

Industrial Structural Change and the Post-2000 Output and Productivity Growth Slowdown: A Canada-U.S. Comparison

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ABSTRACT

Changing foreign and domestic supply and demand conditions have resulted in shifting industrial structures in the Canadian and U.S. economies. This article examines the contribution of individual industries to real GDP and labour productivity growth in the business sector in 1987-2000 and 2000-2008 in the two countries. It highlights the differences that have emerged through a new decomposition technique that is able to decompose real GDP expressed in chained dollars instead of constant dollars. The contribution of each industry is further decomposed in order to identify the role of quantity and price effects in real economic growth and pure productivity and shift effects in the case of labour productivity. This decomposition is able to more precisely identify the sectors and the underlying forces that have either propelled or hindered economic and productivity growth.

RÉSUMÉ

L'évolution de la situation de l'offre et de la demande au Canada et à l'étranger a entraîné des changements dans la structure industrielle des économies canadienne et américaine. Cet article présente le calcul de la contribution d'industries particulières à la croissance du PIB réel et de la productivité du travail dans le secteur des entreprises au Canada et aux États-Unis pour les périodes de 1987 à 2000 et de 2000 à 2008 au moyen d'une nouvelle technique de décomposition. Cette technique fait appel aux dollars enchaînés plutôt qu'aux dollars constants pour estimer le PIB réel. La contribution de chaque industrie au PIB réel se décompose ensuite selon la quantité et les répercussions sur les prix et leur contribution à la croissance de la productivité se décompose selon la pure productivité et les répercussions sur les changements. Cette technique permet de cerner précisément les secteurs et les forces sous-jacentes ayant alimenté ou freiné la croissance de l'économie et de la productivité.

THE INDUSTRIAL STRUCTURE of the Canadian and U.S. economies have each been in a prolonged period of evolution that has become even more pronounced in the wake of the 2008

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Summary Table: Hours Worked, Output, and Labour Productivity Growth in the Canadian and U.S. Business Sectors, 1987-2008

(average annual growth rates)

	1987-2000		2000-2008		1987-2008	
	Canada	United States	Canada	United States	Canada	United States
Hours Worked	1.66	1.78	1.49	0.02	1.60	1.11
Output	2.87	3.60	2.30	2.03	2.70	3.00
Labour Productivity	1.18	1.79	0.79	2.02	1.04	1.88

financial crisis and subsequent economic downturn that a number of journalists have taken to calling “The Great Recession”.² While the two firmly interconnected economies face a host of similar internal trends (such as the declining share of the labour force concentrated in primary and secondary industries) and external pressures (the increasing competitive pressures from emerging markets among them), the reactions and adjustments of various industries have not necessarily been of uniform direction and magnitude on both sides of the border.³

Canada’s business sector has generally underperformed its U.S. counterpart in two key (and related) economic indicators over the past two decades: real gross domestic product (GDP) growth and aggregate labour productivity growth (see Summary Table).⁴ In order to understand the driving forces behind what appears to be divergent performances of two highly integrated economies, it is not enough to merely know that the Canadian business sector has underperformed, but becomes necessary to

identify the sources of growth in both countries. To that end, we analyse the industry contributions to real GDP growth and to aggregate labour productivity growth in Canada and the United States from 1987 to 2008. We also compare and contrast the results in order to identify which industries are more important as sources of growth and to better understand the shift in the composition of the two economies.

The de-industrialization of advanced economies has been a well-publicized trend in the postwar period, with the share of the economy accounted for by manufacturing and primary industries diminishing over the decades as more and more economic activity occurs in service-producing industries.⁵ Caves (1980) has shown that the growth in the demand for goods is outpaced by the growth in the demand for services as economic gains lead to rising real incomes, but the recent acceleration of this trend likely has more to do with the unbalanced foreign and domestic supply and demand conditions that have emerged in recent years. This lack of bal-

2 There remains some debate about the accuracy of this particular moniker, especially as it applies to the Canadian economy as a whole. The Canadian economy, with the exception of the manufacturing sector, experienced a relatively mild recession when compared to other major industrialized economies. However, the label is too convenient a short-hand for the period and altogether too evocative of the perceptions prevalent at the time to not make use of it.

3 The influence of the U.S. economy on the Canadian economy, through trade and foreign direct investment (FDI), is much larger than other economies. For example, Ng and Souare (2010) shows that only FDI originating from the U.S. generates positive productivity spillovers to Canadian-owned firms in industries in which it operates, which may reflect U.S.-owned firms’ superior technological knowledge and management practices.

4 Note, however, that real GDP in Canada grew at an average annual rate of 1.9 per cent in the past decade (2000-2010), which was better than the growth rate of 1.7 per cent in the United States.

5 This does not mean that these industries are shrinking in absolute terms, but rather that their share of the total economy is contracting.

ance results in uneven changes in the relative price of real output and that, in turn, leads to an adjustment in how production resources are allocated across industries. A simplified model of the economy developed by Baumol (1967) suggested, at its core, that resources will be absorbed predominantly by “stagnant” industries and have a downward impact on the overall labour productivity growth rate of the economy. It should be noted that this particular result, often called “Baumol’s cost disease,” is still subject to rather vigorous dispute and discussion (Nordhaus, 2006).

In order to best capture this facet of the conversation, the decompositions of industry-level contributions for both real GDP and labour productivity growth are conducted using a decomposition method developed by Tang and Wang (2004, 2010).⁶ We feel that this particular framework is the most appropriate way to decompose industry-level contributions due to its ability to effectively utilize the implicit information inherent in the chain-Fisher index method of computing real economic activity, while simultaneously preserving the additivity feature of traditional decompositions that use fixed-weight real GDP.

In the case of real GDP growth, this decomposition technique allows us to identify how much of the contribution to growth stems from the quantity effect and how much from the price effect. The use of the chain Fisher index to con-

struct real GDP, as is done by both the Canadian and U.S. statistical agencies,⁷ results in the inclusion of the value of production as well as the real quantity of products or services produced in the economy in real GDP, but it also results in a loss of additivity to real GDP, increasing as one moves away from the base year.⁸ As a result, most traditional decompositions eschew the chain Fisher index method of calculating real GDP because of the additivity issue and instead use the Laspeyres index fixed-weight method. Industry-level outputs over an entire observation period are therefore evaluated at their output prices in the base year and ignore any relative price effect. A consequence of this choice, however, is that the importance of industries that have experienced declining output prices will be overemphasized and, conversely, industries with increasing prices will be underemphasized.

Therefore, traditional methods of decomposition are likely to misestimate the contribution of industries to real GDP growth and labour productivity growth (see Jorgenson and Stiroh, 2000; Stiroh, 2002; Faruqui *et al.*, 2003; Jorgenson, 2004; Ho, Rao, and Tang, 2004; and Sharpe and Thomson, 2010). Moreover, the trend in aggregate real output is particularly sensitive to the base year, with similar periods of decomposition able to provide conflicting results if different base years are selected. This problem may become particularly acute if there are significant

6 The decomposition in Tang and Wang (2004) is based on value added, while in Tang and Wang (2010) it is based on gross output, which allows the latter to engage in further discussion of the impact of intermediate inputs or outsourcing on economic growth.

7 For an excellent discussion of the chain Fisher index and its merits over the fixed-weight Laspeyres quantity index, see Ehemann, Katz, and Moulton (2002) or Whelan (2002). Three of the most commonly used index number formulas are the Laspeyres, the Paasche and the Fisher formulas. A Laspeyres quantity index formula uses the base period’s prices as weights, and the Paasche formula uses current prices as weights. The Fisher quantity index formula is the geometric mean of the Laspeyres and the Paasche indexes. These formulas can be either of the fixed base or the chained variety. As the name implies, a fixed base formula uses the relative price structure of the base year or the current year as weights. A chained formula, however, has no fixed base period, but rather takes into account weights from two successive periods.

8 Real GDP based on the chain Fisher index is thus not a quantity concept and it is influenced by both value and quantity of products or services produced in an economy. Additivity means that the sum of real value added over industries equals total real GDP.

technological advances over the period that result in sharp declines in output prices for an industry relative to the total economy, as has been observed of information and communication technologies, particularly over the 1990s and 2000s.⁹

The framework developed by Tang and Wang allows us to take advantage of the relative weighting of goods and services in real GDP that arises from the natural valuation of output made by producers and consumers. Consequently, it captures some of the forces that may be causing a shift in the industrial structure of the business sector and avoids the pitfalls outlined above. The incorporation of the price effect in measuring industry-level contribution to real GDP (and, by extension, labour productivity) is consistent with Diewert (2008) and with the economic approach outlined by Diewert (2002).¹⁰

In the case of real GDP growth, this means that an industry contributes through two separate streams: real output and output price. For example, if demand for the products of an industry increase, it will likely result in a positive contribution through both streams. Relative output prices will increase to reflect higher demand, resulting in a positive price effect, and will likely spur the industry to increase output, thus resulting in a positive output effect. This is explored in section three, which details the decomposition technique for real GDP growth by industry in the business sector.

Like real GDP growth, industry-level contributions to aggregate labour productivity growth in Canada and the United States can be identified as belonging to two distinct sources: a pure productivity effect and a shift effect. The contribution from the pure productivity effect is due to productivity growth within the industry, while the shift effect stems from the reallocation of production resources and the change in output valuation across industries with differing productivity levels. Thus, the shift effect here captures the change in the “economic significance” of industries in terms of resource use and output valuation. It differs from the reallocation effect by which the traditional terminology only means the effect from the reallocation of production resources. The methodology and results of the decomposition of aggregate business sector labour productivity are explained in more detail in section four.

Using this more detailed technique, we decompose real GDP growth and aggregate labour productivity growth for Canada and for the United States over the 1987-2000 and 2000-2008 periods into their component industry-level contributions and further separate that contribution into the aforementioned effects.¹¹ This level of detail allows us to not only identify the individual role of each industry in the aggregate performance of the Canadian and U.S. business sector, but also to better understand the nature of the forces driving that performance.

9 As Whelan (2002) stated, “...researchers need to be particularly aware of the implications of chain aggregation when assessing the role of information technologies in the U.S. economy. Prices for high-tech products have fallen rapidly relative to other components of GDP and chain aggregates differ most from their traditional fixed-weight counterparts when there are large shifts in the relative prices of their components. Without taking care to handle aggregate series in a manner consistent with their construction, it is easy to mistakenly assign too important a role to the high-tech sector in the recent behavior of investment and output.”

10 Following an index number approach, Diewert (2008) confirms the decomposition of aggregate labour productivity growth into industry effects in Tang and Wang (2004). Tang and Wang (2010) show in an appendix, that the framework, derived axiomatically, is consistent with the economic approach advanced by Diewert (2002) that calls for the price effect to be part of an industry’s contribution.

11 The results may change when different periods are analyzed and compared. In this article, we choose 2000-2008 and compare it to 1987-2000 since as the literature, we are more concerned with the post-2000 output and productivity slowdown in Canada.

The results of the decomposition indicate that Canada's economic slowdown between the two periods is largely due to the manufacturing sector, through both possible channels, while much of the slowdown in real GDP growth in the U.S. business sector can be traced to a decreased contribution from service-producing industries. In terms of aggregate labour productivity growth, Canada's extraction industries cannot be cited as the reason behind the post-2000 malaise, as has often been the case in traditional decompositions, despite a negative contribution through the pure productivity effect. It is the poor productivity performance of industries in the Canadian manufacturing sector that can again be highlighted as the main culprit of Canada's slowdown in aggregate labour productivity growth from the 1987-2000 period to the 2000-2008 period. However, in explaining the persistence of the gap in Canada-U.S. productivity growth, the manufacturing sector cannot be isolated as the singular cause. While it remains true that the Canadian manufacturing sector can shoulder a fair share of the blame for the poor relative performance of the business sector as a whole, Canada's service sector also continued to contribute far less to labour productivity growth than its U.S. counterpart.

An Overview of Industry Structure Change in Canada and the U.S.

Before decomposing the industry-level contributions to real GDP and aggregate labour productivity growth, it is essential to obtain a sense of how the industry structure of Canada and the United States has transformed over the 1987-2008 observation period. In order to achieve this, we examine the relative size of each industry in the business sector of Canada and the United States in terms of total hours worked, identifying the importance of the industry to the business sector as an employer, and in terms of nominal value added, demonstrating the direct impact of the industry on the business sector in nominal output. These two measures of industry size are explored for both Canada and the United States within this section, in addition to an examination of the contribution of each industry to employment growth in the business sector.¹² A third size measure employed in our analysis, combining both a labour component and an output price component to determine the relative importance of the industry for aggregate business sector labour productivity, is discussed in section four.

The observation period is divided into two main periods throughout this paper, 1987 to 2000 and 2000 to 2008. The data sources are discussed in Appendix A. All industries include private as well as non-private activities (if applicable).¹³ The "business sector" is total

12 The industry contribution to growth in total hours worked in the business sector can be decomposed as follows:

$$\dot{H}_{s \rightarrow t} \equiv \frac{H_t - H_s}{H_s} = \frac{1}{H_s} \sum_i (h_{it} - h_{is}) = \sum_i l_{is} \dot{h}_{i,s \rightarrow t}$$

where H and h_i are total hours worked for the business sector and industry i , $\dot{H}_{i,s \rightarrow t}$ and $\dot{h}_{i,s \rightarrow t}$ are hours worked growth from year s to year t for the business sector and industry i , and l_{is} is the share of total hours worked in the business sector by industry i .

13 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, this analysis excludes owner-occupied dwellings from FIRE and management of companies as a whole.

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.

Canada

There have been some important shifts in the composition of the Canadian business sector over the 1987 to 2008 period. In terms of hours worked, manufacturing and primary industries (such as agriculture, fishing, and forestry) have all declined in relative importance (Table 1).¹⁴ Agriculture, forestry, fishing and hunting went from accounting for 6.0 per cent of all hours worked in 1987 to only 2.8 per cent in 2008. While 18.6 per cent of all hours worked in the business sector in 1987 were in the manufacturing sector, this was reduced to only 12.3 per cent by 2008. The services sector share of total hours worked increased 7.9 percentage points, from 65.4 per cent in 1987 to 73.3 per cent in 2008. This is consistent with the trend among most advanced economies towards a more service-oriented business sector.

Between 1987 and 2008, the total hours worked in the Canadian business sector grew at an average annual rate of 1.60 per cent, with the rate of expansion slightly faster from 1987 to 2000 (1.66 per cent) than it was from 2000 to 2008 (1.49 per cent) (Table 2). The vast majority of this growth originated in the service sector, which was the source of nearly nine-tenths of all the growth in hours worked over the entire period. Half of the contribution from the service sector was attributable to three industries: education, health care, and social assistance; professional and business services; and administrative and waste management. The manufacturing sec-

tor was a net drag on the growth rate for total hours, despite positively contributing to the growth rate between 1987 and 2000. In the 1987-2000 period, nine of sixteen manufacturing industries negatively contributed to growth. In the 2000-2008 period, thirteen of sixteen industries reported contracting total hours worked, with the most significant downward period-to-period adjustment coming in transportation equipment manufacturing. The contribution to the growth of hours worked from the mining and construction sectors grew from 1987-2000 to 2000-2008, increasing the importance of these sectors as manufacturing became a net drag on growth and the contribution from service-producing industries diminished.

In terms of the share of nominal value added (Table 3), the manufacturing sector experienced a drop from 20.6 per cent in 1987 to 13.6 per cent in 2008 similar to the overall decrease observed in the share of hours worked.¹⁵ But this obscures the fact that much of the manufacturing sector’s decline in relative importance came in the 2000s. In fact, the manufacturing sector held a 22.0 per cent share of nominal value added produced in the Canadian business sector in 2000, up 1.4 percentage points from 1987. Within the manufacturing sector itself, the transportation equipment manufacturing industry, which is primarily composed of the auto and aerospace sectors in Canada, closely tracks the pattern of rise and then decline of the sector as a whole and is perhaps driving much of this trend. In 1987, transportation equipment represented 2.4 per cent of all business sector value added and 12 per cent of all value added produced within the manufacturing sector. By 2000, coinciding with dramatic increases in the annual sales of motor vehicles over the late 1990s, transportation equipment manufacturing industries comprised 3.9 per cent of value added in

14 All tables are found at the end of the article.

15 Data for 2008 are from preliminary estimates provided by Statistics Canada.

the business sector and 18 per cent of the nominal value added produced in manufacturing. In 2008, on the heels of a period of declining sales in North America (the worst of which were to take place in 2009), the share of value added produced by transportation equipment manufacturing had contracted to only 1.6 per cent and once again represented only 12 per cent of the output in a Canadian manufacturing sector that was much smaller than it had been eight years prior.

Moreover, service sector industries did not experience a dramatic increase in the relative size of their value added corresponding to an expansion in total hours worked. Between 1987 and 2008, the share of the service sector in terms of nominal value added rose from 59.2 per cent to only 62.3 per cent.

Mining (including oil and gas extraction) in Canada saw the most notable increase in relative size, due primarily to the oil and gas extraction industries. Mining represented 5.6 per cent of the nominal value added produced by the Canadian business sector in 1987 and by 2008 it had more than doubled its share to 11.8 per cent.

The United States

The composition of total hours worked in the U.S. business sector has largely followed the same pattern as in Canada (or, more likely, the Canadian economy has realigned in response to changes in the U.S. economy) (Table 1). Agriculture, forestry, fishing, and hunting declined from 4.1 per cent of total hours in 1987 to 2.7 per cent in 2008 and the share represented by the manufacturing sector fell from 20.7 per cent to 12.7 per cent over the same period. Services rose from 66.4 per cent to 75.7 per cent.

The average annual growth for hours worked in the U.S. business sector was 1.11 per cent between 1987 and 2008, lower than the growth rate observed in Canada over the same period (Table 2). While growth was strong in the United States from 1987 to 2000 (1.78 per cent),

it slowed down significantly over the 2000-2008 period (0.02 per cent). As in Canada, the service sector was the primary source of employment growth, responsible for nine-tenths of the growth rate in the 1987-2000 period and experienced a sizeable decline in its total contribution from one period to the next (from 1.70 percentage points per year in the 1987-2000 period to 0.46 percentage points per year in the 2000-2008 period). The magnitude of this decline far exceeded that in Canada (0.29 percentage points). The U.S. manufacturing sector had an even more negative contribution to growth in total business sector hours worked than its Canadian counterpart and was negative in both the 1987-2000 period and the 2000-2008 period, but to a far greater degree in the 2000-2008 period. The U.S. mining sector was less of a source of growth than it was in Canada and the construction sector declined in importance between the 1987-2000 period and the 2000-2008 period.

While the change in the industry-level composition of nominal value added in Canada did not track the shares of total hours worked represented by each industry, most notably in the mining sector, the United States demonstrated a more stable connection between the two (Table 3). Manufacturing value added, which experienced a smoother drop in relative size in the United States than was experienced in Canada, fell from 22.1 per cent of value added in the U.S. business sector in 1987 to 15.3 per cent in 2008. Only computer and electronic equipment manufacturing experienced an increase between 1987 and 2000 (from 2.2 per cent to 2.3 per cent) that was then followed by a fall in relative size (to 1.8 per cent in 2008). However, even this decline in the relative importance of the industry over the 2000-2008 period compares favourably to the contraction experienced by its Canadian counterpart after 2000.

Services increased in relative importance from 64.5 per cent of business sector nominal value added in 1987 to 72.8 per cent in 2008, led by the largest service-producing industry in the United States: finance, insurance, real estate (FIRE) and management of companies. FIRE and management services industries represented 15.8 per cent of business sector value added in 1987 and increased to 18.2 per cent in 2000 and to 19.0 per cent in 2008. In Canada, the share of output represented by FIRE and management also increased, but at a much slower pace.

The U.S. mining sector, at 2.0 per cent of nominal output in 1987, saw its importance diminish to 1.3 per cent in 2000, but then it rebounded to 2.5 per cent by 2008 on the back of a global commodities boom. Both the oil and gas extraction industry and other forms of mining followed the overall sector trend.

Industry Contribution to Real GDP Growth

As noted in the introduction, industry-level contributions to real GDP growth are calculated based on a decomposition technique developed by Tang and Wang (2010). Essentially following a top-down approach, the technique decomposes aggregate real GDP growth into industry components, taking into account the effects from changes in both supply and demand conditions.

The Decomposition Technique

Define V , V^r and P as nominal GDP, real GDP and the GDP deflator, respectively.¹⁶ In addition, let v_i , v_i^r , and p_i be the nominal value added, real value added, and value added deflator for industry i . The sum of industry nominal value added is equal to nominal GDP,

$$\text{that is, } V = \sum_i v_i \quad (1)$$

For a given year, real GDP can be decomposed into its industry components:

$$V^r = \frac{\sum_i v_i}{P} = \frac{\sum_i p_i v_i^r}{P} = \sum_i \tilde{p}_i v_i^r$$

where \tilde{p}_i is the real price of value added for industry i , defined as

$$\tilde{p}_i = p_i / P$$

Equation (1) shows that real GDP can be expressed as the weighted sum of the value added quantities of its constituent industries. These weights are the real prices of value added. Thus, the formulation values industry real output more when its relative price rises and less when its relative price falls.

Real aggregate GDP growth from year s to year t , where $t > s$, can also be decomposed into industry growth components:

$$\begin{aligned} \dot{V}_{s \rightarrow t}^r &\equiv \frac{V_t^r - V_s^r}{V_s^r} = \frac{1}{V_s^r} \sum_i (\tilde{p}_{it} v_{it}^r - \tilde{p}_{is} v_{is}^r) \\ &= \frac{1}{V_s^r} \sum_i [\tilde{p}_{is} (v_{it}^r - v_{is}^r) + (\tilde{p}_{it} - \tilde{p}_{is}) v_{it}^r + (\tilde{p}_{it} - \tilde{p}_{is}) v_{is}^r] \\ &= \sum_i \frac{\tilde{p}_{is} v_{is}^r}{V_s^r} \left(\frac{v_{it}^r - v_{is}^r}{v_{is}^r} + \frac{\tilde{p}_{it} - \tilde{p}_{is}}{\tilde{p}_{is}} + \frac{v_{it}^r - v_{is}^r}{v_{is}^r} \frac{\tilde{p}_{it} - \tilde{p}_{is}}{\tilde{p}_{is}} \right) \\ &= \sum_i \left[\frac{v_{is}}{V_s} \dot{v}_{i,s \rightarrow t}^r + \frac{v_{is}}{V_s} (1 + \dot{v}_{i,s \rightarrow t}^r) \dot{\tilde{p}}_{i,s \rightarrow t} \right] \\ &= \sum_i w_{is} \dot{v}_{i,s \rightarrow t}^r + \sum_i w_{is} (1 + \dot{v}_{i,s \rightarrow t}^r) \dot{\tilde{p}}_{i,s \rightarrow t} \quad (2) \end{aligned}$$

Where $w_{is} = v_{is} / V_s$ is the nominal value added share in total GDP,

$\dot{v}_{i,s \rightarrow t}^r$ is real value added growth of industry i over the period from s to t , and

$$\dot{\tilde{p}}_{i,s \rightarrow t} = \frac{\tilde{p}_{i,t} - \tilde{p}_{i,s}}{\tilde{p}_{i,s}}$$

is the per cent change in real value added price of industry i over the period from s to t .

Equation (2) shows that each industry contributes to real GDP growth through an increase in real output and/or a rise in real output price. The contribution is weighted by its share of nominal or real GDP at the beginning period.

The two terms on the right-hand side, called the *quantity effect* and the *price effect*, respectively, measure the contributions of growth in quantity

16 The GDP deflator is an implicit deflator, calculated as the ratio of nominal GDP to real GDP.

produced in the industry and a rise in real output price. The sum of the price effect over the industries is positive if increases in real output prices occur in industries with relatively high value added levels and/or relatively high value added growth.

As previously noted, the above decomposition technique has two desirable properties. First, it is consistent with real GDP in the chain Fisher index. In addition to contributing to real GDP growth through a change in output quantity, an industry also contributes positively (or negatively) to real GDP growth when the real output price rises (or falls). Thus, it allows one to identify the sources of each industry's contribution to real GDP growth: quantity effect or price effect. Second, it is additive for any long period as it is not necessary for year s and t to be adjacent.

Changes in the prices and quantities produced of a good or a service in a competitive market are determined by a change in its demand and supply conditions. Given demand conditions, technological progress or a reduction in input cost will cause a positive shift (downward) in the supply curve of an industry. This leads to an increase in output and a decrease in price. And the opposite is true when the supply curve shifts upward, as it might as a result of a decline in production efficiency or an increase in input cost. Similarly, when there is a change in consumers' tastes or income or external forces (e.g. international trade), the demand for the product will change. Given supply conditions, an increase in demand (a positive upward shift in the demand curve) for an industry's output will lead to an increase in both its quantity and price, and the opposite is true for a decrease in demand.

If an industry in a competitive product market experiences a positive demand shift and a positive supply shift, there will be an increase in quantity; but the net effect on price will depend on the relative strength of the two shifts. If the

demand shift is stronger, one will observe an increase in price and if the supply shift is stronger, one will observe a decline in price. Similarly, if the industry experiences a negative shift in both demand and supply, there will be a decline in quantity but the net effect on price will again depend on the strength of one shift against the other. In the remaining two possibilities, where the shifts are in opposite directions, the effect on price can be determined, but the effect on quantity depends on the relative strength of the shifts in demand and supply. Because it is difficult to untangle effects from demand and supply shifts in a given period, this paper only addresses the *net* shift experienced by each industry through the quantity effect and the price effect.

Industry Contribution to Output Growth in Canada and the United States

The decomposition technique, equation (2), is applied to the business sector in Canada and the United States, using a comparable data set on value added and labour input for the two countries, as is discussed in Appendix A. For both Canada and the United States, industry real value added growth is presented in Table 4. Of course, the rate of growth of real value added in an industry does not necessarily provide much information on its contribution to real GDP growth rate, as this contribution is also dependent on the change in the industry real value added price (Table 5). An industry with positive real value added growth and a decline in real value added price may be a net drag on real GDP growth. The decomposition results of industry contribution to real GDP growth are presented in Table 6 for Canada and Table 7 for the United States.

Canada

Examining the industry contribution to real GDP growth in the Canadian business sector we

observe that the biggest contributor to growth across both time periods was the services sector (Table 6). Of the 2.87 per cent annual growth rate reported in the business sector between 1987 and 2000, 1.77 percentage points (almost two-thirds of all growth) was from the services sector. Within the service sector, the largest sources of growth were finance, insurance, real estate (FIRE) and management services industries, contributing 0.39 percentage points, and education, health care and social assistance, adding 0.34 percentage points.

The manufacturing sector was the second largest contributor to growth over the period (a sharp contrast, as we will see, with the contribution to real GDP growth it would provide in the following period), adding 0.71 percentage points to annual growth to the business sector. By far, the largest contributor to growth within the manufacturing sector during the 1987-2000 period was transportation equipment manufacturing, which contributed 0.21 percentage points to the annual aggregate real GDP growth rate. Despite being the strongest contributor within the manufacturing sector, it was still surpassed by a number of non-manufacturing industries: FIRE and management services; education, health care and social assistance; professional and business services; and oil and gas extraction. Combined, these five industry groups contributed 1.48 percentage points to the annual growth rate, a little more than half of the growth generated in the total business sector.

In both the services and manufacturing sectors, growth can be traced to the quantity effect rather than the price effect. The effect of relative prices in both the manufacturing and service sectors was slightly negative in the aggregate, but mostly offset by the positive effect in the mining sector. The price effect in this period had the largest positive impact on business sector annual real GDP growth among oil and gas extraction industries (0.16) and education,

health care, and social assistance industries (0.19). In both cases, the price effect exceeded the contribution from their respective quantity effect. The greatest negative contribution from the price effect was within wholesale (-0.13) and retail trade (-0.10). Among the manufacturing industries, computer and electronics manufacturing had a relatively strong contribution through its pure productivity effect, despite its small relative size, but was offset by the largest negative price effect in the manufacturing sector (-0.07).

Over the second period, 2000 to 2008, aggregate annual real GDP growth in the Canadian business sector slowed to 2.30 per cent from 2.87 per cent during the 1987-2000 period. The 2000s marked an increased reliance on the mining sector as a source of growth and the transition of the manufacturing sector from a source of growth to a net drag. The services sector remained the largest contributor to aggregate real GDP growth, contributing 1.78 percentage points between 2000 and 2008 (little changed from the previous period). The top two contributing service-producing industries remained the same, though they exchanged position, from the previous period: education, health care, and social assistance industries (0.38) and FIRE and management services (0.35). In sharp contrast with the previous period, the manufacturing sector acted as a drag on real GDP growth, reducing the overall growth rate by 0.65 percentage points. While the negative impact on the business sector growth was led by transportation equipment manufacturing (-0.23), most manufacturing industries failed to add to business sector growth. Of sixteen industry groups in the manufacturing sector, only four industries contributed positively to real GDP growth between 2000 and 2008: non-metallic mineral products; primary metals; food, beverage, and tobacco products; and petroleum and coal products. The contribution from the mining sector

increased from 0.27 percentage points in the 1987-2000 period to 0.78 percentage points and the contribution from the construction sector as increased from 0.04 percentage points to 0.40 percentage points.

The price effect was negative across most of the business sector, with the most notable exception being the mining sector. Of the 0.78 percentage points that the mining sector contributed to aggregate annual real GDP growth from 2000 through to 2008, the vast majority can be traced to the price effect (0.69) rather than the quantity effect. This corresponds to a boom in commodities worldwide, particularly in oil, which raised the relative prices of the goods produced in this sector, largely as a response to increased demand by emerging markets such as China and India. In the service sector, the only sizeable positive contribution from the price effect was in education, health care and social assistance (0.09), but even in that case the price effect was less important to the industry's contribution to growth than the quantity effect (0.30).

The decomposition of the effect is perhaps the most interesting in the manufacturing sector. As noted above, between 2000 and 2008 the manufacturing sector negatively contributed to annual real GDP growth in the business sector by 0.65 percentage points. This negative contribution originated not only from the price effect (-0.45), as manufactured goods decreased in relative value, but also a negative quantity effect (-0.20) as output in the sector declined. The price effect was almost entirely non-positive among the sixteen manufacturing industries, with only petroleum and coal products contributing to real GDP growth through the price effect (0.03), likely corresponding to the aforementioned run-up in commodity prices. The largest negative price-effect contribution came from transportation equipment manufacturers (-0.18), which may not be altogether surprising

given that demand for new motor vehicles in the United States, representing well over 80 per cent of the North American market in the period and a major destination for Canadian production, peaked in 2000 and began to decline precipitously in the later part of the period. In terms of the contribution of the quantity effect, it was less uniformly negative with five of the sixteen industries reporting a positive contribution to growth over the period. The strongest contribution from the quantity effect for the manufacturing sector was in itself fairly modest, with chemical product manufacturing contributing 0.02 percentage points, less even than this effect had contributed for the same industry in the previous period (0.05). While transportation equipment manufacturing was among the largest negative quantity effect contributors in the manufacturing sector at -0.05 percentage points, it actually exerted less of a negative influence than computer and electronic products manufacturing (-0.06). This industry had had one of the strongest quantity effects in manufacturing from 1987 to 2000 (0.13), but experienced a dramatic restructuring following the so-called "IT bubble" that included the collapse of Nortel Networks Corporation, which at its height accounted for one-third of the total valuation of all companies traded on the Toronto Stock Exchange.

Between the 1987-2000 period and the 2000-2008 period, the sources of Canadian real GDP growth in the business sector underwent a dramatic transition. The manufacturing sector, which had previously been the second largest source of growth, became a net drag on the business sector and was replaced in importance by the mining sector. Industries that had been at the heart of manufacturing's strength in the first period, transportation equipment manufacturing and computer and electronic product manufacturing, led the decline in the second period. The rise in the mining sector was not a story of

greater contribution through output growth, though that remains an element, but was dominated by price effects. The dramatic global rise in the value of commodities, particularly for oil and gas extraction industries, was instrumental in explaining why the mining sector was so essential to growth in the second period. The main culprit behind a slowdown in growth in the 2000-2008 period from the 1987-2000 period can be traced to the manufacturing sector, as the difference in the total contribution from the sector between the 1987-2000 and 2000-2008 periods was 1.36 percentage points, sizeable enough that even the significant increases in the total contributions from mining and construction were not able to totally offset the decline.

The United States

Annual real GDP growth in the U.S. business sector from 1987 to 2000 was 3.60 per cent and the largest contributor to growth, unsurprising given its size, was the services sector (Table 7). Services-producing industries in aggregate were the source of four-fifths of the growth in the 1987-2000 period, contributing 2.94 percentage points to business sector real GDP growth. As with Canada, FIRE and management services provided the largest boost to business sector growth, but its contribution of 0.78 percentage points was much larger than its counterpart in Canada. And just as was the case with Canada, the other top industries were professional and business services (0.45) and education, health care and social assistance (0.40).

While services contributed more to real GDP growth in the business sector in the United States than in Canada in the first period, the opposite is true for manufacturing industries. The manufacturing sector contributed 0.45 percentage points to aggregate business sector

growth in the first period (compared with 0.71 percentage points in Canada). Moreover, the composition of the industries that were contributing to growth in U.S. manufacturing did not resemble the composition in Canada. Whereas transportation equipment manufacturing was the strongest contributor in Canada from 1987 to 2000, it was decidedly less important to growth in the United States over the same period, contributing only 0.02 percentage points.¹⁷ In the U.S., computer and electronic product manufacturing was the largest contributor in manufacturing, adding 0.09 percentage points to the growth rate.

Overall, growth in the U.S. business sector across the 1987-2000 period was completely due to the quantity effect, rather than the price effect, which was negative in the aggregate. As was true with the manufacturing sector in Canada, U.S. manufacturing experienced a negative contribution from the price effect, but to a greater degree (-0.41 percentage points in the United States versus -0.03 percentage points in Canada). Given the persistent trend for the industry, it will perhaps come as no surprise that it was the computer and electronic product manufacturing industry that experienced the greatest negative price effect, contributing -0.45 percentage points to real GDP growth in the first period. That computer and electronic product manufacturing was also the source of the largest contribution within the manufacturing sector despite the strong negative price effect is the result of a particularly strong quantity effect (0.54), which was the second strongest quantity effect in the business sector, and does suggest that technological factors may have been at play in the industry during the period. Given the positive pure productivity effect experienced in this industry (see section 4), this increase in demand

17 The composition of transportation equipment manufacturing industry itself differs between countries, with automotive and auto-related manufacturing comprising a larger share of the total industry in Canada than in the United States, which has a greater share of aerospace manufacturing.

may be in response to the greater adoption of ICT technologies in the United States. As is evidenced by the breakdown of the industry contribution into its component effects, the declining price effects are the supply-side impact of technological advances in those industries. Canadian computer and electronic manufacturing industries observed a similar trend in the period, though to a far lesser extent. No other U.S. manufacturing industry experienced the same degree of contribution, positive or negative, in either the quantity or price effect.

In contrast to the situation in Canada, the U.S. service sector experienced a positive price effect contribution (0.31) in addition to a very strong contribution from the quantity effect (2.63). FIRE and management had both the largest contribution due to the quantity effect (0.59) and the second largest contribution due to the price effect (0.19). While Canada's FIRE and management industry also experienced a large positive quantity effect, there was no price effect impacting the growth rate. This would generally lend some support to the narrative that has arisen around these particular industries following the 2008 financial crisis namely, that there were forces on the supply and demand side in the United States that attracted resources to the industry leading up to the 2000s, but that the same supply and demand conditions were not present in Canada. The largest positive price effect contribution to U.S. business sector growth was education, health care and social assistance (0.25) and this was also true in Canada. Like Canada also, wholesale trade experienced a strong quantity effect (0.38 percentage points in the United States and 0.30 percentage points in Canada) and a relatively strong negative price effect (-0.14 percentage points in the U.S. and -0.13 percentage points in Canada).

Between 2000 and 2008, total real GDP growth in the U.S. business sector was 2.03 per cent per year, a fairly significant slowdown from the 3.60

per cent growth rate experience in the 1987-2000 period. As was the case in Canada in the same period, the manufacturing sector negatively contributed to growth, but there was a significant difference in the degree of the net drag the sector posed to growth in the two countries. Over the 2000-2008 period, the manufacturing sector contributed -0.07 percentage points to annual growth in the United States, far less negative than the contribution of -0.65 percentage points observed in Canada. The industry responsible for the largest negative contribution to annual growth was, as in Canada, the transportation equipment manufacturing industry, which subtracted 0.05 percentage points from business sector real GDP growth. Even this compares positively to the impact of the transportation equipment industry on the Canadian business sector over the same years, as the Canadian industry acted was a net drag of 0.23 percentage point to annual growth. Only the petroleum and coal product manufacturing (0.13) and the chemical product manufacturing (0.04) industries contributed positively on net to the growth rate in the U.S. manufacturing sector.

The service sector was even more essential to growth in this period. The service-producing industries were the source of nearly nine-tenths of all growth in the business sector, contributing 1.74 percentage points to the growth rate, but this too was a sizeable decrease from the 2.94 percentage points contributed over the 1987-2000 period. Nearly all industries in the service sector (with the exception of education, health care, and social assistance) contributed less to the annual growth rate in the second period than in the first period. Even so, much as we saw in Canada, the top contributing industries in the service sector remained similar: FIRE and management (0.49); education, health care, and social assistance industries (0.40); and professional and business services (0.33). Indeed, the Canadian service sector in aggregate provided a slightly stronger con-

tribution to annual real GDP growth in Canada than its counterpart did in the United States.

Extraction industries in the United States were less of a source of growth in the 2000-2008 period than they were in Canada. Just as in Canada, however, it was the mining sector that provided the second largest contribution, in the wake of weakness in the manufacturing sector. Oil and gas extraction contributed 0.13 percentage points and other mining contributed 0.06 percentage points, an increase from the previous period when both industries failed to contribute to the U.S. growth rate.

The aggregate quantity effect continued to account for all growth in the U.S. business sector, but was much less positive over the 2000-2008 period than it had been from 1987 to 2000 (2.10 per cent versus 3.77 per cent). The price effect continued to exert a negative influence on total real GDP growth, slightly mitigated from the previous period by a strong positive price effect observed in the mining sector. The largest contribution from the quantity effect came in the FIRE and management industries (0.44), followed next by information industries (0.37), computer and electronic manufacturing (0.29) and professional and business services (0.29). Counter to the experience in Canada, the quantity effect among manufacturing industries continued to contribute positively to U.S. business sector growth. The U.S. transportation equipment manufacturing, for example, added 0.05 percentage points to growth, despite the beginnings of a large scale decline in domestic demand for motor vehicles at the end of the period. Another point of contrast is the mining sector, where the quantity effect in Canada was positive as the industry successfully expanded output in response to the increase in relative prices, but was negative in the United States.

Ironically, the computer and electronic products industry made a -0.02 percentage point per

year contribution to real GDP growth in the United States in 2000-2008, despite its real growth rate of 16.7 per cent per year. This was caused by the price effect of -0.31 percentage points, which outweighed the quantity effect of 0.29 percentage points. The price index for computer and electronic products fell to 2.8 per cent in 2008 from 9.9 per cent in 2000, and 100.0 per cent in 1987.

Many other manufacturing industries, such as transportation equipment manufacturing, experienced a similar situation where a negative price effect overwhelmed a quantity effect and resulted in an overall negative contribution to growth by the industry. In service-producing industries this phenomenon did not occur, even in information industries where there was a strongly negative contribution from the price effect (-0.21), as quantity effects more than offset any negative contribution from price effects. The largest price effect, not surprisingly, came from the mining sector, with oil and gas extraction contributing 0.14 percentage points and other forms of mining providing an additional 0.06 percentage points. Much as was the case in Canada, the largest positive contribution from the price effect outside the extraction industries came from education, health care, and social assistance (0.12).

The weaker total contribution from service-producing industries from the first period to the second is at the heart of the sizeable slowdown in U.S. business sector real GDP growth. This is paired with a decline in the contribution from manufacturing that was similar to what was observed in Canada over the same period, but with a less pronounced decrease in the quantity effect and little change in the negative contribution of the price effect in the United States. The overall decline in the contribution from U.S. manufacturing was far less severe than what was experienced in Canada.

Industry Contribution to Aggregate Labour Productivity Growth

As we would expect, demand and supply shifts lead to changes in output prices and to a reallocation of production resources across industries. We have already seen the effects of this in section two, discussing the shift in the relative importance of industries in Canada and the United States. A simple analysis of the shifts in industrial structure, as expressed by the share of labour or output, is not able to provide any insight into what forces are pulling and pushing those changes in composition or provide much information on their full impact. Do those changes have any implication for aggregate labour productivity growth?¹⁸ How do they affect industry contribution to aggregate labour productivity growth?

This section extends the decomposition technique for real GDP growth to estimate industry contributions to aggregate labour productivity growth. It follows the framework developed in Tang and Wang (2004). Like the decomposition technique for real GDP growth, the decomposition technique for aggregate labour productivity growth is based on the value added concept for industry output. It is also consistent with real GDP in the chain Fisher index, taking into account the real price effect in addition to the quantity effect.¹⁹

A Framework for Estimating Industry Contributions to Aggregate Labour Productivity Growth

Define H as total hours worked in the business sector. Labour productivity, X , in the business

sector is then defined as real GDP per hour worked. Aggregate labour productivity can then be decomposed into its industry components.

$$\begin{aligned} X &= \frac{V^r}{H} = \frac{V}{P H} = \frac{\sum_i v_i}{P H} \\ &= \sum_i \left(\frac{p_i v_i^r}{P H} \right) = \sum_i \left(\frac{p_i h_i x_i}{P H} \right) \\ &= \sum_i \frac{h_i}{H} (\tilde{p}_i x_i) = \sum_i l_i (\tilde{p}_i x_i) \\ &= \sum_i (\tilde{s}_i x_i), \end{aligned} \quad (3)$$

where h_i is total hours worked for industry i ;

x_i is real value added per hour worked for industry i ; and

$\tilde{s}_i = \tilde{p}_i l_i$ is the relative size of industry i , equal to the product of the industry's labour input share ($l_i = h_i/H$) and its real output price (\tilde{p}_i).

With this formulation, the aggregate labour productivity level equals the weighted industry value added per hour worked. The weights are the corresponding relative size of an industry, which is defined as the product of the hours worked share and the real output price. Thus, the relative size here indicates the economic significance of the industry in aggregate labour productivity by capturing the industry size in terms of labour share as well as the output value of the industry relative to other industries. This formulation departs fundamentally from traditional methods that only consider reallocation effects from labour input.²⁰ Capturing the effect from a change in relative output price is consistent with real GDP in the chain Fisher index in that it values real industry output more when its

18 This article focuses only on labour productivity rather than multifactor productivity (MFP) for a number of reasons. First, labour productivity is directly linked to GDP per capita, commonly used as an indicator of the level of the standard of living. Second, capital input is required to estimate MFP, which is difficult to measure and often not comparable across countries as discussed by Ho, Rao and Tang (2004) and Tang, Rao and Li (2010). Finally, and most importantly, labour productivity is more easily monitored and the data more accessible.

19 As was noted in section one, an important consequence of using the chain Fisher index is that real output is not additive. Therefore, traditional ways of computing an industry's contribution to aggregate productivity growth based on the additivity of real output (e.g., Wolff, 2000; van Ark, Inklaar and McGuckin, 2002; Sharpe and Thomson, 2010) are no longer precise.

relative price rises and less when its relative price falls.

Like real GDP growth, aggregate labour productivity growth between year s and t , where $t > s$, can be decomposed into industry growth components as:

$$\begin{aligned}
 \dot{X}_{s \rightarrow t} &\equiv \frac{X_t - X_s}{X_s} = \frac{1}{X_s} \sum_i \left[(\tilde{s}_{it} x_{it} - \tilde{s}_{is} x_{is}) \right] \\
 &= \frac{1}{X_s} \sum_i \left[\tilde{s}_{it} (x_{it} - x_{is}) + (\tilde{s}_{it} - \tilde{s}_{is}) x_{it} + (\tilde{s}_{it} - \tilde{s}_{is}) x_{is} \right] \\
 &= \sum_i \frac{\tilde{s}_{is} x_{is}}{X_s} \left(\frac{x_{it} - x_{is}}{x_{is}} + \frac{\tilde{s}_{it} - \tilde{s}_{is}}{\tilde{s}_{is}} + \frac{x_{it} - x_{is}}{x_{is}} \frac{\tilde{s}_{it} - \tilde{s}_{is}}{\tilde{s}_{is}} \right) \\
 &= \sum_i \frac{v_{is}}{V_s} \dot{x}_{i,s \rightarrow t} + \sum_i \frac{v_{is}}{V_s} (1 + \dot{x}_{i,s \rightarrow t}) \tilde{\delta}_{i,s \rightarrow t} \\
 &= \sum_i w_{is} \dot{x}_{i,s \rightarrow t} + \sum_i w_{is} (1 + \dot{x}_{i,s \rightarrow t}) \tilde{\delta}_{i,s \rightarrow t}, \text{ or} \\
 &= \sum_i w_{is} \dot{x}_{i,s \rightarrow t} + \sum_i \frac{x_{is}}{X_s} (1 + \dot{x}_{i,s \rightarrow t}) \Delta \tilde{s}_{i,s \rightarrow t}. \quad (4)
 \end{aligned}$$

Where $w_{is} = v_{is}/V_s$ is the nominal value added share in total GDP at the beginning of the period, $\dot{x}_{i,s \rightarrow t}$ is labour productivity growth of industry i over the period from s to t , and

$\Delta \tilde{s}_{i,s \rightarrow t} = \tilde{s}_{it} - \tilde{s}_{is}$ and $\tilde{\delta}_{i,s \rightarrow t} = \frac{\tilde{s}_{it} - \tilde{s}_{is}}{\tilde{s}_{is}}$ are the change and the per cent change in relative size of industry i over the period from s to t .

With this formulation, each industry contributes to aggregate labour productivity growth through an increase in its labour productivity or a rise in its relative size related to economic significance.

The two terms from left to right are *the pure productivity effect*²¹ and *the shift effect*. The pure productivity effect captures an industry's contribution coming from improvements in labour productivity of the industry. The shift effect reflects the change in economic significance of the industry. It differs from the real-

location effect by which the traditional terminology only means the effect from the reallocation of production resources. The sum of the shift effect over the industries is positive if a shift in economic significance is towards industries of relatively high productivity level and/or relatively high productivity growth.

Industry Contribution to Aggregate Labour Productivity Growth in Canada and the United States

The decomposition technique, equation (4), is applied to aggregate labour productivity growth in the business sector in both Canada and the United States, using the same dataset as for the decomposition of real GDP growth.

Below we examine the labour productivity growth rates in the business sector in Canada and the United States, in terms of the average annual growth rate within the industry itself (Table 8). Of course, the rate of growth of labour productivity in an industry does not necessarily provide much information on the actual contribution to the aggregate growth rate. An industry's contribution is also dependent on the productivity level within the industry (Table 9) and the relative size of the industry (Table 10). A small industry with a low level of productivity, but a strong productivity growth rate over the period, would likely contribute less to the aggregate growth rate than a large industry with a high productivity level and a moderate productivity growth rate.

The contribution of each industry is further broken down into a pure productivity effect, which measures the contribution of an increase in efficiency in the industry, and a shift effect, which measures how much of the

20 For example, Basu and Fernald (2002); Jorgenson and Stiroh (2000); Stiroh (2002); Faruqui et al. (2003); Jorgenson (2004); Ho, Rao and Tang (2004), and Sharpe and Thomson (2010).

21 As the terminology was used in Nordhaus (2002).

contribution comes from the change in the economic significance of the industry in terms of relative output price and labour reallocation. These are examined in some detail for both Canada (Table 11) and the United States (Table 12).

Canada

Labour productivity growth between 1987 and 2000 averaged 1.18 per cent per year (Table 8). In this period, service-producing industries had relatively slow productivity growth, expanding only at a rate of 0.62 per cent per annum, well outpaced by the 3.26 per cent growth rate in the manufacturing sector and the 2.28 per cent growth rate in the mining sector. Only three industries reported declining labour productivity, all of them in the service sector: education, health care and social assistance (-2.15 per cent); arts, entertainment, and recreation (-1.92 per cent); and administrative and waste management (-0.79 per cent). Computer and electronic products manufacturing had the strongest productivity growth in the business sector, expanding by 10.18 per cent, and was followed by transportation equipment manufacturing (5.22 per cent) and oil and gas extraction (5.07 per cent).

The relative size of industries in terms of their weighted importance in determining aggregate labour productivity levels also underwent a noticeable shift in the period (Table 10). Only the services and mining sectors were given more weight in 2000 than they were in 1987, as the relative value of output and the share of labour shifted away from the manufacturing sector and the agriculture, forestry, fish, and hunting industries. Within services, the most significant increase in weighting came in education, health care, and social assistance industries and in professional and business services.

When looked at in terms of the contribution to the annual aggregate business sector labour productivity growth rate, the services sector

takes on greater economic significance as a result of its relative size (Table 11). Over half of all growth in labour productivity can be attributed to the service sector, which contributed 0.75 percentage points to the labour productivity growth rate from 1987 to 2000. The contribution from this sector was led by professional and business services (0.21) and FIRE and management (0.20). Education, health care and social assistance contributed 0.11 percentage points to the growth rate, as a negative contribution from the pure productivity effect (-0.33) was more than offset by a strong positive shift effect (0.44).

Despite having a weight of less than one-third that of the service sector, the Canadian manufacturing sector contributed 0.35 percentage points to labour productivity growth, equal to almost half the contribution derived from the services sector, as a result of higher productivity levels relative to the rest of the business sector and strong productivity growth over the period. Transportation equipment manufacturing equipment added 0.16 percentage points to the growth rate, all of it stemming from the pure productivity effect. The strongest productivity growth rate of any industry in Canada was in computer and electronic manufacturing, but it contributed only 0.04 percentage points to the aggregate productivity growth rate as a strong pure productivity effect (0.11) was mostly offset by a decline in its relative output price, which resulted in a negative contribution from the shift effect (-0.07).

The mining sector contributed 0.18 percentage points to growth in the period, entirely due to the oil and gas extraction industries. Oil and gas extraction industries contributed through both a positive pure productivity effect (0.14) and a positive price effect (0.07).

Business sector labour productivity growth in Canada was 0.39 percentage points slower over the 2000 to 2008 period than it was in the previous period, averaging only 0.79 per cent per year

(Table 8). The productivity growth rate in the services sector picked up in the second period, growing at an annual rate of 1.40 per cent, but coincided with a considerable slowdown in labour productivity growth in the manufacturing sector, which went from an annual growth rate of 3.26 per cent in 1987-2000 to only 0.88 per cent over 2000-2008.²² Perhaps the most notable reversal in the trajectory of growth rates came in the mining sector, where labour productivity went from a 2.28 per cent annual growth rate over the 1987-2000 period to -3.76 per cent from 2000 to 2008. At the industry level, productivity growth rates were highest in primary metal manufacturing (4.11 per cent), wholesale trade (3.41 per cent), and retail trade (3.40 per cent) industries. While only three industries reported negative labour productivity growth rates in the first period, that number of industries ballooned to twelve industries by the second period, with the most negative productivity growth rates recorded in oil and gas extraction (-7.26 per cent), apparel and leather manufacturing (-3.94 per cent), and petroleum and coal product manufacturing (-2.60 per cent) industries.

Many of the compositional trends in the relative importance of sectors to labour productivity that were observed between 1987 and 2000 largely continued between 2000 and 2008: the size of the weights for the manufacturing sector continued to decline, though at a more rapid pace than was previously observed; agriculture, forestry, fishing, and hunting industries became increasingly marginal; and the value of the weights for utilities remained fairly constant (Table 10). The importance of service-producing industries remained over the 2000s. The construction and mining sectors, however, experienced a significant increase in their weighting by 2008. The most dramatic increase, perhaps

not surprisingly, came in the mining sector as both the oil and gas extraction industry and other types of mining saw significant gains in their relative importance.

The contribution of the services sector to business sector aggregate labour productivity growth was 0.85 percentage points over the 2000-2008 period, slightly more than it had contributed in the previous period (Table 11). The largest contribution in the services sector came from the education, health care, and social assistance industry (0.19), followed by FIRE and management (0.17) and professional and business services (0.11). The contribution from education, health care, and social assistance was largely from the shift effect (0.12), but in contrast to the previous period, the industry also benefited from a positive pure productivity effect (0.07).

The Canadian manufacturing sector negatively contributed to labour productivity growth in the 2000-2008 period, reducing the aggregate labour productivity growth rate by -0.91 percentage points, a significant turnaround of 1.26 percentage points from the previous period. A sharp decrease in the contribution from the pure productivity effect in the manufacturing sector can be cited as one of the major factors explaining the overall slowdown in aggregate productivity growth in the Canadian business sector, as manufacturing's pure productivity effect contributed only 0.06 percentage points 2000-2008 compared to a 0.65 percentage points in the previous period. However, the pure productivity effect was only a part of the story; the negative contribution of the manufacturing sector came from not just the slowdown in productivity growth, but also from the increasingly negative contribution from the shift effect. The shift effect in the manufacturing sector contributed -0.97 percentage points to total productivity

22 The slowdown in productivity growth in the Canadian manufacturing sector may be largely due to underutilization of capacity associated with exporters (Baldwin, Gu and Yan, 2011)

growth in the business sector, as fourteen of sixteen manufacturing industries had a negative shift effect. Overall, the largest total contribution in the sector came from the petroleum and coal product manufacturing industries, which added only 0.02 percentage points to labour productivity growth, as the contribution from the shift effect (0.04) more than offset the negative pure productivity effect (-0.01).

The mining sector was one of the few areas of the Canadian business sector where the total contribution to the aggregate productivity growth rate increased sizeably. The mining sector added 0.18 percentage points to labour productivity growth in the first period and further increased its contribution to 0.64 percentage points in the second period. This increased contribution was in spite of the fact that the productivity growth performance of extraction industries in Canada deteriorated massively. While negative productivity growth rates in the sector resulted in a negative contribution through the pure productivity effect in both oil and gas extraction (-0.45) and mining (-0.03), the significant increases in the relative prices of outputs in the sector resulted in a very strong shift effect, especially in oil and gas extraction (0.95). It seems entirely plausible that, as was also suggested by Rao *et al.* (2005), higher relative prices have resulted in increasingly more marginal resources being exploited to accommodate the rapid expansion of global demand and this has been the source of declining productivity within extraction industries.²³

Overall, the decrease in labour productivity growth between the two periods was caused by a weaker contribution from the pure productivity effect (reduced by 0.82 percentage points) caused by major productivity declines in mining and manufacturing. This decline in the contri-

bution from the pure productivity effect was only partially offset by an increased contribution from the shift effect (improved by 0.43 percentage points) as the positive gains originating in the mining and construction sectors were mitigated by the downward pressure experienced in the manufacturing and service sector.

The United States

The U.S. business sector labour productivity grew at an annual rate of 1.79 per cent between 1987 and 2000, far faster than the 1.18 per cent recorded by the Canadian business sector over the same period (Table 8). Labour productivity growth among service-producing industries was slower than the business sector as a whole, expanding at a rate of 1.38 per cent per year in the period (more than twice the rate in the Canadian service sector). As was the case in Canada, the manufacturing sector experienced strong productivity growth across the period, with an average growth rate of 4.09 per cent (compared to Canada's 3.26 per cent). The United States experienced weaker labour productivity growth in the mining sector (1.36 per cent in the United States compared to 2.28 per cent in Canada), and the positive rate of growth was, unlike Canada, due entirely to non-oil and gas mining industries (5.34 per cent). Within these three sectors, labour productivity growth was the highest in computer and electronic product manufacturing (25.77 per cent), petroleum and coal product manufacturing (6.21 per cent), and mining, except oil and gas.

The change in the relative size dimension of sectors when it comes to productivity growth generally followed a similar pattern as Canada between 1987 and 2000 (Table 10). The weighting for the manufacturing sector fell at an even

23 Note also that mining projects require large fixed investments and long construction periods, which are typically not productive during capacity construction (although these fixed investments represent part of the construction sector output). It is possible that the weak productivity performance of this industry was also affected by the capacity expansion in the period 2000-2008. If this is the case, then we would expect that the industry be doing better in productivity performance when those new projects start production.

faster rate than in Canada, led by a dramatic decrease in computer and electronic products manufacturing as output prices in the industry underwent a period of rapid decline. Service-producing industries grew more important, led by a similar mix of industries as was observed in Canada. The mining and construction sectors represented a notable deviation from the trends occurring in Canada, as the construction sector increased in importance and the weighting of the mining sector contracted.

While productivity growth was relatively modest, the service sector was the main source of aggregate labour productivity growth (Table 12). It contributed 1.70 percentage points to the growth rate between 1987 and 2000. As was the case in Canada, this was due to its overwhelming majority share of the business sector. All service-producing industries positively contributed to aggregate labour productivity growth, with the largest contributions coming from FIRE and management (0.48), professional and business services (0.31), and education, health, and social assistance industries (0.23).

Despite higher productivity growth rates than its northern neighbour, the contribution of the manufacturing sector was lower in the United States (0.08) than in Canada (0.35) over the same period. Only seven of sixteen manufacturing industries positively contributed to labour productivity growth, with the largest contribution coming from computer and electronic product manufacturing (0.05). Not surprisingly, given the impressive productivity growth reported in the industry over the period, the contribution from the pure productivity effect was strongly positive (0.55). However a negative shift effect (-0.51) largely offset these gains as the relative size of the industry was much smaller in 2000 than it was in 1987 due to falling output prices. In fact, while a few Canadian manufacturing industries had a positive contribution from the shift effect, no manufacturing industry in the United States

provided a positive contribution via the shift effect, as the manufacturing sector underwent a severe contraction in its relative importance to aggregate productivity.

The mining sector negatively contributed 0.03 percentage points to the labour productivity growth rate in the U.S. business sector. The positive contribution from the pure productivity effect (0.04) was overwhelmed by a negative contribution from the shift effect (-0.07) as the share of the sector contracted.

In sharp contrast to the slowdown experienced in Canada, U.S. business sector labour productivity grew 0.23 percentage points faster from 2000 to 2008 than from 1987 to 2000, expanding at an annual rate of 2.02 per cent (Table 8). This divergence in the growth path of aggregate labour productivity has been the chief impetus behind the need to explain and contrast the performance of the two economies. The annual growth rate in the United States of service sector labour productivity over the second period was 1.98 per cent, above the annual 1.40 per cent growth observed in Canada and up from 1.38 per cent experienced by the United States in the first period. The leading performers in the service sector were information industries (9.56 per cent), wholesale trade (3.32 per cent), and administrative and waste management industries (3.11 per cent). The manufacturing sector continued to have impressive productivity gains, diverging from the severe slowdown experienced in Canadian manufacturing, with productivity growth of 5.42 per cent per year. The mining sector had a reversal in productivity growth on par with the Canadian experience, going from 1.36 per cent per year to an annual growth rate of -5.35 per cent.

The relative importance of major parts of the U.S. business sector to labour productivity generally continued to follow the same trends as reported in Canada (Table 10). Manufacturing continued to contract in importance, while the

weighting of service-producing industries continued to grow. Both the mining and construction sectors reported an increase in their relative importance between 2000 and 2008. However, the weighting of the agriculture, forestry, fishing and hunting industries increased slightly, a trend that was not observed in Canada over the same period. By 2008, the weighting of various parts of the business sector would suggest that the United States was generally more reliant on service industries for labour productivity growth than was Canada and less reliant on its mining and manufacturing sectors.

The contribution to aggregate labour productivity growth from services was 1.74 percentage points in the 2000-2008 period (Table 12), a slight increase from the previous period and, again, much higher than the 0.85 percentage point contribution experienced concurrently in Canada. Overall, a contribution of 1.55 percentage points came from the pure productivity effect in the service sector and an additional 0.19 percentage points from the shift effect. The Canadian service sector, by contrast, had only marginal gains from the shift effect (0.02) and had a much smaller pure productivity effect (0.83). The largest contribution within the services sector came from FIRE and management, which added 0.49 percentage points to the aggregate growth rate on a strong pure productivity effect (0.31) and a sizeable positive contribution from the shift effect (0.17). Education, health care, and social assistance contributed 0.40 percentage points to the productivity growth rate, the second highest contribution, but this came almost entirely from the shift effect (0.37), rather than through the pure productivity effect (0.02).

As was the case in Canada, U.S. manufacturing was a net drag on business sector productivity growth in the 2000-2008 period. However,

the degree of the negative contribution by U.S. manufacturing, 0.08 percentage points, was less than one-tenth that of the downward pressure imposed by the Canadian manufacturing sector. While the negative contribution from the U.S. manufacturing shift effect, 0.94 percentage points, was similar to the Canadian experience (-0.97), the greater contribution from the U.S. pure productivity effect (0.87) was more favourable than the minimal contribution from the Canadian pure productivity effect within manufacturing (0.06). The largest positive contribution came from petroleum and coal product manufacturing, which added 0.12 percentage points to labour productivity growth rate, as the industry contributed through both the pure productivity effect (0.04) and the shift effect (0.08).

The U.S. mining sector was one of the few major areas of the business sector that underperformed its Canadian counterpart in terms of its contribution to the labour productivity growth rate over the 2000-2008 period. Overall, the mining sector added 0.19 percentage points to labour productivity growth, an improvement over the net drag reported in the previous period, but below the total contribution reported in Canada (0.64). While the contribution from the pure productivity effect was negative in the sector (-0.08), the positive contribution that stemmed from the shift effect (0.27) was more than enough to offset the impact of negative productivity growth in the sector. This was similar to the situation in Canada, but the degree of contribution was far stronger in Canada, especially in the oil and gas extraction industry. Even in non-oil or gas mining industries, while the productivity contribution was the same for both countries in the period (-0.03), there was a weaker contribution from the shift effect in the U.S. (0.09) than in

Canada (0.18) and this resulted in a lower net contribution.

The improvement in the annual aggregate business sector labour productivity growth rate from the 1987-2000 period to the 2000-2008 period was the result of both an improved pure productivity effect, which increased by 0.12 percentage points, and a reduced drag from the shift effect, which decreased its negative contribution by 0.12 percentage points. Improved productivity performance in the service sector more than offset the negative pressure observed in the pure productivity effect for construction, utilities, and primary industries. However, the support to improved growth that stemmed from a reduced negative contribution from the shift effect did not come from the largest sectors of the business sector, manufacturing and services, but from primary industries such as agriculture and mining.

Concluding Remarks

Despite the high degree of integration of the Canadian and U.S. economies and the fairly open nature of both countries, differences in industry structure and exposure to external pressures resulted in somewhat dissimilar responses to the shifts in supply and demand conditions in foreign and domestic markets over the course of the 1987-2008 period.

In terms of real GDP growth, the slowdown in Canada's post-2000 performance was far more moderate than what was experienced in the United States, and is exemplified by the absence of a recession in 2001 in Canada. At the heart of this seeming convergence of growth rates in the second period was a sizeable decrease in the contribution from the service sector in the United States, which contributed to real GDP growth at a level more consistent with the equivalent Canadian sector, and the increased contribution of the Canadian mining sector, which increased its contribution by 0.51 percentage points, and

the Canadian construction sector, which increased its contribution by 0.36 percentage points. The narrative of Canada's real economic growth resilience would have been completely altered in the 2000s if not for these two sectors, as the downward pressure exerted by manufacturing was far more severe in Canada than in the United States. This is likely the result of weaker demand conditions for manufacturing industries in both countries, but it was clearly felt more acutely in Canada than in the U.S. manufacturing sector.

While the general convergence in Canadian and U.S. real economic growth in the 2000-2008 period from the 1987-2000 period can be traced to a change in the contribution of a number of different sectors, the divergence of aggregate labour productivity growth rates appears to be not as nuanced.

Canada's manufacturing sector was the main source of the post-2000 slowdown in business labour productivity growth in absolute terms relative to the United States. While some sectors of the Canadian business sector continued to contribute less to aggregate growth than their U.S. counterparts and perhaps contribute to the persistence of a productivity growth gap, most notably the service sector, the wider gap from one period to the next can be traced in the dramatic decline net contribution from the Canadian manufacturing sector, which experienced a drop of 1.26 percentage points. It was only due to the increased contribution from mining, construction and services that the gap between Canadian and U.S. labour productivity growth rates was not even wider. Both the U.S. and Canadian manufacturing sectors faced similar negative contributions from the shift effect, as economic significance shifted to other industries in the 2000-2008 period. But this change was more sudden in Canada than in the United States. At the same time, Canada also experienced a steep slowdown in productivity growth

within the sector that accounted for almost half of the reduction in manufacturing's contribution to aggregate labour productivity growth.

The Canadian mining sector, far from being the drag on aggregate labour productivity growth that one would expect from poor productivity growth—it was one of several possible culprits for the post-2000 slowdown that was posited by Rao *et al.* (2005) and was highlighted by Baldwin and Gu (2009) as the sector leading the slowdown in aggregate labour productivity growth—was, in fact, a net benefit as a result of the shift effect. Given that the sector possessed productivity levels well above the business sector average, the shift of economic significance to the mining sector offset some of the drag imposed by the movement of the economic significance from the Canadian manufacturing sector. In addition, improvements in the productivity of Canadian service industries also helped reduce the negative contribution of the manufacturing sector, but Canadian service-producing industries continued to contribute far less to aggregate productivity than their U.S. counterparts.

Few of these trends appear poised to slow or change direction following the events of the “Great Recession”. Supply and demand conditions within North America and overseas may have partially readjusted in the wake of the 2008 financial crisis and the subsequent global recession, but many of the underlying factors that have pushed and pulled the industry structure of Canada and the United States in different directions remain present. Technological advancement, rising demand for commodities in emerging markets, and increased global competition are all trends that promise to endure into the foreseeable future.

Within the United States, which was the epicentre of the global crisis, the long-term effects on the most-impacted industries are not easily discernable. The economic and productivity

gains that originated in the FIRE and management industries may end up being less robust than the data ending at 2008 currently suggest, as some of the supply-side effects are likely to diminish as a result of the widespread impacts of the 2008-09 financial crisis. However, it seems unlikely that these industries will become marginalized. Financial industries are poised to provide more stable growth going forward, but may contribute less to productivity gains in the business sector than was observed in the 2000-2008 period.

Within Canada, the increased reliance on the mining sector for economic and labour productivity growth over the 2000s appears unlikely to abate, as the rise in relative prices for commodities has been in response to expanding demand by emerging markets. Given that the external value of the Canadian dollar is linked to commodity prices, it seems plausible that the Canadian manufacturing sector will continue to undergo readjustment and rebalancing as it responds to weaker demand conditions resulting from the erosion of its competitiveness internationally. However, concerns about the so-called “Dutch Disease” scenario, where commodity prices continue to exert upward pressure on the currency and increasingly renders the manufacturing sector uncompetitive, may be overblown, as discussed by Bayoumi and Mühleisen (2006) and Macdonald (2007). More likely, the Canadian manufacturing sector will settle into a smaller, leaner version of itself with an industry mix more aligned with its competitive advantages.

Where the United States and Canada share an undeniable common path is in the rising importance of education, health care, and social assistance industries. The weight of these industries in the contribution to labour productivity growth and to real GDP growth has been steadily increasing since 1987. The aging population of both countries appears poised to

increase the demand for health care and social assistance services. There have been few signs that the price effect that has been behind the industry's contribution will diminish in either country.

Both the Canadian and U.S. economies have become increasingly services-based, and while it is likely that the speed of this shift away from traditional manufacturing industries will slow as supply and demand conditions rebalance, there is little to indicate that this trend will halt altogether. Therefore, addressing the weak labour productivity contribution from the Canadian service sector relative to the performance of its U.S. counterpart may be a one of the most important challenges facing Canada. A fuller and more nuanced understanding of the structural challenges within these industries has been one of the most glaring knowledge gaps in Canadian productivity research and will have to be addressed if Canada's post-2000 productivity divergence with the U.S. is to become a notable historical aberration rather than the beginnings of an enduring trend.

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Appendix

Value Added and Hours Worked by Industry in Canada and the United States

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 table 379-0023 for value added in nominal dollars and table 383-0021 for real value added. Value added estimates include both private and non-private activities. But, imputed rental income for owner-occupied housing is excluded. To be comparable to the U.S. data, the original value added data at 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, the value added data are from the U.S. Bureau of Economic Analysis (BEA). To be comparable to the Canadian data, 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 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 Bureau of Labor Statistics.

Table 1
Hours Worked Shares by Industry in the Business Sector in Canada and the United States,
1987, 2000, and 2008
(per cent)

	Canada			United States		
	1987	2000	2008	1987	2000	2008
Agriculture, forestry, fishing, and hunting	6.0	3.9	2.8	4.1	2.8	2.7
Mining	1.5	1.3	1.7	0.9	0.5	0.7
Oil and gas extraction	0.4	0.3	0.5	0.2	0.1	0.1
Mining, except oil and gas	1.0	1.0	1.1	0.6	0.4	0.6
Utilities	0.9	0.8	0.9	0.8	0.6	0.5
Construction	7.7	6.8	9.1	7.0	7.5	7.7
Manufacturing	18.6	15.9	12.3	20.7	16.4	12.7
Wood products	1.2	1.1	0.8	0.7	0.6	0.4
Non-metallic mineral products	0.6	0.5	0.5	0.6	0.5	0.5
Primary metals	1.1	0.8	0.5	0.8	0.6	0.4
Fabricated metal products	1.3	1.5	1.3	1.9	1.7	1.4
Machinery	1.1	1.1	0.9	1.6	1.4	1.1
Computer and electronic products	0.9	0.8	0.6	2.4	1.7	1.2
Electrical equipment and appliances	0.6	0.4	0.3	0.8	0.6	0.4
Transportation equipment	2.1	1.9	1.4	2.6	2.0	1.5
Furniture and miscellaneous manuf	1.3	1.3	1.0	1.5	1.3	1.1
Food, beverage, and tobacco products	2.6	1.9	1.6	1.9	1.6	1.6
Textile mills and textile product mills	0.5	0.4	0.2	0.9	0.6	0.3
Apparel and leather	1.3	0.8	0.4	1.2	0.5	0.2
Paper products and printing	2.0	1.5	1.2	1.6	1.3	1.0
Petroleum and coal products	0.2	0.1	0.2	0.2	0.1	0.1
Chemical products	1.0	0.7	0.7	1.2	0.9	0.8
Plastics and rubber products	0.8	1.0	0.8	0.9	0.9	0.7
Services	65.4	71.4	73.3	66.4	72.2	75.7
Wholesale trade	5.6	6.3	6.0	5.8	5.4	5.3
Retail trade	12.0	11.0	10.9	12.6	11.8	11.4
Transportation and warehousing	5.8	5.8	5.9	4.6	4.9	4.8
Information	2.3	2.7	2.6	2.8	3.3	2.6
FIRE and management of companies	6.6	6.7	7.2	9.1	8.4	8.9
Professional and business services	4.3	6.3	6.9	5.2	6.5	7.2
Administrative and waste management	2.7	4.0	5.0	4.3	6.8	6.8
Education, health care and social assistance	11.6	14.5	14.8	9.5	12.1	14.8
Arts, entertainment, and recreation	1.2	1.7	1.9	1.0	1.3	1.4
Accommodation and food services	6.9	6.7	6.1	6.5	6.6	7.2
Other services (except government)	6.3	5.7	5.9	4.9	5.1	5.3
Business sector	100	100	100	100	100	100

Table 2
Industry Contribution to Hours Worked Growth in the Business Sector in Canada and the United States, 1987-2008
(percentage points per year)

	Canada			United States		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	-0.08	-0.10	-0.09	-0.05	-0.01	-0.03
Mining	0.01	0.07	0.03	-0.01	0.02	0.00
Oil and gas extraction	-0.01	0.04	0.01	-0.01	0.00	-0.00
Mining, except oil and gas	0.01	0.04	0.02	-0.01	0.02	0.00
Utilities	0.01	0.02	0.01	-0.01	-0.00	-0.01
Construction	0.05	0.41	0.18	0.16	0.03	0.11
Manufacturing	0.06	-0.24	-0.05	-0.01	-0.47	-0.18
Wood products	0.01	-0.03	-0.00	0.00	-0.02	-0.01
Non-metallic mineral products	-0.01	0.01	-0.00	0.00	-0.01	-0.00
Primary metals	-0.01	-0.02	-0.01	-0.00	-0.03	-0.01
Fabricated metal products	0.04	-0.01	0.02	0.02	-0.03	-0.00
Machinery	0.02	-0.01	0.01	0.01	-0.03	-0.01
Computer and electronic products	0.01	-0.02	0.00	-0.01	-0.07	-0.04
Electrical equipment and appliances	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01
Transportation equipment	0.02	-0.04	-0.00	-0.00	-0.06	-0.03
Furniture and miscellaneous manuf	0.02	-0.02	0.01	0.01	-0.03	-0.01
Food, beverage, and tobacco products	-0.01	-0.01	-0.01	0.01	-0.01	0.00
Textile mills and textile product mills	-0.01	-0.02	-0.01	-0.01	-0.04	-0.02
Apparel and leather	-0.02	-0.04	-0.03	-0.04	-0.03	-0.04
Paper products and printing	-0.01	-0.02	-0.02	0.00	-0.05	-0.02
Petroleum and coal products	-0.00	0.01	0.00	-0.00	-0.00	-0.00
Chemical products	-0.01	0.01	-0.00	0.00	-0.02	-0.01
Plastics and rubber products	0.03	-0.01	0.01	0.01	-0.02	-0.00
Services	1.62	1.33	1.51	1.70	0.46	1.22
Wholesale trade	0.15	0.05	0.12	0.07	-0.01	0.04
Retail trade	0.12	0.15	0.13	0.15	-0.05	0.08
Transportation and warehousing	0.09	0.10	0.10	0.11	-0.01	0.06
Information	0.07	0.02	0.05	0.09	-0.08	0.03
FIRE and management of companies	0.12	0.18	0.14	0.10	0.06	0.09
Professional and business services	0.24	0.17	0.22	0.20	0.09	0.16
Administrative and waste management	0.15	0.20	0.17	0.29	0.00	0.18
Education, health care and social assistance	0.46	0.25	0.38	0.40	0.35	0.38
Arts, entertainment, and recreation	0.06	0.06	0.06	0.05	0.01	0.03
Accommodation and food services	0.10	0.02	0.07	0.12	0.07	0.10
Other services (except gov't)	0.05	0.11	0.08	0.10	0.02	0.07
Business sector	1.66	1.49	1.60	1.78	0.02	1.11

Table 3**Industry Nominal Value Added Share in the Business Sector in Canada and the United States, 1987, 2000, and 2008**

(per cent)

	Canada			United States		
	1987	2000	2008	1987	2000	2008
Agriculture, forestry, fishing, and hunting	3.5	2.6	1.9	2.5	1.5	1.6
Mining	5.6	7.2	11.8	2.0	1.3	2.5
Oil and gas extraction	3.4	5.6	9.1	1.1	0.8	1.6
Mining, except oil and gas	2.3	1.6	2.7	0.8	0.5	0.9
Utilities	3.6	3.1	2.7	2.6	1.9	1.9
Construction	7.5	5.7	7.7	6.3	6.2	6.0
Manufacturing	20.6	22.0	13.6	22.1	18.5	15.3
Wood products	1.1	1.4	0.6	0.5	0.4	0.2
Non-metallic mineral products	0.8	0.5	0.5	0.6	0.6	0.4
Primary metals	1.6	1.4	1.1	0.8	0.6	0.5
Fabricated metal products	1.3	1.6	1.2	1.8	1.6	1.3
Machinery	1.1	1.5	1.1	1.8	1.5	1.1
Computer and electronic products	1.0	1.4	0.6	2.2	2.3	1.8
Electrical equipment and appliances	0.7	0.5	0.3	0.8	0.6	0.5
Transportation equipment	2.4	3.9	1.6	3.3	2.4	1.7
Furniture and miscellaneous manuf	0.8	1.1	0.8	1.2	1.2	1.0
Food, beverage, and tobacco products	3.0	2.5	2.2	2.2	2.0	1.6
Textile mills and textile product mills	0.4	0.3	0.1	0.6	0.4	0.2
Apparel and leather	0.8	0.6	0.1	0.6	0.3	0.1
Paper products and printing	2.7	2.3	1.2	1.8	1.3	0.9
Petroleum and coal products	0.3	0.3	0.5	0.8	0.6	1.4
Chemical products	1.9	1.6	1.2	2.1	2.0	2.0
Plastics and rubber products	0.8	1.1	0.6	0.9	0.9	0.6
Services	59.2	59.4	62.3	64.5	70.6	72.8
Wholesale trade	6.0	5.9	6.3	6.4	6.5	6.1
Retail trade	7.3	5.9	6.2	8.6	7.4	6.4
Transportation and warehousing	6.2	5.3	5.1	4.2	3.8	3.6
Information	3.6	3.9	4.1	4.9	5.2	5.5
FIRE and management of companies	10.8	11.6	12.2	15.8	18.2	19.0
Professional and business services	3.2	5.2	5.7	6.5	8.7	9.9
Administrative and waste management	2.0	2.4	3.0	2.4	3.7	3.9
Education, health care and social assistance	13.5	12.7	13.4	8.0	8.9	10.5
Arts, entertainment, and recreation	0.9	1.0	1.0	0.9	1.2	1.2
Accommodation and food services	2.8	2.7	2.5	3.2	3.3	3.4
Other services (except gov't)	2.9	2.8	3.0	3.6	3.6	3.3
Business sector	100	100	100	100	100	100

Table 4**Industry Real Value Added Growth in the Business Sector in Canada and the United States, 1987-2008**

(per cent per year)

	Canada			United States		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	1.9	0.1	1.2	3.3	1.7	2.7
Mining	2.6	1.0	2.0	-0.7	-1.6	-1.1
Oil and gas extraction	3.3	1.0	2.4	-4.0	-1.6	-3.1
Mining, except oil and gas	1.7	2.1	1.8	3.7	-0.8	2.0
Utilities	1.3	2.1	1.6	2.7	-0.3	1.5
Construction	0.9	4.8	2.4	2.0	-2.1	0.4
Manufacturing	3.8	-0.8	2.0	4.0	2.1	3.3
Wood products	3.4	-1.2	1.6	-0.7	1.1	0.0
Non-metallic mineral products	0.9	1.9	1.3	3.2	-2.1	1.2
Primary metals	3.7	1.0	2.7	2.4	-4.9	-0.4
Fabricated metal products	4.4	-0.6	2.5	2.4	-0.2	1.4
Machinery	4.7	0.5	3.1	1.5	1.3	1.4
Computer and electronic products	11.9	-4.1	5.8	25.2	16.7	21.9
Electrical equipment and appliances	2.0	-4.1	-0.3	2.0	1.2	1.7
Transportation equipment	6.4	-2.0	3.2	0.9	2.5	1.5
Furniture and miscellaneous manuf	5.1	-0.7	2.9	3.7	1.5	2.8
Food, beverage, and tobacco products	1.1	0.4	0.8	1.6	1.0	1.4
Textile mills and textile product mills	0.6	-7.1	-2.3	1.6	-5.2	-1.0
Apparel and leather	0.3	-10.9	-4.0	-1.6	-3.6	-2.4
Paper products and printing	1.1	-2.2	-0.1	0.6	-1.1	-0.1
Petroleum and coal products	3.7	0.3	2.4	4.0	8.2	5.6
Chemical products	2.9	1.0	2.2	2.1	1.4	1.8
Plastics and rubber products	6.3	-1.7	3.2	5.0	-0.8	2.8
Services	3.0	3.3	3.1	3.9	2.6	3.4
Wholesale trade	4.8	4.3	4.6	5.8	3.1	4.7
Retail trade	2.6	4.8	3.4	4.7	0.9	3.2
Transportation and warehousing	2.7	1.8	2.4	4.6	2.7	3.8
Information	5.8	3.9	5.1	5.4	6.6	5.9
FIRE and management of companies	3.4	3.8	3.5	3.6	2.4	3.1
Professional and business services	6.2	3.0	5.0	4.1	3.2	3.8
Administrative and waste management	3.8	4.7	4.2	5.7	3.1	4.7
Education, health care and social assistance	1.1	2.3	1.6	1.7	2.9	2.2
Arts, entertainment, and recreation	2.2	2.4	2.3	4.7	1.1	3.3
Accommodation and food services	2.0	1.4	1.8	2.7	1.5	2.3
Other services (except gov't)	1.7	3.2	2.3	1.6	-0.8	0.7
Business sector	2.9	2.3	2.7	3.6	2.0	3.0

Table 5
Industry Real Value Added Price in the Business Sector in Canada and the United States,
1987, 2000, and 2008
(1987 = 100)

	Canada			United States		
	1987	2000	2008	1987	2000	2008
Agriculture, forestry, fishing, and hunting	100.0	85.5	75.9	100.0	64.9	71.6
Mining	100.0	132.9	242.6	100.0	116.6	316.6
Oil and gas extraction	100.0	156.6	286.9	100.0	196.7	581.6
Mining, except oil and gas	100.0	85.3	143.1	100.0	62.5	144.0
Utilities	100.0	106.3	94.7	100.0	81.2	98.9
Construction	100.0	99.3	110.1	100.0	122.0	163.2
Manufacturing	100.0	95.9	76.0	100.0	79.5	65.5
Wood products	100.0	120.2	68.5	100.0	125.8	89.6
Non-metallic mineral products	100.0	92.5	87.5	100.0	96.0	90.6
Primary metals	100.0	77.3	71.4	100.0	85.4	136.9
Fabricated metal products	100.0	107.6	101.3	100.0	102.5	97.3
Machinery	100.0	115.1	98.4	100.0	108.5	91.6
Computer and electronic products	100.0	47.1	37.0	100.0	9.9	2.8
Electrical equipment and appliances	100.0	91.1	83.0	100.0	93.4	80.9
Transportation equipment	100.0	108.7	62.1	100.0	103.3	70.1
Furniture and miscellaneous manuf	100.0	101.3	99.2	100.0	103.5	90.7
Food, beverage, and tobacco products	100.0	105.2	105.2	100.0	117.8	103.4
Textile mills and textile product mills	100.0	106.3	96.3	100.0	79.3	66.3
Apparel and leather	100.0	104.5	85.4	100.0	90.1	65.6
Paper products and printing	100.0	110.8	78.8	100.0	114.3	97.4
Petroleum and coal products	100.0	121.1	215.5	100.0	86.5	146.5
Chemical products	100.0	82.9	67.7	100.0	116.0	123.8
Plastics and rubber products	100.0	89.5	72.5	100.0	81.4	75.3
Services	100.0	99.0	96.4	100.0	106.1	104.6
Wholesale trade	100.0	77.3	70.4	100.0	77.9	67.9
Retail trade	100.0	83.7	72.4	100.0	75.6	71.8
Transportation and warehousing	100.0	88.5	88.5	100.0	81.7	74.3
Information	100.0	76.3	69.8	100.0	85.0	64.5
FIRE and management of companies	100.0	100.5	94.3	100.0	115.6	118.1
Professional and business services	100.0	110.3	114.7	100.0	125.8	130.3
Administrative and waste management	100.0	111.6	115.4	100.0	120.1	114.8
Education, health care and social assistance	100.0	117.7	124.2	100.0	141.6	155.5
Arts, entertainment, and recreation	100.0	135.2	132.3	100.0	122.9	128.4
Accommodation and food services	100.0	107.9	105.5	100.0	117.7	123.8
Other services (except gov't)	100.0	111.0	110.5	100.0	128.4	148.5
Business sector	100.0	100.0	100.0	100.0	100.0	100.0

Table 6**Industry Contribution to Annual Real GDP Growth in the Canadian Business Sector, 1987-2008**
(percentage points per year)

	Quantity Effect			Price Effect			Total		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	0.06	0.00	0.04	-0.04	-0.04	-0.04	0.02	-0.04	0.00
Mining	0.12	0.09	0.11	0.14	0.69	0.35	0.27	0.78	0.46
Oil and gas extraction	0.10	0.05	0.08	0.16	0.55	0.31	0.26	0.60	0.39
Mining, except oil and gas	0.02	0.04	0.03	-0.02	0.14	0.04	0.01	0.18	0.07
Utilities	0.05	0.06	0.05	0.02	-0.04	-0.01	0.06	0.02	0.05
Construction	0.04	0.31	0.14	0.00	0.09	0.04	0.04	0.40	0.18
Manufacturing	0.74	-0.20	0.38	-0.03	-0.45	-0.19	0.71	-0.65	0.19
Wood products	0.05	0.00	0.03	0.02	-0.08	-0.02	0.06	-0.08	0.01
Non-metallic mineral products	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Primary metals	0.05	0.01	0.03	-0.03	-0.01	-0.02	0.02	0.00	0.01
Fabricated metal products	0.06	-0.01	0.03	0.01	-0.01	0.00	0.06	-0.02	0.03
Machinery	0.06	0.01	0.04	0.01	-0.02	0.00	0.07	-0.02	0.04
Computer and electronic products	0.13	-0.06	0.06	-0.07	-0.02	-0.05	0.06	-0.09	0.00
Electrical equipment and appliances	0.01	-0.02	0.00	0.00	0.00	0.00	0.00	-0.02	-0.01
Transportation equipment	0.19	-0.05	0.10	0.03	-0.18	-0.05	0.21	-0.23	0.04
Furniture and miscellaneous manuf	0.04	-0.01	0.02	0.00	0.00	0.00	0.04	-0.01	0.02
Food, beverage, and tobacco products	0.03	0.01	0.02	0.01	0.00	0.01	0.04	0.01	0.03
Textile mills and textile product mills	0.00	-0.02	-0.01	0.00	0.00	0.00	0.00	-0.02	-0.01
Apparel and leather	0.00	-0.04	-0.01	0.00	-0.01	0.00	0.00	-0.04	-0.02
Paper products and printing	0.02	-0.03	0.00	0.02	-0.08	-0.02	0.04	-0.11	-0.02
Petroleum and coal products	0.00	0.00	0.00	0.01	0.03	0.02	0.01	0.03	0.02
Chemical products	0.05	0.02	0.04	-0.02	-0.04	-0.03	0.03	-0.02	0.01
Plastics and rubber products	0.06	-0.01	0.03	-0.01	-0.02	-0.01	0.05	-0.03	0.02
Services	1.85	2.00	1.91	-0.08	-0.22	-0.13	1.77	1.78	1.77
Wholesale trade	0.30	0.26	0.28	-0.13	-0.07	-0.11	0.17	0.19	0.18
Retail trade	0.17	0.30	0.22	-0.10	-0.12	-0.10	0.07	0.18	0.11
Transportation and warehousing	0.16	0.10	0.13	-0.06	0.00	-0.04	0.10	0.10	0.10
Information	0.22	0.16	0.20	-0.09	-0.05	-0.07	0.14	0.11	0.13
FIRE and management of companies	0.40	0.45	0.42	0.00	-0.10	-0.04	0.39	0.35	0.38
Professional and business services	0.26	0.16	0.22	0.02	0.03	0.02	0.28	0.19	0.24
Administrative and waste management	0.08	0.13	0.10	0.02	0.01	0.02	0.10	0.14	0.12
Education, health care and social assistance	0.15	0.30	0.20	0.19	0.09	0.15	0.34	0.38	0.36
Arts, entertainment, and recreation	0.02	0.03	0.02	0.02	0.00	0.01	0.04	0.02	0.04
Accommodation and food services	0.05	0.04	0.05	0.02	-0.01	0.01	0.07	0.03	0.06
Other services (except gov't)	0.05	0.09	0.06	0.02	0.00	0.01	0.07	0.09	0.08
Business sector	2.86	2.27	2.63	0.02	0.03	0.02	2.87	2.30	2.65

Table 7**Industry Contributions to Annual Real GDP Growth in the U.S. Business Sector, 1987-2008**
(percentage points per year)

	Quantity Effect			Price Effect			Total		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	0.05	0.03	0.04	-0.06	0.01	-0.03	-0.01	0.04	0.01
Mining	0.00	-0.02	-0.01	0.00	0.21	0.08	0.00	0.19	0.07
Oil and gas extraction	-0.02	-0.02	-0.02	0.02	0.14	0.07	0.00	0.13	0.05
Mining, except oil and gas	0.02	0.00	0.01	-0.02	0.06	0.01	0.00	0.06	0.02
Utilities	0.06	-0.01	0.04	-0.04	0.04	-0.01	0.02	0.04	0.03
Construction	0.11	-0.14	0.02	0.09	0.23	0.15	0.20	0.10	0.16
Manufacturing	0.87	0.36	0.67	-0.41	-0.43	-0.42	0.45	-0.07	0.25
Wood products	0.00	0.00	0.00	0.01	-0.01	0.00	0.00	-0.01	0.00
Non-metallic mineral products	0.02	-0.01	0.01	0.00	0.00	0.00	0.02	-0.01	0.00
Primary metals	0.02	-0.03	0.00	-0.01	0.03	0.01	0.01	0.00	0.01
Fabricated metal products	0.04	-0.01	0.02	0.00	-0.01	0.00	0.04	-0.02	0.02
Machinery	0.02	0.01	0.02	0.01	-0.02	0.00	0.03	-0.02	0.01
Computer and electronic products	0.54	0.29	0.45	-0.45	-0.31	-0.40	0.09	-0.02	0.05
Electrical equipment and appliances	0.01	0.00	0.01	0.00	-0.01	-0.01	0.01	-0.01	0.00
Transportation equipment	0.02	0.05	0.03	0.00	-0.10	-0.04	0.02	-0.05	0.00
Furniture and miscellaneous manuf	0.04	0.02	0.03	0.00	-0.02	-0.01	0.05	0.00	0.03
Food, beverage, and tobacco products	0.03	0.01	0.03	0.03	-0.03	0.00	0.06	-0.02	0.03
Textile mills and textile product mills	0.01	-0.02	0.00	-0.01	-0.01	-0.01	0.00	-0.02	-0.01
Apparel and leather	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.02	-0.01
Paper products and printing	0.01	-0.01	0.00	0.01	-0.02	0.00	0.02	-0.04	0.00
Petroleum and coal products	0.02	0.04	0.03	-0.01	0.09	0.03	0.01	0.13	0.05
Chemical products	0.05	0.02	0.04	0.03	0.01	0.02	0.07	0.04	0.06
Plastics and rubber products	0.04	-0.01	0.02	-0.01	-0.01	-0.01	0.03	-0.02	0.01
Services	2.63	1.88	2.34	0.31	-0.14	0.14	2.94	1.74	2.48
Wholesale trade	0.38	0.19	0.30	-0.14	-0.11	-0.13	0.24	0.08	0.18
Retail trade	0.38	0.07	0.26	-0.18	-0.05	-0.13	0.20	0.02	0.13
Transportation and warehousing	0.18	0.10	0.15	-0.06	-0.05	-0.06	0.12	0.05	0.09
Information	0.28	0.37	0.31	-0.07	-0.21	-0.12	0.21	0.16	0.19
FIRE and management of companies	0.59	0.44	0.53	0.19	0.05	0.14	0.78	0.49	0.67
Professional and business services	0.31	0.29	0.30	0.14	0.04	0.10	0.45	0.33	0.41
Administrative and waste management	0.17	0.12	0.15	0.05	-0.02	0.02	0.22	0.09	0.17
Education, health care and social assistance	0.15	0.28	0.20	0.25	0.12	0.20	0.40	0.40	0.40
Arts, entertainment, and recreation	0.05	0.01	0.03	0.02	0.01	0.01	0.07	0.02	0.05
Accommodation and food services	0.09	0.05	0.07	0.04	0.02	0.03	0.13	0.07	0.11
Other services (except gov't)	0.06	-0.03	0.02	0.07	0.06	0.07	0.13	0.03	0.09
Business sector	3.72	2.10	3.10	-0.12	-0.07	-0.10	3.60	2.03	3.00

Table 8**Industry Labour Productivity Growth in the Business Sector in Canada and the United States, 1987-2008**

(per cent per year)

	Canada			United States		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	3.60	3.02	3.38	4.77	2.36	3.85
Mining	2.28	-3.76	-0.02	1.36	-5.35	-1.19
Oil and gas extraction	5.07	-7.26	0.37	-0.22	-4.54	-1.86
Mining, except oil and gas	0.57	-1.32	-0.15	5.34	-4.82	1.47
Utilities	0.40	-0.66	0.00	3.98	0.46	2.64
Construction	0.12	-0.42	-0.08	-0.34	-2.36	-1.11
Manufacturing	3.26	0.88	2.36	4.09	5.42	4.59
Wood products	2.08	1.39	1.82	-1.33	5.64	1.33
Non-metallic mineral products	1.58	0.16	1.04	2.76	-0.20	1.63
Primary metals	4.76	4.11	4.51	2.77	0.00	1.71
Fabricated metal products	1.28	0.16	0.85	1.36	1.69	1.49
Machinery	2.85	1.82	2.46	0.83	3.78	1.95
Computer and electronic products	10.18	-2.08	5.51	25.77	22.38	24.48
Electrical equipment and appliances	3.92	-1.98	1.67	2.83	5.39	3.80
Transportation equipment	5.22	0.41	3.39	1.02	5.99	2.92
Furniture and miscellaneous manuf	2.80	1.35	2.24	2.76	4.35	3.37
Food, beverage, and tobacco products	1.72	1.05	1.46	1.01	1.44	1.18
Textile mills and textile product mills	1.60	-1.70	0.34	3.32	3.34	3.32
Apparel and leather	2.34	-3.94	-0.05	3.54	6.72	4.75
Paper products and printing	1.72	-0.62	0.83	0.42	3.10	1.44
Petroleum and coal products	4.00	-2.60	1.49	6.21	8.39	7.04
Chemical products	3.98	0.07	2.49	2.10	3.24	2.53
Plastics and rubber products	2.72	-0.50	1.49	3.44	2.30	3.00
Services	0.62	1.40	0.91	1.38	1.98	1.61
Wholesale trade	2.23	3.41	2.68	4.49	3.32	4.04
Retail trade	1.58	3.40	2.27	3.38	1.26	2.57
Transportation and warehousing	1.06	0.07	0.68	2.33	2.86	2.53
Information	2.78	3.02	2.87	2.25	9.56	5.04
FIRE and management of companies	1.62	1.20	1.46	2.34	1.71	2.10
Professional and business services	1.29	0.34	0.92	0.57	1.86	1.06
Administrative and waste management	-0.79	0.22	-0.40	0.26	3.11	1.35
Education, health care and social assistance	-2.15	0.54	-1.13	-1.90	0.24	-1.08
Arts, entertainment, and recreation	-1.92	-0.85	-1.52	0.72	0.42	0.60
Accommodation and food services	0.50	1.05	0.71	0.88	0.48	0.73
Other services (except gov't)	0.74	1.27	0.94	-0.44	-1.14	-0.71
Business sector	1.18	0.79	1.04	1.79	2.02	1.88

Table 9**Industry Relative Labour Productivity in the Business Sector in Canada and the United States, 1987, 2000, 2008**

(Business Sector = 100)

	Canada			United States		
	1987	2000	2008	1987	2000	2008
Agriculture, forestry, fishing, and hunting	57.9	77.3	91.0	60.7	81.7	81.3
Mining	379.1	425.3	289.4	228.2	211.7	111.1
Oil and gas extraction	771.8	1220.9	593.1	483.8	348.6	190.0
Mining, except oil and gas	214.7	194.8	163.1	130.3	199.9	110.3
Utilities	424.5	376.9	333.6	311.9	407.1	356.4
Construction	97.4	84.9	76.8	90.1	68.4	47.9
Manufacturing	111.0	144.3	145.2	106.5	142.1	184.1
Wood products	97.4	107.9	111.0	76.9	50.2	65.3
Non-metallic mineral products	125.5	129.8	122.8	97.7	108.3	89.5
Primary metals	146.1	228.0	293.1	100.9	113.3	93.0
Fabricated metal products	99.3	99.4	94.0	99.5	93.5	90.8
Machinery	93.0	111.7	120.5	109.9	95.6	109.4
Computer and electronic products	120.2	346.7	251.7	90.6	1309.4	5442.6
Electrical equipment and appliances	105.5	144.2	112.3	99.6	112.5	144.1
Transportation equipment	118.5	193.9	185.8	129.7	116.8	157.5
Furniture and miscellaneous manuf	64.5	78.3	81.4	79.2	89.5	106.7
Food, beverage, and tobacco products	116.6	123.8	125.9	116.7	103.8	97.9
Textile mills and textile product mills	79.2	82.6	66.9	67.7	81.9	82.0
Apparel and leather	58.5	66.8	44.1	54.0	67.1	95.5
Paper products and printing	130.3	139.1	123.9	106.7	88.6	95.7
Petroleum and coal products	144.8	182.4	130.2	425.1	559.4	816.3
Chemical products	186.3	262.2	245.9	178.6	184.0	196.9
Plastics and rubber products	100.8	121.4	109.0	97.4	119.0	119.5
Services	90.5	84.1	88.2	97.1	92.2	91.9
Wholesale trade	106.3	120.4	147.4	110.1	153.2	168.9
Retail trade	61.0	63.7	78.1	68.6	83.7	78.6
Transportation and warehousing	105.9	103.7	97.7	89.6	95.9	102.2
Information	156.6	189.8	225.0	177.0	185.4	324.6
FIRE and management of companies	164.9	172.9	178.2	174.1	186.4	181.6
Professional and business services	74.7	74.7	72.0	124.8	106.3	105.0
Administrative and waste management	72.9	54.5	52.0	55.7	45.7	49.5
Education, health care and social assistance	115.6	74.3	72.8	84.6	52.3	45.4
Arts, entertainment, and recreation	70.4	46.5	40.5	85.3	73.5	64.3
Accommodation and food services	41.1	37.4	38.1	48.3	42.9	38.0
Other services (except gov't)	46.6	43.8	45.4	73.1	54.7	42.3
Business sector	100.0	100.0	100.0	100.0	100.0	100.0

Table 10**Industry Relative Size* in the Business Sector in Canada and the United States, 1987, 2000, and 2008**

(Business Sector = 100)

	Canada			United States		
	1987	2000	2008	1987	2000	2008
Agriculture, forestry, fishing, and hunting	6.0	3.4	2.1	4.1	1.8	1.9
Mining	1.5	1.7	4.1	0.9	0.6	2.3
Oil and gas extraction	0.4	0.5	1.5	0.2	0.2	0.8
Mining, except oil and gas	1.0	0.8	1.6	0.6	0.3	0.8
Utilities	0.9	0.8	0.8	0.8	0.5	0.5
Construction	7.7	6.7	10.0	7.0	9.1	12.5
Manufacturing	18.6	15.2	9.3	20.7	13.0	8.3
Wood products	1.2	1.3	0.5	0.7	0.7	0.4
Non-metallic mineral products	0.6	0.4	0.4	0.6	0.5	0.4
Primary metals	1.1	0.6	0.4	0.8	0.5	0.6
Fabricated metal products	1.3	1.6	1.3	1.9	1.7	1.4
Machinery	1.1	1.3	0.9	1.6	1.5	1.0
Computer and electronic products	0.9	0.4	0.2	2.4	0.2	0.0
Electrical equipment and appliances	0.6	0.4	0.2	0.8	0.5	0.3
Transportation equipment	2.1	2.0	0.8	2.6	2.1	1.1
Furniture and miscellaneous manuf	1.3	1.4	1.0	1.5	1.4	1.0
Food, beverage, and tobacco products	2.6	2.0	1.7	1.9	1.9	1.6
Textile mills and textile product mills	0.5	0.4	0.2	0.9	0.4	0.2
Apparel and leather	1.3	0.8	0.3	1.2	0.4	0.1
Paper products and printing	2.0	1.7	0.9	1.6	1.5	0.9
Petroleum and coal products	0.2	0.2	0.4	0.2	0.1	0.2
Chemical products	1.0	0.6	0.5	1.2	1.1	1.0
Plastics and rubber products	0.8	0.9	0.6	0.9	0.7	0.5
Services	65.4	70.7	70.7	66.4	76.6	79.2
Wholesale trade	5.6	4.9	4.2	5.8	4.2	3.6
Retail trade	12.0	9.2	7.9	12.6	8.9	8.2
Transportation and warehousing	5.8	5.1	5.3	4.6	4.0	3.6
Information	2.3	2.1	1.8	2.8	2.8	1.7
FIRE and management of companies	6.6	6.7	6.8	9.1	9.7	10.5
Professional and business services	4.3	6.9	7.9	5.2	8.2	9.4
Administrative and waste management	2.7	4.4	5.8	4.3	8.2	7.8
Education, health care and social assistance	11.6	17.1	18.3	9.5	17.1	23.1
Arts, entertainment, and recreation	1.2	2.2	2.5	1.0	1.7	1.8
Accommodation and food services	6.9	7.2	6.5	6.5	7.8	8.9
Other services (except gov't)	6.3	6.3	6.5	4.9	6.6	7.8
Business Sector	100.0	100.0	100.0	100.0	100.0	100.0

* The relative size for an industry is the product of the hours worked share of the industry in the business sector and the real output price of the industry. It indicates the economic significance of the industry in aggregate labour productivity by capturing the industry size in terms of labour input share and the output value of the industry relative to other industries.

Table 11**Industry Contribution to Aggregate Labour Productivity Growth in the Canadian Business Sector, 1987-2008**

(percentage points per year)

	Pure Productivity Effect			Shift Effect			Total		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	0.11	0.07	0.09	-0.14	-0.14	-0.14	-0.03	-0.07	-0.05
Mining	0.15	-0.48	-0.09	0.03	1.13	0.45	0.18	0.64	0.36
Oil and gas extraction	0.14	-0.45	-0.09	0.07	0.95	0.40	0.21	0.50	0.32
Mining, except oil and gas	0.01	-0.03	-0.01	-0.04	0.18	0.05	-0.03	0.15	0.04
Utilities	0.02	-0.02	0.00	-0.01	0.00	-0.01	0.00	-0.02	-0.01
Construction	0.00	-0.04	-0.01	-0.06	0.34	0.09	-0.06	0.30	0.08
Manufacturing	0.65	0.06	0.42	-0.30	-0.97	-0.55	0.35	-0.91	-0.13
Wood products	0.03	0.03	0.03	0.01	-0.12	-0.04	0.04	-0.09	-0.01
Non-metallic mineral products	0.01	0.00	0.00	-0.02	0.00	-0.01	-0.01	0.00	-0.01
Primary metals	0.06	0.05	0.06	-0.06	-0.07	-0.07	0.00	-0.02	-0.01
Fabricated metal products	0.02	0.00	0.01	0.02	-0.04	0.00	0.04	-0.04	0.01
Machinery	0.03	0.02	0.03	0.01	-0.06	-0.01	0.05	-0.04	0.01
Computer and electronic products	0.11	-0.05	0.05	-0.07	-0.05	-0.06	0.04	-0.09	-0.01
Electrical equipment and appliances	0.02	-0.01	0.01	-0.02	-0.02	-0.02	0.00	-0.03	-0.01
Transportation equipment	0.16	0.01	0.10	0.00	-0.28	-0.11	0.16	-0.27	-0.01
Furniture and miscellaneous manuf	0.02	0.01	0.02	0.01	-0.04	-0.01	0.03	-0.02	0.01
Food, beverage, and tobacco products	0.05	0.03	0.04	-0.05	-0.05	-0.05	0.00	-0.03	-0.01
Textile mills and textile product mills	0.00	0.00	0.00	-0.01	-0.02	-0.01	0.00	-0.02	-0.01
Apparel and leather	0.01	-0.01	0.00	-0.02	-0.04	-0.03	-0.01	-0.05	-0.02
Paper products and printing	0.04	-0.01	0.02	-0.03	-0.13	-0.07	0.00	-0.13	-0.05
Petroleum and coal products	0.00	-0.01	0.00	0.01	0.04	0.02	0.01	0.02	0.01
Chemical products	0.07	0.00	0.04	-0.07	-0.04	-0.06	0.00	-0.04	-0.02
Plastics and rubber products	0.02	0.00	0.01	0.01	-0.05	-0.01	0.03	-0.05	0.00
Services	0.31	0.83	0.51	0.43	0.02	0.28	0.75	0.85	0.79
Wholesale trade	0.14	0.21	0.16	-0.07	-0.11	-0.09	0.06	0.09	0.08
Retail trade	0.10	0.21	0.14	-0.14	-0.12	-0.13	-0.04	0.09	0.01
Transportation and warehousing	0.06	0.00	0.04	-0.06	0.01	-0.03	0.00	0.02	0.01
Information	0.10	0.12	0.11	-0.03	-0.07	-0.05	0.07	0.05	0.06
FIRE and management of companies	0.20	0.14	0.17	0.00	0.03	0.01	0.20	0.17	0.19
Professional and business services	0.06	0.02	0.04	0.15	0.09	0.13	0.21	0.11	0.17
Administrative and waste management	-0.03	0.01	-0.01	0.09	0.09	0.09	0.06	0.10	0.07
Education, health care and social assistance	-0.33	0.07	-0.18	0.44	0.12	0.32	0.11	0.19	0.14
Arts, entertainment, and recreation	-0.02	-0.01	-0.01	0.04	0.02	0.03	0.03	0.01	0.02
Accommodation and food services	0.01	0.03	0.02	0.01	-0.04	-0.01	0.02	-0.01	0.01
Other services (except gov't)	0.02	0.04	0.03	0.00	0.01	0.01	0.02	0.05	0.03
Business sector	1.24	0.42	0.92	-0.05	0.38	0.11	1.18	0.79	1.04

Table 12**Industry Contribution to Aggregate Labour Productivity Growth in the U.S. Business Sector, 1987-2008**

(percentage points per year)

	Pure Productivity Effect			Shift Effect			Total		
	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008	1987-2000	2000-2008	1987-2008
Agriculture, forestry, fishing, and hunting	0.08	0.04	0.06	-0.13	0.00	-0.08	-0.04	0.04	-0.01
Mining	0.04	-0.08	-0.01	-0.07	0.27	0.06	-0.03	0.19	0.05
Oil and gas extraction	0.01	-0.06	-0.02	-0.02	0.18	0.05	-0.01	0.12	0.04
Mining, except oil and gas	0.03	-0.03	0.01	-0.05	0.09	0.01	-0.01	0.06	0.02
Utilities	0.09	0.01	0.06	-0.11	0.03	-0.06	-0.02	0.04	0.00
Construction	-0.02	-0.15	-0.07	0.12	0.25	0.17	0.10	0.10	0.10
Manufacturing	0.87	0.87	0.87	-0.78	-0.94	-0.84	0.08	-0.08	0.02
Wood products	0.00	0.02	0.00	0.00	-0.03	-0.01	0.00	-0.01	-0.01
Non-metallic mineral products	0.01	0.00	0.01	-0.01	-0.01	-0.01	0.01	-0.01	0.00
Primary metals	0.02	0.00	0.01	-0.03	0.01	-0.01	0.00	0.00	0.00
Fabricated metal products	0.02	0.02	0.02	-0.01	-0.04	-0.02	0.01	-0.02	0.00
Machinery	0.01	0.04	0.02	-0.01	-0.06	-0.03	0.00	-0.02	0.00
Computer and electronic products	0.55	0.39	0.49	-0.51	-0.41	-0.47	0.05	-0.02	0.02
Electrical equipment and appliances	0.02	0.03	0.02	-0.02	-0.03	-0.03	0.00	0.00	0.00
Transportation equipment	0.02	0.13	0.06	-0.05	-0.18	-0.10	-0.02	-0.05	-0.03
Furniture and miscellaneous manuf	0.03	0.05	0.04	-0.01	-0.05	-0.02	0.03	0.00	0.01
Food, beverage, and tobacco products	0.02	0.02	0.02	0.00	-0.04	-0.01	0.02	-0.01	0.01
Textile mills and textile product mills	0.02	0.01	0.01	-0.03	-0.03	-0.03	-0.01	-0.02	-0.01
Apparel and leather	0.02	0.01	0.02	-0.04	-0.03	-0.03	-0.02	-0.02	-0.02
Paper products and printing	0.01	0.03	0.02	-0.01	-0.07	-0.03	0.00	-0.04	-0.02
Petroleum and coal products	0.03	0.04	0.03	-0.04	0.08	0.01	-0.01	0.12	0.04
Chemical products	0.05	0.06	0.05	-0.02	-0.03	-0.02	0.03	0.04	0.03
Plastics and rubber products	0.03	0.02	0.03	-0.02	-0.03	-0.02	0.01	-0.01	0.00
Services	1.04	1.55	1.24	0.66	0.19	0.48	1.70	1.74	1.71
Wholesale trade	0.29	0.21	0.26	-0.17	-0.13	-0.15	0.12	0.08	0.10
Retail trade	0.27	0.10	0.21	-0.22	-0.07	-0.17	0.05	0.02	0.04
Transportation and warehousing	0.09	0.11	0.10	-0.05	-0.05	-0.05	0.05	0.05	0.05
Information	0.11	0.54	0.27	0.01	-0.38	-0.14	0.11	0.16	0.13
FIRE and management of companies	0.39	0.31	0.36	0.09	0.17	0.12	0.48	0.49	0.48
Professional and business services	0.04	0.17	0.09	0.27	0.16	0.23	0.31	0.33	0.32
Administrative and waste management	0.01	0.12	0.05	0.15	-0.02	0.08	0.16	0.09	0.13
Education, health care and social assistance	-0.17	0.02	-0.10	0.41	0.37	0.39	0.23	0.40	0.30
Arts, entertainment, and recreation	0.01	0.00	0.01	0.04	0.01	0.03	0.05	0.02	0.04
Accommodation and food services	0.03	0.02	0.02	0.04	0.06	0.05	0.07	0.07	0.07
Other services (except gov't)	-0.02	-0.04	-0.03	0.08	0.07	0.08	0.06	0.03	0.05
Business sector	2.11	2.23	2.15	-0.32	-0.20	-0.27	1.79	2.02	1.88