Differences in productivity growth: Canadian-U.S. business sectors, 1987–2000

Productivity growth picked up significantly in 1995 for the United States, and in 1996 for Canada, driven in both cases by a resurgence of productivity in services, however, Canadian productivity growth has remained lower than that in the United States

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The productivity performance of the Canadian business sector relative to its U.S. counterpart has been the subject of numerous recent studies.[1] However, previous work has focussed mainly on the manufacturing sector to explain the Canada–U.S. gap, without really exploring the role played by other industry groups. Furthermore, previous studies have tended to concentrate on Canada–U.S. industry-level productivity performance in the early 1990s.[2]

In this study, we use an industry-level decomposition to better assess the role played by various industries in the Canada–U.S. gap in productivity growth in the business sector.[3] Our methodology takes into account the fact that both industry-level productivity performance and the industrial composition of the economy affect aggregate productivity growth.[4] Ideally, our analysis should cover the period from 1985 onwards.[5] Because of data constraints, however, the study looks at Canadian and U.S. productivity growth from 1987 to 2000 only.[6] Furthermore, our analysis pays special attention to the subperiod 1996 to 2000 for two reasons. First, by the late 1990s, productivity growth had picked up in both the Canadian and the U.S. business sectors, but it remained lower in Canada. Emphasis on this period brings to light the industries most responsible for the remaining difference. Second, our study examines industry-level productivity growth for Canada and the United States for the post-1996 period using comparable data. Therefore, we seek to highlight these new data in the study.

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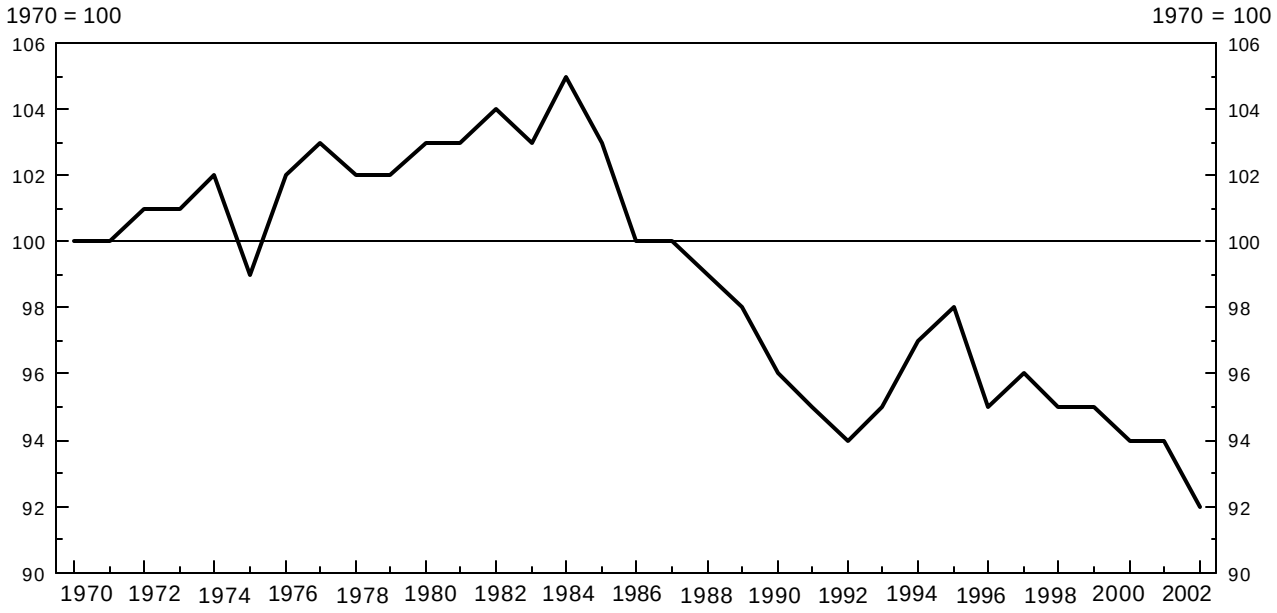
Trends

The slower productivity growth in Canada, compared with that in the United States is often identified as the main factor explaining the growing Canada-U.S. real income gap per capita. Since 1981, Canada's standard of living performance has lagged, on average, behind that of the United States.[7] The major break in the Canada-U.S. productivity performance seems to have occurred around 1985, when productivity growth in Canada slowed significantly, relative to U.S. growth.[8] (See chart 1.)

Two distinct time periods can be identified: from 1970 to 1985, productivity growth in the Canadian business sector gain ground on their American counterpart; after 1985, however, the United States outperformed Canada. By the end of the 1990s, the Canada-U.S. productivity level gap expanded by 7 percentage points, relative to its value in the mid-1980s.

Our analysis shows that productivity growth picked up significantly in the United States starting in 1995 and in Canada starting in 1996, driven in both cases by a resurgence in service sector productivity. However, this growth has remained lower in Canada than in the United States. Our analysis suggests that the service sector contributed most significantly to the Canada-U.S. business sector growth gap from 1987 to 1996, whereas the manufacturing sector was the dominant player in explaining the gap from 1996 to 2000.

Chart 1. Ratio of Canada/U.S. relative labor productivity performance in the business sector, 1970–2000



SOURCE: Canadian data extracted from CANSIM tables 383-0005; U.S. data extracted from BLS Web site.

The data

The sample period for our analysis is from 1987 to 2000, with special emphasis on 1996 to 2000. The analysis focuses on labor productivity, defined as output per hour worked.[9] To ensure comparability across countries, we measure productivity on a value-added chain-Fisher basis for both Canada and the United States. Our data allow for a comparison of annual productivity growth rates between the two countries over the 1987–2000 period for the total business sector and four major industrial sectors: primary,[10] construction, manufacturing and services. Because of data limitations for Canada,[11] we can perform more detailed analysis within each of these sectors for the 1987–97 period only.

Canadian data. Productivity data for Canada are from Statistics Canada. In the past, industry-level output and productivity data have been available with only a considerable lag. These data are derived from the input-output accounts and often lag the latest aggregate output and productivity data by 3 to 4 years. Previous studies examining the industry-level productivity performance in the Canadian business sector, therefore, have had to either manage with somewhat out-of-date data or resort to using other sources for the industry-level output data. One alternate source for output data by industry is the gross domestic product at basic prices (GDPBP) accounts. The GDPBP, however, are on a Laspeyres fixed-price basis, whereas U.S. data are on a chain-Fisher basis. Our study presents Canadian broad sector-level details on a chain-Fisher basis for labor productivity for the post-1996 period.

The output data for the 1987–97 period are derived from revised input-output tables, which now incorporate the capitalization of software.[12] The real output estimates are constructed from a chain-Fisher index up to the most current year for which the input-output tables are available (currently 1997). These data embody the industry-level data available to researchers prior to this study. For this period, output and hours data are available for 230 industries within the business sector.

Post-1997 industry-level data are a unique aspect of this study. For the post-1997 period, output data for the *aggregate* business sector correspond to the average annual estimates of quarterly value-added growth. Industry-level output data for the post-1997 period are restricted to only four industry groups (as opposed to 230 industries for the pre-1997 period) and are based on chain-Fisher estimates[13] of the real value added. These estimates are constructed from Laspeyres volume indexes of industry real gross domestic product at basic prices published by Statistics Canada's Industry Measures and Analysis Division, with some adjustments. Since complete data for the full sample (1987 to 2000) are available only for the business sector and the four main industry groups, the focus here will be on these industry

groups. However, in a second step, we also examine the manufacturing and service sectors in more detail over the limited sample period (1987 to 1997).

Hours worked represent the total number of hours that a person devotes to work, whether paid or unpaid. We calculate this number as the product of the number of jobs times the average hours worked, both of which are derived from household and establishment surveys.

U.S. data. Industry-level productivity data for the United States are harder to obtain than for Canada, as the Bureau of Labor Statistics does not publish these data for industry groups other than the manufacturing, retail trade, and wholesale trade sectors. Therefore, we have constructed these data from source data for our analysis.[14]

The output data used are from the Bureau of Economic Analysis (BEA).[15] The gross domestic product by industry or "gross product originating" (GPO) include nominal value-added and chain-weighted real output for 62 detailed industries for the period 1987 to 2000.[16] U.S. disaggregated output by industry is available only for *private industries* and not the business sector. The primary distinction between the two categories is that 'business sector' includes government enterprises, whereas 'private industries' excludes them.[17] Although different conceptually, there is no significant disparity in the behavior of the two series.[18] Hence, in our study, we use the private sector aggregate as a close proxy for the U.S. business sector.

We use the BLS hours worked data that are for total hours worked of all employed persons, including proprietors. Data for both industry-level output and hours are available for 62 industry groups within the business sector.

Results

The productivity performance in both the Canadian and the U.S. business sectors over the period 1987–2000 can be broken into two distinct episodes: an era of relatively modest productivity growth, followed by a period of more robust performance.

The U.S. productivity revival over the second half of the 1990s has been well documented in the literature.[19] Indeed, the productivity performance of the U.S. business sector has been nothing short of spectacular since 1995: average annual productivity growth increased from 1.5 percent over the 1987–96 period to 2.6 percent over the 1996–2000 period. Canada also showed a revival in business sector productivity over the same period[20]—average annual productivity growth increased from 1.0 percent over the 1987–96 period to 2.2 percent over 1996–2000. These numbers suggest that although average annual productivity growth has remained lower in Canada than in the United States, the *improvement* in productivity growth from the earlier to the later period has been as significant in Canada (1.2 percentage points) as it has been in the United States (1.1 percentage points).[21]

The Canada-U.S. gap in productivity growth in the business sector has remained roughly unchanged over the last 15 years: –0.5 percentage points from 1987 to 1996 and –0.4 percentage points from 1996 to 2000.[22] An issue concerning the U.S. data should be mentioned before we turn to the industrial sources of the Canada-U.S. productivity gap. As mentioned in the previous section, we use output data from the BEA in our analysis. A trouble-some aspect of the BEA output data is that a statistical discrepancy exists in the estimate of output for private industries (our proxy for business sector output). This statistical discrepancy is the difference between the sum of gross domestic product from the expenditure side and the sum obtained from the industry output side. Because the BEA views the expenditure-side data as more reliable, the statistical discrepancy is added as an "industry" to the industry output accounts.[23] As the statistical discrepancy is quite large and negative over the second half of the 1990s, the use of industry-level productivity growth over recent years may be misleading, particularly when one wants to better understand the aggregate U.S. picture or do country comparisons.

To ensure consistency between the aggregate and industry-level productivity growth rates, we have to adjust industry output levels for the statistical discrepancy. Our approach to this problem is to divide the real statistical discrepancy among the industries. (See appendix section "Industry decomposition productivity gap" for details.)[24]

Table 1 documents the unadjusted and adjusted industry-level productivity growth rates for the U.S. industries. The first thing to note is that adjusted numbers for business sector productivity are roughly equivalent to the official BLS data for business sector productivity growth. The same cannot be said for the unadjusted data. The table also shows that although the effect of the adjustments on industry-level productivity performance is minimal for the period 1987 to 1996, there is a noticeable impact for the period 1996 to 2000. Since the statistical discrepancy is large and negative in the late 1990s, the adjusted productivity growth rates are lower than the unadjusted figures.

In the remainder of this section, we investigate the industrial sources of the Canada-U.S. gap in productivity growth in four steps. Aggregate productivity growth for each country is a function of both industry-level productivity performance as well as the industrial composition of the economy.[25] Therefore, the first two steps are to examine industry-level productivity performance and the industrial structure of the business sector in each country. The third step involves an industrial decomposition of the aggregate productivity growth in each country. Finally, in the fourth step, we put all the pieces together

Table 1. U.S. average annual labor productivity growth using adjusted and unadjusted data, 1987–2000

(In percent)

Business sector[2]	1987–1996		1996–2000		Swing[1]	
	1.5		2.7		1.2	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Business sector (sector aggregation)	[3]1.5	1.5	[3]3.2	2.6	1.7	1.1
Primary industries	2.7	2.7	4.5	3.9	1.8	1.2
Construction	.1	.2	–.5	–1.0	–.6	–1.2
Manufacturing	2.6	2.6	5.1	4.6	2.5	2.0
Services	1.1	1.1	2.8	2.3	1.7	1.2

[1] "Swing" is the change in average annual productivity growth across the 1987–96 and 1996–2000 periods.

[2] Based on official BLS published data.

[3] Using private sector aggregate calculated as a sum of industry outputs.

and carry out a contribution to growth analysis by industry for the Canada-U.S. gap in productivity growth. Note again that our primary analysis is done using adjusted U.S. output data. However, as a robustness check, industry decomposition analysis using the unadjusted U.S. industry data is shown in the appendix.

Productivity growth by industry. Table 2 compares the productivity performance of Canadian and U.S. industries. Over the 1987–96 period, Canada lagged behind the United States in almost all major industry groups except for the primary sector. In contrast, between 1996 and 2000, the difference became less significant. Unadjusted U.S. data suggest that Canada lagged behind the United States in the service and manufacturing sectors, whereas the adjusted data suggest that Canada has lower productivity growth only in the manufacturing sector.

Two other points also emerge from the analysis. First, U.S. and Canadian growth in service sector productivity surged from the earlier to the later period. Furthermore, the improvement in service sector productivity performance from the earlier to the later period was as significant for Canada as it was for the United States. Second, table 2 shows that while the productivity performance of the Canadian manufacturing sector deteriorated across the periods, the U.S. manufacturing sector registered an impressive surge in productivity.[26] This implies that the gap in productivity growth (Canada minus the United States) in the manufacturing sector opened up significantly across the two periods.

Industrial structure. Industrial structure can be explored, among other ways, by focussing on the shares of nominal output and hours accounted for by individual industries. Table 3 presents the average shares of nominal output and hours by industry in the Canadian and U.S. business sectors over the 1987–2000 period[27]:

	Nominal output		*Hours worked*	
	Canada	*United States*	*Canada*	*United States*
Primary industries	8.2	3.6	7.3	3.6
Construction	7.8	4.9	9.1	7.8
Manufacturing	24.6	20.0	19.8	22.1
Services	59.3	71.4	63.8	66.5

Four main messages emerge from this analysis:

1. The service sector forms a smaller share of the business sector in Canada than it does in the United States.[28]
2. The importance of the service sector within the business sector has increased considerably since the late 1980s for both Canada and the United States: from 1987 to 1997, the service sector's share of nominal output increased from 56 percent to 60 percent for Canada, and from 68 percent to 73 percent for the United States. (See appendix table A–3.)
3. The manufacturing sector has greater relative importance in Canada than in the United States in its contribution to nominal output. However, the manufacturing sector accounts for a larger share of hours in the United States than it does in Canada.
4. The primary and construction industries are relatively small in both countries, accounting for less than 15 percent of nominal output and total hours in both countries.

Decomposing aggregate productivity growth. The industrial structure and productivity performance by industry can be combined within a growth decomposition framework to examine the contribution of each industry toward aggregate productivity growth. In our study, we adopt the methodology outlined in the McKinsey study.[29] Using this

methodology, changes in aggregate productivity (LP) in country c between period t-1 and t can be written as follows:[30]

$$L\dot{P}_t^c = \frac{H_{t-1}^c}{H_t^c} \cdot \left[\sum_i a_{i,t-1}^c \cdot (\dot{Y}_{i,t}^c - \dot{H}_{i,t}^c) \right] + \frac{H_{t-1}^c}{H_t^c} \cdot \left[\sum_i (a_{i,t-1}^c - c_{i,t-1}^c) \cdot \dot{H}_{i,t}^c \right]$$

$$= \sum_i b_{i,t-1}^c \cdot (L\dot{P}_{i,t}^c) + R_t^c \qquad (1)$$

where $a_{i,t-1}^c$ is the lagged nominal output share of industry 'i', $b_{i,t-1}^c = \left(H_{t-1}^c / H_t^c\right) a_{i,t-1}^c$, $c_{i,t-1}^c$ is the lagged hours worked share of industry 'i', 'H' represents hours worked, 'Y' represents chain-Fisher measure of real value-added output and the dot ('·') over a variable indicates the growth operator.

Equation (1) consists of two interrelated parts: a 'direct' effect and a 'reallocation' effect. The direct effect, the first term of equation (1), is the weighted average of industry-level productivity performance, with the weights equaling the nominal output shares of the industries. As industries improve their productivity, aggregate productivity rises in proportion with industry size. The reallocation effect, R_t^c in equation (1), can be thought of as the impact on aggregate productivity growth from the movement of resources across industries. The reallocation effect is positive if resources move into industries that have higher nominal labor productivity. The direct effect can be interpreted at the industry level, whereas the reallocation effect makes sense for the aggregate only.[31]

Using equation (1), the gap in aggregate productivity growth between two countries A and B can be expressed as follows:[32]

$$L\dot{P}_t^B - L\dot{P}_t^A = \sum_i \frac{(b_i^B + b_i^A)}{2} (L\dot{P}_{i,t}^B - L\dot{P}_{i,t}^A) + \sum_i \frac{(L\dot{P}_i^B + L\dot{P}_i^A)}{2} (b_i^B - b_i^A)$$

$$+ (R_t^B - R_t^A) \qquad (2)$$

In equation (2), we decompose the aggregate productivity growth gap into three parts: a "pure productivity" effect, a

Table 2. Canada-U.S. industry-level productivity growth, 1987–2000

Industry	1987–96		1996–2000		Swing[1]	
	Canada	United States	Canada[2]	United States	Canada	United States
Business sector	1.0	1.5	2.2	2.6	1.2	1.1
Primary industries	3.1	2.7	5.2	3.9	2.1	1.2
Construction	–.7	.2	.4	–1.0	1.1	–1.2
Manufacturing	2.1	2.6	1.9	4.6	–.2	2.0
Services	.7	1.1	2.3	2.3	1.6	1.2

[1] "Swing" is the change in average annual productivity growth across the 1987–96 and 1996–2000 periods.

[2] Estimates for the 1998–2000 period at the industry-level are preliminary and subject to revisions.

Table 3. Contribution to business sector productivity growth in Canada and United States, 1987–2000

Industry and effect	1987–96	1996–2000	Swing[1]
Canada			
Average business sector productivity growth[2]	1.2	2.2	1.1
Direct contribution from—			
Primary	.3	.4	.1
Construction	–.1	.0	.1
Manufacturing	.5	.5	.0
Services	.4	1.4	.9
Reallocation effect	–.1	.0	.0
United States			
Average business sector productivity growth	1.5	2.6	1.1
Direct contribution from—			
Primary	.1	.1	.0
Construction	.0	–.1	–.1
Manufacturing	.5	.9	.3
Services	.8	1.7	.9
Reallocation effect	.1	.0	–.1

[1] "Swing" is the change from the 1987–96 to the 1996–2000 period.

[2] Figures may not sum due to rounding and residual errors.

"structure" effect and a "reallocation" effect. The pure productivity effect (the first term) captures the contribution from differences in productivity performance of industries between the two countries. The structure effect (the second term) indicates the contribution from differences in the size of the industry (relative to the respective business sector) across countries. The structure effect is positive if country *B* has a higher share of industries with faster productivity growth. Finally, the reallocation effect (the third term) measures the difference in the movement of resources across industries between the two countries. The reallocation effect is positive if there are faster shifts in resources toward industries that are more productive. Akin to the analysis in the last section, only the pure productivity effect can be analyzed at the industry level; the other two effects are examined at the aggregate level only.

Table 3 presents the decomposition results for Canada and the United States. The results show that the Canadian manufacturing sector contributed most significantly to business sector productivity growth over the 1987–96 period, followed by the service and primary sectors. For the 1996– 2000 period, however, it is the service sector that contributes most significantly to aggregate productivity growth followed by the manufacturing sector. Our decomposition of the pickup in productivity growth across the two periods clearly shows that the service sector was responsible in large part for this phenomenon. Finally, the contribution from the reallocation effect is small but negative over the 1987–96 period.[33]

A similar decomposition of the U.S. aggregate productivity growth shows the service sector as the dominant industry over both periods (1987–96 and 1996–2000), followed by the manufacturing sector. As is the case in Canada, we find that the importance of the service sector to overall productivity growth has increased in recent years. The results also show that the pickup in overall productivity in the late 1990s can be attributed in large part to the improvement in service sector productivity. Lastly, the estimated contribution from the reallocation effect is found to be minimal over both periods. Using unadjusted BEA data provides similar results. (See appendix section, "Industry decomposition.")

The following tabulation presents the industrial decomposition of the Canada-U.S. productivity growth gap (Canada minus the United States) using equation (2). (Note: figures may not sum due to rounding.):

	1987–96	*1996–2000*
Canada-U.S. productivity growth gap	–0.5	–0.4
'Pure' productivity contribution from—		
Primary	.0	.0
Construction	–.1	.1
Manufacturing	–.1	–.6
Services	–.2	–.0
Structure effect	.1	.1
Reallocation effect	–.1	.0

Two key findings emerge from the results in the tabulation:

1. In terms of the "pure" productivity effect, the service sector is the largest contributor to the business sector gap over the 1987–96 period, compared with the manufacturing sector for the 1996–2000 period.
2. At the aggregate level, structure and reallocation effects are small and offsetting.

Before we proceed further, however, two caveats to the results are in order. First, our industrial decomposition results for the 1996–2000 period are considerably affected by the adjustments made to the U.S. output data: when we use unadjusted data, both the manufacturing and the service sectors contribute to the pure productivity gap over the 1996– 2000 period (See appendix section on "industry decomposition," table A-3 showing the contribution to business sector productivity gap between Canada and United States.); as in the analysis, however, the contribution from the manufacturing sector remains most significant.

Second, the decomposition between productivity, structure, and reallocation effects is sensitive to the level of disaggregation, as the next section demonstrates. This suggests that if the analysis of data presented in the previous tabulation was redone with more disaggregated data,[34] perhaps the pure productivity effect from the manufacturing sector would not be as dominant as it is now in explaining the business sector productivity gap over the 1996 –2000 period. It is possible, for example, that the productivity growth difference in the manufacturing sector across the two countries reflects a difference in the industrial structure of the manufacturing sector.

Detailed industry analysis

The results from the previous section suggest that both the service and the manufacturing sectors have played important roles in the Canada-U.S. gap in productivity growth. This section examines these two sectors in more detail.

Data availability for Canada restricts the detailed industry analysis to the 1987–97 period. For the United States, we continue to use adjusted U.S. output data. (See productivity by industry, p. 19.) However, since the average statistical discrepancy from 1987 to 1997 is close to 0, our results are not affected by using adjusted, versus unadjusted data. Note that we do not break the sample into two subperiods. Instead, the estimates presented in this section are for the whole period for which detailed data are available, 1987–97.

Manufacturing sector. Detailed data are available for 20 industries within the manufacturing sector for both Canada and the United States.[35] (See table 4.) We also define two subaggregates from these industries: high-tech and non-high-tech manufacturing industries. The high-tech industries include the machinery and electrical and electronics product industries, and the non-high-tech industries make up the remainder of the manufacturing industries.

Share and productivity analysis of the manufacturing sector industries for the 1987–96 period shows that:

1. In terms of nominal output share, the transportation equipment industry is the largest manufacturing industry in Canada, whereas the food and beverage industry is the largest in the United States.

2. High-tech manufacturing industries are less important in terms of size (both nominal output and hours) in Canada than they are in the United States, whereas non-high-tech manufacturing industries are more important (in terms of nominal output share) in Canada than they are in the United States.

3. In Canada, average annual productivity growth is highest for refined petroleum, followed by machinery and transportation industries, but the electronics and machinery industries dominate in the U.S. manufacturing sector.

4. For Canada, the largest negative gap in productivity growth (Canada minus United States) by industry is for the electrical and electronic industries, while the most significant positive gap is for the transportation equipment industries.

5. High-tech manufacturing has had much slower productivity growth in Canada than in the United States. From 1987 to 1996, productivity growth in the U.S. high-tech industries was about twice that in their Canadian counterparts. Meanwhile, non-high-tech manufacturing productivity growth was higher in Canada than in the United States.

Using the contribution to growth methodology outlined

Table 4. Shares and productivity growth in 2-digit manufacturing industries, 1987–97

Industry	Nominal output share		Hours share		Productivity growth		
	Canada	United States	Canada	United States	Canada	United States	Canadian-U.S. gap
Business sector	...	...	...	...	1.2	1.6	–0.4
Manufacturing sector	24.4	20.5	19.9	22.7	2.2	2.7	–.5
High-tech industries[1]	2.9	4.4	2.6	4.5	4.1	9.9	–5.8
Non-high tech industries[2]	21.5	16.2	17.3	18.2	1.9	.7	1.2
Logging and wood industries	2.2	2.2	1.9	1.0	.0	–3.0	3.0
Food and beverage industries	3.1	3.1	2.4	2.0	1.0	.8	.2
Tobacco products industries	.2	.2	.0	.1	1.6	–.7	2.3
Rubber product industries	.9	.7	.8	1.1	1.7	4.3	–2.6
Textile industries	.5	.4	.6	.8	2.4	3.1	–.8
Leather and allied products	.1	.1	.2	.1	.2	3.5	–3.3
Clothing industries	.6	.5	1.0	1.1	2.4	2.8	–.4
Furniture and fixture industries	.4	.3	.6	.6	2.5	1.2	1.3
Paper and allied products industries	1.9	.9	1.1	.8	2.6	1.2	1.5
Printing, publishing and allied industries	1.5	1.4	1.4	1.9	–1.8	–2.5	.7
Primary metal industries	1.6	.8	1.0	.9	3.8	2.2	1.5
Fabricated metals products	1.4	1.4	1.5	1.7	1.2	1.2	.0
Machinery industries	1.4	2.2	1.4	2.5	4.9	7.0	–2.1
Transportation equipment industries	3.4	2.3	2.5	2.3	4.8	–.3	5.0
Electrical and electronic product industries	1.5	2.2	1.2	2.0	3.8	13.1	–9.4
Nonmetallic mineral product industries	.7	.5	.6	.7	1.0	3.1	-2.2
Refined petroleum and coal product industries	3	.5	.2	.2	6.0	1.3	4.7
Chemical and chemical products industries	2.1	2.2	1.0	1.3	2.9	2.9	.0
Scientific and professional equipment	.3	.9	.2	1.1	–1.9	–.6	-1.4
Other manufacturing industries	.4	.4	.6	.5	3.8	1.2	2.6

[1] Machinery industries plus electrical and electronic product industries.

[2] Manufacturing minus machinery industries minus electrical and electronic product industries.

NOTE: Nominal output and hour shares are expressed relative to the business sector and represent an average for 1987–97.

in the previous section, we examine the contribution of manufacturing sector in the Canada-U.S. gap in productivity growth in the business sector over the 1987–96 period. Our investigation shows that when viewed in isolation, the high-tech manufacturing industries can account for a large portion of the Canada-U.S. gap in business sector productivity growth over this period. (See table 5.) However, the negative impact of the high-tech industries is countered by a positive contribution to the gap in business sector productivity growth from 'other manufacturing industries' led by transportation equipment industries. These two effects together partially offset one another. Therefore, while the high-tech manufacturing industries figure significantly in the Canada-U.S. gap in productivity growth, the overall contribution of the manufacturing sector to the gap is close to zero for the 1987–97 period .

Our analysis also shows the sensitivity of decomposition analysis to the level of aggregation used for the examination. The first part of table 5 shows the contribution of the manufacturing sector industries to the business sector gap using the 20 industries within the manufacturing sector for the calculations. The last four rows show the same calculations using only the aggregate manufacturing sector data. Note that although the total contribution of the manufacturing sector to the gap is unchanged, the component effects are different across these two calculations. This raises the possibility that if we were to explore the high-tech industries in even more detail, the productivity effect may disappear and be replaced by a structure impact: Canada may just be producing more products requiring lower productivity growth than the United States does.

Service sector. Detailed industry data is available for seven industries within the service sector[36] for both Canada and the United States.[37] Share and productivity analysis of the service sector industries for the 1987–96 period (table 6) shows that:

Table 5. Contribution of manufacturing industries to Canada-U.S. business sector productivity gap, 1987–97

Industry and effect	1987–97
Business sector productivity growth gap	–0.39
Total contribution of manufacturing sector to business sector gap	–.01
Pure productivity effect:	
Sum of manufacturing industries[1]	.01
High-tech industries[2]	–.21
Non-high-tech industries[3]	.22
Logging and wood industries	.04
Food and beverage industries	.00
Tobacco products industries	.00
Rubber Product Industries	–.02
Textile Industries	.00
Leather and allied products	.00
Clothing industries	.00
Furniture and fixture industries	.00
Paper and allied products industries	.01
Printing, publishing and allied industries	.01
Primary metal industries	.02
Fabricated metals products	.00
Machinery Industries, except electrical machinery	–.04
Transportation equipment industries	14
Electrical and electronic product industries	–.17
Non-metallic mineral product industries	–.01
Refined petroleum and coal product industries	03
Chemical and Chemical Products Industries	00
Scientific and professional equipment	–.01
Other manufacturing industries	.01
Structure effect	–.04
Reallocation effect	.02
Total contribution of manufacturing sector to business sector gap (alternate calculation)[4]	–.01
Pure productivity effect	–.13
Structure effect	09
Reallocation effect	.02

[1] Contribution of manufacturing sector to business sector productivity gap is calculated as the sum of industry-level effects using 20 disaggregate industries.

[2] Machinery industries, except electrical machinery, plus electrical and electronic product industries.

[3] Manufacturing minus machinery industries, except electrical machinery, minus electrical and electronic product industries.

[4] Alternate calculation of manufacturing sector's contribution to business sector productivity gap calculated using only aggregate manufacturing sector data.

Table 6. Shares and productivity growth in the service sector, 1987–97

Industry	Nominal share		Hours share		Productivity growth		
	Canada	United States	Canada	United States	Canada	United States	Canadian -U.S. gap
Business sector	...	...	...	...	1.2	1.6	–0.4
Service sector	59.3	71.1	63.5	66.1	.9	1.2	–.3
Transportation	5.3	3.7	5.6	4.4	2.0	1.5	.5
Communication	3.9	3.1	2.5	1.5	3.2	3.9	–.7
Utilities	4.5	3.3	1.1	1.1	–.4	2.5	–2.9
Wholesale trade	7.0	7.8	6.9	7.4	1.8	4.1	–2.3
Retail trade	7.8	10.3	14.8	19.4	1.0	2.4	–1.4
Finance, insurance, and real estate	13.6	20.9	7.2	7.7	1.6	1.8	–.2
Other services	17.2	22.2	25.6	24.7	.0	-.5	.5

NOTE: Figures may not sum due to rounding. Nominal output and hour shares are expressed relative to the business sector and represent an average for 1987–97.

1. In terms of nominal output share, the service sector as a whole is much larger in the United States than in Canada. Interestingly, both service sectors have similar shares of hours.

2. Retail trade, finance, insurance and real estate and "other business services"[38] industries are significantly larger in the United States, in terms of nominal output share, than in Canada. However, transportation service and utilities industries are larger in Canada than in the United States.

3. From 1987 to 1997, communications industries had the strongest productivity performance for Canada, whereas wholesale trade industries registered the most robust average annual productivity growth among U.S. service sector industries.

4. For the most part, the productivity performance of U.S. service-sector industries has exceeded the performance of Canadian industries over the 1987–97 period. The exceptions are the transportation and other business service industries, where Canada did better.

5. The largest negative gap in productivity growth (in favor of the United States) by industry is for the utilities, followed by the wholesale and retail trade.

A decomposition of the contribution of each industry to the Canada-U.S. gap in productivity growth in the business sector (table 7) shows that, consistent with our previous findings, the service sector contributed quite significantly to this Canada-U.S. gap over the 1987–97 period. (See the text tabulation on page 21.) Furthermore, we find that among the service industries, the wholesale and retail trade industries contributed most significantly toward the gap in business sector productivity over the same period (–0.3 percentage points).[39]

Table 7, again illustrates that the results from the decomposition analysis are sensitive to the level of aggregation used for the examination: when disaggregated service-sector data are used, the pure productivity contribution from the service sector is twice as large as when aggregate service-sector data are used. The results in this section, therefore, suggest caution in concluding that the service sector played a very small role in explaining the business sector gap over the period 1996 to 2000 (text tabulation, page 21), because the decomposition results are subject to change based on the level of aggregation used.[40]

USING RECENT INDUSTRY-LEVEL DATA, our work examines the industry-level productivity performance in the Canadian and U.S. business sectors. Our analysis suggests that the

Table 7. Contribution of service sector industries to business sector productivity gap, 1987–97

Industry and effect	1987–97
Business sector productivity growth gap	–0.39
Total contribution of service sector to business sector gap	–.46
'Pure' productivity effect:	
Sum of service industries[1]	–.35
Transportation	.02
Communication	–.02
Utilities	–.11
Wholesale trade	–.17
Retail trade	–.13
Finance, insurance, and real estate	–.02
Other services	.08
Structure effect	–.10
Reallocation effect	–.01
Total contribution of service sector to business sector gap (Alternate calculations)	–.47
Productivity effect[2]	–.16
Structure effect	–12
Reallocation effect	–20

[1] Contribution of service sector to business sector productivity gap is calculated as sum of industry-level effects using seven disaggregated industries.

[2] Alternate calculation of the service sector's contribution to business sector productivity gap calculated using only aggregate service sector data.

productivity revival in both the United States (starting in 1995) and Canada (starting in 1996) can be attributed in large measure to the performance of the service sector. The service sector's heavy investment in information and communication technologies (ICT) provides support to the view that what really matters for improving productivity growth is the incorporation or the use of ICT into the service-sector industries, rather than its production in manufacturing.

We find that although productivity growth has improved markedly in the Canadian business sector since 1996, it still lags behind the performance of the U.S. business sector. Our investigation into the industrial sources of the Canada-U.S. gap in productivity growth suggests that the service sector contributed most significantly to this gap from 1987 to 1996, whereas the manufacturing sector was the dominant player from 1996 to 2000. Given the role that high-tech industries played in U.S. manufacturing productivity performance over the late1990s, it would seem that the gap over the 1996–2000 period reflects a Canada-U.S. gap in high-tech productivity. However, it remains unclear whether the contribution from the manufacturing sector reflects a pure productivity gap or differences in the industrial composition of the high-tech

Notes

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[1] See for example, S. Rao and S. Nadeau, "The role of Industrial Structure in Canada's Productivity Performance" in *Productivity Issues in Canada*, May 2002, pp.137–164, and L. Eldridge, and M. Sherwood, "A perspective on the U.S.-Canada Manufacturing Productivity Gap," *Monthly Labor Review*, February 2001, pp. 31–48, among others.

[2] The reason is that data for these most recent years are always preliminary and subject to revisions. For the last 2 years, the United States has revised its GDP downward by more than 1 percentage point.

[3] Our study does not look at the productivity level gap between the two countries. Instead our focus is solely on the Canada-U.S. productivity growth gap.

[4] This implies that a low productivity growth within an industry can contribute significantly to aggregate productivity growth if the industry is relatively large. Similarly, a high productivity growth for a given industry combined with a small relative importance of that industry within the business sector might lead to a small contribution.

[5] The major break in Canada-U.S. productivity performance over the last 30 years seems to have occurred around 1985. (Please see chart 1.)

[6] Canadian input-output tables (on which our output data are based) switched their commodity classification in 1987. We are working on getting Canadian data back to 1981 on a comparable post-1987 basis, and will be updating our results when they are available.

[7] Canadian data for standard of living, which is measured as real gross domestic product per capita, are from Statistics Canada. This indicator equals gross domestic product in chained 1997 dollars (available in CANSIM tables 380-0017) divided by the total population (available in CANSIM table 051-0001). The U.S. data for per capita gross domestic product in chained 1996 dollars are taken from National Income and Product Accounts Tables (accessible via Bureau of Economic Analysis (BEA) Web site, table 8.7).

[8] Chart 1 shows the productivity index for the Canadian business sector divided by productivity index in the U.S. (1970=100 for both countries). A reading above 1 implies that the relative Canada/U.S. productivity *level* is above the *level* in the base period (1970). A decrease in the relative index implies that productivity *growth* in Canada is slower than the productivity *growth* in the U.S. business sector. Data are from Statistics Canada (available in CANSIM table 383-008) and BLS (accessible via the BLS Web site, **http://stats.bls.gov** detailed statistics, series ID: PRS84006092).

[9] In the remainder of this article, 'productivity' will refer to labor productivity.

[10] The primary sector includes agriculture, fishing, mining and forestry industries.

[11] The use of the North American Industry Classification System (NAICS) for the input-output tables after 1997 causes a break in data at detailed industry level.

[12] A more detailed discussion of the Canadian data (including the impact of the revisions to the output data) appears in the appendix.

[13] Note that these estimates are preliminary at this point and subject to revision.

[14] Another option is to use the STAN database from the Organisation for Economic Co-operation and Development (OECD) data, which is a compilation of industry-level data for OECD countries in a standardized format. There are two problems with using these data. First, the data are on a Laspeyres (1992 dollars) basis. Second, the OECD data do not include the latest revisions that our data set includes.

[15] These output data are taken from the BEA Web site at: **http://www.bea.doc.gov/bea/dn2/gpo.htm**.

[16] See S. Lum and B. Moyer, "Gross output by Industry 1997–1999," *Survey of Current Business*, December 2000, pp. 24–35 and S. Lum, B. Moyer, and R. K. Yuskavage, "Improved Estimates of Gross Product Originating by Industry for 1947–1998," *Survey of Current Business*, June 2000, pp. 24–54. Lum and Moyer summarize the recent data and Lum and others provide details on the data construction and sources.

[17] The other distinction is that "private industries" include non-profit organizations and paid employees of private households, whereas "business sector" excludes these two categories.

[18] For the 1987–2000 period, average annual growth for business sector output is 3.6 percent, compared with 3.5 percent for private industries.

[19] See, for example, K. Stiroh, *Information technology and the U.S. Productivity Revival: What do Industry Data Say?* (New York, Federal Reserve Bank of New York, 2001) and C. Stiendel and K. Stiroh, "Productivity: What is it and Why do we care about it?" *Business Economics*, October 2001. In fact, Stiroh's 2001 study goes on to suggest that the pickup in productivity growth in 1996 signalled a shift in trend productivity in the United States.

[20] While productivity revival in the U.S. seems to have begun in 1995, productivity growth in Canada started to accelerate in 1996.

[21] Note that the latest revisions to U.S. and Canadian business sector productivity (in June 2002 for Canada and September 2002 for the U.S.) are not reflected in our analysis. The revisions to the U.S data were mostly for the 1999–2001 period and would not change our results drastically.

[22] Interestingly, the magnitude of the Canada-U.S. productivity growth gap along with the evolution of the gap over periods is quite sensitive to the periods chosen. For example, if we divide our sample (1987–2000) in two periods according to the pickup in U.S. productivity performance (1987–95, 1995–2000), the productivity gap *increases* significantly from the first to the second period (–0.1 percentage point over 1987–95 to –1.0 percentage point over 1995–

2000). However, if we use the pickup in Canadian productivity growth as the breakpoint in the sample (1987–96, 1996–2000), the productivity growth gap *declines* slightly across the two periods (table 1). The one constant across these two scenarios is that regardless of how we break the sample, a productivity growth gap exists between Canada and the United States over the second half of the 1990s, and that is what is important for our analysis.

[23] For the years prior to 1996, the statistical discrepancy is relatively small (accounting for less than 0.1 percent of nominal business sector output), post 1996, however, the discrepancy is nontrivial (averaging 0.4 percent of nominal output).

[24] Another alternative is to use the industry aggregate of private industries that excludes the statistical discrepancy. This is not done, however, because there is a large discrepancy between the average annual growth rate of business sector output (from BLS) and this proxy of the business sector output.

[25] See formula for decomposing aggregate productivity growth by industry, equations (1) and (2) in the text.

[26] Stiroh, *Information technology and the U.S. Productivity Revival,* 2001, and Steindel and Stiroh, "Productivity: What is it and Why do we care about it?", 2001, suggest that the surge in U.S. manufacturing productivity performance over the late 1990s was due, in large part, to the performance of the high-tech manufacturing industries, an element missing on the Canadian side.

[27] Note that we do not have any data on nominal output for Canada (total and industry-level) post 1997. To "fill-in" this missing data we assume that that nominal output shares follow the same growth pattern as real output shares over the 1998–2000 period. The average nominal output shares for Canada over 1987–2000 shown in table 2, therefore, represent an *approximation*.

[28] This may, in part, reflect the fact that health and educational services are largely public in Canada (thus excluded from the definition of the business sector) whereas these services are often privately provided in the United States and thus counted as part of the U.S. service sector.

[29] McKinsey Global Institute Study, *U.S. Productivity Growth 1995–2000: Understanding the Contribution of Information Technology Relative to Other Factors*, 2001.

[30] It should be noted that decomposing aggregate productivity growth into the contribution of component industries is quite difficult and several alternative methods to the formula used in our study exist (for example, Stiroh, *Information technology and the U.S. Productivity Revival* 2001 and Eldridge and Sherwood "Perspective on the U.S.-Canada Manufacturing Productivity Gap," 2001). However, using alternative methods to decompose aggregate productivity growth does not change the main findings of our article. See section on decomposition in appendix.

[31] Reallocation involves resource shifts across individual industries of the total business sector. As such, it measures the contribution from the total business sector, rather than from individual industries.

[32] See B. Ark, R. Inklaar, and M. Timmer, "The Canada-U.S. Manufacturing Productivity Gap Revisited: New ICOP Results," University of Groningen, 2000. Ark uses a similar methodology to decompose the Canada-U.S. level gap in the manufacturing sector. Our modification is to adapt the methodology to analyze the growth gap.

[33] This might suggest a movement of resources from higher to lower productivity level industries.

[34] Unfortunately, more detailed industry data are not yet available for Canada for the 1997–2000 period.

[35] The 20 industries correspond to a 2-digit SIC level of disaggregation for the manufacturing sector.

[36] The seven industries correspond to a pseudo-1-digit SIC level of disaggregation for the service sector.

[37] Caveats to the detailed analysis of the service sector: Both Statistics Canada and BLS acknowledge that data for the service sector are, in general, of a poorer quality than those for the manufacturing sector.

[38] This subgroup includes health, education, travel, and food services industries.

[39] Concentrating on the productivity effect.

[40] Unfortunately, the lack of detailed industry data for Canada post 1997 prevents a test of this hypothesis.

Appendix: Methodologies and detailed data

Canadian data

To ensure that the final estimates in Canada are comparable with those in the United States, we measure labor productivity as real value-added per hour and real value-added as a chain-Fisher index in both countries.

For productivity measurement, output should be defined from the point of view of the producer and valued at basic prices. This includes subsidies and excludes all indirect taxes on products as well as trade and transportation margins incurred in the deliveries of output to other sectors. Similarly, intermediate inputs should be defined from the producer-as-purchaser point of view and valued at purchaser's prices. The value of inputs includes all taxes, as well as trade and transportation margins associated with taking delivery of intermediate inputs from other sectors.

In Canadian input-output tables, the valuation of inputs is at purchasers' prices, but the valuation of output does not reflect basic prices. Instead, output is valued at modified basic prices. The main difference between basic prices and modified basic prices relates to subsidies on products: valuation at basic prices includes subsidies on products, whereas valuation at modified basic prices excludes them. As subsidies on products are quite small in Canada except in a few industries (such as field crops and urban transit system industries), there is normally little difference between the value of output at basic prices and that at modified basic prices.

As part of the 2001 revision of the Canadian System of National Accounts, business purchases and government expenditures for software, including own-account production of software are now recognized as investment instead of intermediate inputs. The value-added estimates in this article reflect the results of the recent revision. These are summarized in tables A-1 and A-2.

As shown in table A-1, the recognition of business expenditures on software as investment has very little effect on the growth rate of real value added for all major industry groups. The growth of real value added for the business sector was revised up by 0.03 percentage points for the 1987–97 period. The effect of the revision was small for all sectors, ranging from –0.16 percentage points in the wholesale trade industry to 0.28 percentage points in the agriculture industry.

The nominal valued added for the business sector was revised up by about 1 percent for the period 1987 to 1997 as a result of the treatment of software expenditures as investment (table A-2). The effects of the revision on nominal value added vary across

Table A–1. Revisions to average annual growth of real value added by major industry sectors, 1987–97

(In percent)

Industry	Without software	With software	Revision
Business sector	2.06	2.10	0.03
Agriculture	4.14	4.42	.28
Mining	1.74	1.77	.03
Manufacturing	1.38	1.47	.09
Construction	–.34	–.40	–.06
Transportation	3.03	2.98	–.05
Communication	3.97	3.88	–.09
Other utilities	.96	.98	.02
Wholesale trade	3.49	3.33	–.16
Retail trade	1.72	1.71	–.01
Finance, insurance, and real estate	3.65	3.71	.05
Other services	2.16	2.19	.02

NOTE: The manufacturing sector includes logging industries to conform to the U.S. definition, and "other services" include agriculture services, fishing and trapping. The revision for the agriculture industry includes the treatment of rent on land as property income, hence it became part of value added instead of intermediate expenditures.

Table A–2. Revisions to value added in current dollars by major industry sectors

[In billions Canadian dollars]

Industry	1987			1997		
	Without software	With software	Percent difference	Without software	With software	Percent difference
Business sector	$426.2	$431.0	1.1	$606.0	$612.2	1.0
Agriculture	9.8	10.8	9.6	11.2	12.6	12.4
Mining	25.8	25.7	–.2	35.0	33.9	–3.0
Manufacturing	111.4	111.1	–.3	153.5	152.4	–.7
Construction	38.0	37.8	–.6	42.8	43.0	.5
Transportation	23.2	23.2	.1	33.1	33.0	–.2
Communication	15.6	15.6	.1	22.7	22.3	–1.8
Other utilities	18.4	18.4	.0	26.5	26.8	1.1
Wholesale trade	30.3	30.4	.2	44.7	43.8	–2.0
Retail trade	35.4	35.4	–.1	43.9	46.4	5.9
Finance, insurance, and real estate	49.5	53.6	8.3	81.2	87.1	7.3
Other services	68.7	69.0	.5	111.5	110.9	–.5

NOTE: The manufacturing sector includes logging industries to conform to the U.S. definition, and "other services" include agriculture services, fishing and trapping. The revision for agriculture industry includes the treatment of rent on land as property income, hence it became part of value added instead of intermediate expenditures.

industries. In 1997, the revision had significant effects on nominal value added for agriculture (12.4 percent), retail trade (5.9 percent), and finance, insurance, and real estate (7.3 percent), but it had very little effect for other industries.[1]

Industry decomposition of productivity gap

One troublesome aspect of the Bureau of Economic Analysis output data we used for our analysis was that a statistical discrepancy was included in the estimate of output for private industries. To ensure consistency between the aggregate and industry-level productivity growths, we adjusted industry output levels for the statistical discrepancy. Our approach to this problem was to assume that the statistical discrepancy was proportional to the size of the industries. We divided the real statistical discrepancy among the industries in proportion to their nominal shares and then added the two together using Fisher aggregation to obtain a new real output level adjusted for statistical discrepancy.

In this appendix, we present a similar analysis of the industry-level decomposition of the Canada-U.S. productivity gap as in the main text of the article. This is meant to highlight the sensitivity of our findings to the adjustments made to the data. Table A-3 shows average annual labor productivity growth in percent for industries in Canada and the United States in the top panel, contributions to business sector productivity growth in the United States in the middle panel, and contributions to the business sector productivity growth gap in the bottom panel.

Contribution to growth methodology

K.J. Stiroh decomposes aggregate labor productivity growth in the

U.S. private industries using the following methodology [2]:

$$CTG_{i,t} = b_{i,t} \cdot \left[\dot{Y}_{i,t} - \dot{H}_{i,t}\right] + (b_{i,t} - d_{i,t}) \cdot \dot{H}_{i,t} \qquad (3)$$

$$b_{i,t} = \left[\frac{Y^N_{i,t}}{Y^N_t} + \frac{Y^N_{i,t-1}}{Y^N_{t-1}}\right] / 2 \qquad (4)$$

$$d_{i,t} = \frac{H_{i,t}}{H_t} \qquad (5)$$

Where Y is the chain-Fisher measure of real output, Y^N is the nominal value-added output and H is total hours worked.

Stiroh's methodology is quite similar in structure to the one adopted in our work (equation 1). Like the McKinsey Global Institute, Stiroh divides the total contribution from industry '*i*' to the aggregate productivity growth into a "direct" effect and a "cross" effect.[3] The interpretation of the direct and indirect effects is also quite similar to McKinsey. The direct effect, given by the first term in equation 4, is a weighted average of industry-level labor productivity growth, with the weights representing the average nominal output share of industry '*i*' in period *t*-1 and *t*. Therefore, as industries improve their individual productivity, aggregate productivity also rises, in proportion with relative industry size. The cross effect, on the other hand, reflects the effect on aggregate productivity growth from a reallocation of hours. This effect implies that as industries with nominal shares larger than labor shares experience growth in hours, aggregate productivity rises in tandem, and vice versa.

There are only two differences, both relatively minor, between the two methodologies. First, whereas McKinsey uses the lagged nominal output share, Stiroh uses an average of current and last period nominal output share as the weight on the direct effect. Second, the McKinsey formula has an adjustment term ($\frac{H_{t-1}}{H_t}$) in the formula, whereas the McKinsey formula does not.

The direct, cross and total contribution effects shown by our testing using the Stiroh method are similar to those obtained by the McKinsey formula.

Detail industry tables

Table A-4 presents the nominal output and hour shares in Canada and the United States.

Table A–3. Canada-U.S. industry level productivity performance, contribution to U.S. business sector productivity growth, and contribution to business sector productivity growth gap (Canada minus United States), 1987–2000

Industry	1987–96 Canada	1987–96 U.S.	1996–2000 Canada[1]	1996–2000 U.S.	Swing[2] Canada	Swing[2] U.S.
Business sector	1.0	1.5	2.2	3.2	1.2	1.7
Primary industries	3.1	2.7	5.2	4.5	2.1	1.8
Construction	–.7	.1	.4	–.5	1.1	–.6
Manufacturing	2.1	2.6	1.9	5.1	-.2	2.5
Services	.7	1.1	2.3	2.8	1.6	1.7

	1987–96	1996–2000	Swing[2]
Average business sector productivity growth in the United States	1.5	3.2	1.7
Direct contribution from—			
Primary	.1	.1	.0
Construction	.0	.0	–.0
Manufacturing	5	.9	.4
Services	.7	2.1	1.4
Reallocation effect	.1	.0	–.1

	1987–96	1996–2000
Canada-U.S. productivity growth gap	–0.5	–1.0
'Pure' productivity contribution from—		
Primary	0	.0
Construction	–.1	.1
Manufacturing	–.1	–.7
Services	–.2	–.4
Structure effect	.1	.1
Reallocation effect	–.1	.0

[1] Estimates for the 1998–2000 period at the industry-level are preliminary and subject to revisions.

[2] "Swing" is the change in average annual productivity growth across the 1987–96 and 1996–2000 periods.

Table A–4. Nominal output and hours shares in Canada and the United States, 1987 and 1997

Industry	Nominal share (percent)		Hours shares (percent)	
	1987	1997	1987	1997
Canada				
Primary industries	9.6	8.0	8.2	7.0
Agriculture	3.1	2.4	6.6	5.5
Mining	6.5	5.5	1.7	1.6
Construction	8.6	7.0	9.3	8.7
Manufacturing	25.3	24.9	21.9	19.0
High-tech	2.9	3.2	2.8	2.5
Non high-tech	22.4	21.7	19.1	16.4
Services	56.5	60.1	60.6	65.4
Transportation	5.8	5.4	5.8	5.4
Communication	3.8	3.6	2.4	2.4
Other utilities	4.4	4.4	0.9	1.0
Wholesale trade	6.8	7.2	6.6	7.3
Retail trade	8.4	7.6	15.0	14.4
Finance, insurance, and real estate	12.5	14.2	6.9	7.1
Other services	15.0	17.8	23.3	27.5
United States				
Primary industries	4.4	3.5	4.3	3.3
Agriculture	2.2	1.8	3.3	2.6
Mining	2.3	1.7	1.0	.8
Construction	5.4	4.7	7.8	7.9
Manufacturing	21.8	19.1	24.3	21.1
High-tech	4.5	4.3	4.8	4.3
Non-high-tech	17.3	14.8	19.5	16.7
Services	68.4	72.8	63.6	67.8
Transportation	3.9	3.6	3.9	3.6
Communication	3.1	3.1	1.6	1.5
Other utilities	3.5	2.9	1.2	1.0
Wholesale trade	7.6	7.9	7.5	7.1
Retail trade	10.7	10.3	19.6	19.3
Finance, insurance, and real estate	20.3	21.7	8.1	7.6
Other services	19.4	23.4	21.5	26.7

Notes to the appendix

[1] The revision for agriculture includes the treatment of rent on land as property income, hence it became part of value added instead of intermediate expenditures.

[2] K. Stiroh, *Information technology and the U.S. Productivity Revival: What do Industry Data Say*? Federal Reserve Bank of New York, 2001.

[3] Global McKinsey Institute, *U. S Productivity Growth 1995–2000: Understanding the Contribution of Information Technology Relative to Other Factors*, 2001.