Sensitivity of Capital Stock and Multifactor Productivity Estimates to Depreciation Assumptions: A Canada-U.S. Comparison

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ABSTRACT

This article provides consistent estimates for capital stock and multifactor productivity (MFP) for Canada and the United States across major industries for the 1987-2007 period. For this purpose, capital stock estimates are developed for Canadian and U.S. industries using the same asset depreciation rates (either from the U.S. Bureau of Economic Analysis or from Statistics Canada) for the two countries. The results show that on an hours worked basis Canadian industries invest more in total capital than their U.S. counterparts. This situation reflects much greater investment in structures, with less in machinery and equipment (including information and communications technologies). The results imply that all of the Canada-U.S. labour productivity gap arises from the multifactor productivity gap.

RÉSUMÉ

Cet article a pour objectif de présenter des estimations convergentes pour le Canada et les États-Unis pour le stock de capital et de la productivité multifactorielle (PMF) dans l'ensemble des grandes branches d'activité pour la période de 1987-2007. À cette fin, nous avons élaboré des estimations du stock de capital pour les branches d'activité canadiennes et américaines en utilisant les mêmes taux d'amortissement de l'actif (ceux du U.S. Bureau of Economic Analysis et de Statistique Canada, selon le cas) pour les deux pays. Les résultats montrent que les entreprises canadiennes investissent davantage par heure travaillée dans le capital total que leurs contreparties américaines. Cette situation reflète plus de capital dans les strucures et moins dans les machines et matériel (y compris les technologies de l'ínformation et des communications). Les résultants impliquent que tout l'écart Canada-EU dans le niveau de la productivité du travail vient de l'écart dans le niveau de la productivité multifactorielle.

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THE UNITED STATES IS CANADA'S dominant trading partner and competes head to head for foreign direct investment (FDI), innovation activities, and skilled labour within the continent as well from outside of the region. Hence, Canada needs to be highly competitive in terms of productivity, costs, and business and market framework policies and programs.

In this context, there has been a great deal of research and policy discussion over the past 20 years about Canada's relative productivity performance vis-à-vis the United States. Estimates suggest that Canada's labour productivity level is considerably below the U.S. level and that the gap has widened since 2000 (Lee and Tang, 2000; Rao *et al.*, 2004, 2008; Baldwin, Gu and Yan, 2008). The research also suggests that the Canada-U.S. labour productivity gap is broadly-based across major Canadian industries, and is the result of a multifactor productivity (MFP) (innovation) gap.

Comparable and consistent estimates of capital stock by industry are needed for accurate Canada-U.S. MFP comparisons and to understand the reasons behind Canada's relative MFP performance on an industry basis.[2] Current Statistics Canada geometric depreciation rates, which are key parameters underlying capital stock estimates, are in general higher than those used by the Bureau of Economic Analysis (BEA) for the United States (Table 1)[3], particularly for building and engineering structures.[4] Given similar economic organization and production in the two countries, the large variation in certain asset depreciation rates between the two countries cannot be explained by country specifics such as differences in climate.[5]

If we use the "official" capital stock data from Statistics Canada and the BEA for comparing MFP levels between the two countries, we would underestimate Canada's capital intensity relative to the U.S. level, which in turn would overestimate Canada's relative MFP levels.

The primary objective of this article is to develop capital stock estimates for Canadian and U.S. industries using the same depreciation rates for the two countries. In particular, we address the following three policy research questions or issues:

- Should current official capital stock data be used for Canada-U.S. industry capital intensity and MFP comparisons?
- How are the Canada-U.S. industry capital intensity comparisons affected when we use either Canadian or U.S. depreciation rates for estimating capital stock data in both countries?
- How do Canadian industries perform relative to their U.S. counterparts in terms of MFP (growth rates and levels) when consistent estimates of capital stock data are used?

Note that this article does not make any attempt to justify favoring either Statistics Canada or BEA depreciation rates for estimating capital stock series. This is beyond the scope of our research. Instead, it simply compares Canada's performance in capital intensity as well as multifactor productivity when either Statistics Canada or BEA depreciation rates are used for both countries.

In the first section, we use either Statistics Canada or BEA depreciation rates in estimating capital stock at the industry level in both Canada and the United States, and then compare them to the official estimates. In sections 2 and 3, we estimate Canada's MFP growth and levels at the industry

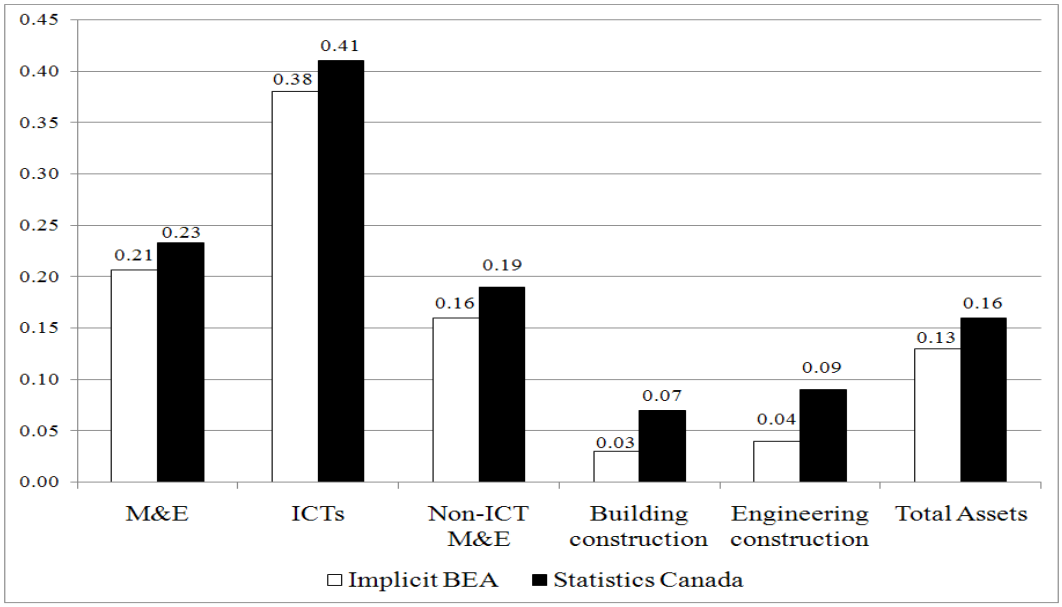
2 Statistics Canada produces several estimates of capital stock using different assumptions about the depreciation patterns and service lives of assets. For our U.S. comparisons, we only discuss capital stock estimates based on the geometric depreciation profile.

3 All tables are found at the end of this article

4 Engineering structures provide the foundation capital for railways, utilities, oil and gas, and pipelines, while building structures include manufacturing plants, commercial offices, hotels, and retail and wholesale facilities.

5 The next section will provide more discussion of capital stock estimation in Canada and the United States.

Chart 1
A Comparison of Depreciation Rates by Asset Type



level, and compare the results with the United States. The final section summarizes the key findings and discusses their research nd policy implications.

Estimating Capital Stock

In this section, we compare and discuss capital stock estimates based on Statistics Canada and BEA geometric depreciation rates. At the outset, it should be noted that only non-residential machinery and equipment (M&E) capital and structures capital (building and engineering construction) are included. Owner-occupied dwellings, inventories, and non-depreciable land are excluded from the estimates.

The Perpetual Inventory Method

Capital stock is commonly estimated using the perpetual inventory method:

$$K^a_{jt} = K^a_{j,t-1}(1-\delta_a) + I^a_{jt} \qquad (1)$$

where I^a_{jt} is the 2002 chained Fisher dollar investment in asset *a* of industry *j* at year *t*, δ_a is the depreciation rate for asset *a*, and K^a_{jt} represents the capital stock in 2002 chained Fisher dollar.

The perpetual inventory method of estimating capital stock shows that the level of capital stock is sensitive to the depreciation rate, which depends on the age profile of the asset. The BEA has adopted the geometric depreciation pattern, which predicts that assets depreciate faster in the early years of their service life than in the later years. There is evidence showing that the geometric depreciation profile is a good approximation of the aging profile for both M&E and structures (e.g. Hulten and Wykoff (1996) for the United States and Patry (2007) for Canada).

Under the geometric depreciation profile, the depreciation rate is calculated as the ratio of the declining balance rate to the service life of the asset. For the United States, the BEA generally uses a declining balance rate of 1.65 for M&E assets and 0.9 for structures. [6] Before 2006, Statistics Canada more or less followed the BEA and produced Canada's capital stock estimates under the geometric

6 They are derived from a variety of sources (Fraumeni, 1997).

depreciation profile. The estimates were thus fairly comparable to the BEA capital stock estimates. After November 2006, however, Statistics Canada adopted new depreciation rates estimated by Statistics Canada (2007).[7] Basically, under the new geometric depreciation profile, the declining balance rates are significantly larger and the services lives are significantly shorter than the ones used by BEA. As a result, the new depreciation rates are generally larger than the old rates, especially for structures.

Table 1 reports Statistics Canada's new depreciation rates and the implicit BEA depreciation rates for 28 assets. These rates are derived from Statistics Canada research, which compares Canadian and U.S. depreciation profiles for a diverse set of assets (Statistics Canada, 2007). The resulting new Canadian depreciation rates are on average slightly higher than those used by the BEA for M&E (23.3 per cent versus 20.7 per cent), and are significantly higher for building and engineering construction (7.8 per cent versus 3.2 per cent) (Chart 1).

Because of the substantial difference in depreciation rates between Canada and the United States, the official capital stock estimates, especially in terms of levels, are not comparable between the two countries. To resolve this problem, this article uses the same depreciation rates, either from Statistics Canada or BEA, to estimate capital stock for both Canada and the United States.

Capital Data Sources and Industry Details

We first discuss the data sources for the new estimates. The investment data used in generating non-residential capital stock estimates in Canada are based on investment surveys, which are conducted by the Investment and Capital Stock Division (ICSD) at Statistics Canada. These data are based on the North American Industry Classification System (NAICS) and contain investment in current dollars as well as chained Fisher volume indices from 1961 to 2008 for 175 assets. To simplify our analysis, we aggregate the 175 assets into the 28 asset types listed in Table 1.

The investment data for estimating non-residential capital stock in the United States are provided by the BEA.[8] These data contain investment at the NAICS industry level for 47 assets over the period 1901 to 2007. For comparison purposes, we classify the 47 assets into 28 asset types.

In this section, we rely on the investment data to estimate capital stock for both Canada and the United States, and discuss how capital stock estimates differ when different depreciation rates are used. To this end, we first classify the business sector into 16 broad industry groups which are at the single or combined 2-digit NAICS level (Table 2). For the mining and manufacturing sectors, we further divide them, respectively, into two and 16 industries at the single or combined 3-digit NAICS level. The classification is mainly driven by the need to comply with Statistics Canada confidentiality constraints. In this article, all industries include private as well as non-private activities (if applicable).[9] The "business sector" is total economy minus public administration and owner-occupied dwelling. Thus, our aggregate "business sector" differs from the traditional business sector that only includes private activities. Despite this departure, for simplicity, we continue to refer the aggregate as the business sector.

In Table 2, we also report value added and hours worked shares by industry in the business sector as

7 The Statistics Canada study is based on a Canadian micro database on the purchase and disposal of capital goods from Statistics Canada's Capital Expenditure Survey, which contained data on the selling value of used assets, the age of the assets and the corresponding gross book value as well as the expected service lives of new assets. For other research on this topic, see Gellatly, Tanguay, and Yan (2002) and Patry (2007).

8 http://www.bea.gov/national/FA2004/Details/Index.html

9 For instance, the public portion of water treatment is included in utilities and public education and health are in education, health and social assistance. Note, however, that owner-occupied dwellings are excluded from FIRE and management of companies.

an indication of the relative importance of each industry in Canada and the United States.[10] The Canadian business sector is concentrated relatively more than that in the United States in resource industries (such as mining, especially oil and gas extraction; wood products; primary metals; food, beverage and tobacco products; and paper products and printing), construction, transportation and warehousing, and education, health and social assistance, and less in computer and electronic products, chemicals, finance, insurance and real estate (FIRE) and management of companies, and professional, scientific and technical services.[11]

Alternative Estimates of Capital Stock

In this sub-section, we first compare Canadian capital stock estimates using Statistics Canada's current depreciation rates and BEA depreciation rates. We then compare Canada's capital intensity, defined as capital stock per hour worked, relative to its U.S. counterpart.

Canadian Capital Stock Estimates with Different Depreciation Rates

We first estimate Canadian capital stock by industry using both Statistics Canada depreciation rates and BEA depreciation rates.[12] Table 3 reports the ratio of the two alternative estimates for four groups: total capital, machinery and equipment (M&E), information and communications technology (ICT), and structures (consisting of both engineering and building structures). M&E contains ICT and total capital includes both M&E and structures.

As expected, given the higher depreciation rates in Canada the total capital stock of Canada based on Statistics Canada depreciation rates is 58.8 per cent of Canada's total capital stock estimates using BEA depreciation rates. The average ratio varies greatly across industries from 0.28 in other services to 0.88 in professional, scientific and technical services.

Most of the differences in total capital stock estimates are from the differences in structure capital stock estimates. For the business sector as a whole, the average ratio for structure capital stock is 0.49 while it is 0.89 for M&E capital. This reflects the fact that depreciation rates for structures in Canada are more than double that of the United States. In contrast, M&E depreciation rates in Canada are only 1.13 times those in the United States.

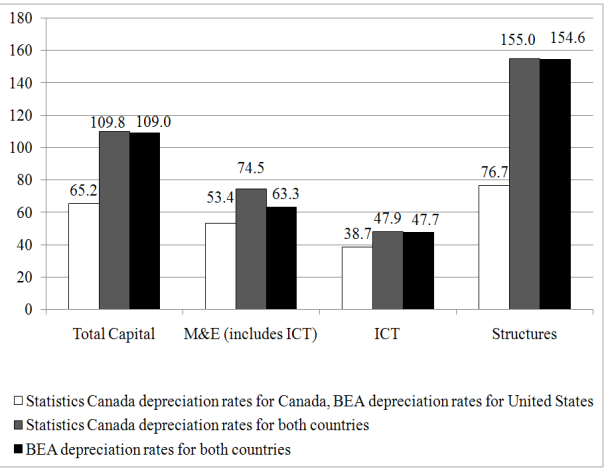
The use of different depreciation rates in estimating the capital stock also affects the growth rate of the capital stock, as shown in Table 4. But the growth difference is relatively smaller than the level difference. On average, capital stock growth based on Statistics Canada depreciation rates is higher than based on BEA depreciation rates. For instance, over the period 1987-2008, the growth rate of the total capital stock under Statistics Canada depreciation rates is 2.6 per cent versus 2.2 per cent under BEA depreciation rates. At the industry level, there are 10 industries for which total capital stock grew faster under Statistics Canada depreciation rates and six industries for which total capital

10 We do not discuss industry contributions to aggregate productivity performance. On this issue, see Sharpe (2010) and Tang and Wang (2010).

11 It is interesting to note that the value added share for mining in the Canadian business sector was 11.8 per cent in 2008 while its hours worked share was only 1.7 per cent. This is mainly because that the mining sector is much more capital intensive than the other industries of the business sector.

12 To apply the perpetual inventory method, we estimate Canadian capital stock using the historical investment from 1961-2008 with initial capital stock estimated as $K_{i,0} = \frac{I_{i,0}}{g_i - \delta_i}$, where $I_{i,0}$ is the value of investment in asset i in the year of 1961 with depreciation rate δ_i and average growth rate g_i between 1961 and 1995. For the United States, capital stock is estimated using historical investment from 1901 to 2007 with initial capital stock set to zero in 1901. The actual initial capital stock value chosen has little effect on capital stock estimates for the 1987-2008 period, which is the focus of this study.

Chart 2
A Comparison of Business Sector Canada-U.S. Capital Intensity by Asset Type, 2000-07
(US=100)



stocks grew faster under BEA depreciation rates. Similar pictures emerge for M&E and structure capital.

Canada-U.S. Capital Intensity Level Comparisons

Investment in physical capital gives workers more machines and tools to use, which increases labour productivity. Machinery and equipment also embody new technologies, which increases the overall efficiency of all inputs, i.e. multifactor productivity. Thus, capital intensity is very important for productivity performance. This sub-section compares capital intensity by industry between Canada and the United States when different depreciation rates are used.

We first compare capital intensity, defined as capital stock per hour worked which is PPP-adjusted, between Canada and the United States when capital stock in the two countries are estimated using their corresponding "official" depreciation rates.[13] Under this comparison, the results show that Canadian industries significantly underinvest relative to their U.S. counterparts in all types of assets (Table 5 and Chart 2). For the business sector as a whole, Canada's capital intensity in the period 2000-2007 was 65.2 per cent of the U.S. level for total capital, 53.4 per cent for M&E capital, and 76.7 per cent for structure capital. At the industry level, the ratio for total capital ranged from as little as 16.8 per cent (apparel and leather) to 83.7 per cent (mining excluding oil and gas extraction).

We believe that the substantially lower capital intensity for Canada relative to the United States is an artefact of the substantially different capital depreciation rates used for estimating capital stock in the two countries. Importantly, as we discussed earlier, the comparison under this scenario will imply that most Canadian industries will be more productive (in terms of MFP) than their counterparts in the United States, a result that runs counter to well-established facts that Canada is lagging the United States in innovation (e.g. R&D) and investment in technologies that are believed to be the driving forces of MFP improvement (Expert Panel on Business Innovation, 2009).

To eliminate this artefact, we need to use comparable depreciation rates for estimating the capital stocks of the two countries. We use either Statistics Canada depreciation rates or BEA depreciation rates for estimating capital stock for both countries. The comparison results are reported in Tables 6 and 7.

With Statistics Canada depreciation rates (Table 6), for the business sector as a whole, Canada's total capital intensity, was slightly higher than that in the United States over the period 2000-2007 (109.8 per cent).[14] The composition of the total capital in the Canadian business sector is, however, different from its United States counterpart.

13 Since purchasing power parities (PPPs) for ICT capital are not available for the analysis, we apply M&E PPPs to ICT capital. This is based on the fact that ICT capital in Canada accounts for about 25 per cent of M&E capital. PPP related measurement issues are discussed in the Appendix.

14 Data on hours worked for Canada is from Statistics Canada and for United States from the Bureau of Labor Statistics. Again, these numbers include both private and non-private activities for each industry (for more discussion, see the Appendix).

Compared to the United States, Canada has less M&E capital and more structure capital. In fact, over the period of 2000-2007, Canada's M&E capital intensity was on average 74.5 per cent of the level in the United States while its structure capital intensity was 55.0 per cent higher (Chart 2).[15]

Note also that Canada's capital intensity decreased relative to the United States from the period 1987-1999 to the period 2000-07, which has an important implication for labour productivity performance. Most of the decline was from underinvestment in M&E capital; the M&E capital intensity decreased from 91.4 per cent of the level in the United States in the period 1987-99 to 74.5 per cent in 2000-07.

At the industry level, there is a great variation. Over the period 2000-07, Canada's total capital intensity relative to the United States ranged from a low of 33.9 per cent in machinery to a high of 165.6 per cent in wood products. For M&E capital intensity, it ranged from 28.3 per cent (accommodation and food services) to 170.3 per cent (wood products), and for structures capital intensity, it ranged from 27.2 per cent (other services) to 354.9 per cent (petroleum and coal products).

Similar patterns emerge when capital stocks in both countries are estimated using BEA depreciation rates (Table 7). The relative capital intensity is highly correlated between the two different sets of estimates. The correlation coefficients for all columns between Tables 6 and 7 are 0.8 or higher. The correlation coefficients for ICT capital intensity are almost one for both periods. However, despite the high correlation and very similar estimates for total capital and structure capital, Canada's M&E capital intensity levels relative to the U.S. levels under Statistics Canada depreciation rates are 17.7 per cent higher (74.5 per cent versus 63.3 per cent) than those under BEA depreciation rates (Chart 2). This difference is mainly due to non-ICT M&E capital since for ICT capital, the relative estimates are very similar, at least for the business sector as a whole.

It is also important to note that a switch from using Statistics Canada depreciation rates to using BEA depreciation rates can lead to a higher or lower level of capital intensity for Canada relative to the United States at the industry level. This, we believe, depends on differences in asset composition at the industry level and between the two countries. For instance, for agriculture, forestry, fishing and hunting, the switch increases Canada's relative capital intensity. This is mainly because of differences in asset composition between the two countries. For Canada, agriculture, forestry, fishing and hunting has more structure capital than M&E capital while in the United States, this industry has more M&E capital than structure capital. Given that the difference between Statistics Canada and BEA depreciation rates for structure assets is generally higher than that for M&E assets, the switch will favour Canada.

Note, however, that even with the same share of M&E and structure assets in the two countries, the composition of M&E or structure assets also matters for Canada's capital intensity relative to the United States after the switch since the differences in depreciation rates between Statistics Canada and BEA are not the same within M&E or structure asset groups.

Productivity Growth in Canadian and U.S. Industries

How do these different capital stock estimates affect productivity estimates? We discuss the differences in productivity estimates using different capital stock estimates in the remainder of the article. We proceed with a brief explanation of the methodology in estimating MFP growth.

Following Jorgenson, Gollop, and Fraumeni (1987), we use the growth accounting framework to examine the sources of labour productivity

15 Note also that the intensity gap between Canada and the United States is more pronounced for ICT capital. It was about 50 per cent over the period of analysis.

growth at the industry level. This methodology has been widely used to study the sources of economic growth (Jorgenson and Stiroh, 2000; Gu and Ho, 2000; Ho, Rao and Tang, 2004). Under this framework with the value added output concept, MFP growth for industry *i* can be expressed as: [16]

$$\Delta lnMFP_i = \Delta lnLP_i - \bar{v}_{k,i}\Delta lnk_i \qquad (1)$$

where LP_i is labour productivity (value added per hour worked), k_i is capital intensity (capital stock per hour worked), and $\bar{v}_{k,i}$ is the moving two-year average capital income share of value added.

Capital here is the total capital stock, including M&E and structures. For any variable X (i.e., MFP_i, LP_i, or k_i), $\Delta lnX = lnX_t - lnX_{t-1}$.

Under this framework, the change in MFP is measured as a residual.[17] It is equal to labour productivity growth minus the contribution from a change in capital intensity. The latter is often referred to as the "capital deepening" effect.

Labour Productivity Growth in Canada and the United States

We first discuss labour productivity growth in Canadian and U.S. industries (see Appendix for a discussion of the data used for the productivity analysis). The results for both countries for the period 1987-2008 as well as two sub-periods (1987-2000 and 2000-2008) are reported in Table 8. Over the period of 2000-2008, labour productivity, defined as real value added per hour worked, in the Canadian business sector grew 0.8 per cent per year, 0.4 percentage points slower than in 1987-2000. In contrast, labour productivity growth in the U.S. business sector accelerated from 1.8 per cent in 1987-2000 to 2.2 per cent in 2000-2008, a 0.4 percentage points increase.

At the industry level, the industry with the fastest labour productivity growth in Canada over the whole sample period was the computer and electronic product manufacturing industry or the ICT manufacturing industry (4.6 per cent per year).[18] It was followed by primary metal manufacturing (4.4 per cent), agriculture, forestry, fishing and hunting (3.2 per cent), and transportation equipment (3.2 per cent). In the United States, the fastest growing industry was also ICT manufacturing (22.6 per cent), followed by the information services (5.2 per cent) and retail trade (4.0 per cent).

On the other hand, the industry with the slowest labour productivity growth in Canada over the whole sample period was arts, entertainment, and recreation (-1.6 per cent) while in the United States, it was construction (-1.8 per cent).

Between the two sub-periods, labour productivity growth in Canada accelerated in most services industries (eight out of the 11 services industries) while all goods producing industries experienced a decline. The largest slowdown was in computer and electronic manufacturing, a 13.0 percentage point fall. This was followed by a 12.7 percentage point decline in oil and gas extraction. In the United States, 10 goods producing industries and nine services industries experienced an increase in labour productivity growth between the two periods. As in Canada, mining and computer and electronic manufacturing industries in the United States experienced a large decline in labour productivity growth, but the magnitude of the decline in the computer and electronic manufacturing industry in the United States was much smaller than for its Canadian counterpart.

16 The framework is commonly used based on the gross output concept. In this article, we use the value added output concept mainly because we have up-to-date and comparable value added data for both Canada and the United States.

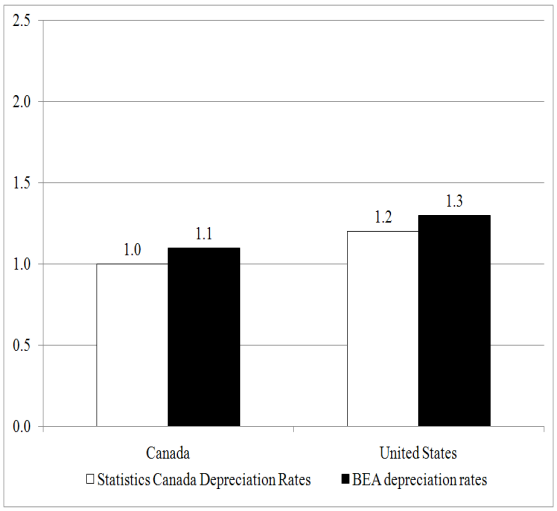
17 As many have correctly pointed out, this MFP growth term is a residual that captures a variety of other factors, including economies of scale, unaccounted for changes in input quality (such as labour quality) and inputs (such as managerial talent and organizational structure), and measurement errors (in both output and inputs).

18 Note that for the disaggregated industries under mining and manufacturing sectors, the data are only up to 2007 for the United States.

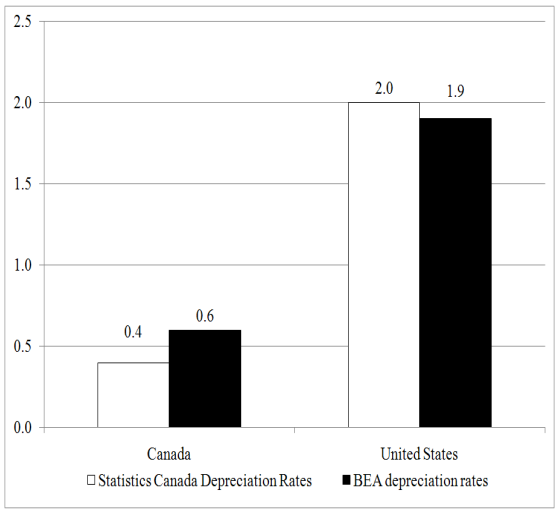
Chart 3

A Comparison of Business Sector MFP Growth in Canada and the United States Under Different Depreciation Assumptions (Average Annual Rate of Change)

(a) 1987-2000



(b) 2000-2007



In the post-2000 period, seven industries (agriculture, forestry, fishing and hunting; mining excluding oil and gas extraction; construction; primary metal manufacturing; wholesale trade, accomodation and food services, and other services) had higher labour productivity growth in Canada than in the United States. The largest productivity growth gap between Canada and the United States was in the computer and electronic product manufacturing industry at 23 percentage points.

This finding of a pervasive slowdown across Canadian industries in labour productivity growth in the post-2000 period and the widening gap with the United States are similar to the results of other studies (e.g. Rao *et al.*, 2008).

MFP Growth in Canada and the United States

Labour productivity growth is equal to MFP growth plus the contribution from a change in capital deepening. Thus, MFP growth is an important part of labour productivity growth. As discussed earlier, MFP calculations are crucially dependent upon the accurate measurement of the capital stock. Unfortunately, measuring capital stocks is difficult, especially for international comparisons. In this section, we first discuss MFP estimates with capital stock based on both Statistics Canada and BEA depreciation rates.

Table 9 and Chart 3 report industry MFP growth estimates for Canada and the United States with capital stock estimates based on both Statistics Canada and BEA depreciation rates. The two sets of MFP growth estimates are generally similar, especially for the business sector. The correlation coefficients between the two sets of estimates are 0.99 for Canada and 1.00 for the United States. This implies that the MFP growth estimates are less sensitive to the choice of depreciation rates than MFP level, especially at the aggregate level.

At the industry level, the difference in the two MFP growth estimates for certain industries can be relatively large. For example in the 2000-07 period, when the capital stock is based on Statistics Canada depreciation rates, the MFP growth estimate for Canada's administrative and waste management industry is more than 0.9 percentage points lower than the estimate when capital stock

is based on BEA depreciation rates. For the United States, petroleum and coal product manufacturing industry, using Statistics Canada depreciation rates results in a MFP growth estimate that is 1.5 percentage points lower than the MFP growth estimate when the BEA depreciation rates are used.

When the MFP growth estimates in Canada are compared to the U.S. estimates, the general picture is similar to that for labour productivity growth. MFP growth in Canada slowed significantly between the 1987-2000 and 2000-2007 periods. In contrast, MFP growth significantly improved in the United States between the two periods. As a result, there is a substantial business sector MFP growth gap (1.3 percentage points based on BEA depreciation rates and 1.6 percentage points based on Statistics Canada rates) between the two countries in the post-2000 period (Chart 3).

Despite the general picture favouring the United States, some Canadian industries outperformed their U.S. counterparts in at least one of the periods. Over the post-2000 period, for example, the MFP growth rate was significantly higher in Canada in agriculture, forestry, fishing and hunting; utilities; construction; non-metallic mineral products; primary metals; wholesale trade; FIRE and management of companies; and other services.

When MFP growth estimates (Table 9) are compared to labour productivity growth estimates (Table 8), one finds that the slowdown in labour productivity growth in Canada between pre-2000 and post-2000 periods and the increased growth gap in labour productivity between Canada and the United States in the post-2000 period are mainly due to a weaker MFP performance in Canada. The result holds for the aggregate business sector as well as for most industries.

Canada-U.S. Productivity Level Comparisons

Productivity growth is an important indicator of improvements in production efficiency and international competitiveness of Canadian industries compared to U.S. industries, but it does not reveal how productive Canadian industries are relative to their U.S. counterparts at any point in time. This section addresses this issue.

For the analytical framework, we follow Jorgenson, Kuroda and Nishimizu (1995) and Christensen, Cummings and Jorgenson (1995). They show that differences in the logarithms of the MFP levels between Canada and the United States, for the i^{th} industry, can be expressed as the value of the difference between the logarithms of labour productivity, less the differences between the logarithms of capital intensities in the two countries:

$$ln\left[\frac{MFP_i(Can)}{MFP_i(US)}\right] = ln\left[\frac{LP_i(Can)}{LP_i(US)}\right] - \hat{v}_i^k ln\left[\frac{k_i(Can)}{k_i(US)}\right] \quad (2)$$

where

$$\hat{v}_i^k = \frac{1}{2}\left[v_i^k(Can) + v_i^k(US)\right]$$

is the average compensation shares of capital in Canada and the U.S. for the i^{th} industry.

To reflect price differences in output and inputs in Canada and the United States, labour productivity as well as capital intensity for Canada in the above equation has been converted into U.S. dollars using PPPs for output and capital investment at the industry level. A discussion of the calculation of the PPP estimates is in the Appendix .

According to the above formulation, the relative MFP between Canada and the United States is equal to the relative labour productivity net of the relative contributions attributed to capital deepening.

Canada-U.S. Labour Productivity Levels Comparisons

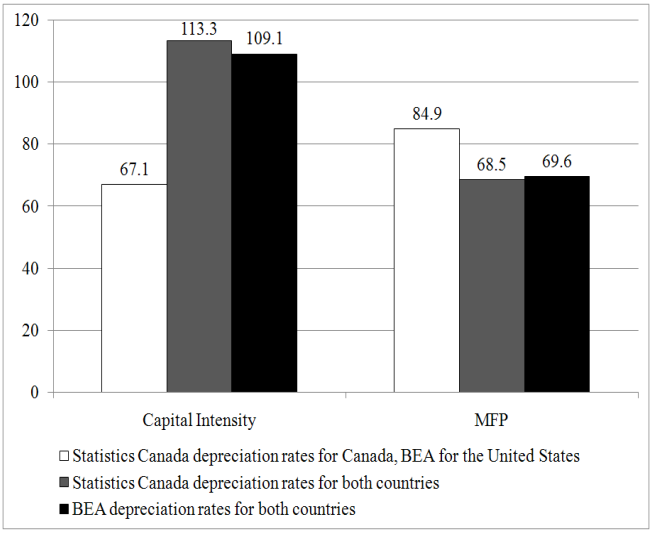
We first calculate labour productivity levels in Canada relative to those in the United States for the 32 industries for 2002 and 2007. As shown in the first panel "LP" of Table 10, Canada's labour productivity level in the business sector in 2007 was 72.1 per cent of the U.S. level, or a 27.9 per cent gap between the two countries. The gap widened from 22.7 per cent in 2002.

The widening gap is pervasive across industries, with 28 out of 32 experiencing a growing gap over this period. In 2007, Canada had a higher labour productivity level than the United States in only 7 industries (construction, wood products manufacturing, primary metals manufacturing, transportation equipment, transportation and warehousing, administrative and waste management, and other services). On the other hand, Canada lagged the United States substantially (more than a 20 per cent labour productivity level gap) in 17 industries. The largest gap was in the computer and electronic products manufacturing industry at 77.6 per cent. The unprecedented gap in this industry in 2007 is due to a substantial difference in labour productivity growth since the benchmark year 2002 between the two countries. Over this period, labour productivity growth in the industry was 4.6 per cent per year in Canada, compared to 23.2 per cent per year in the United States.[19]

Canada-U.S. MFP Level Comparisons

For the Canada-U.S. MFP comparison, we first calculate Canada's MFP levels relative to the United States, using "official" capital stock estimates for each country; that is, Canada's capital stock is estimated using Statistics Canada depreciation rates and U.S. capital stock is estimated using BEA depreciation rates. The results for the 32 industries for 2002 and 2007 are reported in the second panel "MFP" of Table 10. Basically, under this scenario, Canada is performing reasonably well in MFP compared to the United States, and much better than in the case of labour productivity. In 2007, the majority of Canadian industries (18 out the 32 industries) had higher MFP levels than their U.S. counterparts. For the manufacturing sector as a whole, Canada was doing almost as well as its U.S. counterpart (98.7 per cent of the U.S. level). For the business sector, Canada's MFP level was 84.9 per cent of the U.S. level in 2007 (Chart 4).

Chart 4
A Comparison of Business Sector Canada-US Capital Intensity and MFP, 2007
(US=100)



The problem is that the numbers fail a reality check. It is well-established that Canada considerably underperformed compared to the United States in R&D, investment in technology (measured as investment in M&E or ICT as percentage of GDP), and level of education of the workforce, which are key determinants of MFP performance (Expert Panel on Business Innovation, 2009). Given the evidence, it seems to be reasonable to conclude that the use of the official capital stock estimates for Canada and the United States leads to the overestimation of Canada's MFP performance and that they should not be used for MFP level comparison between the two countries.

Now we discuss a MFP level comparison when the same depreciation rates are used for estimating capital stock in both countries. The estimated relative MFP levels by industry with capital stock

19 Chan, Gu and Tang (2010) show that the dramatic decline in productivity growth in the Canadian computer and electronic product industry in the post-2000 compared to 1997-2000 was mainly due to the slowdown in productivity growth within industry (as opposed to composition effects), which can largely be traced to the decline in labour productivity growth of continuing plants.

based on either Statistics Canada or BEA depreciation rates are reported in Table 11. At the aggregate level, the MFP level estimates based on Statistics Canada depreciation rates for capital are very similar to those based on BEA depreciation rates (Chart 4). In 2007, the Canada-U.S. MFP gap in the total business sector was about 30 per cent, while the capital intensity was higher in Canada (Chart 4). Thus, the MFP gap was entirely responsible for the Canada-U.S. business sector labour productivity gap.

At the industry level, however, the MFP estimates based on Statistics Canada depreciation rates for capital can be significantly different from those based on BEA depreciation rates. The estimate based on BEA depreciation rate for the primary metal manufacturing industry is 26.7 percentage points higher than that based on Statistics Canada depreciation rates. Similarly, it was 22.9 percentage points higher for petroleum and coal manufacturing industry. On the other hand, it was 18.6 percentage points lower for agriculture, forestry, fishing and hunting and 9.5 percentage points lower for other services. As discussed earlier, this was mainly driven by difference in asset composition at the industry level and between the two countries.

Given that most previous literature uses depreciation rates similar to the BEA rates (Lee and Tang, 2000; Ho, Rao and Tang, 2004; Rao *et al.*, 2008), the discussion at the industry level in the remainder of this section will be based on the estimates under BEA depreciation rates.

In 2007, Canada had lower MFP levels than the United States in 21 of the 32 industries. In particular, Canada was considerably less productive (20 per cent gap or more) in 14 industries. As for labour productivity, the industry with the largest MFP level gap was the computer and electronic products manufacturing industry (74.6 per cent), followed by mining (except oil and gas extraction) (63.6 per cent). On the other hand, Canada was significantly more productive than the United States in eight industries, namely construction, wood products, non-metallic mineral products, primary metals, machinery, wholesale trade, administrative and waste management, and other services. Canada was also equally productive in oil and gas extraction; transportation equipment; food, beverage, and tobacco products; transportation and warehousing; education, health and social assistance.

Conclusion

The main objective of this article has been to estimate Canada and U.S. capital stock using the same depreciation rates in order to make comparable Canada-U.S. industry capital intensity and MFP comparisons. Similar to other productivity research, this study is subject to measurement errors, and probably more so given that it also deals with level comparisons.[20] In addition, an industry in Canada may not be fully comparable to its U.S. counterpart due to differences in industry/product composition.[21] With these caveats, we now highlight several key findings drawn from this research.

- Canada-U.S. level comparisons for capital intensities and MFP across industries are misleading when "official" capital stock series data, estimated using different depreciation rates in the two countries, are used. However, when comparisons are made in terms of growth, the results are less sensitive, especially at the aggregate level.
- Canada-U.S. capital intensity and MFP level comparisons should use capital stock data

20 One possible measurement issue is that investment data series in Canada may not be totally comparable to the U.S. counterparts. Research is on-going to document differences in the practices of collecting and estimating investment data between the two countries, but it is not clear how the differences, if there is any, will change the comparison results.

21 For instance, the U.S. computer and electronic product manufacturing industry is concentrated relatively more in computers and semiconductors than its Canadian counterpart.

based on either Statistics Canada or BEA depreciation rates for both countries.

- Canadian industries invested relatively more in structure capital assets but less in machinery and equipment (including information and communications technologies) than their U.S. counterparts.
- Canada-U.S. labour productivity level gaps as well as the widening of these gaps over time across Canadian industries are all due to the MFP level gaps.

The explanations that have been offered for Canada's relatively weak productivity performance are numerous and often multi-faceted. The most widely held view is that Canadian businesses invest insufficiently in innovation, technology adoption (M&E including ICTs), business practice and management, and intangibles (e.g. branding, firm-specific human capital, and modernization of organizational structures) (e.g. Boothe and Roy, 2008; Expert Panel on Business Innovation, 2009).[22]

Other factors that might contribute to Canada's weak productivity performance, especially since 2000, include: lower capacity utilization (allowing buildings, equipment and the other tools Canadian workers could use to sit idle), especially in the manufacturing sector; and the slow response of individual Canadian business to changes in economic conditions. In Canada's manufacturing sector, these issues could have emerged as a result of a strong Canadian dollar, increased competition from emerging markets, and decreased foreign (primarily U.S.) demand for our products.

Over the longer term, MFP is primarily influenced by three key factors: business innovation, allocation of productive resources, and economies of scale. Therefore, government policies and programs which would positively affect these three key determinants of MFP would improve Canada's productivity and real income performance.

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22 Firm size has been shown to be a key determinant in the innovation level of producers due to factors associated with skills, financing, and economies of scale. The innovation gap between Canada and the U.S. industries are often tied to the firm size differences observed in the two countries. For a discussion of firm size and its impact on the Canada-U.S. productivity gap, see Almon and Tang (2010).

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Appendix: Data Sources

Capital Stock

Our investment and capital stock estimates provide data on chained-Fisher quantity indices as well as real and nominal values of investment and capital stock for the individual industries of the business sector. The methodology for constructing the Fisher index of investment (capital stock) uses three sets of tables: investment (capital stock) tables in current prices; investment (capital stock) tables valued using prices in the previous year (called Lasypeyres prices); and investment (capital stock) tables valued using prices in the subsequent year (called Paasche prices).

We apply the Fisher aggregation to estimate the chained-Fisher index of capital stock by four types of assets: ICT M&E, Non-ICT M&E, Building, and Engineering Structures.[23] The nominal value of capital stock in asset type *i* of industry *j* at time *t*, PK_{ijt}, equals the total capital stock in asset type *i*, where a = (1,2,...,n) $\in$ *i,*

$$PK_{ijt} = \sum PK^{a}_{ijt}$$

where *i* =1,2,3,4 represents the four types of assets: ICT M&E, Non-ICT M&E, Building, and Engineering Structures, and *a* represents sub-assets within the group of asset type *i*, as each of four asset groups include a number of sub-assets.

The quantity index of capital stock is chained-Fisher index that is calculated as the geometric mean of the Laspeyres and Paasche indices:

$$\frac{IFQZ_{ijt}}{IFQZ_{ijt\text{-}1}} = \left(\frac{ILQZ_{ijt}}{ILQZ_{ijt\text{-}1}} \frac{IPQZ_{ijt}}{IPQZ_{ijt\text{-}1}} \right)^{\frac{1}{2}}$$

where the Laspeyres quantity index of capital stock, $\frac{ILQZ_{ijt}}{ILQZ_{ijt\text{-}1}}$, uses the previous year's investment prices to aggregate capital stock for industry *j* and type *i* asset, and the Paasche quantity

23 We apply the same methodology to take capital stock aggregation across industries.

$\frac{IPQZ_{ijt}}{IPQZ_{ijt-1}}$, uses current year investment prices to aggregate capital stock:

$$\frac{IPQZ_{ijt}}{IPQZ_{ijt-1}} = \frac{\sum_{a} P^{a}_{ijt} K^{a}_{ijt}}{\sum_{a} P^{a}_{ijt} K^{a}_{ijt-1}}$$

where K^{a}_{ijt} represents the Fisher quantity of capital stock of industry j in sub-asset a , where $a \in i$ and P^{a}_{ijt} is the 2002 chained price index of investment which is provided along with the investment data by Statistics Canada. We choose the 2002 as the base year for the Fisher quantity index, and then the real capital stock in 2002 Chained Fisher dollar is expressed as:

$$K_{ijt} = \frac{IFQZ_{ijt}}{IFQZ_{ij2002}} * PK_{ij2002}$$

The Fisher price index of capital stock can be derived as the ratio of nominal capital stock to the real capital stock in 2002 chained Fisher dollar:

$$IFPZ_{ijt} = \frac{PK_{ijt}}{K_{ijt}}$$

Once we have the aggregated capital stock by four types of assets for each individual industry, we then apply the same methodology to take Fisher aggregation across industries. The nominal value of capital stock in asset i of industry j at time t, PK_{ijt}, equals the total capital stock of industry j, where $IND=(1,2,...,I) \in j$,

$$PK_{ijt} = \sum_{IND} PK^{IND}_{ijt}$$

Value added

Industry value added for Canada is a special tabulation from Statistics Canada. It is consistent with CANSIM tables 379-0023 for value added in nominal dollars and 383-0021 for real value added. However, to make it comparable to capital stock data, the value added data are adjusted to include both private and non-private activities. They exclude imputed rental income for owner-occupied housing. In addition, to make it comparable to the U.S. data, the original value added data at the basic prices are adjusted to value added at factor costs, using information on net indirect taxes on production from input-output tables from Statistics Canada.

For the United States, value added data are from the U.S. BEA. To make them comparable to the Canadian data and capital stock, two adjustments are made. First, we exclude rental imputation for owner-occupied housing from real estate. Second, value added at market prices are adjusted to value added at factor cost, using information on net indirect taxes on both products and production that are also from BEA.

Hours worked

For both Canada and the United States, hours worked data at the industry level are hours worked for all jobs, including both private and non-private activities. The data from Canada are special tabulation, which are consistent with CANSIM table 383-0009. For the United States, they are from the Bureau of Labor Statistics.

PPP Exchange Rates

To compare productivity and capital intensity levels between Canada and the United States, it is necessary to use purchasing power parities at the industry level to control for price level differences between the two countries. The use of the market exchange rate is not desirable since it is highly volatile and can lead to unreliable and misleading estimates for country comparison across industries.

The 2002 PPP estimates for value added by industry are from Hao *et al.* (2008). For capital, we derive 2002 capital PPPs from 1999 investment PPPs estimates for total capital, M&E and structures as found in Rao *et al.* (2004), using investment price deflators.

The PPP estimates for value added as well as for total capital, M&E and structures are reported in Table 12.

Table 1
BEA and Statistics Canada (Productivity Accounts) Depreciation Rates by Asset Type

Asset Code	Canadian Asset Type	Implicit BEA Depreciation Rates	Statistics Canada Depreciation Rates	Asset Class
1	Office Furniture, Furnishing & Fixtures	0.29	0.24	Non-ICT
2	Non-Office Furniture, Furnishings & Fixtures	0.14	0.21	Non-ICT
3	Motors, Generators, and Transformers	0.14	0.13	Non-ICT
4	Computer-assisted Process	0.16	0.17	Non-ICT
5	Non-computer-assisted Process	0.16	0.16	Non-ICT
6	Communication Equipment	0.14	0.22	ICT
7	Tractors and Heavy Construction Equipment	0.16	0.17	Non-ICT
8	Computers, Hardware & Word Processors	0.50	0.47	ICT
9	Trucks, Truck Tractors, Truck Trailers & Parts	0.22	0.23	Non-ICT
10	Automobiles and Major Replacement Parts	0.22	0.28	Non-ICT
11	Other Machinery and Equipment	0.18	0.20	Non-ICT
12	Electrical Equipment and Scientific Devices	0.16	0.22	Non-ICT
13	Other Transportation Equipment	0.07	0.10	Non-ICT
14	Pollution Abatement & Control Equipment	0.07	0.15	Non-ICT
15	Software	0.49	0.55	ICT
16	Plants for Manufacturing	0.03	0.09	Bldg
17	Farm Building, Garages, and Warehouses	0.03	0.08	Bldg
18	Office Buildings	0.03	0.06	Bldg
19	Shopping Centers and Accommodations	0.03	0.07	Bldg
20	Passenger Terminals, Warehouses	0.03	0.07	Bldg
21	Other Buildings	0.03	0.06	Bldg
22	Institutional Building Construction	0.02	0.06	Bldg
23	Transportation Engineering Construction	0.02	0.07	Eng
24	Electric Power Engineering Construction	0.02	0.06	Eng
25	Communication Engineering Construction	0.02	0.12	Eng
26	Downstream Oil and Gas Engineering Facilities	0.07	0.07	Eng
27	Upstream Oil and Gas Engineering Facilities	0.07	0.13	Eng
28	Other Engineering Construction	0.02	0.08	Eng
Simple Average				
ICTs		0.38	0.41	
Non-ICT M&E		0.16	0.19	
Building Construction		0.03	0.07	
Engineering Construction		0.04	0.09	
Total Assets		0.13	0.16	

Source: Statistics Canada, 2007*, Depreciation Rates for the Productivity Accounts;* Bureau of Economic Analysis, 2003, *Fixed Assets and Consumer Durable Goods in the U.S., 1925-97.*

Table 2: Industry Classification and Industry Shares of Nominal Value Added and Hours Worked in Canada and the United States, 2008* (per cent)

NO.	Industry	NAICS Codes	Value Added**		Hours Worked	
			Can	U.S.	Can	U.S.
1	Agriculture, forestry, fishing, and hunting	11	1.9	1.4	2.8	2.7
2	Mining	21	11.8	2.5	1.7	0.7
2.1	Oil and gas extraction	211	9.1	1.3	0.5	0.1
2.2	Mining, except oil and gas	212 & 213	2.7	0.9	1.1	0.6
3	Utilities	22	2.7	2.2	0.9	0.5
4	Construction	23	7.7	5.0	9.1	7.7
5	Manufacturing	321-339	13.6	13.8	12.3	12.7
5.1	Wood products	321	0.6	0.3	0.8	0.4
5.2	Non-metallic mineral products	327	0.5	0.5	0.5	0.5
5.3	Primary metals	331	1.1	0.5	0.5	0.4
5.4	Fabricated metal products	332	1.2	1.2	1.3	1.4
5.5	Machinery	333	1.1	1.1	0.9	1.1
5.6	Computer and electronic products	334	0.6	1.2	0.6	1.2
5.7	Electrical equipment	335	0.3	0.5	0.3	0.4
5.8	Transportation equipment	336	1.6	1.7	1.4	1.5
5.9	Furniture and miscellaneous manufacturing	337 & 339	0.8	0.9	1.0	1.1
5.10	Food, beverage, and tobacco products	311 & 312	2.2	1.3	1.6	1.6
5.11	Textile mills and textile product mills	313 & 314	0.1	0.2	0.2	0.3
5.12	Apparel and leather and allied products	315 & 316	0.1	0.1	0.4	0.2
5.13	Paper products and printing	322 & 323	1.2	0.8	1.2	1.0
5.14	Petroleum and coal products	324	0.5	0.6	0.2	0.1
5.15	Chemical products	325	1.2	2.1	0.7	0.8
5.16	Plastics and rubber products	326	0.6	0.6	0.8	0.7
6	Wholesale trade	41 or 42	6.3	5.6	6.0	5.3
7	Retail trade	44-45	6.2	6.1	10.9	11.4
8	Transportation and warehousing	48-49	5.1	3.4	5.9	4.8
9	Information	51	4.1	5.1	2.6	2.6
10	FIRE*** and management of companies	52-53, 55	12.2	16.0	7.2	8.9
11	Professional, scientific and technical services	54	5.7	9.4	6.9	7.2
12	Administrative and waste management	56	3.0	3.7	5.0	6.8
13	Education, health and social assistance	61-62	13.4	10.0	14.8	14.8
14	Arts, entertainment, and recreation	71	1.0	1.1	1.9	1.4
15	Accommodation and food services	72	2.5	3.0	6.1	7.2
16	Other services (except public admin)	81	3.0	2.7	5.9	5.3
	Business Sector	11-81	100	100	100	100

* 2007 for value added for U.S. sub-industries in the mining and manufacturing sectors.

** Share of nominal value added.

***FIRE stands for Finance, Insurance, Real Estate, Rental and Leasing.

Source: Statistics Canada, U.S. Bureau of Economic Analysis and U.S. Bureau of Labor Statistics.

Table 3

Ratio of Canadian Capital Stock with the Statistics Canada Depreciation Rates to Canadian Capital Stock Based on the BEA Depreciation Rates, Average for 1987-2008

	Total Capital	M&E*	ICT	Structures
Agriculture, forestry, fishing, and hunting	0.41	0.88	0.80	0.26
Mining	0.65	0.91	0.90	0.63
Utilities	0.53	0.93	0.89	0.48
Construction	0.84	0.96	0.97	0.59
Manufacturing	0.70	0.96	0.93	0.46
Wholesale trade	0.72	0.90	0.93	0.60
Retail trade	0.67	0.83	0.92	0.61
Transportation and warehousing	0.52	0.81	0.89	0.41
Information	0.54	0.73	0.71	0.43
FIRE and management of companies	0.71	0.88	0.91	0.63
Professional, scientific and technical services	0.88	0.95	0.95	0.78
Administrative and waste management	0.50	0.91	0.91	0.32
Education, health and social assistance	0.46	0.84	0.93	0.43
Arts, entertainment, and recreation	0.71	0.84	0.87	0.68
Accommodation and food services	0.68	0.74	0.94	0.67
Other services (except public admin)	0.28	0.89	0.93	0.21
Business Sector	0.59	0.89	0.80	0.49

* M&E includes ICT.

Table 4

Canadian Capital Stock Based on Statistics Canada and BEA Depreciation Rates, 1987-2008 (Average Annual Rate of Change)

	Total Capital		M&E*		ICT		Structures	
	StatCan Rate	BEA Rate	StatCan Rate	BEA Rate	StatCan Rate	BEA Rate	StatCan Rate	BEA Rate
Agriculture, forestry, fishing, and hunting	-1.51	-0.87	-1.97	-2.01	10.49	9.58	-1.00	-0.51
Mining	4.34	4.04	7.10	6.81	19.53	18.90	3.91	3.74
Utilities	0.53	0.95	0.11	0.07	14.72	14.82	0.65	1.08
Construction	3.72	3.66	4.43	4.30	17.94	17.45	1.74	2.59
Manufacturing	0.63	0.85	1.64	1.72	14.63	14.30	-0.99	0.20
Wholesale trade	6.21	5.40	8.23	7.92	16.98	16.77	4.18	3.71
Retail trade	5.61	4.95	6.68	6.42	17.54	17.03	4.98	4.36
Transportation and warehousing	2.60	1.39	4.49	4.17	18.64	17.81	1.42	0.50
Information	4.63	4.28	7.30	6.62	7.40	6.70	2.23	3.06
FIRE and management of companies	3.06	3.19	6.85	6.85	14.68	14.23	0.30	1.36
Professional, scientific and technical services	14.59	14.11	16.09	15.82	17.89	17.74	9.70	9.56
Administrative and waste management	7.62	3.74	10.18	9.56	17.02	16.17	4.41	1.23
Education, health and social assistance	2.96	2.09	8.26	7.58	17.34	16.85	2.23	1.71
Arts, entertainment, and recreation	4.88	4.93	9.25	8.62	18.66	17.93	3.64	4.10
Accommodation and food services	2.52	2.99	3.41	3.47	13.36	13.19	2.28	2.85
Other services (except public admin)	3.89	0.50	10.25	9.77	17.51	17.27	1.28	-0.42
Business Sector	2.62	2.22	4.29	4.22	12.33	11.19	1.77	1.65

* M&E includes ICT.

Table 5: Canada-U.S. Capital Intensity Comparisons (U.S.=100), Period Average
(Statistics Canada Depreciation Rates for Canada and BEA Depreciation Rates for the United States)

	Total Capital		M&E*		ICT		Structures	
	87-99	00-07	87-99	00-07	87-99	00-07	87-99	00-07
Agriculture, forestry, fishing, and hunting	61.0	60.3	67.9	57.8	102.0	71.7	67.5	76.4
Mining	72.8	80.9	37.2	56.2	14.1	26.2	94.7	101.2
Oil and gas extraction	60.8	59.5	32.7	68.0	6.6	20.8	76.6	70.6
Mining, except oil and gas	107.7	83.7	40.0	38.5	24.9	28.3	175.7	135.7
Utilities	87.6	55.2	55.0	29.3	38.2	61.1	116.8	76.1
Construction	89.1	72.5	102.5	69.8	69.1	13.1	74.5	87.5
Manufacturing	64.0	45.9	72.1	51.5	22.3	29.6	69.3	49.1
Wood products	83.3	81.4	103.0	96.5	75.2	100.1	72.0	73.5
Non-metallic mineral products	54.7	47.8	71.0	60.6	24.2	44.2	48.9	39.7
Primary metals	68.2	60.8	85.8	79.0	42.6	79.7	68.4	56.5
Fabricated metal products	40.2	29.9	47.0	35.1	20.4	25.3	40.9	28.4
Machinery	32.6	20.6	36.0	21.6	8.8	10.4	34.4	23.3
Computer and electronic products	40.2	25.4	47.3	28.8	13.5	29.9	37.3	23.7
Electrical equipment	33.0	29.9	39.4	40.3	22.5	39.9	30.3	22.0
Transportation equipment	89.5	73.2	106.9	89.0	27.9	38.0	73.5	53.3
Furniture and miscellaneous manufacturing	24.4	23.5	28.5	27.4	14.9	24.5	27.6	25.7
Food, beverage, and tobacco products	38.1	41.8	48.3	53.4	29.9	48.6	35.4	36.4
Textile mills and textile product mills	56.2	40.8	75.2	54.8	55.9	101.6	39.6	29.1
Apparel and leather and allied products	40.9	16.8	60.3	23.4	55.8	41.8	35.0	14.3
Paper products and printing	109.0	69.4	110.6	67.6	68.2	57.4	112.0	80.4
Petroleum and coal products	91.0	65.1	25.0	39.2	19.3	23.8	217.5	125.4
Chemical products	70.8	54.1	75.1	52.9	20.5	25.8	79.6	68.2
Plastics and rubber products	49.1	35.9	50.7	38.7	92.8	66.4	54.0	32.9
Wholesale trade	28.6	28.5	24.4	23.1	38.3	37.5	40.6	49.1
Retail trade	28.6	34.2	48.9	51.0	47.4	57.5	29.3	35.8
Transportation and warehousing	79.3	77.2	59.3	61.7	11.7	15.2	108.4	103.1
Information	54.0	47.4	62.8	57.5	90.7	70.3	55.7	45.8
FIRE and management of companies	77.3	61.2	88.1	75.1	61.9	54.8	84.2	58.0
Professional, scientific and technical services	22.9	35.9	28.7	34.4	41.2	33.7	17.1	37.8
Administrative and waste management	29.4	28.2	39.9	27.5	46.1	36.6	22.2	27.7
Education, health and social assistance	54.4	52.6	23.2	26.5	5.2	14.2	68.4	69.3
Arts, entertainment, and recreation	47.3	33.2	40.9	34.2	135.0	117.5	51.2	33.9
Accommodation and food services	39.0	36.7	24.6	21.7	33.8	38.8	45.2	44.5
Other services (except public admin)	13.7	17.2	21.8	43.0	56.8	88.4	13.0	12.7
Business Sector	73.1	65.2	62.0	53.4	39.3	38.7	83.0	76.7

* M&E includes ICT.

Table 6

Canada-U.S. Capital Intensity Comparisons (U.S.=100), Period Average

(Statistics Canada Depreciation Rates for Both Countries)

	Total Capital		M&E*		ICT		Structures	
	87-99	00-07	87-99	00-07	87-99	00-07	87-99	00-07
Agriculture, forestry, fishing, and hunting	107.0	104.3	86.2	70.5	119.1	79.1	156.6	194.4
Mining	103.8	117.7	53.0	80.0	19.8	31.2	136.4	149.6
Oil and gas extraction	86.1	85.8	47.3	100.5	9.6	25.6	108.9	102.3
Mining, except oil and gas	157.7	126.6	59.9	57.0	35.6	35.1	275.1	236.5
Utilities	241.2	152.4	93.6	51.0	52.1	73.6	412.9	265.5
Construction	117.0	94.7	112.1	79.2	72.4	14.7	131.8	189.9
Manufacturing	118.1	85.7	128.5	91.1	28.8	36.6	149.8	115.7
Wood products	166.1	165.6	187.8	170.3	91.1	119.4	170.1	201.8
Non-metallic mineral products	115.9	95.5	128.7	102.7	30.5	53.7	136.1	117.7
Primary metals	164.0	162.7	174.0	167.1	55.0	97.5	214.5	225.6
Fabricated metal products	76.3	57.2	80.6	58.2	24.4	28.9	90.1	72.3
Machinery	57.3	33.9	60.2	33.1	11.1	12.3	67.9	47.6
Computer and electronic products	66.4	42.0	80.6	48.7	17.8	37.8	67.5	45.1
Electrical equipment	57.2	56.9	76.8	83.5	33.9	54.2	54.1	44.9
Transportation equipment	155.0	125.4	172.6	139.8	32.8	44.2	144.4	110.6
Furniture and miscellaneous manufacturing	44.8	43.8	46.8	43.7	17.9	28.4	58.5	62.5
Food, beverage, and tobacco products	71.5	85.5	76.7	89.2	36.5	57.4	81.0	100.2
Textile mills and textile product mills	119.5	101.9	136.6	112.7	71.0	125.8	107.5	100.0
Apparel and leather and allied products	79.8	36.0	111.2	43.7	70.5	51.7	74.2	38.0
Paper products and printing	193.8	136.3	208.1	137.1	91.3	73.8	238.6	204.1
Petroleum and coal products	190.1	134.5	44.9	66.2	22.6	26.8	569.3	354.9
Chemical products	124.5	97.3	112.6	79.3	22.4	27.2	157.4	143.4
Plastics and rubber products	84.5	64.0	83.9	65.1	107.9	76.0	105.5	73.0
Wholesale trade	39.8	39.7	32.0	29.9	49.3	45.6	65.8	96.9
Retail trade	47.5	57.5	69.3	70.4	62.9	72.1	51.4	66.0
Transportation and warehousing	154.6	137.3	85.6	86.8	15.4	19.7	307.7	256.4
Information	96.7	82.2	92.2	82.8	133.6	98.5	116.7	100.9
FIRE and management of companies	111.0	89.5	130.0	105.4	90.3	72.2	125.8	99.5
Professional, scientific and technical services	31.8	45.8	40.4	45.7	53.4	42.3	26.6	63.7
Administrative and waste management	42.0	41.0	58.3	39.9	66.6	49.9	34.5	51.7
Education, health and social assistance	91.0	85.3	30.6	34.2	6.6	17.8	125.2	131.5
Arts, entertainment, and recreation	78.4	48.5	48.5	39.3	184.6	128.7	91.6	53.0
Accommodation and food services	62.2	60.1	32.7	28.3	45.1	47.1	78.3	83.6
Other services (except public admin)	27.5	34.4	32.3	61.1	69.7	102.1	27.6	27.2
Business Sector	126.3	109.8	91.4	74.5	52.0	47.9	159.0	155.0

* M&E includes ICT.

Table 7

Canada-U.S. Capital Intensity Comparisons (U.S.=100), Period Average

(BEA Depreciation Rates for Both Countries)

	Total Capital		M&E*		ICT		Structures	
	87-99	00-07	87-99	00-07	87-99	00-07	87-99	00-07
Agriculture, forestry, fishing, and hunting	145.2	148.6	74.7	62.8	131.7	81.2	253.4	289.4
Mining	114.9	119.5	44.2	63.6	17.1	29.4	154.7	156.6
Oil and gas extraction	91.5	83.8	39.8	76.4	7.8	22.5	117.1	102.5
Mining, except oil and gas	187.2	147.8	49.5	46.6	32.5	34.4	337.4	279.3
Utilities	158.6	110.3	61.0	32.9	44.1	71.2	232.4	165.8
Construction	106.8	86.8	104.5	70.2	71.6	12.6	121.1	156.1
Manufacturing	89.7	66.5	82.2	59.4	26.9	34.0	143.1	112.6
Wood products	111.3	112.1	114.2	107.3	87.7	112.3	143.5	158.4
Non-metallic mineral products	89.9	76.2	75.9	65.6	27.9	49.7	151.0	132.2
Primary metals	99.3	97.6	90.9	85.7	51.0	91.1	158.1	161.6
Fabricated metal products	56.4	41.8	48.3	36.7	22.7	27.0	91.4	68.4
Machinery	48.4	30.2	40.5	24.1	9.9	11.3	75.8	54.2
Computer and electronic products	54.1	34.5	56.3	34.7	15.8	33.8	71.5	48.3
Electrical equipment	48.9	43.7	49.4	49.6	27.6	47.9	72.1	56.2
Transportation equipment	114.5	97.2	120.6	101.6	32.1	41.1	131.4	113.7
Furniture and miscellaneous manufacturing	34.5	32.2	30.5	29.3	16.3	26.0	53.8	51.1
Food, beverage, and tobacco products	71.0	73.1	51.5	57.0	33.5	52.6	117.6	120.1
Textile mills and textile product mills	81.7	63.5	78.5	57.6	62.5	110.8	112.7	93.1
Apparel and leather and allied products	65.4	29.3	66.6	25.7	63.9	45.8	89.6	45.0
Paper products and printing	140.2	101.6	129.9	80.5	86.1	70.2	234.2	207.2
Petroleum and coal products	106.2	75.5	27.5	41.4	21.1	24.9	258.2	155.4
Chemical products	101.6	82.3	73.4	52.1	21.4	25.8	161.6	144.5
Plastics and rubber products	63.5	45.6	54.0	41.2	102.5	70.9	110.1	74.6
Wholesale trade	40.6	38.0	28.9	26.9	44.1	42.3	69.0	79.6
Retail trade	43.5	49.2	63.9	65.8	56.4	65.9	49.3	56.5
Transportation and warehousing	162.0	139.7	76.8	78.2	13.9	16.8	278.8	238.3
Information	100.8	86.3	94.2	82.2	138.7	101.8	123.4	109.6
FIRE and management of companies	107.2	87.4	120.8	103.1	84.6	70.6	126.0	100.5
Professional, scientific and technical services	26.1	39.5	34.7	41.0	50.1	39.9	22.3	47.2
Administrative and waste management	68.7	48.4	53.3	34.9	61.8	45.8	84.6	71.9
Education, health care and social assistance	124.6	109.4	31.7	33.5	6.3	16.2	163.5	156.0
Arts, entertainment, and recreation	66.4	46.8	48.4	37.7	151.1	125.0	73.5	51.0
Accommodation and food services	55.6	56.5	34.9	30.6	38.3	42.2	65.2	70.7
Other services (except public admin)	58.4	50.3	24.6	47.5	61.1	94.4	67.8	52.4
Business Sector	126.1	109.0	73.7	63.3	53.9	47.7	168.3	154.6

* M&E includes ICT.

Table 8

Labour Productivity* Growth in Canada and the United States, 1987-2008**

(Average Annual Rate of Change)

	Canada			United States		
	87-00	**00-08**	**87-08**	**87-00**	**00-08**	**87-08**
Agriculture, forestry, fishing, and hunting	3.4	2.9	3.2	4.0	1.7	3.1
Mining	2.1	-3.9	-0.3	3.0	-5.3	-0.3
Oil and gas extraction	4.8	-7.9	-0.2	3.3	-3.9	0.7
Mining, except oil and gas	0.4	-1.4	-0.3	4.6	-2.8	2.0
Utilities	0.3	-0.7	-0.1	3.7	1.7	2.9
Construction	0.1	-0.5	-0.1	-0.8	-3.5	-1.8
Manufacturing	3.2	0.9	2.3	4.0	4.4	4.1
Wood products	2.0	1.1	1.7	-1.3	3.2	0.2
Non-metallic mineral products	1.4	0.1	0.9	3.0	0.5	2.1
Primary metals	4.7	4.0	4.4	2.8	2.6	2.8
Fabricated metal products	1.2	0.1	0.8	1.4	1.8	1.5
Machinery	2.6	1.7	2.3	0.8	4.4	2.0
Computer and electronic products	9.8	-3.2	4.6	24.2	19.9	22.6
Electrical equipment, appliances, and components	3.6	-2.3	1.3	2.4	5.0	3.3
Transportation equipment	5.1	0.3	3.2	0.7	6.3	2.6
Furniture and miscellaneous manufacturing	2.7	1.3	2.2	2.7	4.3	3.3
Food, beverage, and tobacco products	1.6	1.0	1.4	0.5	1.3	0.8
Textile mills and textile product mills	1.5	-1.8	0.2	3.4	4.1	3.6
Apparel and leather and allied products	2.2	-4.3	-0.3	4.0	3.8	3.9
Paper products and printing	1.7	-0.6	0.8	0.2	2.9	1.1
Petroleum and coal products	3.0	-3.4	0.5	2.1	-1.8	0.7
Chemical products	3.9	0.0	2.4	2.0	5.2	3.1
Plastics and rubber products	2.6	-0.6	1.4	3.4	1.6	2.8
Wholesale trade	2.1	3.4	2.6	3.8	2.3	3.2
Retail trade	1.5	3.4	2.2	3.6	4.7	4.0
Transportation and warehousing	1.0	0.0	0.6	2.3	2.1	2.2
Information	2.7	3.0	2.8	3.1	8.7	5.2
FIRE and management of companies	1.5	1.2	1.4	1.9	1.3	1.7
Professional, scientific and technical services	1.2	0.3	0.8	0.9	3.3	1.8
Administrative and waste management	-1.1	0.2	-0.6	-0.6	2.3	0.5
Education, health care and social assistance	-2.2	0.5	-1.2	-1.9	0.8	-0.9
Arts, entertainment, and recreation	-2.0	-0.9	-1.6	0.2	1.8	0.8
Accommodation and food services	0.5	1.0	0.7	0.6	0.7	0.7
Other services (except public admin)	0.7	1.3	0.9	-0.8	0.2	-0.4
Business Sector	1.2	0.8	1.0	1.8	2.2	2.0

* Real value added per hour worked.

** 1987-2007 for U.S. sub-industries in the mining and manufacturing sectors.

Table 9

Multifactor Productivity Growth in Canada and the United States under Different Depreciation Assumptions, 1987-2007 (Average Annual Rate of Change)

	StatCan Depreciation Rates				BEA Depreciation Rates			
	Canada		United States		Canada		United States	
	87-00	00-07	87-00	00-07	87-00	00-07	87-00	00-07
Agriculture, forestry, fishing, and hunting	3.5	1.7	3.4	0.7	3.1	1.5	3.2	1.0
Mining	0.7	-5.3	2.6	-4.8	0.7	-4.5	2.2	-4.1
Oil and gas extraction	0.4	-6.6	1.4	-5.8	0.4	-6.0	0.9	-5.0
Mining, except oil and gas	1.1	-1.8	4.5	-2.7	0.7	-0.9	4.2	-2.0
Utilities	1.2	0.7	2.7	-0.3	0.5	0.8	2.0	0.2
Construction	-0.3	0.1	-1.7	-4.4	-0.3	0.2	-1.6	-4.6
Manufacturing	2.9	1.1	3.0	4.4	2.9	0.8	3.2	4.0
Wood products	1.4	2.3	-1.3	2.7	1.5	2.0	-1.3	2.5
Non-metallic mineral products	0.9	0.8	2.8	0.0	1.0	1.0	3.0	-0.1
Primary metals	4.2	4.2	3.1	2.5	4.2	3.4	3.0	2.1
Fabricated metal products	1.7	0.8	1.1	1.8	1.7	0.6	1.2	1.5
Machinery	2.0	1.9	-0.5	3.7	2.2	1.6	-0.2	3.4
Computer and electronic products	8.6	-4.1	22.2	19.8	8.8	-4.3	22.4	19.8
Electrical equipment	2.4	-2.6	1.7	4.1	2.5	-2.9	1.5	3.5
Transportation equipment	4.1	0.7	-0.1	5.9	4.0	0.5	0.0	5.6
Furniture and miscellaneous manufacturing	2.2	0.6	2.4	3.5	2.3	0.5	2.4	3.2
Food, beverage, and tobacco products	0.6	0.6	0.5	1.9	1.1	0.8	0.3	1.4
Textile mills and textile product mills	1.2	-0.5	3.0	4.0	1.2	-1.1	3.0	3.0
Apparel and leather and allied products	1.6	-2.1	1.9	2.4	1.7	-2.7	1.9	1.5
Paper products and printing	0.9	1.1	-0.1	2.4	0.9	0.4	-0.3	2.0
Petroleum and coal products	3.6	-4.7	1.5	-5.1	3.5	-4.2	1.1	-3.6
Chemical products	3.2	2.1	0.1	5.0	3.0	1.3	0.3	4.3
Plastics and rubber products	2.4	0.0	2.5	1.0	2.6	0.0	2.6	0.4
Wholesale trade	1.0	2.7	3.0	1.8	1.3	2.8	2.9	1.8
Retail trade	0.6	2.2	3.0	4.6	0.7	2.4	3.0	4.4
Transportation and warehousing	0.8	0.0	2.1	2.5	1.1	0.3	2.4	2.5
Information	1.5	2.5	1.6	7.4	1.8	2.3	2.0	6.6
FIRE and management of companies	0.8	1.6	0.1	1.4	0.7	1.6	0.0	1.1
Professional, scientific and technical services	-0.3	-0.1	-1.0	1.3	-0.2	-0.2	-0.7	1.3
Administrative and waste management	-1.7	-0.8	-0.6	1.2	-0.6	0.1	-0.6	1.0
Education, health and social assistance	-1.9	0.0	-2.0	0.2	-1.9	0.3	-2.0	0.3
Arts, entertainment, and recreation	-2.3	-1.1	-0.6	0.7	-2.4	-1.0	-0.1	0.6
Accommodation and food services	0.3	0.4	0.5	0.8	0.1	0.5	0.5	0.7
Other services (except public admin)	0.2	1.0	-0.8	0.0	0.7	1.4	-0.7	-0.2
Business Sector	1.0	0.4	1.2	2.0	1.1	0.6	1.3	1.9

Table 10: Canada-U.S. Productivity and Capital Intensity Comparisons (U.S.=100)
(Statistics Canada Depreciation Rates for Canada and BEA Depreciation Rates for the United States)

	Labour Productivity		MFP		Capital Intensity	
	2002	2007	2002	2007	2002	2007
Agriculture, forestry, fishing, and hunting	85.5	86.4	115.4	120.2	60.5	59.1
Mining	88.9	88.0	104.5	93.8	79.0	92.2
Oil and gas extraction	87.9	81.6	130.5	132.7	61.6	57.2
Mining, except oil and gas	58.1	47.3	63.0	48.8	82.4	95.1
Utilities	76.5	62.7	111.3	102.1	59.5	51.2
Construction	149.5	192.5	161.6	210.3	72.2	68.3
Manufacturing	84.4	73.2	115.0	98.7	45.0	44.8
Wood products	121.8	118.9	136.3	125.0	73.6	81.8
Non-metallic mineral products	96.6	94.4	132.9	136.7	48.1	43.4
Primary metals	106.1	121.5	130.7	161.6	55.1	55.7
Fabricated metal products	64.2	59.3	94.4	86.7	28.5	31.1
Machinery	92.5	84.0	150.6	145.4	19.6	19.6
Computer and electronic products	50.9	22.4	53.4	26.4	29.2	20.9
Electrical equipment	51.8	41.7	79.2	62.9	30.5	26.8
Transportation equipment	110.7	101.7	127.3	109.7	69.5	75.3
Furniture and miscellaneous manufacturing	51.8	42.2	88.6	70.1	21.9	24.3
Food, beverage, and tobacco products	89.4	85.4	139.1	124.3	42.3	45.5
Textile mills and textile product mills	82.2	60.9	105.3	73.3	39.4	36.1
Apparel and leather and allied products	38.5	30.0	67.1	42.9	16.9	14.9
Paper products and printing	107.8	87.0	120.6	101.5	72.8	57.6
Petroleum and coal products	73.4	65.4	86.5	88.7	75.5	62.1
Chemical products	89.2	65.1	120.2	102.4	59.9	44.5
Plastics and rubber products	86.9	79.8	132.2	111.1	35.2	37.0
Wholesale trade	73.7	90.0	108.0	134.1	26.9	30.7
Retail trade	81.3	75.6	108.1	99.3	31.4	37.4
Transportation and warehousing	123.8	108.1	133.2	118.0	78.2	77.5
Information	64.5	46.6	89.7	70.9	50.1	44.0
FIRE and management of companies	70.0	72.1	90.8	91.3	59.0	62.1
Professional, scientific and technical services	45.4	38.6	57.1	50.6	36.6	34.3
Administrative and waste management	113.5	107.6	157.0	138.6	24.3	35.2
Education, health care and social assistance	99.4	95.9	110.5	106.3	52.3	54.8
Arts, entertainment, and recreation	39.6	39.0	54.8	53.9	31.5	33.4
Accommodation and food services	74.1	72.2	95.6	88.3	34.0	41.5
Other services (except public admin)	145.3	143.8	209.1	207.4	17.2	17.2
Business Sector	77.3	72.1	92.0	84.9	63.7	67.1

Table 11

Canada-U.S. Productivity and Capital Intensity Comparisons (U.S.=100), 2002 and 2007

(Same Capital Depreciation Rates for Both Countries)

	Labour Productivity		StatCan Depreciation Rate				BEA Depreciation Rate			
			MFP		Capital Intensity		MFP		Capital Intensity	
	2002	2007	2002	2007	2002	2007	2002	2007	2002	2007
Agriculture, forestry, fishing, and hunting	85.5	86.4	82.8	86.2	105.5	100.5	67.7	67.6	148.2	148.2
Mining	88.9	88.0	79.3	72.5	118.1	128.0	78.9	71.2	119.0	131.1
Oil and gas extraction	87.9	81.6	94.9	100.3	90.9	79.0	97.8	100.4	87.7	78.9
Mining, except oil and gas	58.1	47.3	52.2	39.4	128.6	135.0	48.8	36.4	150.6	154.2
Utilities	76.5	62.7	53.9	49.0	162.3	140.4	67.0	62.7	120.1	100.1
Construction	149.5	192.5	151.8	196.9	93.7	90.8	154.6	202.5	86.9	80.5
Manufacturing	84.4	73.2	91.1	77.2	82.2	86.7	99.8	85.3	64.9	66.3
Wood products	121.8	118.9	105.2	104.9	148.8	166.0	120.8	115.2	102.1	113.8
Non-metallic mineral products	96.6	94.4	98.8	100.8	95.0	86.4	107.8	112.4	77.7	67.5
Primary metals	106.1	121.5	93.5	98.3	143.5	154.6	110.9	125.0	88.1	94.4
Fabricated metal products	64.2	59.3	77.9	69.5	53.3	61.5	85.3	77.3	39.6	44.3
Machinery	92.5	84.0	130.8	121.5	31.4	33.5	134.6	126.6	28.5	29.6
Computer and electronic products	50.9	22.4	52.4	24.8	46.8	37.5	52.9	25.4	38.2	30.5
Electrical equipment	51.8	41.7	63.7	50.6	56.1	54.0	69.8	54.9	43.5	41.4
Transportation equipment	110.7	101.7	104.6	94.0	116.0	135.0	114.3	101.3	92.0	101.7
Furniture and miscellaneous manufacturing	51.8	42.2	71.5	55.8	40.1	45.8	79.4	62.3	29.9	33.7
Food, beverage, and tobacco products	89.4	85.4	97.2	87.3	85.0	95.5	104.4	95.8	73.9	78.5
Textile mills and textile product mills	82.2	60.9	83.9	60.6	92.5	102.7	94.3	66.5	59.6	61.8
Apparel and leather and allied products	38.5	30.0	53.6	36.5	34.6	35.7	57.0	37.9	28.5	28.9
Paper products and printing	107.8	87.0	95.6	83.3	140.9	116.6	106.2	89.2	104.6	91.2
Petroleum and coal products	73.4	65.4	55.6	59.1	160.8	117.1	78.8	82.0	88.7	70.1
Chemical products	89.2	65.1	86.4	72.1	105.7	83.2	95.2	78.4	89.4	71.7
Plastics and rubber products	86.9	79.8	106.0	90.2	61.0	69.1	120.1	102.5	44.7	47.0
Wholesale trade	73.7	90.0	97.8	120.3	37.7	42.4	98.9	122.6	36.3	40.1
Retail trade	81.3	75.6	95.3	85.5	52.4	64.1	98.4	90.3	46.1	52.7
Transportation and warehousing	123.8	108.1	112.5	96.7	137.8	138.4	111.7	97.4	141.4	135.7
Information	64.5	46.6	69.9	52.3	84.5	79.9	68.0	51.7	89.6	81.8
FIRE and management of companies	70.0	72.1	75.7	74.9	85.4	92.6	76.0	76.9	84.7	87.8
Professional, scientific and technical services	45.4	38.6	54.0	47.6	46.9	43.7	56.0	49.2	39.8	38.4
Administrative and waste management	113.5	107.6	144.1	126.2	35.3	51.8	135.8	126.9	45.7	50.7
Education, health care and social assistance	99.4	95.9	102.0	98.0	85.3	87.9	97.6	94.7	111.5	107.8
Arts, entertainment, and recreation	39.6	39.0	49.4	47.9	45.6	49.6	49.7	48.9	44.8	46.5
Accommodation and food services	74.1	72.2	85.2	78.8	55.5	68.4	86.0	80.2	53.3	63.1
Other services (except public admin)	145.3	143.8	181.6	178.3	34.0	35.6	166.1	168.8	52.4	46.4
Business Sector	77.3	72.1	75.4	68.5	106.8	113.3	75.1	69.6	107.7	109.1

Table 12
Bilateral Industry PPPs between Canada and the United States, 2002 ($CAN/$U.S.)

	Value Added	Total capital	M&E	Structures
Agriculture, forestry, fishing, and hunting	1.74	1.28	1.48	0.94
Mining	2.16	1.06	1.36	0.86
Oil and gas extraction	2.16	1.05	1.37	0.85
Mining, except oil and gas	2.16	1.04	1.27	0.86
Utilities	1.32	1.16	1.42	0.93
Construction	0.72	1.35	1.47	1.04
Manufacturing	1.37	1.49	1.45	1.03
Wood products	1.46	1.46	1.52	1.04
Non-metallic mineral products	1.14	1.52	1.51	1.04
Primary metals	1.52	1.56	1.57	1.04
Fabricated metal products	1.78	1.54	1.62	1.05
Machinery	1.27	1.44	1.46	1.04
Computer and electronic products	1.67	1.38	1.30	1.05
Electrical equipment	1.62	1.41	1.29	1.05
Transportation equipment	1.39	1.46	1.55	1.05
Furniture and miscellaneous manufacturing	1.74	1.51	1.53	1.04
Food, beverage, and tobacco products	1.28	1.46	1.54	1.05
Textile mills and textile product mills	1.79	1.46	1.53	1.05
Apparel and leather and allied products	2.15	1.46	1.43	1.05
Paper products and printing	1.22	1.41	1.36	1.04
Petroleum and coal products	1.57	1.37	1.59	0.97
Chemical products	1.11	1.41	1.64	1.03
Plastics and rubber products	1.26	1.51	1.59	1.05
Wholesale trade	1.07	1.29	1.24	1.03
Retail trade	1.10	1.32	1.37	1.02
Transportation and warehousing	0.97	1.26	1.47	0.97
Information	1.30	1.21	1.21	1.00
FIRE and management of companies	1.20	1.28	1.22	1.04
Professional, scientific and technical services	1.37	1.14	1.07	1.02
Administrative and waste management	0.96	1.12	1.07	1.02
Education, health care and social assistance	1.22	1.17	1.23	1.03
Arts, entertainment, and recreation	1.79	1.11	1.32	1.03
Accommodation and food services	1.21	1.12	1.28	1.03
Other services (except public admin)	0.63	1.08	1.27	1.03
Business Sector	1.17	1.17	1.38	0.99

Source: Hao *et al* (2008).