of Canada's ICT performance, the main findings of the report are highlighted below.

- In 2004, current dollar ICT investment per worker in the Canadian business sector was 45.1 per cent of that of the United States. This low proportion applied to all three ICT asset types – software (43.5 per cent), communications equipment (44.1 per cent), and computers (54.1 per cent).

- The largest industry contributions to the Canada-US ICT investment per worker shortfall in 2004 were from professional, scientific and technical services, which accounted for 26 per cent of the gap, manufacturing (20 per cent), transportation and warehousing (11 per cent), and information and cultural industries (9 per cent).

- A second metric for Canada-US ICT investment intensity comparisons, because of productivity level differences between the two countries, is ICT investment as a share of GDP. On this criteria, ICT investment in the Canadian business sector in 2004 was 61.6 per cent of the US level. Again, all three ICT asset types were well below the US level – software (59.4 per cent), communications equipment (60.2 per cent), and computers (73.8 per cent).

- Canada's lower share of ICT investment in GDP was not accounted for by a lower overall investment share in GDP, but by a lower share of ICT investment in total business sector investment, 18.5 per cent versus 30.5 per cent in 2004.

- Both ICT per worker and ICT as a share of GDP in the Canadian business sector have been on a strong downward trend in Canada, relative to the United States, over the past 17 years. The former fell from 60.4 per cent in 1987 in 45.1 per cent in 2004, while the latter decreased from 74.0 per cent to 61.6 per cent.

- Given that ICT investment accounted for 30 per cent of total current dollar business sector machinery and equipment (M&E) investment in 2004, the shortfall in ICT spending by the Canadian firms relative to their US counterparts explains much of the lower M&E investment intensity in this country. Non-ICT M&E investment per worker in the Canadian business sector was 70.3 per cent of the US level in 2004 and non-ICT M&E investment as a share of GDP was 96.0 per cent.

- Although a poor performer in terms of ICT investment relative to the United States, Canada in 2001 ranked above the OECD average (eighth or ninth out of 19 OECD countries) for the share of ICT investment in total investment, the share of ICT investment in GDP, and ICT investment per worker.

- Data on computers in use in Canadian business support the finding based on computer investment data that Canadian workers have much less computer capital to work with than their US counterparts. However, data on telecom equipment use and telecom services availability appear similar in the two countries. This

situation appears inconsistent with the reported large shortfall in communications investment in Canada relative to the United States.

The report investigated a large number of possible reasons for the Canada-US ICT investment intensity gap. The factors can be organized into four categories based on the evidence found during the course of the research:

- factors where there is strong, quantitative evidence that they contribute to the gap;
- factors that appear to contribute to the gap, although the evidence is weaker;
- factors where there is evidence that they do not contribute to the gap; and
- factors for which the evidence is inconclusive.

The report identified three factors that fall into the first category: industrial structure, the size distribution of employment, and ICT measurement. Canada has smaller employment shares than the United States in two ICT-intensive industries: the cultural and information industry, which includes telecommunications, finance, insurance and real estate. Equally, Canada has a larger share of employment in small- and medium-sized enterprises than the United States, and these firms spend less on ICT than larger firms. Simulations using 2003 data show that if Canada had the industrial structure and size distribution of employment of the United States, 7-8 points of the 38.4 percentage point gap in the Canada-US share of ICT investment in GDP would be eliminated. Thus these two factors together account for about 20 per cent of the gap.

Our research uncovered gaps in the measurement of ICT investment by Statistics Canada. The survey used to estimate investment ICT assets in the oil and gas industry does not identify ICT assets. There is no investment survey of either the construction or fishing industries so ICT investment for these industries is likely underestimated. Because the industries affected are relatively small, the effect of this underestimation of ICT assets on the Canada-US ICT gap is also small, around 1 percentage point.

In terms of the second category of factors, the report identified two factors. The first is the 20 per cent lower labour compensation costs in Canada relative to the United States. In surveys of factors influencing the adoption of advanced technologies, firms identify cost as the most important barrier. With ICT investment goods prices similar in both countries, the higher price of ICT investment goods relative to labour costs in Canada makes firms more reluctant to substitute capital for labour by adopting ICT than their US counterparts. The second factor is the much greater extent of foreign direct investment in Canada than in the United States. Multinationals often purchase ICT assets such as servers and software in the home country for use in the host countries, with the result that these investments are sometimes not recorded in the host country. The third factor, with the weakest evidence, is that the proportion of Canadian managers with a

university education is less than in the United States. To the degree that university educated managers are more comfortable with ICT, and more able to appreciate the potential benefits, this educational attainment gap may contribute to the ICT intensity gap.

In terms of the third category of factors, the evidence indicates that differences in the definition of ICT assets by statistical agencies do not explain the ICT investment intensity differences between Canada and the United States. Equally, the marginal effective tax rate on ICT assets in 2005 is similar in Canada and the United States so therefore cannot account for current differences in ICT investment although, in the past, tax rates on ICT assets were somewhat higher in Canada than in the United States and may have played some role in explaining the gap.

There is much anecdotal evidence that there are cultural differences in the operation of businesses between Canada and the United States and that these differences account for the ICT investment gap. Unfortunately, this report found no hard data to support this view, although it may still be valid and may indeed account for part of the gap. Further research is needed that surveys managers in both countries on their attitudes to ICT. Lower ICT investment is Canada may also reflect the lower intensity of competition in this country, but again the evidence on this issue is inconclusive at this stage.