Canada's Recent Productivity Record and Capital Accumulation

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Abstract

This paper analyzes the role of capital accumulation in the Canada-U.S. labour productivity gap in the 1990s. The empirical results indicate that the M&E capital intensity is more important than the structures capital intensity for labour productivity. The inter-industry variation in labour productivity level is highly and positively correlated with differences in M&E capital intensity. Similarly, the inter-industry differences in the labour productivity level gap between Canada and the U.S. are also highly and positively correlated with differences in the M&E capital intensity gap. At least 12% of the business sector Canada-U.S. labour productivity level gap in 2000 was due to the capital intensity gap between the two countries. More importantly, much of the widening of the labour productivity level gap at the aggregate level in the second half of the 1990s was due to the widening of the capital intensity gap. Depreciation of the Canadian dollar and the unemployment rate gap between the two countries seem to have contributed significantly to the faster rate of increase in the capital-to-labour cost in Canada in the 1990s, hence to the widening of the capital intensity and labour productivity level gaps.

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1 Introduction

Canada's relatively good economic performance and the stellar record on the trade front in the second half of the 1990s seriously mask its underlying competitiveness problem.[1] Canada's labour productivity growth lagged behind the U.S. in the last 15 years and the problem is generally pervasive across all industries and all provinces.[2] In a world of increased globalization of production and innovation activity, and fierce international competition for productive resources, physical capital, skilled workers and intellectual capital (innovation activities) have become highly mobile across countries and among regions and industries within a given country. Hence, Canada's ability to attract and retain internationally mobile resources, and create a virtuous cycle of strong economic growth and improvements in quality of life for its citizens will critically depend on its success in making progress in closing the productivity and living standards gaps vis-à-vis the U.S., its largest trading partner and one of the most prosperous and dynamic economies in the world.

The causes of the widening productivity and living standards gaps between the two countries have been studied extensively. In a number of recent studies, we examined the role of differences in innovation, human capital and the production and use of the information and communication technologies in the widening of the Canada-U.S. labour productivity level gap.[3] The objective of this paper is to analyse in some detail the contribution of capital accumulation to labour productivity growth in Canada and the widening of the Canada-U.S. labour productivity level gap in the 1990s, especially in the latter half of the decade.[4] The following are some of the key research questions we hope to address:

- Did the pace of increase in capital intensity (the capital-labour ratio) slow in Canada in the 1990s? Was the slowdown pervasive across industries or concentrated in a few large industries?

- How much of the inter-industry variation in labour productivity levels across Canadian industries can be explained by the variation in capital intensity levels?

- Is the impact of M&E capital on productivity significantly larger than the structures capital?

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[1] The competitiveness of a country can be formerly defined as the degree to which a country can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining and expanding the real incomes of its citizens (President's Commission on Industrial Competitiveness (1985)).

[2] See Rao (2002).

[3] Rao, et al. (2001) for innovation, Rao, Tang and Wang (2002) for human capital, and Rao and Tang (2001) for the production and use of the information and communication technologies.

[4] Lower investment intensity in Canada has been identified as one of the key factors responsible for the Canada-U.S. labour productivity gap by many studies, e.g. Lee and Tang (2001), Bernstein, Harris, and Sharpe (2002), Nadeau and Rao (2002), Rao, Tang and Wang (2002), and Sharpe (2003).

- How much of the Canada-U.S. labour productivity level gap can be accounted for by the capital intensity gap between the two countries?

- What role capital intensity played in the widening of the Canada-U.S. productivity level gap?

- What role did the differences in trends in the relative rental price of capital to labour cost in the two countries play in the widening of the capital intensity gap?

- What were some of the key drivers of different trends in the relative rental price of capital to labour in the two countries?

Our empirical results indicate that the slowdown in the pace of capital intensity in the 1990s was pervasive across all Canadian industries. Inter-industry variation in capital intensity explains a large part of the productivity level differences across Canadian industries. In addition, the slowdown in capital intensity growth was a major drag on labour productivity growth in the second half of the 1990s. Our regression results suggest that M&E capital exerts a much bigger impact on productivity than structures capital. Furthermore, the widening of the capital intensity gap also contributed significantly to the widening of the Canada-U.S. labour productivity gap. After controlling for industry specific effects, the differences in trends in the real rental price of capital (the ratio of rental price of capital to wage rate) in Canada and the U.S. played a significant role in the widening of the capital intensity gap between the two countries. The depreciation of the Canadian dollar and the unemployment rate gap seem to have mainly contributed to the faster increase in the real rental price of capital in Canada in the 1990s, hence to the widening of the capital intensity and the labour productivity level gaps between the two countries.

The paper is organised in the following way. In the next section, section 2, we examine recent trends in labour productivity in Canadian and U.S. industries. In section 3, we discuss changes in the two types of capital intensities: M&E and structures. In this section, we also examine the role of two types of capital intensities in inter-industry differences in Canadian labour productivity levels and the Canada-U.S. labour productivity level gaps. Using the growth accounting framework, we also assess the role of capital intensity in Canada's labour productivity growth as well as in the Canada-U.S. labour productivity level gap in the 1990s. In section 4, we examine the sources of the widening of the capital intensity gap between the two countries. In this section, we also discuss possible reasons for the faster growth in the real rental price of capital in Canada. In the last section, section 5, we summarise the key findings of our paper and explore their research and policy implications.

2. Canada's productivity record: an industry analysis

Based on the data from the OECD Economic Outlook, in the second half of the 1990s, real GDP per worker for the total economy, increased at an annual rate of 1.7 percent, compared to 1.0 percent per year during the 1987-1995 period.[5] But, despite the large acceleration, Canada's

[5] OECD Economic Outlook does not provide hours worked for productivity analysis and U.S. Statistical agencies do not publish hours worked for detailed industries. To be consistent, the

productivity growth lagged behind the U.S. and other OECD countries in the second half of the last decade. More importantly, labour productivity growth in the U.S. averaged 2.4 percent per year, compared to only 1.7 percent in Canada, resulting in a significant widening of the Canada-U.S. labour productivity level gap.

Nevertheless, Canada's productivity growth varied a great deal across industries. For instance, during the 1987-98 period, labour productivity (real GDP per worker) increased at a healthy pace (between 2.5 and 5.4 percent per year) in a number of Canadian industries: primary industries, rubber and plastic products, furniture and fixtures, primary metals, fabricated metals, machinery and electrical and electronic equipment, refined petroleum and wholesale trade (Table 1). On the other hand, in many other industries, labour productivity either declined or remained stagnant. These industries include construction, leather, textiles, lumber and wood, printing and publishing, other manufacturing and retail trade.

Like Canada, productivity growth also varied considerably across industries in the U.S. during the 1987-1998 period. Canada's labour productivity growth lagged behind the U.S. in machinery and electrical and electronic equipment, transportation and warehousing, communication and utilities, wholesale trade and retail trade (Table 1). On the other hand, Canada performed better than the U.S in primary industries, furniture and fixtures, primary metals, fabricated metals, transportation equipment and refined petroleum products.

The large widening of the Canada-U.S. manufacturing labour productivity level gap in the second half of the 1990s was largely due to Canada's relatively lower productivity growth in machinery and electrical and electronic equipment industry. In this industry, labour productivity increased by 14.6 percent per year in the U.S., compared to a mere 2.0 percent in Canada (Table 1). However, Canada's performance in other manufacturing industries, on average, was better than that in the U.S.

There is also a great deal of variation in labour productivity levels across Canadian industries. For instance, real GDP per worker varies from a low of $ 27 thousand in retail trade to a high of over $120 thousand in chemicals and allied products industry in 1998.[6] The top five industries in terms of labour productivity levels are: chemicals and allied products, communication and utilities, wholesale trade, primary metals and refined petroleum. The bottom five industries include retail trade, other manufacturing, leather, textiles, and furniture and fixtures. In general, labour-intensive industries have low productivity levels. On the other hand, resource-based and high-tech industries display high productivity levels.

Canada's labour productivity in the business sector was about 16 percent below the U.S. level in 2001, widened from 14 percent in 1990 (Chart 1).[7] A similar picture emerges from the multi-factor productivity level gap in the business sector. More importantly, in the manufacturing

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number of employees is used to define labour productivity (i.e. GDP per worker) and capital intensity (i.e., capital stock per worker) throughout the paper.

[6] Labour productivity level is defined as real GDP per worker at market prices in 1997 dollars (real GDP at basic prices is adjusted to real GDP at market prices).

[7] Note that Canada's productivity problem relative to the U.S. started in the early of 1980s.

sector, the battle ground of fierce international competition, the Canada-U.S. labour productivity level gap increased from about 25 percent in 1990 to around 35 percent in 2001. Canada's' productivity challenge is not confined to a few large industries. Instead, the problem is generally pervasive across Canadian industries (Chart 2). But, Canada performs well or exceeds the U.S. productivity levels in mining, construction, paper and allied products, primary metals, lumber and wood, furniture and fixtures and transportation equipment. On the other hand, in electrical and electronic equipment and machinery industries, Canadian productivity levels are only about 30 percent of the U.S. levels.[8]

3. Capital accumulation and labour productivity

Capital accumulation is a key driver of living standards, because it contributes directly towards an increase in productivity of labour by providing more capital per unit of labour input. Capital formation, especially the M&E capital, also raises the productivity of all other inputs, in other words increases total factor productivity (TFP), by facilitating an effective utilisation of new and the state of the art technologies.[9] Hence, capital accumulation contributes both directly and indirectly towards raising labour productivity.

In this section, first, we examine the recent trends in capital intensity, measured as capital stock per worker, in Canadian and U.S. industries, disaggregated by two types of capital: M&E and structures. Next, we analyse the impact of two capital intensities on labour productivity. Finally, we discuss the role of capital accumulation in inter-industry variation in labour productivity levels in Canada and the Canada-U.S. labour productivity level gaps.

Recent trends in capital intensity

In this paper, capital consists of machinery and equipment and structures. Capital intensity is defined as capital stock per worker.[10] Aggregate capital intensity in the Canadian business sector increased at a slower pace in the latter half of the 1990s, compared to the 1987-95 period (Table 2). This slowdown was mainly due to an absolute decline in the structures capital intensity in the manufacturing sector. In addition, the M&E capital intensity in this crucial sector more or less remained constant between 1995 and 2000. Furthermore, the following manufacturing industries registered an absolute decline in the total capital intensity during this period: lumber and wood, fabricated metals, machinery and electrical and electronics equipment, transportation equipment,

[8] The gap is calculated based on real GDP per worker.

[9] For instance, Solow (1960) and Greenwood, Hercowitz, and Krusell (1997) suggest that technical change is "embodied" in new M&E investment. Therefore, M&E is needed to realize fully the benefits of technological progress. According to Stiroh (2002), the investment-specific technical change is conceptually distinct from capital accumulation and disembodied technical change.

[10] Preferably, one could measure capital in such a way it is consistent with the concept of "constant quality" as used by Jorgenson and his associates, e.g. Jorgenson (1995), Jorgenson and Griliches (1995), Jorgenson and Stiroh (2000). Under this framework, capital input is derived as quantity indices of capital stocks of different types of assets, using capital rental prices as weights. However, we don't have data for undertaking such an exercise.

petroleum and coal products and chemicals. On the other hand, total capital intensity increased at a healthy pace in primary industries, primary metals, communication and utilities and wholesale trade. These industries also registered a significant increase in M&E intensity.

As expected, there is a considerable variation in capital intensity across Canadian industries. The top five capital intensity industries in 2000 were: communication and utilities, petroleum and coal products, paper and allied products, primary metals and chemicals. They were also the top-five in terms of M&E intensity. On the other hand, furniture and fixtures, textiles, retail trade, construction and printing and publishing were at the bottom end of the spectrum. It is very surprising that machinery and electrical and electronics industry has one of the lowest intensities for both M&E and structures.

The M&E capital intensity in the business sector in 2000, on average, was only 55 percent of the U.S. level, and the gap widened between 1995 and 2000 (Chart 3).[11] In the manufacturing sector, the M&E intensity gap increased from about 30 percent in 1995 to 40 percent in 2000. Furthermore, the Canadian advantage in the structures intensity in this sector declined from 29 percent in 1995 to just 5 percent in 2000. In all two-digit manufacturing industries, with the exception of lumber and wood and paper allied products, the M&E capital intensity is considerably below the U.S. level (Table 3). More importantly, in the machinery and electrical and electronics equipment industry, it is only 30 percent of the U.S. intensity. Similarly, there is also a large M&E intensity gap in primary industries and service industries. However, Canada's structures intensity exceeds by a large margin the U.S. levels in many industries: primary industries, construction, leather, lumber and wood, paper and allied products, primary metals, petroleum products, chemicals, transportation and warehousing and communication and utilities.

Inter-industry differences in capital intensity and labour productivity levels

In this sub-section, we discuss the role of capital intensity in inter-industry variation in labour productivity levels in Canada and the Canada-U.S. labour productivity level gaps. Towards this objective, we first analyse the importance of the two types of capital intensities for labour productivity.

Since M&E capital is the carrier of new and state of the art technologies, its impact on labour productivity is expected to be significantly larger than structures capital. In an effort to get an empirical estimate of the relative importance of the two types of capital intensities, using pooled industry and time-series data, we estimated an equation for labour productivity for Canada as well as the U.S.:[12]

$$(1) \qquad \Delta \ln LP_t = \alpha + \beta_1 \Delta \ln k_{ME,t} + \beta_2 \Delta \ln k_{ST,t} + \varepsilon_t ,$$

[11] Note, however, that total capital intensity in Canada was equal to or slightly higher than that in the U.S. briefly in the middle 1990s (Table 3).

[12] For both countries, there are 15 manufacturing and 6 non-manufacturing industries. Each industry has 11 observations for Canada and 13 observations for the U.S.

where $\Delta \ln LP_t$ is the change in log of real value added per worker in year *t* from *t-1*; $\Delta \ln k_{ME,t}$ and $\Delta \ln k_{ST,t}$ are the change in log of M&E capital intensity and log of structures capital intensity. Capital intensity is defined as capital stock per worker.

As expected, the coefficient on the M&E capital intensity is positive and statistically significant in both countries (Table 4).[13] On the other hand, the coefficient on the structures intensity, while is positive, is either statistically insignificant or weakly significant. More importantly, in all equations, the estimated elasticity of labour productivity with respect to the M&E capital intensity is close to or more than three times that of the structures elasticity. For instance, in the manufacturing sector, the M&E elasticity is 0.54, compared to the structures elasticity of 0.19. These results imply that without taking into consideration the differences in elasticities of the two capital intensities and changes in the composition of the capital stock, we will get an inaccurate estimate for the contribution of capital accumulation to labour productivity.

How much of the variation in labour productivity levels across Canadian industries can be explained by inter-industry differences in capital intensities? Our regression results imply that the differences in capital intensity, especially the M&E intensity, explain very well the large inter-industry differences in labour productivity levels in Canada. For instance, the top five industries in terms of M&E intensity are also the top industries in labour productivity – communication and utilities, paper and allied products, primary metals, petroleum and coal products and chemicals. Similarly, the bottom five industries in M&E capital intensity, with the exception of wholesale trade, also have the lowest levels of labour productivity – retail trade, furniture and fixtures, leather and textiles. The simple correlation between M&E capital intensity and labour productivity levels across Canadian industries in 1998 is 0.65, while with structures it is only 0.47.

Can differences in M&E intensity between Canadian and U.S. industries also explain the large inter-industry variation in the Canada-U.S. labour productivity level gaps? The answer is again yes. For example, in construction, lumber and wood, and paper and allied products, the M&E intensity in Canada is either equal to or higher than in the U.S. (Table 3). In these industries, Canada's productivity levels are either comparable to or higher than in the U.S. (Chart 2). Similarly, in industries where the M&E intensity gap is large, the Canada-U.S. labour productivity level gap is also large: machinery and electrical and electronic equipment, petroleum and coal products, textiles and fabricated metals. Moreover, in the manufacturing sector, the M&E intensity gap is about 40 percent, while the labour productivity gap is about 35 percent. More importantly, the widening of the M&E intensity gap seems to have played an important role in the widening of the manufacturing labour productivity gap between 1995 and 2000. There is a strong positive correlation (0.66) between the M&E intensity gap and the Canada-U.S. labour productivity level gap across industries in 2000.

Sources of the Canada-U.S. labour productivity gap: growth accounting[14]

[13] The estimates are White-heteroskedasticity consistent, which take care of the presence of any heteroskedasticiy across industries.

[14] The growth accounting framework has been widely used by Jorgenson and his associated in economic growth and productivity studies, e.g., Jorgenson and Nishimizu (1978), Jorgenson,

In this section, we examine the Canada-U.S. labour productivity growth as well as level gap. We first deal with the growth gap.

Canada-U.S. labour productivity growth gap

Using the growth accounting framework, we estimate the contribution of capital intensity growth to labour productivity growth in the business sector as well as the manufacturing sector. Following Jorgenson, Gollop, and Fraumeni (1987), we express the labour productivity growth in each country as a function of the growth in TFP and capital intensity:[15]

$$(2) \qquad \Delta \ln LP_t = \Delta \ln MFP_t + \bar{v}_{K,t} \Delta \ln k_t ,$$

where $\Delta \ln LP_t$ is the change in log of real value added per worker in year *t* from *t-1*; $\Delta \ln MFP_t$ is the change in log of multi-factor productivity (MFP) in year *t* from *t-1*;[16] $\Delta \ln k_t$ is the change in log of capital intensity, defined as capital stock per worker, in year *t* from *t-1*; and $\bar{v}_{K,t}$ is the two-year average income share of the capital in year *t* and *t-1*.

Using equation (2), we analyse the contribution of capital accumulation to labour productivity growth. In the business sector, labour productivity (real GDP per worker) in Canada increased from 1.0 percent per year during the period 1987-95 to 2.1 percent per year during the second half of the 1990s. U.S. labour productivity growth exceeded Canadian growth in both periods by 0.4-0.5 percentage points per year. All of the increase in labour productivity growth in Canada was due to the acceleration in MFP growth (Table 5). As a matter of fact, the contribution of capital intensity to labour productivity growth declined in Canada by 0.4 percentage points per year between the two periods. On the other hand, in the U.S., capital contribution increased by 0.4 percentage points per year during this period. Hence, the widening of the labour productivity level gap in the business sector during the latter half of the 1990s was largely (80 percent) due to the widening of the capital intensity gap.

Developments were different in the manufacturing sector. Labour productivity in the U.S. manufacturing sector increased by 4.5 percent per year during the second half of the 1990s from 2.9 percent in the period 1987-1995, compared to a deceleration in Canada from 3.2 to 1.5

Gollop and Fraumeni (1987), Jorgenson (1995), Jorgenson and Griliches (1995), Jorgenson and Stiroh (2000), Jorgenson and Lee (2001), Jorgenson and Yun (2001).

[15] This growth accounting framework is based on the assumptions of constant returns to scale and competitive product and factor markets.

[16] Under this framework, MFP growth is calculated as a residual, equal to labour productivity growth minus the contribution of capital intensity growth. MFP growth is often referred to as technical progress. Nevertheless, it captures the influence of a variety of other factors, including innovation of all sorts, economies of scale and scope, market imperfections, worker management relations, resource re-allocation, measurement errors in both output and inputs, etc.

percent per year. The widening of the capital intensity growth gap explains about 37 percent of the labour productivity growth gap in the latter half of the 1990s (Table 5).

Canada-U.S. labour productivity level gap

Using the growth accounting framework, we can also estimate the contribution of the capital intensity level gap to the Canada-U.S. labour productivity level gap in the business sector as well as the manufacturing sector. As in Jorgenson and Nishimizu (1978), the theoretical framework for productivity gap and source comparisons between Canada and the U.S. is based on a translog production function originally introduced by Christensen, Jorgenson and Lau (1971, 1973),

$$(3) \qquad \Delta \ln LP_{CA/US} = \Delta \ln MFP_{CA/US} + \bar{v}_{K,CA/US} \Delta \ln k_{CA/US},$$

where $\Delta \ln LP_{CA/US}$ is the log of real value added per worker in Canada (PPP-based) relative to the U.S.; $\Delta \ln MFP_{CA/US}$ is the log of multi-factor productivity in Canada relative to the U.S.; $\Delta \ln k_{CA/US}$ is the log of capital intensity in Canada (PPP-based) relative to the U.S.; and $\bar{v}_{K,CA/US}$ is the two-country average income share of the capital.

Using equation (3), we estimate the contribution of the capital intensity gap to the Canada-U.S. labour productivity level gap in the business sector as well as the manufacturing sector. These results are reported in Table 6.

In the business sector, the labour productivity level gap is estimated to be about 16 percent in 2000. Capital intensity gap accounted for 12 percent of this gap (Table 6). In the manufacturing sector, the labour productivity level gap was 34 percent in 2000. The growth accounting framework suggests that about 16 percent of this gap was due to the capital intensity gap. However, as pointed out earlier, these are lower bound estimates because M&E capital affects labour productivity more than structures capital.

In summary, the capital intensity played a major role in the widening of the labour productivity gap in the latter half of the 1990s in both the business and the manufacturing sectors. In addition, the capital intensity gap accounted for between 12 to 16 percent of the Canada-U.S. labour productivity level gap in 2000. But, the actual contribution of capital intensity could be significantly higher because the M&E intensity gap is considerably bigger than the total capital intensity gap and its impact on labour productivity is also considerably larger than structures capital.[17]

4. Causes of the Canada-U.S. Capital Intensity Gap

[17] For instance, if total capital stock is replaced by M&E capital stock and 0.543 used as the capital income share in equation (2) for the Canadian manufacturing sector, as per the regression results in Table 4, then the M&E capital intensity level gap will explain about 64 percent of the Canada-U.S. manufacturing labour productivity level gap between Canada and the U.S. in 2000.

Why is Canada significantly less capital intensive than the U.S., especially in M&E capital? Why did the capital intensity gap increase in the second half of 1990s? What explains the large inter-industry differences in the capital intensity gap? Did depreciation of Canadian dollar play a role in the widening of the capital intensity gap in the 1990s by raising the real cost of capital in Canada relative to the U.S.? These are some of the important questions we hope to address in this section.

Firms minimise their costs of production of goods and services or maximise their profits subject to their production function constraints. Under these assumptions, each firm will choose the mix of capital and labour based on relative input prices. Hence, the optimal level of capital intensity, defined as capital stock per unit of labour, is a function of the ratio of rental price of capital to wage rate:

$$(4) \qquad k = f\left(\frac{r}{w}\right),$$

where k is capital intensity, r is the rental price or user cost of capital services, and w is the wage rate of labour. According to this model, capital intensity will be negatively correlated with the ratio of rental price of capital to the wage rate.[18] For simplicity, in this paper we refer the price ratio as the real rental price of capital.

According to equation (4), the inter-industry differences in capital intensity in Canada depend on the differences in the real rental price of capital. In addition, the capital intensity gap between Canada and the U.S. will be determined by the gap in the real rental price of capital between the two countries. Furthermore, the trends in capital intensity gap between Canada and the U.S. will be influenced by the trends in the real rental price of capital in the two countries.

As shown in Chart 4, the aggregate real rental price of capital in Canada rose significantly faster than in the U.S. during the 1990s, a dramatic reversal of the steady decline between 1987 and 1991, suggesting that it might be an important factor in the widening of the capital intensity gap between the two countries. To examine empirically its role in the capital intensity gap, hence the labour productivity gap, we regress capital intensity in Canada relative to the U.S. on real rental price of capital in Canada relative to the U.S. The regression model is

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[18] It is straightforward to show that $k = \frac{\alpha}{1-\alpha}\left(\frac{r}{w}\right)^{-1}$ under the Cobb-Douglas production function ($Y = AK^{\alpha}L^{1-\alpha}$), and $k = \left[\frac{\lambda}{1-\lambda}\left(\frac{r}{w}\right)^{-1}\right]^{\frac{1}{1-\rho}}$ under the Constant Elasticity of Substitution production function, ($Y = \left(\lambda K^{\rho} + (1-\lambda)L^{\rho}\right)^{\frac{1}{\rho}}$).

(5) $$k_{i,t}^{R} = \beta\left(\frac{r}{w}\right)_{i,t}^{R} + \sum_{i=1}^{21} a_i I_{t,t} + \varepsilon_i ,$$

where $k_{i,t}^{R}$ denotes the capital intensity in Canada relative to the U.S. in industry *i* in year *t*; $\left(\frac{r}{w}\right)_{t}^{R}$ is the real rental price of capital in Canada relative to the U.S. in industry *i* in year *t*; and $I_{i,t}$ is the industry dummy for industry *i* in year *t*.

We ran two separate regressions based on this model, using pooled industry and time series data between 1987 and 1998.[19] In the first regression, capital intensity is regressed on real rental price of capital in Canada relative to the U.S. However, we don't have the data on the industry specific real rental price of capital. Therefore, we used the aggregate data for the business sector. Consequently, it does not vary across industries in any given year, but varies over time.

In the second regression, to get around this data problem, we used industry specific real prices of investment (price of investment relative to the wage rate) in Canada relative to the U.S. They vary across industries and over time.

Like the aggregate real rental price of capital, the aggregate real price of investment too increased steadily in Canada relative to the U.S. in the 1990s (Chart 4). Nevertheless, the rate of decline prior to 1992 and the pace of increase thereafter was significantly lower than in the real rental price of capital, because trends in the latter, in addition to investment price, are also influenced by the trends in real interest rates, corporate tax rates and tax credits in the two countries. For instance, the gap between the Canadian and U.S. real interest rates narrowed dramatically between 1987 and 1992. This trend seems to explain a large part of the divergence between the trends in the real rental price of capital and the real price of investment during this period.

After controlling for industry specific effects, the coefficients on the real rental price of capital and the real price of investment gaps are negative and statistically significant in the two regression equations (Tables 7 and 8).[20] In addition, the long-run impact is more than three times that of the short-run impact. These results imply that differences in the real rental price of capital and the real price of investment in Canadian industries relative to their American counterparts contributed significantly to the capital intensity gap between Canada and the U.S. The widening of the real rental price of capital and real price of investment gaps also played an important role in the widening of the capital intensity gap between Canada and the U.S.

Reasons for the widening of the real rental price of capital gap between Canada and the U.S.

[19] We have data for 15 manufacturing and 6 non-manufacturing industries for 1987-2000 and thus have a pooled sample of 294 observations.

[20] The estimates are White-heteroskedasticity consistent, which take care of the presence of any heteroskedasticiy across industries.

The next question is what were the factors behind the widening of the real rental price of capital gap. A change in the real rental price of capital in Canada relative to the U.S. could be due to either a change in capital cost in Canada relative to the U.S. or a change in the Canadian wage rate relative to the U.S. or a combination of the two. We examine these alternative sources, based on the purchasing power parities (PPP) prices for the two inputs. PPP price for capital input is defined as the ratio of the Canadian dollars required by Canadian firms to purchase the standard service of capital input in Canada to the U.S. dollars required by U.S. firms to use the same standard capital service in the U.S. Similarly, PPP price for labour is the ratio of Canadian dollars paid by Canadian firms for a standard hour worked in Canada to U.S. dollars paid by U.S. firms to the same standard hour worked in the U.S. (Lee and Tang, 2001).

The PPPs for capital and labour inputs followed very different trends in the 1990s. The PPP for labour input trended downwards gradually (Chart 5), implying that labour cost in Canada grew at a slower pace than that in the U.S. during this period. On the other hand, the PPP for capital input declined sharply over the 1987-92 period but increased steadily since 1992.[21] It followed closely the movements in the value of Canadian dollar relative to the U.S. currency. These different trends for labour and capital input prices in the two countries were mainly responsible for the widening of the real rental price of capital gap and hence the widening of the capital intensity gap between Canada and the U.S.

Trends in capital and labour PPPs can be due to many factors such as trends in real interest rates, price of investment, corporate tax rates and tax credits, exchange rate, labour market conditions in the two countries.[22] Here, we examine two important factors: trends in the Canada-U.S. exchange rate and the unemployment rate gap between Canada and the U.S. We think that these two factors were largely responsible for the widening of the gaps in the real rental price of capital and real price of investment in Canada relative to the U.S. in the second half of the 1990s.

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[21] The real rental price of capital in Canada relative to the U.S. dropped sharply over the 1987-92 period. One possible explanation for the significant decline is the reduction in the real interest spread in the two countries. Real interest rate in Canada was significantly above that in the U.S. in the late of the 1980s and early of the 1990s, and the spread reached 5.8 percent in 1990. The spread is the risk premium that Canadian firms paid for obtaining capital, and it affects the user cost of capital by influencing rate of return on each asset. The spread gradually declined after 1990, and virtually disappeared after 1995. The reduction in the spread coincided with the sharp decline in the user cost of capital in Canada relative to the U.S. This phenomenon has also been studied by McKenzie and Thompson (1997).

[22] Besides investment of price, the user cost of capital is also influenced by many tax related parameters such as the statutory tax rate, property taxes, and personal taxes. Many studies have documented that these taxes discourage investment (e.g., Mintz, 1995; Jorgenson and Yun, 2001). McKenzie and Thompson (1997) provide excellent comparisons of the two tax systems and their impact on the cost of capital, and more recently by Chen and Mintz (2003). They show that despite the tax reforms in both Canada and the U.S. in the middle of 1980s, the overall impact of tax system on the cost of capital has been higher in Canada than in the U.S. However, the tax disadvantage more or less stabilized after 1989 (McKenzie and Thompson, 1997; Jog and Tang, 2001).

A large portion of capital, especially machinery and equipment, is imported from the U.S. Therefore, the prices of investment goods are heavily influenced by the movements in the market value of the Canadian dollar relative to the American currency. In other words, the large increase in capital PPP since 1992 was largely due to the depreciation of the Canadian dollar vis-à-vis the U.S. currency.[23] On the other hand, a large part of wages and salaries in Canada is paid in Canadian dollars. Consequently, labour PPP is mostly immune to movements in the market value of the Canadian dollar. In addition, labour market in the U.S. in the 1990s was much tighter than in Canada, as evidenced by the large unemployment rate gap between the two countries (Chart 6). The tighter labour market in the U.S. contributed to the faster growth in the U.S. wage rate, hence a declining PPP for the labour input. The stronger economic growth and the tighter labour market in the U.S. were largely due to greater dynamism of ICT producing industries in the U.S. and a bigger share of these industries in the U.S. economy, and more efficient use of ICTs in U.S. service industries.

5. Conclusions

The main objective of this paper has been to analyse the role of capital accumulation in the Canada-U.S. labour productivity level gap in the 1990s. The following are some of the key findings:

- M&E capital intensity is more important for labour productivity than structures capital intensity;
- The inter-industry variation in labour productivity levels in Canada is highly positively correlated with the inter-industry differences in the M&E capital intensity;
- Similarly, the inter-industry variation in Canada-U.S. labour productivity level gap and the differences in the M&E capital intensity level gap are also highly positively correlated:
- The capital intensity gap accounted for at least 12 percent of the Canada-U.S. business sector labour productivity level gap in 2000;
- More importantly, the widening of the labour productivity level gap in the latter half of the 1990s was largely due to the widening of the capital intensity gap between the two countries;
- After controlling for industry specific effects, the capital-to-labour cost in Canada relative to the U.S. has a significantly positive impact on the Canada-U.S. capital intensity gap;
- The depreciation of Canadian dollar vis-à-vis the U.S. currency and the unemployment rate gap between the two countries seem to have contributed significantly to the faster rate of

[23] Note, however, that the rental cost of capital increased at a slower pace than the exchange rate in the 1990s. This may be explained by the fact that prices of some assets such as structures are less affected by the exchange rate changes.

increase in the real price of capital in Canada in the 1990s, hence to the widening of the capital intensity gap between the two countries.

These findings point to an optimistic outlook for the Canada-U.S. labour productivity and real income gaps. The market value of the Canadian dollar vis-à-vis the American currency, despite the recent appreciation, is still considerably below the PPP rate (between 15 and 20 percent). Therefore, there is a potential for a significant appreciation of the Canadian dollar over the medium term. This in combination with the possibility of narrowing of the unemployment rate gap between the two countries would result in a slower rate of increase in the real price of investment in Canada, a reversal of the trend in the last decade. These positive developments, other things being equal, would narrow the capital intensity and the labour productivity level gaps over the next five years or so. Nevertheless, capital is highly footloose across countries, especially in North America. Hence, to attract and retain investments in M&E and structures, Canada needs to maintain a highly competitive and flexible corporate tax and investment incentive systems vis-à-vis the United States.

Future research should analyse in some detail the reasons behind the considerable M&E capital intensity gap between Canada and the U.S. in many industries, especially in high tech industries. We also need to do more in-depth research about the causes of the higher relative price of investment in Canada.

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Table 1: Labour Productivity Growth by Industry

Industry	Canada			U.S.		
	1987-95	1995-00	1987-00	1987-95	1995-00	1987-00
Primary industries	3.1	3.8	3.4	0.9	2.4	1.5
Construction	-1.4	2.0	-0.1	0.2	-0.3	0.0
Food & Kindred products	1.8	0.9	1.4	1.6	-5.2	-1.0
Rubber & plastic	3.1	2.4	2.9	4.2	4.2	4.2
Leather	1.9	-1.1	0.7	4.2	-0.6	2.3
Textiles	-0.3	2.5	0.8	2.9	3.4	3.1
Lumber & Wood	-2.1	1.3	-0.8	-3.2	-1.1	-2.4
Furniture and Fixture	2.9	4.1	3.4	0.8	1.1	0.9
Paper & allied	0.9	2.6	1.5	0.0	1.1	0.4
Printing and Publishing	-1.8	-1.0	-1.5	-2.6	0.0	-1.6
Primary metals	2.8	3.8	3.2	2.6	2.2	2.5
Fabricated metal	2.6	3.0	2.8	1.6	0.8	1.3
Machinery, Electrical and Electronics	6.7	2.1	4.9	9.4	16.1	12.0
Transportation Equipment	5.4	-0.6	3.0	0.8	1.9	1.2
Non-metallic	-1.8	6.0	1.1	3.0	0.9	2.2
Refined petroleum & coal	6.9	2.0	5.0	0.6	4.4	2.0
Chemicals & Allied	3.4	-2.7	1.0	2.3	1.6	2.0
Other manufacturing	-1.3	1.4	-0.2	0.3	1.0	0.6
Transportation & Warehousing	1.9	0.2	1.3	1.8	1.4	1.7
Communications & Utilities	1.5	5.7	3.1	3.9	1.5	3.0
Wholesale trade	3.4	2.6	3.1	2.9	7.1	4.5
Retail trade	-0.1	1.8	0.6	1.2	4.8	2.6
Manufacturing sector	3.2	1.5	2.5	2.9	4.5	3.5
Business sector	1.0	2.1	1.4	1.4	2.6	1.8
Total economy	1.0	2.0	1.4	1.1	2.0	1.5

Note: Labour productivity is defined as real GDP per worker.
Sources: Statistics Canada (Table 379-0017 for real GDP and Table 282-0008 for workers) and U.S. Bureau of Economic Analysis.

Table 2: Capital Intensity[a] in Canadian Industries

Industry[b]	M&E			Structures			Total		
	1987	1995	2000	1987	1995	2000	1987	1995	2000
Primary industries	42.2	31.5	42.4	238.7	281.8	365.6	280.2	313.4	408.0
Construction	10.3	15.0	16.8	5.7	7.4	7.2	16.0	22.4	24.0
Manufacturing (total)	35.8	49.2	49.1	39.3	44.9	39.5	75.0	94.2	88.7
Food and Beverage and tobacco	24.1	33.3	37.7	34.1	37.8	37.3	58.6	71.7	75.6
Rubber & Plastics	21.3	30.4	34.9	19.8	19.8	17.2	41.2	50.2	52.1
Leather	5.6	12.1	13.1	12.9	22.8	25.7	18.5	34.9	38.8
Textiles[c]	9.6	12.2	14.5	13.4	14.4	14.7	22.9	26.6	29.2
Lumber & Wood	33.7	45.7	42.5	27.1	29.1	25.7	60.8	74.7	68.1
Furniture & Fixtures	3.5	5.8	7.9	9.4	11.3	9.5	12.8	17.1	17.4
Paper & Allied	133.1	197.0	200.8	68.7	91.1	95.3	202.1	288.1	296.1
Printing & Publishing	12.4	16.7	18.8	8.5	10.1	9.4	20.8	26.8	28.2
Primary Metal	104.3	123.8	148.6	85.3	106.5	107.9	189.6	230.3	256.6
Fabricated Metal	14.0	15.9	18.8	18.0	20.5	17.4	31.9	36.3	36.2
Machinery, Electrical and Electronics	11.7	18.6	22.7	18.7	23.7	18.8	30.2	42.3	41.2
Transportation Equipment	36.6	56.9	52.1	30.2	33.8	28.9	66.8	90.7	81.0
Stone, Clay & Glass	44.5	52.4	60.6	44.9	46.9	41.7	89.6	99.3	102.3
Petroleum and Coal Prod.	67.3	115.4	132.5	561.6	743.7	641.3	625.8	859.0	773.7
Chemicals	85.7	95.7	95.7	103.0	109.4	102.6	188.6	205.1	198.2
Transportation & Warehousing	30.7	38.5	47.5	143.3	149.6	141.6	173.5	188.0	189.1
Communications & Utilities	155.2	211.9	276.9	543.1	642.8	709.6	695.5	854.7	985.0
Wholesale trade	4.5	10.3	17.3	17.6	21.0	19.9	21.1	31.1	37.0
Retail trade	2.4	4.7	6.7	11.2	13.5	15.0	13.3	18.2	21.6
Business Sector	20.7	26.1	30.9	67.7	74.7	72.1	88.1	100.8	102.9

[a] Real net non-residential capital stock (machinery & equipment, and structures, in 1997 CDN dollars) per worker.
[b] Industrial classifications for Canada are based on North American Industry Classification.
[c] Including primary textile mills, apparel and other textile products.

Sources: Statistics Canada.

Table 3: Relative Capital Intensity[a] in Canadian Industries (U.S. =100)

Industry[b]	M&E			Structures			Total		
	1987	1995	2000	1987	1995	2000	1987	1995	2000
Primary industries	0.43	0.34	0.40	0.90	1.22	1.52	0.78	0.96	1.16
Construction	0.82	1.08	1.01	0.93	1.17	1.39	0.95	1.23	1.25
Manufacturing (total)	0.62	0.71	0.60	1.21	1.29	1.05	0.91	1.00	0.83
Food and Beverage and tobacco	0.37	0.44	0.43	0.79	0.85	0.80	0.58	0.65	0.61
Rubber & Plastics	0.53	0.60	0.53	0.97	0.94	0.72	0.74	0.77	0.65
Leather	0.49	0.95	0.61	0.87	1.28	1.08	0.72	1.16	0.89
Textiles[c]	0.45	0.48	0.40	0.88	0.87	0.68	0.67	0.68	0.55
Lumber & Wood	1.26	1.85	1.57	1.32	1.53	1.41	1.37	1.82	1.62
Furniture & Fixtures	0.27	0.38	0.43	0.60	0.68	0.60	0.46	0.56	0.54
Paper & Allied	1.01	1.26	1.15	1.84	2.25	2.20	1.36	1.67	1.56
Printing & Publishing	0.43	0.54	0.47	0.51	0.55	0.50	0.50	0.59	0.53
Primary Metal	0.62	0.72	0.85	1.11	1.49	1.57	0.86	1.06	1.17
Fabricated Metal	0.26	0.29	0.33	0.83	0.97	0.85	0.48	0.53	0.52
Machinery, Electrical and Electronics	0.24	0.31	0.30	0.79	0.87	0.56	0.46	0.53	0.42
Transportation Equipment	0.66	0.82	0.66	1.08	0.96	0.85	0.88	0.95	0.80
Stone, Clay & Glass	0.64	0.76	0.66	1.15	1.25	1.08	0.90	1.02	0.88
Petroleum and Coal Prod.	0.23	0.25	0.28	1.45	1.91	1.51	0.95	1.07	0.90
Chemicals	0.62	0.54	0.47	1.45	1.34	1.11	0.99	0.88	0.74
Transportation & Warehousing	0.27	0.37	0.42	1.02	1.32	1.40	0.70	0.90	0.93
Communications & Utilities	0.52	0.58	0.62	1.16	1.24	1.34	0.93	1.00	1.05
Wholesale trade	0.16	0.27	0.29	0.56	0.62	0.56	0.39	0.45	0.43
Retail trade	0.26	0.44	0.51	0.59	0.63	0.66	0.47	0.56	0.61
Business Sector	0.51	0.57	0.55	1.20	1.31	1.26	0.93	1.01	0.95

[a] Real net non-residential capital stock (machinery & equipment, and structures, in 1997 U.S. dollars) per worker. Canadian net capital stock is converted into U.S. dollars using purchasing power parity exchange rate for M&E and structure (Statistics Canada, 2002).
[b] Industrial classifications for Canada are based on North American Industry Classification System and those for the U.S. are based on U.S. 1987 Standard Industrial Classification.
[c] Including primary textile mills, apparel and other textile products.

Sources: Statistics Canada and U.S. Bureau of Economic Analysis.

Table 4: Estimated Impacts of Capital Intensity Growth on Labour Productivity Growth

	Canada		U.S.	
	All Industries	Manufacturing Industries	All Industries	Manufacturing Industries
Constant	0.003 (0.50)	0.005 (0.58)	0.014 (2.94)**	0.013 (2.02)**
M&E capital intensity growth	0.557 (4.94)**	0.543 (3.35)**	0.429 (2.49)**	0.579 (1.95)*
Structure capital intensity growth	0.159 (1.67)*	0.190 (1.27)	0.111 (0.73)	-0.009 (-0.04)
AR(1)	0.370 (5.05)**	0.371 (4.48)**		
No of observation	210	150	273	195
Durbin-Watson	1.99	1.96	1.81	1.80
R-square	0.47	0.50	0.05	0.04

"*" and "**" denotes significance at 10% and 5% level, respectively.

Table 5: Sources of Labour Productivity Growth in Canada and the United States
(Percent per year)

	Canada		U.S.		U.S. minus Canada	
	1987-95	1995-00	1987-95	1995-00	1987-95	1995-00
Business Sector						
Growth:						
Labour Productivity	1.0	2.1	1.4	2.6	0.4	0.5
Contribution:						
Multifactor Productivity	0.4	1.9	1.1	2.0	0.8	0.1
Total Capital Intensity	0.6	0.2	0.2	0.6	-0.4	0.4
Manufacturing Sector						
Growth:						
Labour Productivity	3.2	1.5	2.9	4.5	-0.3	3.0
Contribution:						
Multifactor Productivity	2.1	1.7	2.3	3.5	0.2	1.8
Total Capital Intensity	1.1	-0.2	0.5	0.9	-0.5	1.1

Note: Labour productivity is defined as real GDP per worker.
Sources: Statistics Canada, U.S. Bureau of Labor Statistics and U.S. Bureau of Economic Analysis

Table 6: Sources of the Canada-U.S. Labour Productivity Level Gap in 2000

Business Sector	
Relative labour productivity in Canada (U.S.=100)	84.4
Relative MFP in Canada (U.S.=100)	86.2
Relative total capital intensity (U.S. =100)	94.5
Canada-U.S. labour productivity gap	15.6
Contribution (%):	
Multifactor Productivity	87.9
Total Capital Intensity	12.1
Manufacturing Sector	
Relative labour productivity in Canada (U.S.=100)	65.8
Relative MFP in Canada (U.S.=100)	70.3
Relative total capital intensity (U.S. =100)	84.5
Canada-U.S. labour productivity gap	34.2
Contribution (%):	
Multifactor Productivity	84.0
Total Capital Intensity	16.0

Note: Labour productivity is defined as real GDP per worker. The percentage contribution is calculated based on equation (3).
Sources: Statistics Canada, U.S. Bureau of Labor Statistics and U.S. Bureau of Economic Analysis

Table 7: Estimated the Impact of the Real Rental Price of Capital in Canada Relative to the U.S. on the Industry Canada-U.S. Capital Intensity Gap

Industry	**Model (1)**		**Model (2)**	
	Estimate	t-ratio	Estimate	t-ratio
Lagged Capital Intensity	--	--	0.7095	11.54
Real Rental Price of Capital in Canada Relative to the U.S.	-0.2221	-2.66	-0.2495	-4.14
Primary Industries	1.2019	11.29	0.5126	7.40
Construction	1.4228	14.88	0.5771	7.11
Food and Beverage and Tobacco	0.8354	10.59	0.4077	6.74
Rubber & Plastics	0.9643	9.97	0.4458	6.61
Leather	1.2350	7.78	0.5232	6.63
Textiles[c]	0.8414	9.28	0.4102	6.46
Lumber & Wood	1.9236	19.51	0.7228	6.84
Furniture & Fixtures	0.7412	8.49	0.3802	6.48
Paper & Allied	1.8287	16.16	0.6955	6.76
Printing & Publishing	0.7734	9.17	0.3897	6.57
Primary Metal	1.3241	11.64	0.5484	7.06
Fabricated Metal	0.7499	8.94	0.3829	6.56
Machinery, Electrical and Electronics	0.6925	8.68	0.3666	6.34
Transportation Equipment	1.0986	14.00	0.4847	6.81
Stone, Clay & Glass	1.2221	10.47	0.5203	6.65
Petroleum and Coal Prod.	1.2697	5.56	0.5343	5.76
Chemicals	1.0528	11.52	0.4722	6.53
Transportation & Warehousing	1.1210	12.82	0.4898	7.18
Communications & Utilities	1.1992	12.80	0.5130	7.07
Wholesale trade	0.6503	8.15	0.3539	6.31
Retail trade	0.7664	8.83	0.3872	6.62
AR(1)	0.7264	10.84		
Number of Observation	273		273	
Durbin-Watson Statistics	1.82		1.90	
Adjusted R-squared	0.9646		0.9672	

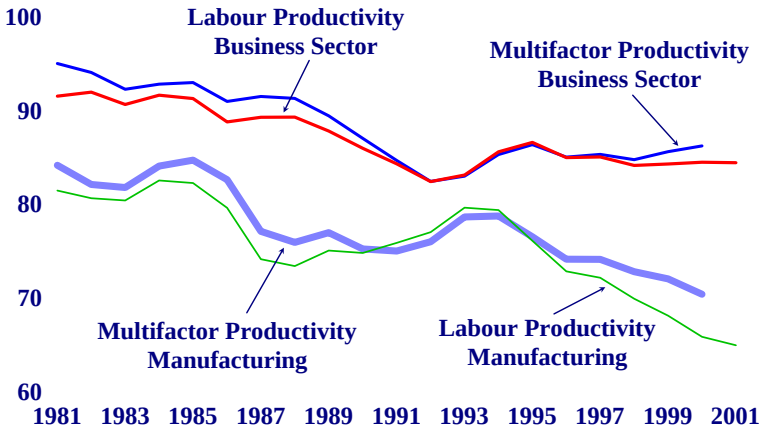
Note: Real rental price of capital is defined as the ratio of the rental price of capital to wage rate.

Table 8: Estimated the Impact of the Real Price of Investment in Canada Relative to the U.S. on the Industry Canada-U.S. Capital Intensity Gap

Industry	**Model (1)**		**Model (2)**	
	Estimate	t-ratio	Estimate	t-ratio
Lagged Capital Intensity	--	--	0.7113	11.58
Real Investment Price in Canada Relative to the U.S.	-0.1126	-2.29	-0.1110	-2.56
Primary Industries	1.1088	14.81	0.3955	5.03
Construction	1.3309	20.51	0.4619	4.94
Food and Beverage and Tobacco	0.7448	14.67	0.2994	4.42
Rubber & Plastics	0.8798	10.57	0.3367	4.36
Leather	1.1436	9.21	0.3990	4.81
Textiles[c]	0.7530	10.70	0.2922	4.26
Lumber & Wood	1.8321	24.58	0.6070	4.99
Furniture & Fixtures	0.6458	10.94	0.2604	4.34
Paper & Allied	1.7425	20.47	0.5877	4.90
Printing & Publishing	0.6850	11.06	0.2652	4.44
Primary Metal	1.2363	13.92	0.4382	4.85
Fabricated Metal	0.6632	11.23	0.2724	4.30
Machinery, Electrical and Electronics	0.6024	10.41	0.2544	4.14
Transportation Equipment	1.0170	16.52	0.3748	4.56
Stone, Clay & Glass	1.1346	10.70	0.4046	4.55
Petroleum and Coal Prod.	1.1881	6.13	0.4337	4.93
Chemicals	0.9708	12.33	0.3575	4.36
Transportation & Warehousing	1.0227	18.84	0.3637	4.89
Communications & Utilities	1.1110	16.01	0.3996	4.75
Wholesale trade	0.5808	9.33	0.2571	4.05
Retail trade	0.7033	9.57	0.2975	4.24
AR(1)	0.7193	11.39		
Number of Observation	273		273	
Durbin-Watson Statistics	1.85		1.82	
Adjusted R-squared	0.9653		0.9651	

Note: Real price of investment is defined as the ratio of investment price to wage rate.

Chart 1
Relative Productivity Levels in Canada (U.S.=100)

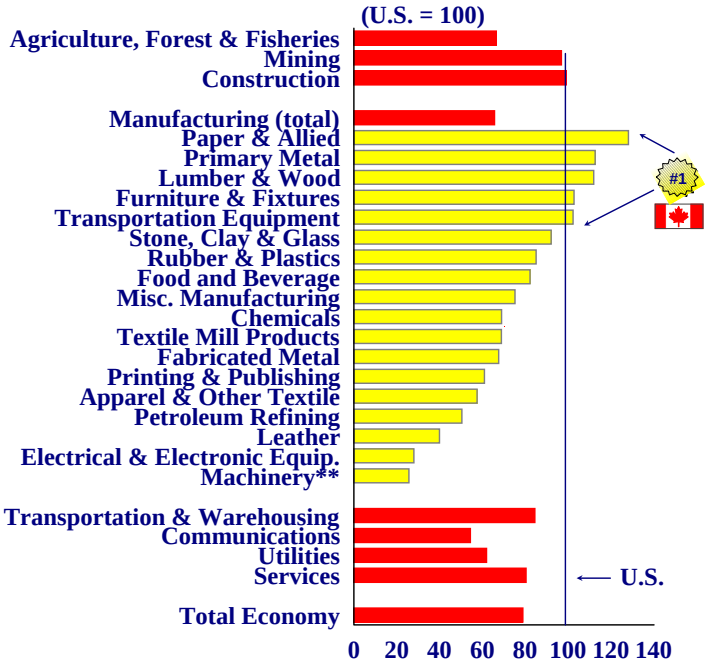


*Labour productivity is defined as real GDP per worker, PPP based.

capital stock intensity.

Analysis

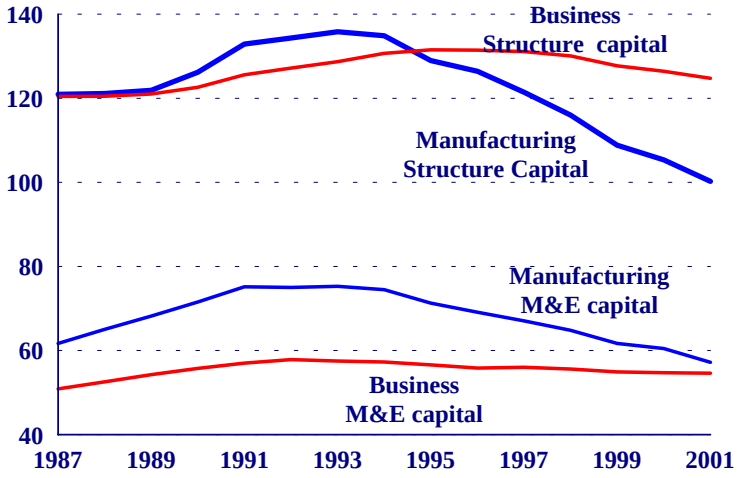
Chart 2
Relative Labour Productivity levels* of Canadian Industries, 2000



* GDP per worker in 1990 dollars.
** Machinery includes computer and office equipment industry.

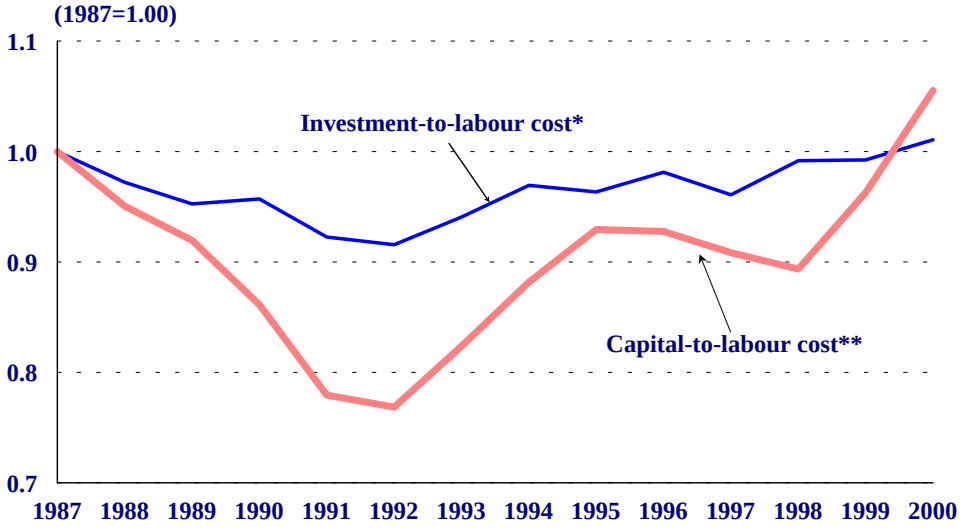
Economic Analysis, and OECD STAN (98).

Chart 3
Relative Canadian Capital Intensity* in the Business and the Manufacturing Sectors (U.S.=100, 1987-2001)



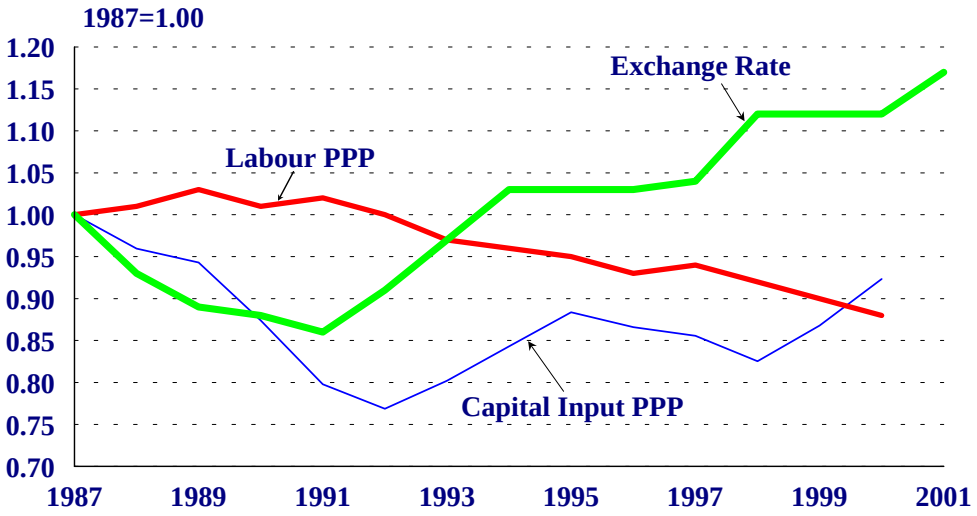
for structure)
Source: Statistics Canada and U.S. Bureau of Labor Statistics.

Chart 4
Relative Capital-to-labour Cost or Investment-to-labour Cost in the Canadian Business Sector (U.S.=1.00)



*Ratio of investment cost relative to labour cost
**Ratio of capital rental cost relative to labour cost
Sources: Statistics Canada and U.S. Bureau of Labor Statistics

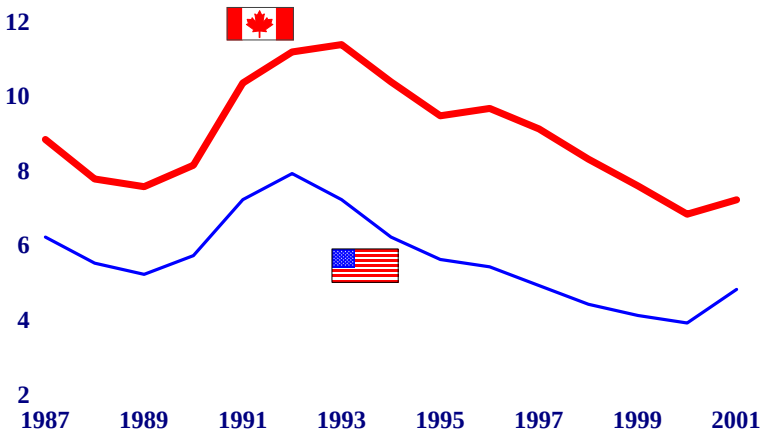
Chart 5
Exchange Rate and Purchasing Power Parities for Capital and Labour Inputs



Note: Labour input PPP is simply defined as the ratio of average hourly wage rate in Canada in Canadian dollars to that in the U.S. in U.S. dollars. Similarly, capital input PPP is defined here as the ratio of capital income per unit of capital stock in Canada to that in the U.S.

Sources: Statistics Canada and U.S. Bureau of Labor Statistics

Chart 6
Unemployment Rates in Canada and the United States (Percent)



Sources: Statistics Canada and U.S. Bureau of Labor Statistics