The Contribution of Small and Medium Sized Producers to the Productivity Gap between the Manufacturing Sectors of Canada and the United States

by

John R. Baldwin
Micro-Economics Analysis Division
Statistics Canada
Voice: 951-8588
Email: baldjoh@statcan.ca

and

Jianmin Tang[*]
Micro-Economic Policy Analysis Branch
Industry Canada
Voice: (613) 946-1621
Email: tang.jianmin@ic.gc.ca

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Abstract

Small and medium-sized producers account for a greater share of manufacturing output in Canada than in the United States. Moreover, during the last twenty years, small producers increased their presence in the manufacturing sector while the relative labour productivity of this group fell. During this period, the Canada-U.S. manufacturing labour productivity gap increased considerably.

This paper examines whether the difference in SME share between Canada and the United States contributed to the labour productivity gap and changes in the gap over the 1980s and 1990s. Using census of manufactures data, this paper finds the larger SME employment share in Canada accounts for about one quarter of the gap. But it was not the most important factor behind the gap, nor was it primarily responsible for the widening Canada-U.S gap in 1980s or 1990s. Instead, the paper reports that the weaker labour productivity performance of Canadian manufacturing producers, especially SMEs, relative to their U.S. counterparts was the driving force behind the large and widening gap and it is medium-sized firms that account for most of the increase in the gap over time. Their contribution to the gap is large because their sector is large. Their contribution to the gap is actually less then their share of employment. In contrast, while the share of the gap that is accounted for by large producers is less than that of SMEs, the share of large producers in the productivity gap is disproportionately large compared to the size of this sector.

1. Introduction

A succession of studies has examined the determinants of the productivity gap between Canada and the United States. One branch of this literature has focused on differences in the industrial structure (Faruqui, Gu et al., 2003). Some studies in this area have asked whether Canada's disadvantage stems from its reliance on early-stage natural resource industries or if the United States advantage comes from its possession of more mature or more cutting-edge high value added industries. The latest in this type of study has focused on America's edge in high-tech industries (Armstrong, Harchaoui, 2002).

This paper also asks whether Canada's industrial structure matters. But it falls in the range of studies (i.e., Baldwin and Gorecki, 1986) that ask whether producer size differences cause differences in productivity between Canada and the United States. It is stimulated by our recent paper that compares the importance of small producers in Canada to the United States (Baldwin, Jarmin and Tang, 2003). In that paper, we showed Canada has a larger proportion of its manufacturing employment in small plants. In 1997, Canada had over 37% of total employment in manufacturing in plants with less than 100 employees while the United States had less than 30% in the same size class. Conversely, Canada had only 23% in plants with over 500 employees, while the United States had 33%.

This paper poses two questions about the effect of Canada's industrial structure on its relative productivity in the manufacturing sector. First, it asks whether the level of labour productivity in Canada would be increased if Canada had the same distribution of employment across producers of different sizes as did the United States and if the productivity disadvantage of small relative to large producers were the same in both countries. Answers to this question allow us to indirectly infer the impact of economies of scale and the difference in the importance of large/small producers on the Canada/US productivity gap.

Small plants have a lower productivity than large plants (Baldwin, 1996, 1998). In 1997, value added per worker in small plants was only 67% that of larger plants in Canada. Average labour productivity of the economy as a whole is just the weighted average of productivity of all plants where the weights are the employment shares of plants. Since a larger percentage of employment in Canada is found in smaller plants with relatively lower productivity, average productivity in Canada would be expected to be lower than the United States.

Second, the paper investigates how changes in industrial structure and the relative productivity performance of different sized plants have affected changes in the gap between Canada and US productivity levels. During the last quarter century, employment shares in small and medium-sized entities in the Canadian manufacturing sector have increased (Baldwin, 1996, 1998). And associated with this, the productivity of small and medium-sized plants has fallen relative to the larger plants (Figure 1). Similar, though not identical patterns, have occurred in the US manufacturing sector (Baldwin, Jarmin and Tang, 2003).

Although informative, our previous paper that examines the similarity in the trends in relative productivity does not reveal whether small plants are behind the increasing gap in labour productivity between the two countries. Similar trends in the relative performance of different size classes within a country may hide significant differences in performance of each size class across the two countries. In one country, the decline in relative productivity of small producer may arise if small producers have declining productivity and large producers have little or no growth in their productivity. In another country, small producers may be stagnant while large producers may be enjoying rapid productivity growth. Yet, a comparison of small to large producers in a country would only show that labour productivity of small producers declined relative to large producers—not that there was a large differential in the performance of each size class between the two countries. It is for this reason that we now turn to more direct comparisons of the relative productivity of each size class in Canada as opposed to the United States.

2. Data

In this study, we examine the relative effect on productivity of different size plants[1] by aggregating data taken from the micro-economic records of Statistics Canada to examine three different size groups.[2] In the first section of the paper, small plants are defined as those with 0 to 100 employees, medium-sized plants are those from 101 to 500 employees, and large plants are those with over 500 employees. In the second section of the paper, we combine the small and medium-sized groups into one—SMEs. We match this data to comparable information taken from the Bureau of the Census Longitudinal Research File.

We choose to examine differences in the importance of producers by using plant data. Use of plant rather than firm data allow us to examine whether the economics of production at the lowest unit—the production establishment—has changed over time. Changes in the relative size of firms are the joint result of changes in establishment size and the number of establishments owned. The two may move in quite opposite directions if the economies of plant size and the economies of multi-plant ownership take different paths. A study of changing multiplant operations of manufacturing plants during the last quarter century shows that firms have become more specialized over time in a number of different dimensions (Baldwin, Beckstead and Caves, 2002). In particular, the number of plants per firm has tended to decline—especially surrounding the implementation of the Free Trade Agreement with the United States. Because of these offsetting trends, we focus directly on the lowest level of production—the plant—in this study.

In examining data on the differences between small and large producers, it is important to keep in mind the manner in which the data are constructed. We estimate the effect of industrial structure on productivity using a measure of labour productivity—defined as output per unit of labour input. Labour input is defined variously as employment (the

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[1] We include both head office and operating plants.
[2] These records are derived from the Census (now the Survey) of Manufactures. The manufacturing program derives data from a truncated population of all plants in manufactures, where the truncation cuts

total of production and non-production workers jobs) and as hours-worked. Output is defined alternately as shipments and value-added. Value-added is the difference between shipments and all intermediate expenditures—on materials, services, and energy.

The advantage of using value added is that its summation, across all stages of the production process, is gross domestic product (GDP). Value added in any industry is the contribution that the industry makes to the economy's gross domestic product. Value of shipments on the other hand measures the total shipments or revenue of an industry and cannot be summed across industries to obtain gross domestic product because this sum contains considerable double counting. Sales or shipments can increase in an industry or sector, even though value added does not do so, if the degree of vertical integration changes. For this reason, it is common for many studies of productivity to focus on value added per worker. But there are reasons not to rely on this measure alone.

First, shipments for a sub-population like small plants may be more accurately measured than value added. In our comparisons, we use data from the micro-economic files maintained by the Micro-Economics Studies and Analysis Division that are derived from the files generated by the Manufacturing Division on individual manufacturing plants. These files come from a combination of data derived from detailed surveys that are taken of plants in the manufacturing sector and from administrative records taken from tax files. The former are obtained from detailed questionnaires that are answered by larger firms. Administrative records are used for smaller producers and provide a more restricted range of data—such as revenues and expenses. The other variables that are normally captured by surveys (such as value added) are added to the administrative records by a complex estimation (imputation) procedure—using data on the relationship between the observed and unobserved data that are taken from the surveys. In both sets of data (surveys and administrative records), value of shipments is measured directly from revenues of the plant.

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off plants below a certain dollar threshold. Data on the largest firms in the population are derived from surveys. Data on the smallest firms are derived from administrative tax records.

It should be noted that all records from the Census of Manufacturers measure value added (what is often referred to as census value added) as inclusive of payments for services. In this paper, we adjusted these estimates to the National Accounts GDP concept.[3] Because these adjustments rely on separate survey information on the purchase of services and these surveys are conducted infrequently, changes over time in value added per worker of different size classes may be less accurately measured than the shipments per worker.[4]

The second reason to examine both shipments and value added per worker arises from our use of price indices to deflate both of these measures for changes in price levels over time in order to provide measures of 'real' output changes. There are two reasons for preferring deflators of shipments to deflators of value added. First, there are conceptual problems with the double-deflation method used for value added. Second, the data on inputs is often inferior to the data on outputs and since the former, as well as the latter, are required for deflators of value added, estimates of real value added are less precise than estimates of real shipments.

There is a third reason to use both shipments per worker and value added per worker as measures of output per worker. Both of these are only partial measures of productivity—labour productivity. Labour productivity can increase over time because the other inputs available to workers increase. If capital per worker increases, so too can labour productivity. If the amount of materials inputs increase per worker, value added per worker may also change. Measuring output per worker just as value added per worker is appropriate only if the production function for shipments is entirely separable into the value added component and the other inputs (materials and services) component—that is, if there is no substitution occurring over time between materials and value added (see Bruno, 1978). In our study of differences in the industrial structure of Canada and the US (Baldwin, Jarmin and Tang, 2003), we show that there have been substantial changes in the shipment/value added ratio in the Canadian manufacturing sector during the last

[3] The adjustments differ for the period before and after 1980. After 1980, census value added on both short and long-form records excludes purchased services. Before 1980, short-form census value added excludes purchased services but long-form value added does not.

twenty years. These suggest that the preconditions for treating value added as a separate entity do not exist. For these reasons, we focus on both measures of output to allow for comparisons.

The paper proceeds in two stages. In the first section, we ask what impact the differences in Canada's industrial structure have on the measured level of productivity. In the second section, we ask what impact differences in industrial structure had on the gap in labour productivity between Canada and the US.

We deliberately proceed in two stages, despite a certain amount of repetition. Statistics Canada does not produce official estimates of differences in productivity levels between Canada and other countries, but instead focuses on the growth in labour productivity. It does this for two reasons. First, it collects a large amount of information that allows an estimate of changes in real output to be derived from changes in revenues. Second, when it derives measures of growth, it controls both the data collection and methodology that are used. As such, it can hold the methodology used for measurement constant over time.

Statistics Canada does not collect the same amount of information that would allow it to transform estimates of revenue in different countries into very precise estimates of relative quantities produced, which is a necessary input into estimates of relative real output per worker. (i.e., it would have to translate revenues in the lumber industry in Canada and the United States into an estimate of relative board feet of lumber produced to obtain an estimate of relative real output). While there are estimates collected of relative price differences across countries for purchasing power parity (PPP) programs, the number of prices collected is much less than for estimates of changes in real quantities within Canada. In addition to this problem, there are sufficient differences in terms of collection techniques in different countries to render some inter-country comparisons problematic.

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[4] It should also be noted that no attempt is made to provide different correction factors for small and large plants.

All of this makes the estimation of the gap in the level of productivity between Canada and the United States more problematic than estimating the gap in the growth of labour productivity between Canada and the United States. Growth is more accurately measured because both countries have reasonably accurate measures of the growth in real output and while there are differences in methodology for measuring outputs and labour inputs, as long as these methodologies remain unchanged, the estimates of relative growth rates will be reasonably accurate.[5]

In this paper, we make use of micro-records that are collected by the Manufactures programs in the two countries. The two programs are quite similar, collecting data on outputs and inputs in very similar ways. The first section of this paper makes use primarily of these data to derive a straightforward estimate of how much Canadian productivity would have increased if Canada had a similar industrial structure (size distribution) to the United States. The resulting estimate can be set against existing estimates of the gap without sanctioning any one estimate of the gap.

In the second section, we start with an estimate of the gap—recognizing that there are problems with that estimate. But by making use of a particular estimate, we can proceed further than we can in the first section. In particular, we can ask whether changes in the gap are due to industrial structure, or to the poor performance of small and medium-sized firms.

The two sections are complementary—both pointing to the same conclusions. The first requires fewer assumptions, but prevents us from pursuing as many questions. The second provides answers to issues that the first section cannot answer, but the answer requires us to make more assumptions.

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[5] For example, the estimate of the level of employment derived from a Canadian household survey (the LFS) is different from estimates of firm-based surveys (SEPH). But the growth rates derived from the two are quite close.

3. The Effect of Size Structure on the Level of Canadian Productivity

Average labour productivity of the economy as a whole (*P*) is just the weighted average of productivity of all plants in a particular size class (P_i) where the weights w_i are the shares of each size class of plants.

(1) $$P = \sum w_i P_i \ .$$

Over the last quarter century, the share of employment in small and in medium sized plants has increased (Figure 1). In addition, the productivity of small and medium-sized plants has fallen relative to that of larger plants.

This has affected average labour productivity in two ways. First, the increasing proportion of employment in small less productive producers has a deleterious affect on average productivity, since the latter is simply the employment weighted average of the productivity of each size class. Smaller producers have a lower labour productivity and their increased employment share would, ceteris paribus, cause average productivity to fall or to have increased less than otherwise. Second, average productivity would have been detrimentally affected even with no change in the employment share of smaller producers since smaller producers have become increasingly less productive than large producers.

But to conclude that these changes have placed Canada in a competitive disadvantage vis-à-vis the United States requires a more detailed comparison of structural trends in Canada to those in the United States. The size-class changes within Canada resembled those within the United States (see Figure 1). The small-producer employment share increased both in Canada and the United States and the relative labour productivity of this group fell in both countries. But determining whether this structural change affected Canada more than it did the United States requires detailed comparisons of Canada/US productivity differences within each producer size class. In this section, we examine these differences.

In order to draw a comparison between Canada and the United States by size class, we use shipments and value added as reported in the five- year censuses of the United States and the annual surveys in Canada .[6] Both countries define shipments to include the value of all products shipped, including those to other plants of the same parent. Both define value added as the difference of shipments minus the cost of materials, supplies, containers, fuel, purchased electricity, and both add to this the value added derived from merchandising activity (the difference between the sales value and the cost of merchandise sold without further manufacture).[7]

When comparisons are made between Canada and the United States using census value added, we make the total of census value added across all size classes equal gross domestic product in Canada and 'gross product originating' in the United States. In the United States, this is done by calculating the ratio of gross product originating to value added and applying this ratio to census value added in all size classes. For Canada, we apply a similar procedure after 1980; but prior to 1980, we apply a correction ratio to long-form value added to correct for purchased services that leaves the sum of short-form value added and the corrected long-form value added equal to gross domestic product.[8]

Value added per employee and shipments per employee for Canada and the United States are presented in Table 1. For Canada, the ratio is expressed in current $CDN and for the United States, in current $US. The ratio of labour productivity in Canada to the United States using shipments per employee and value added per employee are presented in Table 2, panel 1 and Table 3, panel 1, respectively.

[6] We use the five-year censuses because this is the point where US numbers are rebenchmarked to more complete estimates of the population that take into account births and deaths of plants. The Canadian annual data are generally, though not always, rebenchmarked annually to take into account both births and deaths.

[7] See U.S Department of Commerce (1993)

Since prices have changed over time, we apply an implicit price deflator[9] to bring both Canadian and US series to a 1992 base and recalculate the Canada/US ratios in Table 2, panel 2 and Table 3, panel 2 for shipments per employee and value added per employee respectively. It should be noted that the output per worker series are still in different currencies—but any correction that might be utilized for 1992 (either using exchange rates or purchasing power parity corrections) would affect all years equally since the comparisons are in 1992 prices and would not affect the relative values reported in Tables 2 and 3.

Changes in the relative productivity of each size class will be examined over the period 1977 to 1997.[10] If we use the shipments per worker, small Canadian plants decline slightly and larger Canadian plants increase relative to their American counterparts but the differences in size class performance are minor and well within the standards of accuracy provided for by the quality of the data. If we use value added per worker, both small and large Canadian plants decline by about the same amount.

An alternate way of examining the progress made by each size class is to take the ratio of the Canada/US relative in the small size class and divide it by the relative in the larger size class (Table 4). If there is a larger disadvantage for Canadian small plants than for Canadian large plants, this ratio will be less than one. It will decrease over time if the disadvantage should widen.

When we use value added per worker to calculate relative productivity, small Canadian plants suffered a disadvantage at the beginning of the period that is reversed in the 1980s but that reemerges in the 1990s. If shipments per worker are used, the same u-shaped pattern is evident, but the gap widens dramatically in the 1990s. The same pattern is evident for medium-sized plants relative to large plants and the same difference exists between value added and shipment measures.

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[8] Short-form value added in Canada excluded purchased services but long-form value added did not prior to 1980.

[9] This deflator was obtained by dividing $current GDP by a chained fisher real output index.

Thus, compared to large plants in the United States, Canadian large plants performed poorly during the 1980s relative to their Canadian small and medium-sized compatriots; but they improved their performance in the 1990s. In both cases, large plants do much better when measured in terms of shipments—because their shipments to value added ratio was increasing (see Baldwin, Jarmin and Tang, 2003).

That still leaves the question of the effect of the Canadian industrial structure on the gap in terms of the level of labour productivity between Canada and the United States. To answer this question, we can ask how much the output per worker in Canada would have changed if we weighted the output per worker of each size class by the US employment shares. To do so, we calculate Canadian average productivity using the US employment weights multiplied by the labour productivity of each size class and divide it by actual Canadian average productivity:

(2) $$\text{Ratio}_1 = \frac{\sum w_{iu} P_{ic}}{\sum w_{ic} P_{ic}},$$

where P_{ic} is Canadian labour productivity in the i'th size class

w_{ic} is Canadian employment share in the i'th size class

w_{iu} is US employment share in the i'th size class

This is presented in Table 5. If we use value added, Canadian output per worker would have increased by some 3% in 1977 and some 3% in 1997. If we use shipments per worker, it would have increased by some 3% in 1977 and some 9% in 1997.

We can also ask how output per worker would have increased if the relative output per worker differed across size classes by the same ratio in Canada as it did in the United

[10] We choose not to use 1972 since the Canadian data for this point come from 1973 and bias the comparison upwards.

States, but output per worker in the larger size classes remained the same. This is calculated as:

$$(3)\qquad \text{Ratio}_2 = \sum w_{ic}\left(\frac{P_{iu}}{P_{3u}}\right)P_{3c} \Big/ \sum w_{ic}P_{ic}\ ,$$

where P_{iu} is US labour productivity in the *i*'th size class.

This is presented in the second panel of Table 5. When we adopt the same large/small productivity gradient as existed in the United States, the Canadian output per worker in 1997 increased slightly (1%) using value added per worker and somewhat more (14%) using shipments per worker.

Finally, we combine both counterfactuals to estimate the effect on Canadian productivity of having the same employment shares in each size class and the same relative productivity gradient across size classes as existed in the United States:

$$(4)\qquad \text{Ratio}_3 = \sum w_{iu}\left(\frac{P_{iu}}{P_{3u}}\right)P_{3c} \Big/ \sum w_{ic}P_{ic}\ .$$

The results are presented in Table 5, panel 3. If small plants were less important and had the same relative disadvantage to large plants as their United States counterparts, Canadian output per worker would be some 7% higher on average using value added and 21% higher using shipments in 1997.

Finally, we examine how the various size classes contributed to the productivity gap between Canada and the United States. To do so, we must choose a deflator that puts Canadian output per worker measured in $CDN into $US. Several options are available—the Canada/US exchange rate, or an estimate of the relative price of commodities in Canada and the United States. The former is unlikely to reflect actual relative prices in the manufacturing sector of the two countries. However, the existence of an accurate PPP for the manufacturing sector is problematic. Nevertheless, for the purposes of this exercise, we will chose a benchmark derived from De Jong (1996) without passing judgement on its accuracy.[11]

The difference in output per worker in the two countries can be written as:

(4) $$\text{Difference}_1 = \sum_{i=1}^{3} w_{iu}(P_{ic} - P_{iu}) + \sum_{i=1}^{3} P_{ic}(w_{ic} - w_{iu}) \quad \text{or}$$

(5) $$\text{Difference}_2 = \sum_{i=1}^{3} w_{ic}(P_{ic} - P_{iu}) + \sum_{i=1}^{3} P_{iu}(w_{ic} - w_{iu}) .$$

The first term is just the differences in the productivity of each size class weighted by the size class's employment share. It provides an estimated of the productivity difference associated with a size class. By dividing this term for each size class by the difference in labour productivity between the two countries, we can determine the portion of the total productivity gap that is the result of productivity differences in a particular size class. The other terms are the product of the employment share difference across the two countries multiplied by the productivity of that size class. This term reveals how much of the gap is the result of a different industrial structure (size class structure) in Canada as opposed to the United States.[12]

Each of the terms is divided by the total gap and its estimate is presented in Table 6. Since the decomposition can be done either by weighting the productivity differences by the Canadian employment shares or the U.S. shares, we present both estimates.[13]

On average, differences in the industrial structure (a larger employment share in the smaller size classes in Canada) account for between 14% and 17% of the total gap over the period 1977 to 1997. When we use the employment shares relevant to Canada, we see

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[11] We use the De Jong (1996) estimate of 1.46 Canadian dollars per US dollar for 1987 and then derive the other rates from the implicit price indices in the two countries for GDP in the manufacturing sector. These implicit indices were derived by dividing current dollar GDP by a Fisher quantity index of outputs.

[12] They must be taken together as a sum—because the share of one size class cannot be changed without simultaneously changing the share of the other size classes taken together.

[13] Alternately, the employment shares of the two countries could be averaged.

there has been an increase in the share attributed to industrial structure of 6 percentage points between 1977 and 1997. The structural changes that have been taking place have increased their contribution to the gap.

On average, the productivity disadvantage of small plants accounts for between 22% and 27% of the productivity gap between the two countries. There has been a slight decline in this share over the entire period—but virtually no change since the late 1980s.

The largest changes occurred in the middle-sized plants. Irrespective of the weighting technique used, the contribution that this segment makes to the productivity gap has increased by 6 to 9 percentage points.

Over the period, the share of the gap attributed to productivity differences in large plants ranged from 43% to 32%. And the importance of this gap has actually declined between 1977 and 1997.

Each of these shares needs to be placed in context. A natural metric for comparison is the employment size of each of these sectors (Table 6, panel 3). The share of the gap accounted for by large producers is considerable above its share of employment. Thus while the share of the gap arising from a gap in large-firm productivity has been declining, this sector continues to contribute disproportionately to the productivity gap between Canada and the United States.

4. Measuring the Contributions of SMEs to the Canada-U.S. Manufacturing Productivity Gap

In this section, we investigate the role played by SMEs in the widening manufacturing productivity level gap between Canada and the U.S. Three changes are made from the previous section. First, we group small and medium-sized producers together here rather than leaving them separate.

Second, we move from an output per worker concept of labour productivity to output per hour-worked. While the latter is the more usual form of labour productivity, we cannot derive estimates of hours worked from the micro data and using hours worked requires an additional assumption about how hours worked are spread across all size classes.

Third, we disregard the problems with Canada/US comparisons and, arbitrarily proceed with one particular estimate of the gap in Canada/US productivity levels. We do so not because we believe we have adequately solved all the problems in inter-country differences in productivity levels—but because by doing so, we can complement the information that we presented in the first section. The results are meant to provide general indications of the relative importance of SMEs to the gap—without having resolved the problems that need to be addressed before a more definitive measure of the gap can be produced.[14]

We proceed with the definition of labour productivity. Labour productivity in country *j* in year *t* is defined as real value added per hour worked,

$$(6) \qquad LP_t^j = \frac{VA_t^j}{HOUR_t^j} \bullet \frac{1}{PPP^j},$$

where VA_t^j and $HOUR_t^j$ are the total manufacturing real value added and the total hours worked in country *j* in year *t* respectively; and PPP^j represents the manufacturing purchasing power parity for country *j* in the base year on which real value added is based. For the U.S., the purchasing power parity is set equal to unity. Labour productivity is measured in real not nominal terms, since this allows us to compare productivity performance over time by abstracting from differences in inflation.

The overall manufacturing productivity gap between Canada and the U.S. in year *t* is then defined as:

[14] We are presently mounting a research project to accomplish this.

$$(7) \qquad \Delta_t = \frac{LP_t^{US} - LP_t^{CA}}{LP_t^{US}} \times 100 ,$$

where Δ denotes the productivity gap, in terms of percentage points, between the U.S. and the Canadian manufacturing sector; and LP^{US} and LP^{CA} are real productivity levels in the U.S. and the Canadian manufacturing sector, as defined earlier.

Before we estimate the contribution of SMEs to the Canada-U.S. manufacturing gap, we make the census value added data comparable with the official productivity statistics from the two countries. As pointed out in the previous section, Census value added data are not the same as value added data that are used in the official productivity statistics. There are several adjustments that need to be made. First, census value added tends to overstate the actual value added by purchased services that are included in census value added. Overtime, manufacturing establishments have been using more and more services in their production, probably due to the increasingly knowledge-based economy and the advent of information technologies. In addition, the census value added does not include output from self-employment. To resolve this problem, we adjust census value added to equal official value added.

Second, the number of employees from the Census of Manufactures is not exactly equal to the number of employees used by statistics agencies to produce official productivity statistics for several reasons. The estimate of total employment comes from the Labour Force Survey (the LFS) and generally tends to be higher than the employee estimates that are obtained from the Census of Manufactures. Second, the census employment does not include self-employment. We correct these problems by adjusting manufacturing census employment to the official statistics of manufacturing employment.

Third, the census value added is in current dollars. In order to make comparisons over time, we use an implicit value added price deflator to convert nominal value added into real dollars.

Fourth, labour input has to be converted into hours from employment using the ratio of official hours to employment.

Finally, to be comparable, real value added in Canadian dollars has to be converted into real value added in U.S. dollars, using purchasing power parity.

With these adjustments, the official manufacturing productivity level can be linked to the census data in country *j* in year *t* as follows:

$$
\begin{aligned}
LP_t^j &= \frac{VA_t^j}{HOUR_t^j} \bullet \frac{1}{PPP_t^j} \\
&= \frac{1}{PPP_t} \bullet \frac{VA_t^j}{NVA_t^j} \bullet \frac{EMP_t^j}{HOUR_t^j} \bullet \frac{NVA_t^j}{NCVA_t^j} \bullet \frac{CEMP_t^j}{EMP_t^j} \bullet \frac{NCVA_t^j}{CEMP_t^j} \qquad (8) \\
&= \lambda_t^j \bullet \frac{NCVA_t^j}{CEMP_t^j},
\end{aligned}
$$

where NVA_t^j, $NCVA_t^j$, EMP_t^j, and $CEMP_t^j$ are the official total manufacturing nominal value added, total manufacturing nominal census value added, official employment, and census of manufactures employment in country *j* in year *t*. The adjustment factor (λ_t^j) converts census-based total manufacturing labour productivity (per worker) in current national dollars into official total manufacturing labour productivity (per hours worked) in real terms in the U.S. currency. It is equal to

$$
(9) \qquad \lambda_t^j = \frac{1}{PPP_t^j} \bullet \frac{VA_t^j}{NVA_t^j} \bullet \frac{EMP_t^j}{HOUR_t^j} \bullet \frac{NVA_t^j}{NCVA_t^j} \bullet \frac{CEMP_t^j}{EMP_t^j}.
$$

The adjustment factor consists of five separate components. The first adjustment ($\frac{1}{PPP_t^j}$) converts all productivity measures to U.S. currency. $\frac{NVA_t^j}{VA_t^j}$ is the value-added price deflator, converting nominal value added into real value added. $\frac{HOURS_t^j}{EMP_t^j}$ is work intensity, defined as hours per worker. It adjusts for differences in work intensity between the two countries. $\frac{NVA_t^j}{NCVA_t^j}$ is the ratio of official nominal value added to nominal census value added. It adjusts for differences between census value added and actual value added. And, finally, $\frac{CEMP_t^j}{EMP_t^j}$ is the adjustment for differences between official employment used in productivity estimates and census of manufactures employment.

With these adjustments, we now proceed to decompose total manufacturing labour productivity into components of different size classes as follows:

$$
\begin{aligned}
LP_t^j &= \lambda_t^j \bullet \frac{NCVA_t^j}{CEMP_t^j} \\
&= \lambda_t^j \bullet \sum_i w_{i,t}^j q_{i,t}^j \qquad (10) \\
&= \sum_i w_{i,t}^j \widetilde{P}_{i,t}^j \ ,
\end{aligned}
$$

where $w_{i,t}^j$ is the census employment share of a group of firms with size *i* in the total manufacturing sector in country *j* in year *t*; $q_{i,t}^j$ is the unadjusted census value added per worker for a group of firms with size *i* in country *j* in year *t*, and $\widetilde{P}_{i,t}^j$ (equal to $\lambda_t^j q_{i,t}^j$) is the adjusted census value added per worker for group of firms with size *i* in country *j* in year *t*. The adjusted labour productivity levels for groups of firms in different size classes for both Canada and the U.S. have been translated into real terms in a common currency and as such can be compared over time and across countries.

We should note that there are several issues that we have deliberately chosen to ignore for the purpose of this paper that probably affect the level of gap that is used for the foundation of this section—though not the findings as to which size class contributes most to the gap. For this paper, we accept the official estimates of value added and hours worked that are used in the productivity programs of the two countries. But first, we note that there are conceptual differences in the way that output is measured between the two countries. Second, the statistical agencies of Canada and the United States develop estimates of hours-worked from different types of surveys and this may affect estimates of levels of hours worked and therefore estimates of output per unit of labour. The US uses an employer survey and Canada uses a household survey to estimate employment in the two countries. Third, the same adjustment factor is applied to groups of firms with different sizes. Amongst other things, this assumes the same ratio of hours worked to employment in different size classes, which may not be accurate—if there are more part time employees in smaller firms.

Define $P_{i,t}^{j} = \widetilde{P}_{i,t}^{j} / LP_{t}^{US}$ for group of firms with size *i* in country *j* in year *t*, which scales down the labour productivity level for all size groups in both countries by the U.S. manufacturing labour productivity level. When we combine equations (3) and (6), we derive the following expression for the Canada-U.S. manufacturing productivity gap:

$$(11) \qquad \Delta_t = \left[\overline{\theta}_t \left(w_{s,t}^{CA} - w_{s,t}^{US}\right) + \overline{w}_{s,t}(P_{s,t}^{US} - P_{s,t}^{CA}) + \overline{w}_{l,t}(P_{l,t}^{US} - P_{l,t}^{CA})\right] \times 100,$$

where $\overline{\theta}_t = \frac{1}{2}\left[\left(P_{l,t}^{CA} - P_{s,t}^{CA}\right) + \left(P_{l,t}^{US} - P_{s,t}^{US}\right)\right]$, $\overline{w}_{s,t} = \frac{1}{2}\left(w_{s,t}^{CA} + w_{s,t}^{US}\right)$, and $\overline{w}_{l,t} = \frac{1}{2}\left(w_{l,t}^{CA} + w_{l,t}^{US}\right)$.

$\overline{\theta}_t$ is the average of the labour productivity differences between large plants and SME plants in Canada and the U.S. $\overline{w}_{s,t}$ is the average of the employment share of SMEs in Canada and the U.S. Similarly, $\overline{w}_{l,t}$ is the average of the employment share of large-sized plants in Canada and the U.S. These averages allow us to calculate the contributions of different size classes to the overall productivity difference.

Equation (11) divides the manufacturing productivity gap between the U.S. and Canada into three components. The first component is associated with the differences in the employment distribution in manufacturing between Canada and the U.S and is commonly referred to as the component that captures the effect of differences in industrial structure. If large-sized plants are more productive than small-sized ones and if Canada has a greater share of employment in SMEs than the U.S., then the first term will be positive.

The second and the third components capture the effect of productivity differences between Canada and the U.S for SMEs and for large establishments respectively. If SMEs or large-sized plants in Canada are less productivity than those in the U.S., then these terms will be positive. Dividing each by the total gap provides estimates of the share of this gap that productivity differences in each size class make to the total manufacturing productivity gap.

Thus, SMEs can be said to contribute to the overall gap in productivity in two ways; first, via their higher employment share relative to that in the U.S.; second, but then by their productivity performance relative to its U.S. counterparts. The first is referred to as the 'industrial structure' effect; the second is called the 'productivity' effect.[15]

5. Empirical Results: the Contributions of SMEs to the Canada-U.S. Manufacturing Productivity Gap

To complete our estimates, we need to start with an estimate of labour productivity level, defined as real value added (in 1987 U.S. dollars) per hour worked, for the manufacturing sector in both Canada and the U.S. The real value added data for the U.S. are taken from the U.S. Bureau of Economic Analysis (BEA) and is re-based from 1996 to 1987. The hours worked data for the U.S. are derived using the total hours worked in 1987 and the hours worked index from the international comparisons program at the U.S. Bureau of Labour Statistics (BLS). The hours-worked data in 1987 are based on employment from BEA and average weekly hours from BLS. The real value added per hour worked is the ratio of real value added in $U.S 1987 to the total hours worked.

[15] The decomposition methodology implicitly assumes that these two effects are independent of one another.

The official data on value added and employment for total manufacturing in Canada are based on the productivity accounts at Statistics Canada. The real labour productivity level in $CDN 1992 is re-based to $CDN in 1987. The series is converted into U.S. dollars, using an implicit purchasing-power-parity (PPP) for manufacturing value added. The implicit PPP in 1987 was 1.41. It is based on the benchmark estimate that Canada's labour productivity was 79.4 percent of that in the U.S. in 1987 (De Jong (1996)). It is between the estimate of 1.40 by Pilat (1996) and the estimate of 1.44 by Hooper (1996).[16] The resultant estimate of the productivity gap is charted in Figure 2.

The official labour productivity level is then linked to the census data by equation (10), through the adjustment factor for each country. The components of the adjustment factor are listed in Table 7 for both Canada and the U.S. Hours-worked per employee in the United States is higher than in Canada and the gap increased over time from 1977 to 1997. Similarly, U.S. producers engaged in more out-sourcing than Canadian producers since the ratio of Census value added to official valued added was higher in the United States and the gap between the two countries has increased over time.

Labour productivity growth for each size group is compared over time in Table 8. Labour productivity increased significantly for all size groups in both countries. For instance, SMEs in Canada were 47.1 percent more productive in 1997 than in 1987; this compares to an increase of 86.6 percent for Canadian large plants over the same time period. The increase is 12.5 percent higher for SMEs and 8.3 percent higher for large plants in the U.S.

The relative labour productivity after the adjustments in both countries is reported in Table 9. Two important observations emerge. First, SMEs are less productive than large plants and the gap between SMEs and large plants is widening in both countries. Second,

[16] The PPP for 1990 by Hooper (1996) is backdated to 1987 with manufacturing GDP deflator. Canada's labour productivity level as a percentage of that in the U.S. is then derived by extending a benchmark estimate in 1987, by using labour productivity indexes from Statistics Canada and the U.S. Bureau of

both SMEs and large plants in Canada are less productive than their U.S. counterparts, and the gaps are widening.

Using equation (11), we decompose the Canada-U.S. manufacturing gap into components associated with employment structure, differences in the productivity of SMEs, and differences in the productivity of larger plants (Table 10). All three factors contributed to the Canada-U.S. manufacturing labour productivity gap in every year. The contribution arising from the larger employment share of SMEs in Canada than in the U.S. contributes the smallest portion of the gap in every year, but it does increase slowly over time. The larger share of SMEs in Canada than in the U.S. is not the key factor behind the Canada-U.S. manufacturing productivity gap. Instead, it is the weaker labour productivity performance of Canadian firms, both SMEs and large plants, relative to that of their U.S. counterparts that primarily accounts for the gap.

The Canada-U.S. manufacturing labour productivity gap widened from 9.4 percent in 1977 to 20.6 percent in 1987. It then narrowed to 13.2 percent in 1994, but widened again to 21.4 percent in 1997 (Figure 2). For the whole period, the gap widened 12.0 percentage points. Which factor is mostly responsible for the widening gap? As shown in Table 11, by 1997 the largest contributor was the productivity gap of Canadian SMEs with their U.S. counterparts. The second most important factor was the productivity gap in larger plants. The third factor was the larger share of SMEs. Table 11 also reports the results for two sub-periods: 1977-87 and 1992-97.

As before, it is important to place the contribution of SMEs in context. The share of the total productivity effect that is accounted for by the productivity effect in SMEs can be compared to their share of employment (See Table 6). The latter increases from 68% in 1977 to 77% in 1997. The share of SMEs in the combined productivity effect is always smaller than their share of employment. In contrast, the share of the productivity gap in large firms is generally greater than their employment share.

Labour Statistics. The benchmark estimate in 1987 was 79.4 (de Jong (1996)). The approach is followed by other studies including van Ark, Inklaar and Timmer (2000).

6. Conclusion

Small producers in Canada are more important than in the US. And the share of employment in small producers over the last quarter century has increased at the same time that the relative labour productivity of this group has fallen. This paper has examined whether this structural change contributed to the Canada/US productivity gap. We found that the higher SME share in Canada than the U.S. contributed 3 percentage points to the gap in the late 1970s, increasing to over 5 percentage points by 1997. This accounts for about one quarter of the gap by 1997. The share of the gap that it accounts for has remained relatively constant over the period. Industrial structure therefore matters.

This estimate can be set against an earlier study (Baldwin and Gorecki, 1986) that examined the effect of plant scale differences between Canada and the United States. Although it adopted a more complex methodology that required the estimation of production functions and it examined total factor productivity rather than labour productivity, the estimates of the effects of scale differences are quite similar. Baldwin and Gorecki (1986, p. 138) note that about one-third of the difference in total factor productivity differences between Canada and the United States were accounted for by differences in plant scale.

The results of this paper also show that while structure matters, it is not the most important factor behind the gap. It is the direct productivity differences between Canadian and US plants. The proportion of the gap that is due to these productivity differences has increased slightly—from around 70% in 1977 to 75% in 1997.

Most of this productivity effect comes from SMEs rather than from large plants—and it is medium-sized plants rather than smaller plants that matter most. The share of SMEs in the productivity effect increases from less than 46% in 1977 to 63% in 1997. On the face of it then, most of the decline in relative productivity came from deterioration in the SME segment.

It should be recognized that this is to be expected, since SMEs account for the majority of employment. In 1977, they accounted for 68% of manufacturing employment. In 1997, they accounted for 77% of manufacturing employment. Throughout the period, therefore, the SME employment share was larger than its share of the gap that was due to productivity differences as opposed to industrial structure differences. In contrast, it is the larger plants that accounted for a disproportionate share of the productivity gap.

The results from this paper, however, are accompanied by three caveats. First, the adjustments that we carry out in the second section of the paper are the same for all size groups in a country. For example, we adjusted census value added to reduce it to GDP for both SMEs and large plants using the same margin, which implicitly assumes that SMEs use purchased service as intensively as large plants. If SMEs use less purchased services than large plants, then the adjustment will underestimate the labour productivity for SMEs, and overestimate the contribution of SME employment share to the Canada-U.S. manufacturing labour productivity gap. The same caveat applies to the assumption used for the ratio of hours-worked to employment.

Second, this paper only explores the producer size dimension of industrial structure, ignoring the industry dimension. Differences in industry structure also contribute to the Canada-U.S. manufacturing labour productivity gap. For instance, the manufacturing sector in the U.S. has a greater share of total employment in information and communication equipment producers than does Canada. Canada has a greater share in wood and paper products.

Third, the results here apply to a particular value of the Canada/ US gap in manufacturing labour productivity. The results with regards to the percentage point contribution that SMES make will change as estimates of the gap changes—though the estimate of the contribution that SMEs make to the total gap will be less sensitive to alternate estimates of the productivity gap.

Despite these caveats, this paper shows that SMEs are responsible in two ways for much of the productivity gap—because of their higher employment share and because of their productivity gap with their US counterparts. Any improvement that increases either their size or their relative productivity would have the largest impact on reducing the Canada/US productivity gap.

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Table 1
Comparison of shipments per employee and value added per employee by plant size class: Canada and the United States

	United States					Canada			
	Value added per employee(US$ 000)					Value added per employee(CDN$000)			
Year	All	Small	Med	Large		All	Small	Med	Large
1977	24.86	20.30	22.55	29.84		22.23	17.36	22.17	26.97
1982	36.56	28.41	33.98	45.01		32.95	26.56	34.00	39.20
1987	50.14	37.64	46.86	63.88		50.28	36.87	50.73	67.61
1992	62.53	45.06	58.12	83.80		57.47	41.11	62.57	75.28
1994	74.61	53.00	68.68	98.26		71.14	48.17	75.69	100.20
1997	77.96	53.72	72.70	106.90		80.47	54.10	83.50	118.21
	United States					Canada			
	Shipments per employee (US$ 000)					Shipments per employee (Cdn$000)			
Year	All	Small	Med	Large		All	Small	Med	Large
1977	73.37	58.93	68.13	86.60		74.20	53.76	72.05	96.48
1982	110.01	82.43	105.95	134.37		125.83	92.00	133.79	155.80
1987	139.75	102.98	133.19	176.14		168.62	117.17	167.41	239.49
1992	177.28	123.32	168.03	236.01		199.36	127.53	208.87	297.62
1994	200.24	138.76	187.54	264.76		249.35	149.96	240.07	423.92
1997	224.85	150.98	212.68	306.51		269.15	165.96	265.65	443.57

Table 2
Comparison of relative shipments per worker of Canadian and United States plants: by size class

	Canada/United States			
	Relative Productivity ($CDN/$US)--no price corrections			
Year	All	Small	Medium	Large
1977	1.01	0.91	1.06	1.11
1982	1.14	1.12	1.26	1.16
1987	1.21	1.14	1.26	1.36
1992	1.12	1.03	1.24	1.26
1994	1.25	1.08	1.28	1.60
1997	1.20	1.10	1.25	1.45
1997-77	0.19	0.19	0.19	0.34
	Relative Productivity ($CDN/$US)—1992 prices each country			
Year	All	Small	Medium	Large
1977	1.19	1.07	1.24	1.31
1982	1.22	1.19	1.35	1.24
1987	1.12	1.06	1.17	1.26
1992	1.12	1.03	1.24	1.26
1994	1.17	1.02	1.20	1.51
1997	1.13	1.04	1.18	1.37
1997-77	-0.06	-0.03	-0.06	0.06

Table 3
Comparison of relative value added per worker of Canadian and United States plants: by size class

	Canada/United States			
	Relative Productivity ($CDN/$US)--no price corrections			
Year	All	Small	Medium	Large
1977	0.89	0.86	0.98	0.90
1982	0.90	0.94	1.00	0.88
1987	1.00	0.98	1.09	1.06
1992	0.92	0.92	1.08	0.90
1994	0.96	0.91	1.10	1.02
1997	1.03	1.00	1.15	1.10
1997-77	0.14	0.16	0.17	0.20
	Relative Productivity ($CDN/$US)—1992 prices each country			
Year	All	Small	Medium	Large
1977	1.07	1.04	1.18	1.09
1982	0.97	1.00	1.07	0.94
1987	0.91	0.89	0.98	0.96
1992	0.92	0.92	1.08	0.90
1994	0.89	0.85	1.03	0.95
1997	0.98	0.96	1.10	1.05
1997-77	-0.09	-0.06	-0.09	-0.04

Table 4
Comparison of size class productivity disadvantage of Canada relative to the United States for different size classes

	Value Added				Shipments		
Year	smll/large	small/med	med/large		smll/large	small/med	med/large
1977	0.95	0.88	1.09		0.82	0.86	0.95
1982	1.07	0.94	1.14		0.96	0.88	1.09
1987	0.93	0.91	1.03		0.84	0.91	0.92
1992	1.02	0.85	1.20		0.82	0.83	0.99
1994	0.90	0.83	1.09		0.67	0.84	0.80
1997	0.91	0.87	1.04		0.76	0.88	0.86

Table 5
Increase in Canadian output per worker from adopting U.S. size class structure

	Effect of Adopting U.S. employment shares	
Year	Using value added	Using shipments
1977	1.03	1.04
1982	1.00	1.03
1987	0.98	1.06
1992	1.02	1.07
1994	1.04	1.11
1997	1.03	1.09
	Effect of Adopting US small and medium-sized plant output per worker disadvantages	
Year	Using value added	Using shipments
1977	0.98	1.07
1982	0.93	0.98
1987	1.01	1.08
1992	0.93	1.06
1994	1.00	1.20
1997	1.01	1.14
	Effect of Adopting US small and medium-sized plant output per worker disadvantages and U.S. employment shares	
Year	Using value added	Using shipments
1977	1.01	1.10
1982	0.97	1.01
1987	1.06	1.13
1992	0.98	1.12
1994	1.06	1.29
1997	1.07	1.21

Table 6
Contribution of different size classes to productivity gap between Canada and the United States

	Using US Employment Share Weights on Productivity Differences			
Year	Differences in Employment Shares	Productivity Differences in Small Plants	Productivity Differences in Medium Plants	Productivity Differences in Large Plants
1977	14.6	25.8	15.8	43.9
1982	8.7	19.6	21.7	50.1
1987	14.6	22.0	25.2	38.2
1992	14.2	21.3	19.4	45.1
1997	18.5	20.2	24.9	36.4
mean	14.1	21.8	21.4	42.7
1997-77	3.9	-5.5	9.1	-7.5
	Using Canadian Employment Share Weights on Productivity Differences			
Year	Differences in Employment Shares	Productivity Differences in Small Plants	Productivity Differences in Medium Plants	Productivity Differences in Large Plants
1977	16.4	29.0	19.2	35.5
1982	13.0	24.0	24.4	38.6
1987	13.7	27.5	29.7	29.1
1992	17.9	27.5	21.0	33.6
1997	22.5	27.0	25.5	25.0
mean	16.7	27.0	24.0	32.4
1997-77	6.1	-2.0	6.4	-10.4
Year		Employment Share of Small Plants	Employment Share of Medium Plants	Employment Share of Large Plants
1977		30.4	38.1	31.6
1982		34.2	37.1	28.7
1987		35.1	38.7	26.2
1992		38.1	37.6	24.2
1997		37.3	39.8	22.9

Table 7: Adjustment Factor in Canada and the U.S.

Year	Total Adjustment		Adjustment for PPP (1 / PPP)		Adjustment for Deflator (VA / NVA)		Adjustment for Work Intensity (Emp / Hours)		Adjustment for Nominal Census Value-added (NVA / NCVA)		Adjustment for Census Employment (CEMP / EMP)	
	Can	U.S.	Can	U.S.	Can	U.S.	Can	U.S.	Can	U.S.	Can	U.S.
1977	0.543	0.522	0.708	1.000	1.959	1.444	0.523	0.475	0.833	0.791	0.899	0.962
1982	0.340	0.398	0.708	1.000	1.301	1.056	0.536	0.489	0.785	0.790	0.936	0.975
1987	0.280	0.341	0.708	1.000	1.000	1.000	0.520	0.469	0.809	0.762	0.940	0.953
1992	0.273	0.287	0.708	1.000	0.953	0.852	0.525	0.463	0.803	0.759	0.959	0.959
1997	0.232	0.268	0.708	1.000	0.827	0.854	0.513	0.456	0.804	0.716	0.959	0.961

Table 8: Adjusted Labour Productivity of Different Size Producers in Canada and the U.S.

Year	Labour Productivity in Canada (1987 = 1.00)			Labour Productivity in the U.S. (1987 = 1.00)			Labour Productivity in Canada Relative to that in the U.S. (1987=100)		
	SMEs	Large	Total	SMEs	Large	Total	SMEs	Large	Total
1977	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1982	1.072	1.026	1.047	1.112	1.145	1.116	0.964	0.896	0.938
1987	1.160	1.322	1.192	1.332	1.448	1.360	0.871	0.911	0.876
1992	1.356	1.466	1.358	1.404	1.637	1.464	0.966	0.895	0.927
1997	1.471	1.866	1.541	1.682	2.033	1.776	0.875	0.917	0.868

Table 9: Relative Adjusted Labour Productivity of Different Size Producers Among and Between Canada and the U.S.

Year	Relative Labour Productivity in Canada (Canadian Manufacturing = 1.00)		Relative Labour Productivity in the U.S. (U.S. Manufacturing = 1.00)		Relative Labour Productivity in Canada (U.S. = 1.00)		
	SMEs	Large	SMEs	Large	SMEs	Large	Total
1977	0.902	1.213	0.864	1.196	0.946	0.919	0.906
1982	0.924	1.190	0.861	1.228	0.912	0.824	0.850
1987	0.878	1.345	0.846	1.273	0.824	0.838	0.794
1992	0.901	1.310	0.828	1.338	0.914	0.823	0.840
1997	0.861	1.469	0.818	1.369	0.828	0.844	0.786

Table 10: Factors Underlying the Canada-U.S. Manufacturing Labour Productivity Gap

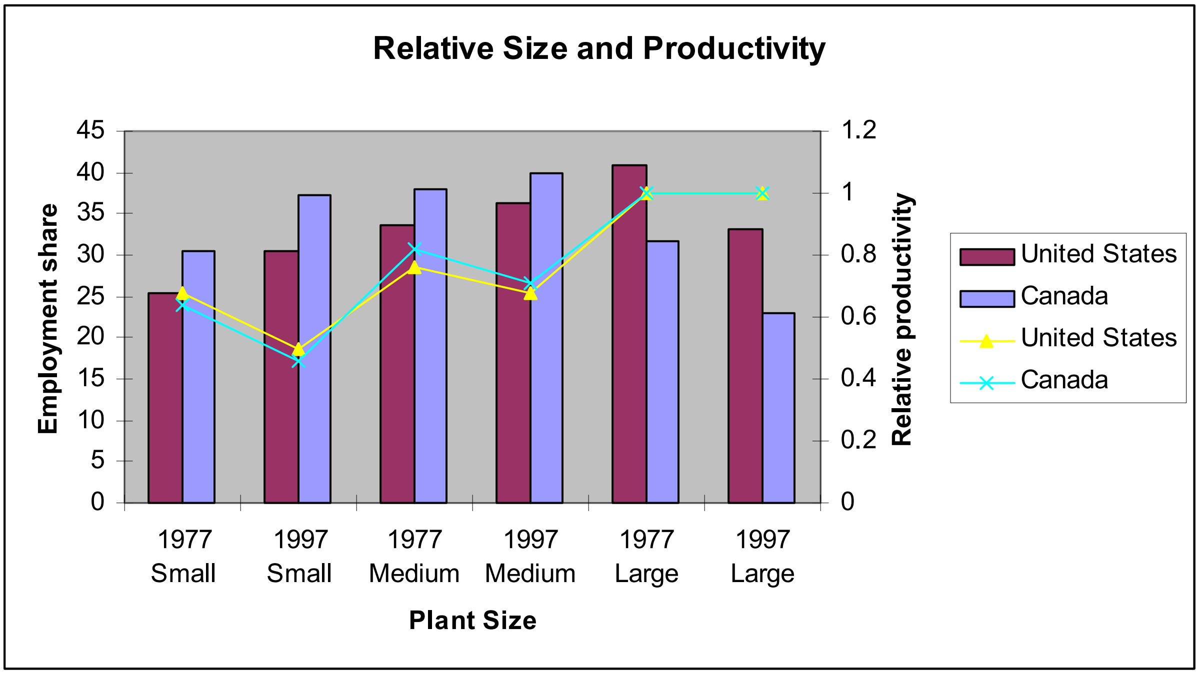
Year	1977	1982	1987	1992	1997
Canada-U.S. Manufacturing Labour Productivity Gap	9.38	14.96	20.60	15.97	21.36
Due to Factors (percentage points):					
High SME Employment Share	2.91	2.70	3.93	4.05	5.25
SMEs Being Less Productive in Canada than in the U.S.	2.97	5.06	10.28	5.06	10.14
Large Plants Being Less Productive in Canada then in the U.S.	3.50	7.20	6.39	6.87	5.97
Due to Factors (percent of the productivity gap):					
High SME Employment Share	31.07	18.04	19.06	25.35	24.56
SMEs Being Less Productive in Canada than in the U.S.	31.64	33.86	49.90	31.67	47.48
Large Plants Being Less Productive in Canada then in the U.S.	37.29	48.10	31.04	42.98	27.95

Note: preliminary data for Canada have been employed for 1987 that underestimate productivity in small plants.

Table 11: Factors Underlying the Widening Canada-U.S. Manufacturing Labour Productivity Gap

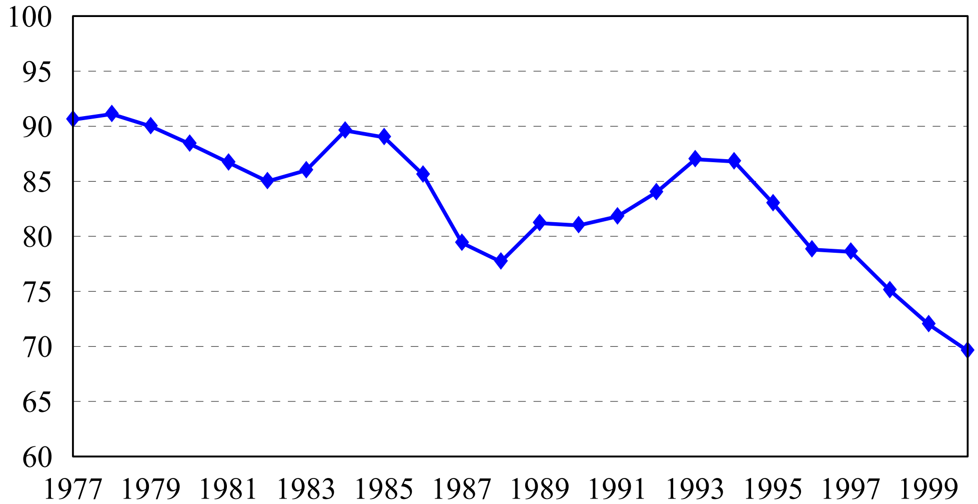
Period	Total	Factors		
		Higher SME Employment Share in Canada than in the U.S.	SMEs Being Less Productive in Canada than in the U.S.	Large Plants Being Less Productive in Canada than in the U.S.
In terms of Percentage Points				
1977-97	11.98	2.34	7.17	2.47
1977-87	11.22	1.01	7.31	2.90
1992-97	5.39	1.20	5.08	-0.90
In terms of percent				
1977-97	100.00	19.53	59.85	20.62
1977-87	100.00	9.03	65.16	25.83
1992-97	100.00	22.26	94.25	-16.70

Figure 1



Note: Relative productivity is set against the axis on the right hand side. The productivity of small and medium sized plants is calculated against a value of 1 for large plants

Figure 2
Labour Productivity in the Canadian Manufacturing Sector (U.S.=1.00)



Note: Labour productivity is GDP per hour worked, derived by extending a benchmark estimate (79.4) in 1987 (de Jong, 1996) using real GDP per hour worked indexes from the U.S. Bureau of Labour Statistics.