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Productivity Performance of Canadian Industries Relative to Their U.S. Counterparts: Consistent Estimates

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Abstract

The objective of this paper is to provide consistent and up-to-date Canada-U.S. gap estimates for capital intensity, labour productivity and multifactor productivity (MFP) across major industries in the period 19987-2008. For this purpose, it develops capital stock estimates for Canadian and U.S. industries using the same (either U.S. Bureau of Economic Analysis or Statistics Canada) depreciation rate for the two countries. The results show that Canadian industries invested more in structure capital assets but less in machinery and equipment (including information and communications technologies) than their U.S. counterparts. In addition, it is found that Canada's weak labour productivity performance in the post-2000 period compared to the pre-2000 period as well as relative to the U.S. was a result of weaker MFP performance. Finally, it demonstrates that Canada's labour productivity and MFP problem relative to the U.S. has worsened since 2000 and has been pervasive across all major industries.

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1. Introduction

The United States (U.S.) 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 U.S. Available estimates suggest Canada's labour productivity level is considerably below the U.S. level and the gap has widened a great deal since 2000 (Lee and Tang, 2000; Hao, et al, 2008; Baldwin, Gu and Yan, 2008). The research also suggests that Canada's labour productivity gap is broad-based across major Canadian industries, and is the result of multi-factor productivity (MFP) (innovation) gap.

For undertaking the Canada-U.S. MFP comparisons and understanding well the reasons for Canada's weak/superior MFP performance in each industry, we need comparable and consistent estimates of capital stock by industry in the two countries. The Statistics Canada depreciation rates, which are the underlying parameters in estimating capital stock, are in general significantly higher than those used by the Bureau of Economic Analysis (BEA) for U.S. industries (Table 1). Canadian rates are particularly larger for engineering and structures capital. If we use the "official" capital stock data from Statistics Canada and BEA for estimating MFP growth and level comparisons between the two countries, we would overestimate Canada's relative MFP levels and underestimate the contribution of capital intensity gap to the Canada-U.S. labour productivity gap.

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

(1) Why the current official capital stock data cannot be used for undertaking Canada-U.S. industry capital intensity and MFP comparisons? In other words, what are the consequences of using official capital stock data for the Canada-U.S. comparisons?
(2) How the Canada-U.S. industry capital intensity comparisons are impacted when we use either Canadian or U.S. depreciation rates for estimating capital stock data in the two countries?
(3) How do Canadian industries perform relative to their U.S. counterparts in terms of MFP (growth rates and levels) with comparable and consistent estimates of capital stock data?

Note that this paper does not make any attempt to justify or favor either Statistics Canada or BEA depreciation rates for estimating capital stock series. Instead, it compares Canada's performance in capital intensity as well as productivity using both Statistics Canada and BEA depreciation rates in the two countries.

The plan of the paper goes as follows. In the next section, section 2, we use consistent and comparable methodology in estimating capital stock at the industry level in both Canada and

the U.S., and then compare them to the official estimates. In sections 3 and 4, we estimate Canada's MFP growth and level at the industry level, with a comparison to the U.S. The concluding section, section 5, summarizes the key findings of the paper and discusses their research and policy implications.

2. 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 this paper deals with only non-residential machinery and equipment (M&E) capital and structures capital (building construction and engineering construction). It excludes owner-occupied dwellings and does not deal with inventories and non-depreciable land.

2.1. The Perpetual Inventory Method

Capital stock is commonly estimated using the perpetual inventory method

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

where I^a_{jt} is the 2002 chained Fisher dollar investment in asset a of industry j at year t,
δ^a_{jt} 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 suggests that the level of capital stock is sensitive to the depreciation rate, which depends on the aging profile of the asset. The BEA has been following the geometric pattern, which predicts that the asset depreciates faster in the early years of its 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 assets) (e.g., Hulten and Wykoff (1996) for U.S. 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 U.S., the BEA generally uses a declining rate of 1.65 for M&E asset and 0.9 for structures. Before 2006, Statistics Canada more or less followed the BEA geometric depreciation method and produced Canada's capital stock estimates, which were fairly comparable to the BEA capital stock estimates. After November 2006, however, Statistics Canada has followed the new geometric depreciation rates that are estimated by Statistics Canada (2007).[1] 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 assets.

[1] This study is based on a Canadian micro database on the purchase and disposal of capital goods from Statistics Canada's Capital Expenditure Survey, which contains 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).

Table 1 reports the Statistics Canada new depreciation rates and the implicit BEA depreciation rates for 28 Canadian 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% v.s. 21%), while are significantly higher for building and engineering construction (8% v.s. 3%).

Because of the substantial difference in depreciation rates between Canada and the U.S., the official capital stock estimates, especially in terms of levels, are not comparable between the two countries. To resolve this incomparability problem, this paper in the remaining of section 2 uses the same depreciation rates, either from Statistics Canada or BEA, to estimate capital stock for both Canada and the U.S.

2.2. Capital Data Sources and Industry Details

We first discuss the data sources for the new estimation. The investment data used in generating the estimates of non-residential capital stocks 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 over 1961 to 2008 for 175 assets. To simplify our analysis, we aggregate the 175 assets into 28 asset types that correspond to the asset types in Table 1.

The investment data for estimating non-residential capital stock in the United States are provided by the BEA.[2] These data contain investment at the NAICS industry level for 47 assets over the period of 1901 and 2007. For a comparison purpose, we also 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 U.S., 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 single or combined 2-digit NAICS level (Table 2). For the mining and manufacturing sectors, we further divide them, respectively, into 2 and 16 industries at single or combined 3-digit NAICS level. The classification is mainly driven by complying with Statistics Canada confidentiality constraints. In this paper, all industries include private as well as non-private activities (if applicable).[3] 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. For simplicity, we refer this aggregate as business sector in the discussion.

It is interesting to note that the value added share for mining in the business sector in Canada was 11.8% in 2008 while its hours worked share was only 1.7%.

[2] http://www.bea.gov/national/FA2004/Details/Index.html

[3] For instance, public portion of water treatment is included in utilities and public education and health are in education, health and social assistance. Note, however, this paper excludes owner-occupied dwellings from FIRE and management of companies.

2.3. Alternative Estimates of Capital Stock

In this sub-section, we first compare and discuss Canadian capital stock estimates using Statistics Canada current depreciation rates versus BEA depreciation rates. We then compare Canada's capital intensity, defined as capital stock per hour worked, relative to the 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.[4] 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).[5] M&E contains ICT and total capital includes both M&E and structures.

As expected, Canada's total capital stock based on Statistics Canada depreciation rates is 59% of Canada's total capital stock estimates using BEA depreciation rates, almost 40% difference. 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.

The use of different depreciation rates in estimating capital stock also affects the growth of capital stock, as shown in Table 4. But, the growth difference is relatively smaller than the level difference. On average, the growth rate of capital stock based on Statistics Canada depreciation rates is higher than the one based on BEA depreciation rates. For instance, over the period 1987-2008, the growth rate of total capital stock under Statistics Canada depreciation rates is 2.6 versus 2.2 under BEA depreciation rates. At the industry level, there are 10 industries whose total capital stocks grow faster under Statistics Canada depreciation rates compared to 6 industries whose total capital stocks grow faster under BEA depreciation rates. Similar pictures emerge for M&E or structure capital.

Canada-U.S. Capital Intensity Level Comparisons

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[4] To apply the perpetual inventory method, we estimate Canadian capital stock using the historical investment from 1961-2008 with initial capital stock estimated as $K_{i,0} = \frac{I_{i,0}}{g_i - \delta}$, where $I_{i,0}$ is the value of investment in asset i in the year of 1961 with depreciation rate δ and average growth rate g_i between 1961 and 1995. For the United States, capitals 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 analyzed in this project.

[5] 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.

Investment in physical capital gives workers more machines and tools to use, which increases labour productivity. Machinery and equipment also embody advanced 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 U.S. when different depreciation rates are used.

We first compare capital intensity, which is PPP-adjusted and defined as capital stock per hour worked, between Canada and the U.S., when capital stock in Canada and the U.S. are estimated using their corresponding "official" depreciation rates.[6] Under this scenario of comparison, the results show that Canadian industries are significantly under-invest relative to their U.S. counterparts in all types of assets (Table 5). For the business sector as a whole, Canada's capital intensity in the period 2000-2007 was 65% of the U.S. level for total capital, 53% for M&E capital, and 77% for structure capital. At the industry level, the ratio for total capital ranges from as little as 17% (apparel and leather) to 84% (mining excluding oil and gas extraction). We believe that the substantial low capital intensity for Canada relative to the U.S. is artefact, due to the substantial different capital depreciation rates used for estimating capital stock in the two countries. Importantly, as we discussed in section 4.2., the comparison under this scenario will implicitly imply that most of Canadian industries will be more productive (in MFP) than their U.S. counterparts, a result that counters against well-established facts that Canada is lagging the U.S. in innovation (e.g., R&D) and investment in technology that are believed to be the driving forces of MFP improvement (the Expert Panel on Business Innovation, 2009).

To eliminate the artefact of the above comparison between Canada and the U.S., we need to use comparable depreciation rates for estimating capital stock for the two countries. In this paper, 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 U.S. over the period 2000-2007.[7] The composition of the total capital in the Canadian business sector is, however, different from its U.S. counterpart. Compared to the U.S., Canada has less M&E capital and more structures capital. In fact, over the period of 2000-2007, Canada's M&E capital intensity is on average about 75% of the U.S. level while its structure capital intensity is 55% higher.[8]

[6] The purchasing power parities (PPPs) for ICT capital are not available so for the analysis in this paper, we apply M&E PPPs to ICT capital. This is based on the fact that ICT capital in Canada accounts for about 25% of M&E capital. PPP related measurement issues are discussed in Appendix C.

[7] Data on hours worked for Canada is from Statistics Canada and for U.S., they are from Bureau of Labour Statistics. Again, these numbers include both private and non-private activities for each industry (for more discussion, see Appendix B).

[8] Note also that the intensity gap between Canada and the U.S. is more pronounced for ICT capital. It was about 50% over the analysis period.

Note also that Canada's capital intensity decreased relatively to the U.S. 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 investment in M&E capital; the M&E capital intensity decreased from 91% of the U.S. level in the period 1987-99 to 75% 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 U.S. ranged from the lowest level of 34% in other services to the highest level of 166% in wood products. For M&E capital intensity, it ranged from 28% (accommodation and food services) to 170% (wood products), and for structure capital intensity, it ranged from 27% (other services) to 355% (petroleum and coal products).

Similar pattern emerges 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 is almost one for both periods. However, despite the high correlation and very similar estimates for relatives in total capital and structure capital, Canada's M&E capital intensity levels relative to the U.S. levels under Statistics Canada depreciation rates are about 20% higher than those under BEA depreciation rates. 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 to using BEA depreciation rates can lead to a higher or lower level of capital intensity for Canada relative to the U.S. 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 U.S., the 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 between 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 U.S. after the switch since the difference in depreciation rates between Statistics Canada and BEA is not homogenous within M&E or structure asset groups.

3. 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 arising from using different capital stock estimates in the remainder of this paper. We proceed with a brief 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 growth of industries. This framework 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, value added output is a trans-log function of capital and labour, as well as time as an index of technology for each industry.[9] Under the assumption of constant returns to scale and competitive product and factor markets, the translog index of MFP growth for industry *i* is:

$$(1) \qquad \Delta \ln MFP_i = \Delta \ln LP_i - \bar{v}_{k,i} \Delta \ln k_i \ ,$$

where LP_i is labour productivity (value added per hour worked), k_i is capital intensity (capital stock per hours worked), $\Delta \quad = \quad - \quad$ for all variables, and $\bar{v}_{k,i}$ is the two-period average capital income share of value added, and where the sum of income shares for capital and labour equals one under the assumption of constant return to scale. Capital here is the total capital stock, including M&E and structures.

This means that MFP growth is equal to labour productivity growth minus contribution from changes in capital intensity. The change in capital input intensity is often referred to as "capital deepening". Under this framework, the change in MFP is measured as the residual of labour productivity net contributions from capital deepening. [10]

3.1. Labour Productivity Growth in Canada and the U.S.

We first discuss labour productivity growth of Canadian and U.S. industries (see Appendix B 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 in the Canadian business sector grew 0.8% per year, 0.4 percentage points slower than the previous period 1987-2000. In contrast, labour productivity growth in the U.S. business sector accelerated from 1.8% in 1987-2000 to 3.2% in 2000-2008.

At the industry level, the industry with fastest labour productivity growth in Canada over the whole sample period was computer and electronic product manufacturing industry (4.6% per year).[11] The industry is commonly referred as information and communication technology (ICT) manufacturing industry. It was followed by primary metal manufacturing (4.4%) and agriculture, forestry, fishing and hunting (3.2%). In the U.S., the fastest growth industry is also the ICT manufacturing industry (22.6%), followed by the information services (5.5%).

[9] The framework is commonly used under the gross output concept. In this paper, we use value added output concept mainly because we have up-to-date and comparable data for both Canada and the U.S.

[10] 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 unmeasured input quality (such as labour quality) and inputs (such as managerial talent and organizational structure), and measurement errors (in both output and inputs).

[11] Note that for the disaggregated industries under mining and manufacturing sectors, the data are only up to 2007.

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%) while in the U.S., it was construction (-1.8%).

Over the two sub-periods, labour productivity growth accelerated in most of services industries (eight out of the 11 Canadian services industries) while all goods producing industries experienced a decline in labour productivity growth. The largest slowdown was in computer and electronic manufacturing, a 13.0 percentage points decline. This is followed by a 12.7 percentage points decline in oil and gas extraction. In the U.S., there were 11 goods producing industries and all services industries experienced an increased labour productivity over these two periods. The mining and computer and electronic manufacturing industries in the U.S. also experienced a larger decline in labour productivity growth, but the magnitude (less than 7 percentage points) is much small than in Canada.

In the post-2000 period, only five industries (agriculture, forestry, fishing and hunting; mining (excluding oil and gas extraction), construction, primary metal manufacturing, and other services) had higher labour productivity growth in Canada than in the U.S.; all other industries had a slower labour productivity growth. The largest growth gap between Canada and the U.S. was in computer and electronic product manufacturing industry at 23 percentage points.

The finding of pervasive slowdown across Canadian industries in labour productivity growth in the post-2000 period and the widening gap with U.S. are similar to other studies (e.g., Hao, et al, 2008).

3.2. MFP growth in Canada and the U.S.

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

Table 9 reports industry MFP growth estimates for Canada and the U.S. with capital stock based on both Statistics Canada and BEA depreciation rates. The two sets of MFP growth estimates are generally similar, as indicated by the high correlation coefficients between the two sets of estimates (0.99 for Canada and 1.00 for the U.S.) and the estimates for the business sector are very similar. This implies that a MFP growth comparison between Canada and the U.S. based on the "official" capital stock estimates are not unreasonable, especially at the aggregate level.

At the industry level, for some industries, the difference in the two MFP estimates can be relatively large. For example, when capital stock are based on Statistics Canada depreciation rates, the MFP estimate for Canada's administrative and wage management industry is more

than 0.9 percentage points lower than the estimate when capital stock is based on BEA depreciation rates. For the U.S. petroleum and coal product manufacturing industry, the 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 in many industries over the two periods 1987-2000 and 2000-2007. In contrast, MFP significantly improved in the U.S. over the two periods. As a result, there is a substantial MFP growth gap (about 1.5 percentage points) between Canada and the U.S. in the post-2000 period.

Despite the general picture that is in favour of the U.S., some Canadian industries outperformed their U.S. counterparts in some periods. Over the post-2000 period, the MFP growth rate was significantly higher in Canada than in the U.S. 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), it shows that the slowdown in labour productivity growth in Canada between pre-2000 and post-2000 periods as well as the growth gap in labour productivity between Canada and the U.S. in the post-2000 period is mainly due to a weaker MFP performance in Canada. The result holds for the aggregate business sector as well as for most of the Canadian industries.

4. Canada-U.S. Productivity Level Comparisons

Productivity growth is an important indicator for improvement in production efficiency and international competitiveness of a Canadian industry when it is compared to the performance of the counterpart in the U.S., but it does not reveal how productive the Canadian industry is relative to its counterpart in the U.S. at a point of time. This section addresses this issue.

We first setup the framework for the analysis. As in Jorgenson and Nishimizu (1978), our theoretical framework for MFP level comparisons between Canada and the United States is based on a trans-log production function, originally introduced by Christensen, Jorgenson and Lau (1971, 1973). In this framework, value added output is a trans-log function of capital and labour, as well as a dummy variable equal to one for Canada and zero for the United States, and time as an index of technology for each industry.

From the production function, Jorgenson, Kuroda and Nishimizu (1995) and Christensen, Cummings and Jorgenson (1995) 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 value added, less the differences between the logarithms of capital intensities in the two countries:

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

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 United States for the i^{th} industry.

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

Thus, 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 the capital intensity.

4.1. 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, the benchmark year with PPPs, 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 percent of the U.S. level, or a 28 percent gap between the two countries. The gap widened from 23 percent in 2002.

The widening gap is pervasive across industries. 28 out of the 32 industries experienced a widening gap over this period. In 2007, Canada had higher labour productivity level than the U.S. 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 U.S. substantially (more than a 20% labour productivity level gap) in 17 industries. The largest gap is in computer and electronic products manufacturing industry at 78%. The unprecedented gap 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 year in Canada, compared to 23.2% per year in the U.S.[12]

[12] We are conducting a case study of this industry to see if the difference in industry structure between Canada and the U.S. is a major cause of the substantial difference in labour productivity growth between the two countries.

4.2. Canada-U.S. MFP Levels Comparisons

For Canada and U.S. MFP comparison, we first calculate Canada's MFP levels relative to the U.S., 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 and 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 U.S., much better than the case in labour productivity. Canada's MFP level was 85% of the U.S. level in 2007, declined from 92% in 2002. In 2007, most 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 as well as its U.S. counterpart. Although the numbers look good, they fail a reality check. It is well-established that Canada are considerably underperformed compared to the U.S. in R&D, investment in technology (measured as investment in M&E or ICT as percentage of GDP) and educated worker force (The Expert Panel on Business Innovation, 2009). Given these evidence, it seems to be reasonable to conclude that the official capital stock estimates for Canada and the U.S. are not comparable and 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 for both countries. The estimated relative MFP levels by industry with capital stock 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. The MFP level estimates and their trend development are also generally similar to those for labour productivity. In 2007, the Canada-U.S. MFP gap in the total business sector was 30 percent. Thus, the MFP gap was entirely responsible for the Canada-U.S. business sector labour productivity gap. This is confirmed by the fact that the capital intensity in Canada was slightly higher than that in the U.S. in this year.

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 primary metal manufacturing industry is 26 percentage points higher than that based on Statistics Canada depreciation rates. Similarly, it was 23 percentage points higher for petroleum and coal manufacturing industry. On the other hand, it was 19 percentage points lower for agriculture, forestry, fishing and hunting and 10 percentage points lower for other services. As discussed in section 2.3, this is mainly driven by difference in asset composition at the industry level and between the two countries.

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

In 2007, Canada was less productive than the United States in 21 of the 32 industries. In particular, Canada was considerably less productive (20% gap or more) than the U.S. in 14 industries. As for labour productivity, the industry with the largest MFP level gap is the

computer and electronic products manufacturing industry (75%), followed by mining (except oil and gas extraction) (64%). On the other hand, Canada was significantly more productive than the United States in eight industries, including construction, wood products, non-metallic mineral products, primary metals, machinery, wholesale trade, administrative and waste management, and other services. Canada is also equally productive compared to the U.S. in oil and gas extraction; transportation equipment; food, beverage, and tobacco products; transportation and warehousing; education, health and social assistance.

5. Conclusion

The main objective of this paper has been to provide consistent estimates of capital stock data, to undertake Canada-U.S. industry capital intensity and MFP comparisons. The following are the key findings from this research:

- Use of "official" capital stock series data from Statistics Canada for Canada and BEA for the U.S. do not provide reliable Canada-U.S. level comparisons for capital intensities and MFP across industries.

- Canada-U.S. capital intensity and MFP level comparisons should use capital stock data based on either Statistics Canada or BEA depreciation rates for both countries.

- Canadian industries invested more in structure capital assets but less in machinery and equipment (including information and communications technologies) than their U.S. counterparts.

- In 2007, Canada's business sector labour productivity level was about 30% below the U.S. level. The gap widened significantly from 2002.

- Canada's labour productivity problems are pervasive across major Canadian industries.

- The labour productivity level gaps as well as the widening gaps overtime across Canadian industries are primarily due to the MFP level gaps.

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

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Appendix A: Capital Stock Estimation for Canada and the U.S.

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.[13] 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 $a = (1,2,...,n) \in$.

$$PK_{ijt} = \sum_{a} PK^{a}_{ijt},$$

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:

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

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

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

where K^{a}_{ijt} represents the Fisher quantity of capital stock of industry j in sub-asset a , where $a \in$ 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:

[13] We apply the same methodology to take capital stock aggregation across industries.

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

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 $IND = (1,2,...,I) \in$
$PK_{ijt} = \sum_{IND} PK_{ijt}^{IND}$.

Appendix B: Value Added and Hours Worked by Industry in Canada and the U.S.

In this Appendix, we discuss the Canadian and U.S. data sources for value added and hours worked at the industry level.

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. But, 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 U.S., the value added data are from 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 costs, using information on net indirect taxes on both products and production that are also from BEA.

Hours worked

For both Canada and the U.S., 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 U.S., they are from Bureau of Labour Statistics.

Appendix C: 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 differences in the two countries. The use of the market exchange rate is not desirable since it is highly volatile and subject to speculation and will lead to unreliable and misleading estimates for country comparison across industries.

The 2002 PPP estimates for value added from Hao, et al (2008). For capital, we derive 2002 capital PPPs from 1999 investment PPPs estimates for total capital, M&E and structures 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 C1.

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

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

Table 2: Business Sector Industry Classification

NO.	Industry	NAICS Codes	Share in Canada (%), 2008	
			Value Added	Hours Worked
1	**Agriculture, forestry, fishing, and hunting**	11	1.9	2.8
2	**Mining**	21	11.8	1.7
2.1	Oil and gas extraction	211	9.1	0.5
2.2	Mining, except oil and gas	212 & 213	2.7	1.1
3	**Utilities**	22	2.7	0.9
4	**Construction**	23	7.7	9.1
5	**Manufacturing**	321-339	13.6	12.3
5.1	Wood products	321	0.6	0.8
5.2	Non-metallic mineral products	327	0.5	0.5
5.3	Primary metals	331	1.1	0.5
5.4	Fabricated metal products	332	1.2	1.3
5.5	Machinery	333	1.1	0.9
5.6	Computer and electronic products	334	0.6	0.6
5.7	Electrical equipment	335	0.3	0.3
5.8	Transportation equipment	336	1.6	1.4
5.9	Furniture and miscellaneous manufacturing	337 & 339	0.8	1.0
5.10	Food, beverage, and tobacco products	311 & 312	2.2	1.6
5.11	Textile mills and textile product mills	313 & 314	0.1	0.2
5.12	Apparel and leather and allied products	315 & 316	0.1	0.4
5.13	Paper products and printing	322 & 323	1.2	1.2
5.14	Petroleum and coal products	324	0.5	0.2
5.15	Chemical products	325	1.2	0.7
5.16	Plastics and rubber products	326	0.6	0.8
6	**Wholesale trade**	41 or 42	6.3	6.0
7	**Retail trade**	44-45	6.2	10.9
8	**Transportation and warehousing**	48-49	5.1	5.9
9	**Information**	51	4.1	2.6
10	**FIRE* and management of companies**	52-53, 55	12.2	7.2
11	**Professional, scientific and technical services**	54	5.7	6.9
12	**Administrative and waste management**	56	3.0	5.0
13	**Education, health and social assistance**	61-62	13.4	14.8
14	**Arts, entertainment, and recreation**	71	1.0	1.9
15	**Accommodation and food services**	72	2.5	6.1
16	**Other services (except public admin)**	81	3.0	5.9
	Business sector	11-81	100.0	100.0

*FIRE stands for Finance, Insurance, Real Estate, Rental and Leasing.
Source: Statistics Canada

Table 3: The Ratio of Canadian Capital Stock with the Statistics Canada Depreciation Rates to Those 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: Growth Rate of Canadian Capital Stock Based on Statistics Canada and BEA Depreciation Rates, 1987-2008

	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 U.S.)

	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 U.S., 1987-2008*

	Canada			U.S.		
	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**	**1.5**	**3.1**
Mining	**2.1**	**-3.9**	**-0.3**	**3.0**	**-3.6**	**0.4**
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**	**4.2**	**3.9**
Construction	**0.1**	**-0.5**	**-0.1**	**-0.8**	**-3.3**	**-1.8**
Manufacturing	**3.2**	**0.9**	**2.3**	**4.0**	**4.9**	**4.3**
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**	**5.5**	**4.4**
Retail trade	**1.5**	**3.4**	**2.2**	**3.6**	**7.8**	**5.2**
Transportation and warehousing	**1.0**	**0.0**	**0.6**	**2.3**	**2.8**	**2.5**
Information	**2.7**	**3.0**	**2.8**	**3.1**	**9.7**	**5.5**
FIRE and management of companies	**1.5**	**1.2**	**1.4**	**1.9**	**3.1**	**2.4**
Professional, scientific and technical services	**1.2**	**0.3**	**0.8**	**0.9**	**3.5**	**1.9**
Administrative and waste management	**-1.1**	**0.2**	**-0.6**	**-0.6**	**2.5**	**0.6**
Education, health care and social assistance	**-2.2**	**0.5**	**-1.2**	**-1.9**	**0.9**	**-0.9**
Arts, entertainment, and recreation	**-2.0**	**-0.9**	**-1.6**	**0.2**	**3.2**	**1.4**
Accommodation and food services	**0.5**	**1.0**	**0.7**	**0.6**	**2.5**	**1.3**
Other services (except public admin)	**0.7**	**1.3**	**0.9**	**-0.8**	**0.9**	**-0.2**
Business Sector	**1.2**	**0.8**	**1.0**	**1.8**	**3.2**	**2.4**

*1987-2007 for U.S. disaggregated mining and manufacturing industries.

Table 9: MFP Growth in Canada and the U.S., 1987-2007

	StatCan Depreciation Rates				BEA Depreciation Rates			
	Canada		U.S.		Canada		U.S.	
	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 U.S.)

	LP		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)
(Same capital depreciation rates for both countries)

	LP		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 C1: Bilateral Industry PPPs between Canada and the U.S., 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).