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# The Exchange Rate and Wages How They Affect Capital Investment



The  
**CANADA**  
Project

ECONOMIC PERFORMANCE AND TRENDS

## The Conference Board of Canada Insights You Can Count On



The Exchange Rate and Wages: How They Affect Capital Investment  
by *Stuart Landon* and *Constance E. Smith*

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### Preface

*The Exchange Rate and Wages: How They Affect Capital Investment* is an outcome of a unique partnership between The Conference Board of Canada and the Social Sciences and Humanities Research Council (SSHRC)—linking the Conference Board’s efforts under the banner of The Canada Project with SSHRC’s Initiative on the New Economy (INE). This collaboration leverages the strengths of the Conference Board in sharing knowledge with Canadian business and policy leaders with those of SSHRC in accessing the academic research community. The research and dialogue funded through the joint initiative explore topics that The Canada Project has targeted as critical to Canada’s future prosperity.

This study, conducted by Stuart Landon and Constance E. Smith of the University of Alberta, aims to understand the critical factors influencing capital investment. The results show that, for the average country in the sample of 17 developed OECD economies (including Canada), a currency depreciation has significant negative effects on investment in physical capital, especially in services sectors. Real wage increases—that may arise from labour market rigidities, for example—have important negative consequences for investment in the medium and long run. Given the already well-documented evidence of the significance of investment for Canada’s future productivity and output growth, these findings suggest policies that generate movements in the exchange rate have important (perhaps unintended) consequences for industry investment, productivity and economic growth. Further, policies that increase the real wage costs of firms may also hinder investment and future growth.

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## EXECUTIVE SUMMARY

# The Exchange Rate and Wages How They Affect Capital Investment

### At a Glance

- A currency depreciation has a significant negative effect on total investment in physical capital in both the short and long run for the average country in the sample of 17 developed OECD countries, including Canada.
- This finding has important policy implications: policies that generate movements in the exchange rate have important (perhaps unintended) consequences for industry investment.
- Although movements in the real wage generally have an insignificant impact on investment in the short run, they have a significant long-run effect on investment. An increase in real wages without a corresponding increase in labour productivity would reduce investment in the medium and long run.
- Differences in real wage movements explain much more of the Canada–U.S. investment gap than do exchange rate movements. If policies that restrict labour market flexibility lead to higher wages, they may hinder investment and future growth.

A country's success in improving the living standards of its citizens depends, ultimately, on productivity increases. Canada's level of labour productivity was 83 per cent of the level in the United States in 2005; this gap accounts for a large component of the \$8,000 per capita income gap with the United States.

Because of the importance of productivity in explaining living standards, many experts have tried to identify the factors that drive productivity. This study looks at one important productivity driver—investment in physical capital (for example, machinery and equipment), and presents results with respect to the effect of the exchange rate and real wage on investment in a typical developed economy (a weighted average of 17 OECD countries).

A key contribution of this study is the focus on investment at the *industry level*. Most empirical analyses examine investment in the total economy or investment in manufacturing only. Given differences across sectors with respect to capital intensity, as well as export and import exposure (in terms of both inputs and competing final goods), sector-level responses of investment to changes in the exchange rate may differ significantly. These differences may mean that currency valuation changes encourage investment in some sectors relative to others and that, as a result, exchange rate policy may operate as an (perhaps unintended) instrument of industrial policy.

Another contribution of the study is the identification of both short- and long-run effects on investment of the exchange rate and real wage, as well as the speed at which the long-run effect is achieved. This is likely to be particularly important if some factors take time to

affect investment and, therefore, alter the level of investment only in the long run, while others have only a short-run effect. Even if a variable does not have a long-run impact on investment, a large short-run effect that is persistent may be important from a policy perspective.

Overall, the results show that a currency depreciation has a significant negative effect on total investment in physical capital, in both the short and long run, for the average country in the sample of 17 developed OECD countries. The exchange rate effect is significant in the short run in a majority of sectors and often persists for several years, particularly in services sectors. In addition, although movements in the real wage generally have an insignificant impact on investment in the short run, they have a significant long-run effect on investment.

These results suggest that policies that generate movements in the exchange rate have important consequences for investment. While a currency depreciation can have a positive impact on exports and domestic demand, policy-makers interested in future growth may want to take into account the negative short-run impact that a depreciation can have on investment, especially in services sectors. The impact of the exchange rate on investment in these sectors may be particularly important as faster productivity growth has been observed in services sectors.

The impact of the exchange rate on a country's investment is affected by its degree of export and import exposure. Even for sectors in which the exchange rate has a significant and persistent effect on investment, exchange rate movements will be more important to countries that are more open (such as Belgium) and less important to a country with a relatively closed economy (such as the United States).

The results of the study also show that, assuming that nothing else changes—including labour productivity—real wage increases have a negative impact on investment in the medium and long run, particularly in the non-agriculture business sector. Further, it is shown that differences in real wage movements explain much more of the Canada–U.S. investment gap than do exchange rate movements.

These results should sound a warning bell to policy-makers concerned with Canadian competitiveness. Policies that increase wage costs by restricting labour market flexibility—for example, through mandatory retirement ages or barriers to interprovincial labour mobility—may hinder investment and future growth.

## CHAPTER 1

# Introduction

### Chapter Summary

- There is general agreement in the literature that countries with high rates of investment in machinery and equipment also have, on average, higher productivity growth. For almost the entire 1971–2001 period, investment in the United States was above that in Canada and the gap widened significantly over the 1990s.
- Existing research suggests that there may be a link between investment activity in Canada and the levels and volatility of the Canadian dollar. Another research stream suggests that wage changes could have a significant impact on the profitability of production and investment.
- Much of the existing research on investment employs a closed economy framework and often focuses on just one country, typically the United States. In addition, very few studies investigate the effect of movements in the exchange rate on investment. Existing open economy investment studies usually do not include the cost of labour as a potential determinant of investment, and most studies examine only the short-run effect of the exchange rate on investment in one sector, manufacturing.

A country's success in improving the living standards of its citizens depends, ultimately, on productivity increases. In Canada, our productivity gap with the United States has received much attention, not only from economists, but also from politicians and journalists. In 2005, Canada's level of labour productivity was 83 per cent of the level in the United States (see Chart 1), and this gap accounts for a large component of the \$8,000 per capita income gap with the United States.<sup>1</sup>

Because of the importance of productivity in explaining living standards, many experts have tried to identify the factors that drive productivity. Exhibit 1 shows a framework for organizing the literature on these drivers. Of particular note is the evidence, from a large number of studies, that countries with high rates of investment in machinery and equipment also have, on average, higher productivity growth.<sup>2</sup> In industries where Canadian firms have a higher capital intensity, such as wood products manufacturing, Canadian productivity levels are higher than those in the United States.<sup>3</sup> The type of capital matters too—there is evidence that the use of high-technology products contributed substantially to the U.S. productivity revival in the late 1990s.<sup>4</sup> Chart 2 shows that for almost the entire 1971–2001 period, investment in the United States was above that in Canada, and the gap widened significantly over the 1990s.

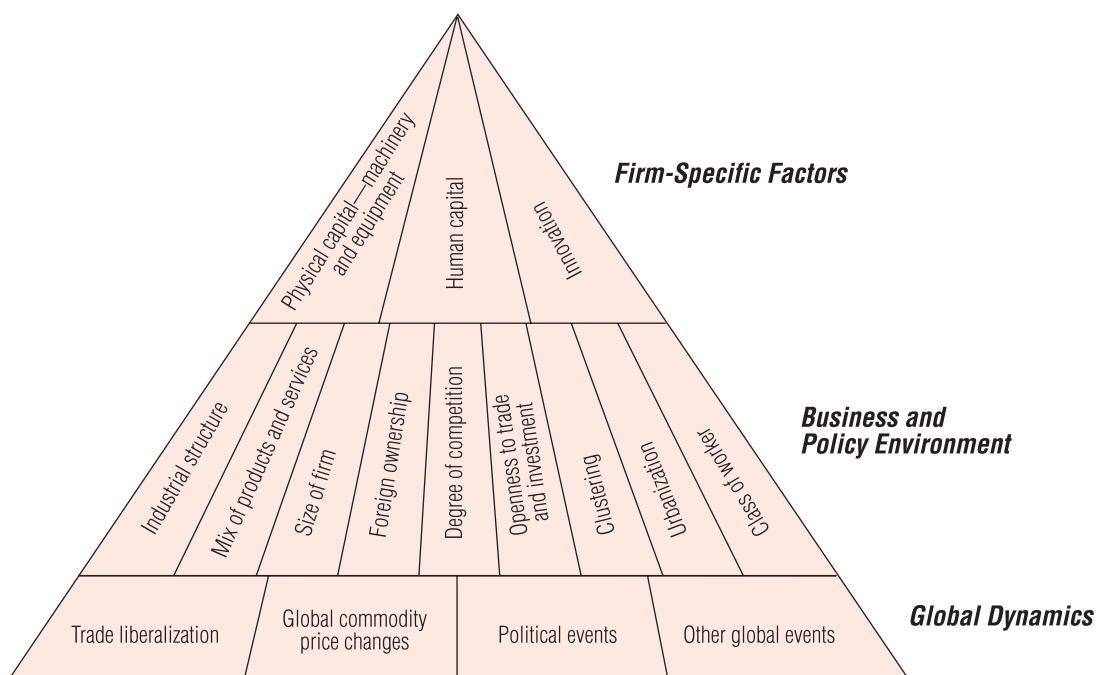
**Chart 1**

Canada's Relative Labour Productivity Levels in the Total Economy, 1985–2005  
(per cent; as a share of the United States levels)



Source: Centre for the Study of Living Standards.

**Exhibit 1**  
Framework of Productivity Drivers



The bulk of the literature on productivity drivers to date has focused on firm-specific factors—factors that relate to the physical or human capital within firms as well as to innovation and technological change.

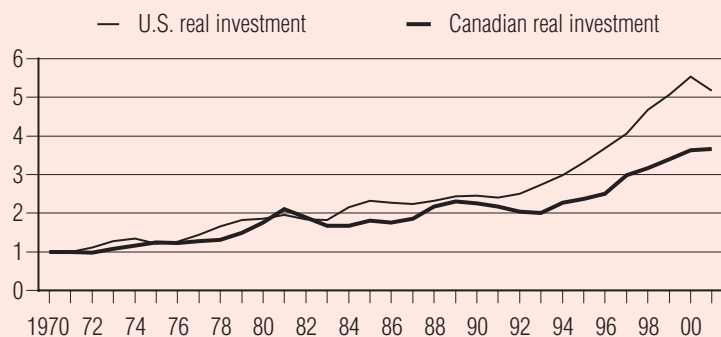
Another layer of productivity drivers relates to the business and policy environment within which the firm-specific factors operate. For example, the openness of the economy to trade and investment, the degree of competitive pressures that firms experience, and the regulatory

regime set the context for improving productivity. The business and policy environment can directly influence productivity or can indirectly influence it through its effect on firm-specific variables.

Finally, a third layer relates to dynamics in the global economy. Canada has some influence over several of these dynamics, such as trade liberalization. Others, such as changes in global commodity prices, are essentially beyond our control.

Source: The Conference Board of Canada.

**Chart 2**  
Real Investment in the Non-Agriculture Business Sector, 1970–2001  
(indexed to 1970=1)



Source: OECD STAN database.

Given the significance of capital intensity for productivity and economic growth, it is important to identify and quantify the determinants of investment.<sup>5</sup> One research stream has focused on the responsiveness of investment activity in Canada to the levels and volatility of the Canadian dollar. Existing research suggests that there may be a link between these variables.<sup>6</sup> For example, Someshwar Rao, Jianmin Tang and Weimin Wang found that the depreciation of the Canadian dollar in the 1990s seems to have contributed significantly to the faster rate of increase in the real rental price of capital and, hence, to the widening of the capital intensity gap.<sup>7</sup> They showed that much of the widening of the Canada–U.S. labour productivity gap is due to the widening of the capital intensity gap in the 1990s.



A relationship between the exchange rate and productivity is also often identified in the business press. Here the view is expressed that, because about 80 per cent of the machinery and equipment used in Canada is imported, a currency appreciation means that “the cost of staying productive decreases for Canadian companies.”<sup>8</sup>

A second research stream has introduced cost factors as potential determinants of investment. Labour costs are generally the largest component of production costs and, as a result, wage changes could have a significant impact on the profitability of production and investment. A study carried out for the National Bureau of Economic Research in 2002 argued that the wage is an important determinant of investment and that government expenditure policy is an important determinant of the wage.<sup>9</sup> The study provided evidence of a relationship between government expenditure and investment, and between government expenditure and wages.

Much of the existing research on investment employs a closed economy framework<sup>10</sup> and often focuses on just one country, typically the United States. In addition, very few studies investigate the effect of movements in the exchange rate on investment, and existing open economy investment studies usually do not include the cost of labour as a potential determinant of investment. (See box “What the Literature Has to Say . . . .”)

The next chapter outlines how this study contributes to the existing literature. The analytical framework is explained in Chapter 3. Chapter 4 discusses the calculated impact of the exchange rate and the real wage on investment for an average OECD country, in terms of both the magnitude and persistence of the impact. Chapter 5 provides estimates of the impact of the exchange rate on investment in individual countries and gauges the relative importance of exchange rates and wages in explaining the Canada–U.S. investment gap. Chapter 6 provides a brief conclusion with policy implications.

### What the Literature Has to Say . . .

#### . . . About the Effect of Exchange Rates on Investment

In an early contribution, Linda S. Goldberg (1993) found that currency appreciations led to a reduction in U.S. investment in the 1970s, but caused an expansion of investment in the 1980s. In a follow-up to the original study, J.M. Campa and L.S. Goldberg (1995) attributed the difference to the fact that the U.S. manufacturing sectors evolved from being primarily export exposed in the 1970s (that is, the negative effect of the appreciation on exports outweighed the positive effect of the appreciation on imported capital and other inputs) to being primarily import exposed by the early 1980s. Due to this pattern in exposure, U.S. exchange rate appreciations reduced investment in the durable goods sectors in the 1970s and stimulated investment after 1983.

More recently, Kristin Forbes (2002) found that commodity firms with higher capital/labour ratios exhibit slower growth in capital investment following a currency depreciation.<sup>1</sup> Similarly, Campa and Goldberg (1999) showed that a 10 per cent currency depreciation leads to a 1 to 2 per cent decline in manufacturing investment in the United States. Interestingly, they found that exchange rate movements do not have a significant effect on manufacturing investment in Canada. Further, of the four countries they studied—the United States, the United Kingdom, Japan and Canada—investment in Canadian manufacturing was found to be the least responsive to movements in the exchange rate.

In a paper investigating the extent to which the flexible exchange rate regime might have been detrimental to investment in Canada, R. Lafrance and D. Tessier (2001) found an insignificant link between Canadian real exchange rates and their volatility and investment activity. A Bank of Canada working paper by T. Harchaoui, F. Tarkhani

and T. Yuen (2005) examined the relationship between exchange rates and investment in 22 Canadian manufacturing industries. Their results showed that the overall effect of exchange rates on investment is statistically insignificant, yet could have an impact when exchange rate volatility is low. They noted that their results highlight the importance of differentiating between the investment response in high and low exchange rate variability regimes.

Richard Harris (2001) argued that the sustained real depreciation of the Canadian dollar in the 1990s raised the cost of imported investment goods, raising the relative price of machinery and equipment to wages in Canada compared with the United States. Hence, in the 1990s, investment per hour worked grew substantially in the United States relative to Canada, with a negative impact on relative Canadian productivity.

#### . . . About the Effect of Wages on Investment

If labour and capital can be substituted for one another, lower wage growth may lead to a substitution of labour for capital. Jeffrey Bernstein, Richard Harris and Andrew Sharpe (2003) noted that wage growth in Canada was slower than in the United States after 1994, and may partially explain the Canada–U.S. investment gap. On the other hand, if labour and capital are complements, a rise in wages can lead to a fall in investment. Further, consistent with arguments proposed by Gilchrist and Himmelberg (1995), it is also possible that a rise in labour costs may cause a fall in investment by reducing firm cash flow for firms that rely on cash flow to finance investment. In addition, even if labour and capital are technical substitutes, as noted by Alesina, Ardagna, Perotti and Schiantarelli (2002), a rise in the wage reduces the whole future stream of profits, lowers the marginal profitability of capital, and makes investment less attractive.

1 Forbes used data from 1,128 commodity firms in 51 countries, including 170 from Canada.

Source: Stuart Landon and Constance E. Smith.

- 
- 1 See Brenda Lafleur, "Explaining the Canada–U.S. Income Gap," pp. 55–79. These income and productivity data were updated in July 2006.
  - 2 For an overview of the literature, see Richard Harris, "Determinants of Canadian Productivity Growth," pp. 165–209.
  - 3 Brenda Lafleur and Andrew Sharpe, "The Canada–U.S. Productivity Gap," pp. 61–79.
  - 4 Eric Brynjolfsson and Lorin Hitt, "Beyond Computation," pp. 23–48.
  - 5 In this study, "investment" refers to investment in physical capital as opposed to financial or human capital.
  - 6 Jack Strauss, "Productivity Differentials, the Relative Price of Non-Tradables and Real Exchange Rates," pp. 383–409; Richard Harris, "Is There a Case for Exchange Rate Induced Productivity Changes?"; Someshwar Rao, Jianmin Tang and Weimin Wang, "Canada's Recent Productivity Record and Capital Accumulation."
  - 7 Rao et al., "Canada's Recent Productivity Record."
  - 8 Craig Wright, Chief Economist of the Royal Bank of Canada, as quoted in Marian Stinson, "Loonie Breaks Through 70-cent Barrier," pp. A1, A8.
  - 9 A. Alesina, S. Ardagna, R. Perotti and F. Schiantarelli, "Fiscal Policy, Profits, and Investment," pp. 571–89.
  - 10 For economies that are open, like Canada's, the volatility of the dollar can have an impact on the incentive to invest.

## CHAPTER 2

# Contributions to an Understanding of the Factors That Drive Investment

### Chapter Summary

The current study contributes in four ways to an understanding of the factors that drive investment:

1. The study analyzes the determinants of investment using both aggregate and sector-level data.
2. The methodology allows for both the short- and long-run effects to be estimated.
3. The study employs data for 17 OECD countries, rather than for a single country.
4. The study compares the relative roles of the real wage and the exchange rate as determinants of investment.

The current study contributes in four ways to an understanding of the factors that drive investment. The first contribution is its analysis of the determinants of investment using both aggregate and sector-level data. (See box “About the Data.”) Most empirical analyses of investment examine investment in the total economy or investment in manufacturing only.<sup>1</sup> Given differences across sectors with respect to capital intensity, as well as export and import exposure (in terms of both inputs and competing final goods), sector-level responses of investment to changes in the exchange rate may differ significantly. These differences may mean that currency valuation changes encourage investment in some sectors relative to others and that, as a result, exchange rate policy may operate as an (perhaps unintended) instrument of industrial policy.

A second contribution is the study’s use of an empirical methodology that allows for the identification of the short-run impact on investment of the explanatory variables, as well as the long-run impact on investment and the speed at which the long-run impact is achieved. This is likely to be particularly important if some factors take time to affect investment and, therefore, alter the level of investment only in the long run, while others have only a short-run effect. Even if a variable does not have a long-run impact on investment, a large short-run effect that is persistent may be important from a policy perspective.

A third contribution is that this study employs data for 17 OECD countries,<sup>2</sup> and pools these data across countries and time for each sector. In effect, this pooled data set represents a “typical or average developed economy.” Most empirical studies of investment behaviour use data for a single country. The use of multi-country panel data makes it possible to exploit variation in the data across countries, particularly variation in the exchange

rate. Further, by pooling the data across countries, many more data points are available than would be the case for a single country, such as Canada. This should result in more precise estimates of the impact of the exchange rate on investment.

The fourth contribution of the current study is to introduce the real wage directly into an open economy model of investment. This allows the impact of the real wage on investment to be quantified and, in addition, allows for a comparison of the relative roles of the real wage and the exchange rate as determinants of investment.

### About the Data

Data on investment (real gross fixed capital formation) are taken from the OECD's new STAN database.<sup>1</sup> Investment equations are estimated for the following 13 different categories of investment:

- investment in the total economy;
- investment in nine individual sectors that together comprise all economic activity, including services sector activity<sup>2</sup>; and
- three multi-sectoral aggregates (the non-agriculture business sector, business sector services, and total services).<sup>3</sup>

Annual data are used, spanning the period from 1971–2003, for 17 countries.<sup>4</sup> Data for all 17 countries are available for total investment, as well as for two of the three other multi-sectoral aggregates and eight of the nine individual sectors. The sample for the remaining

sector has observations for 15 countries, while the sample for the final multi-sectoral aggregate includes data for 13 countries. Across the nine individual sectors, the average number of observations available per country varies from 23 to 25, while the total number of observations employed in the sector-level regressions varies from 366 to 398.

The real effective exchange rate data are from the OECD and are weighted by imports plus exports as a share of GDP for each country. A weighted exchange rate is employed, as there are large differences in the international exposure of the countries in the sample, and the magnitude of the impact on investment of movements in the exchange rate is likely to depend on a country's import and export dependence (with respect to both inputs and final goods).

- 1 The new STAN database employs a standard sector list based on ISIC Rev.3. It merges the OECD's International Sectoral Database (which is no longer updated) and the old STAN Database for Industrial Analysis (which was based on ISIC Rev.2 and covered the manufacturing sector only).
- 2 The nine sectors are manufacturing; electricity, gas and water supply; transportation, storage and communication; finance, insurance, real estate and business services; agriculture, hunting, forestry and fishing; mining and quarrying; construction; wholesale and retail trade, restaurants and hotels; and community, social and personal services.
- 3 The non-agriculture business sector includes all sectors except agriculture, hunting, forestry and fishing; community, social and personal services; and the subsector real estate activities. Business sector services comprises wholesale and retail trade, restaurants and hotels; transport, storage and communication; and finance, insurance, real estate and business services. Total services is equal to business sector services plus community, social and personal services.
- 4 The 17 countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden and the United States. Data for the remaining 13 member countries of the OECD were not employed, because either data on investment were not available in the STAN database (for Iceland, Japan, Luxembourg, New Zealand, Switzerland and the United Kingdom) or the countries were new members of the OECD and had very short data samples available and/or very different industrial structures than the other countries in the sample (Hungary, Mexico, Slovakia, Turkey, the Czech Republic, Korea and Poland).

Source: Stuart Langdon and Constance E. Smith (2006).

1 Although manufacturing remains important, it accounts for only a relatively small share of investment spending in most countries. For example, in 2001, investment in manufacturing, as a percentage of the non-agricultural business sector investment, was 13.8, 15.3 and 17.6 per cent in Australia, Canada and the United States, respectively.

2 The countries are listed in footnote 4 in the "About the Data" box.

## CHAPTER 3

# The Analytical Framework

### Chapter Summary

- This study uses a standard theoretical model to derive an equation that can be used to estimate the impact of the exchange rate and real wage on investment.
- The real exchange rate affects the level of investment through three channels: the effect on the price of imported capital, the effect on output demand, and the effect on the price of imported intermediate inputs.
- These three effects can be contradictory; the net effect depends on which effect is dominant. The net effect will differ by country and sector, depending on such factors as reliance on imported capital and export orientation.
- Changes in the real wage can also have contradictory effects on investment, depending on the substitutability of labour and capital.

A standard theoretical model, augmented to incorporate important open economy factors, is used to derive an equation that can be used to estimate the impact of the exchange rate and real wage on investment.<sup>1</sup>

It is also assumed that domestic firms use both domestic and imported inputs, produce output that is sold in both domestic and export markets, and purchase both tradable and non-tradable investment goods.

As with most empirical investment studies, aggregate domestic real output is used to determine the demand for capital goods. A rise in domestic real output leads to a rise in the demand for capital (because more capital is required to satisfy the increased demand for the domestic final product).

The framework recognizes that the real exchange rate may affect the level of investment through three channels. As an example, take the case of a real currency appreciation:

- **Effect on Imported Capital:** The higher dollar decreases the domestic currency price of imported capital, which tends to increase investment.
- **Effect on Demand:** The higher dollar makes Canadian goods and services relatively more expensive both inside and outside the country. Lower demand for Canadian goods and services in domestic and international markets decreases a firm's profitability, which leads to a decrease in production. This results in a fall in the demand for all inputs, including capital.
- **Effect on Imported Intermediate Inputs:** The higher dollar reduces the domestic price of imported intermediate inputs. The impact of this price change on investment is uncertain, as it depends on the degree of substitutability between these inputs and capital.

Because of these contradictory effects, the net effect on investment of a real currency appreciation is uncertain. It will depend on which effect is dominant. Investment is likely to rise following a depreciation only if the effect on demand is sufficient to outweigh the cost effect. The net effect will differ by country and sector, depending on such factors as reliance on imported capital and export orientation.

In addition to exchange rate changes, exchange rate volatility may affect investment by creating uncertainty about whether the change is permanent or not. A more uncertain exchange rate could increase the risk premium and discourage investment.<sup>2</sup>

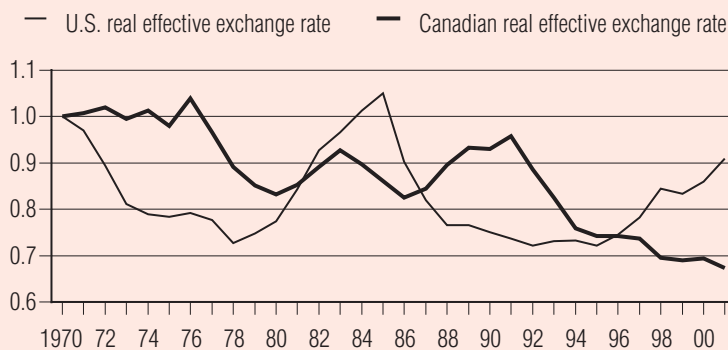
Since the mid-1970s, Canada has experienced three multi-year periods (all at least three years in length) when the currency has depreciated significantly. (See Chart 3.) During these three periods, the Canadian real

effective exchange rate fell by over 3 per cent per year, on average.<sup>3</sup> Each of these periods was followed by a multi-year period of currency appreciation in which the real effective exchange rate rose in value, on average, by over 4 per cent per year.<sup>4</sup> Movements in the Canadian real exchange rate have, therefore, been large and persistent, and these movements could potentially have had significant implications for investment.

The model also incorporates the real wage as a determinant of investment. Labour costs are generally the largest component of production costs. As a result, real wage changes could have a significant impact on the relative prices of capital and labour, as well as on the profitability of production and, thereby, on investment.<sup>5</sup> For example, an increase in real wages could increase investment by increasing the incentive for firms to use labour-saving machinery and equipment instead of the higher priced labour. On the other hand, wage increases could reduce the cash flow of firms and the profitability of investment and, therefore, decrease the ability and incentive of firms to invest.

Finally, both country and year fixed effects are incorporated in the framework. These reflect, respectively, factors that are constant across time, but that may cause investment rates to differ across countries, and factors that are constant across countries but differ across time. An example of the former would be the general business climate, while the latter includes movements in world demand, interest rates, oil prices, and the impacts of technological progress and increased trade and competition.

**Chart 3**  
Real Effective Exchange Rates, 1970–2001  
(indexed to 1970=1)



Note: A rise corresponds to an appreciation.  
Source: OECD, Main Economic Indicators.

1 The model of investment employed follows Jacques Mairesse, Bronwyn H. Hall and Benoit Mulkay, "Firm-Level Investment in France and the United States"; S. Bond, J.A. Elston, J. Mairesse and B. Mulkay, "Financial Factors and Investment in Belgium, France, Germany and the United Kingdom," pp. 153–65; and J.M. Campa and L.S. Goldberg, "Investment, Pass-Through, and Exchange Rates," pp. 287–314, with the addition that the investment good (capital) may be imported.

2 When an exchange rate volatility measure is added to the investment equation, it is insignificant in all sectors except one, and its inclusion never alters the sign or significance of the estimated wage or exchange rate parameters.

3 The real effective exchange rate is a trade-weighted average of bilateral nominal exchange rates adjusted by the relative price of domestic to foreign goods.

4 Exchange rates for many other countries have also fluctuated widely and persistently. For example, relative to the U.S. dollar, the average annual percentage change (in absolute value) of OECD country currencies was 10.5 per cent from 1981 to 2001 (according to the OECD Bilateral Trade Database).

5 See A. Alesina, S. Ardagna, R. Perotti and F. Schiantarelli, "Fiscal Policy, Profits, and Investment," pp. 571–89.

## CHAPTER 4

# Assessing the Impact of Exchange Rates and Wages on Investment

### Chapter Summary

- The results show that, for the average OECD country in the sample, a real currency depreciation has a significant negative effect on investment in the total economy in both the short run and long run.
- In the short run, the effect is greatest in the construction sector and the mining and quarrying sectors. The short-run response in three sectors is insignificantly different from zero: community, social and personal services; manufacturing; and transportation, storage and communication.
- The long-run effect of a currency depreciation on investment in the total economy, as well as in two of the three other multi-sectoral aggregates (non-agriculture business sector and total services), is negative and significant. Although the exchange rate has an insignificant long-run effect on investment in most individual sectors, the significant short-run response is often large and, at times, persists for three years or more.
- Although the real wage is generally an insignificant determinant of investment in the short run, relatively little time is typically required for a significant effect to materialize. The most rapid response of investment to the real wage, and the largest long-run impact, is in wholesale and retail trade, restaurants and hotels.

### CURRENCY DEPRECIATIONS HURT INVESTMENT

Overall, the results show that, for the average OECD country in the data set, a real currency depreciation has a significant<sup>1</sup> negative effect on investment in the total economy in both the short run and long run.<sup>2</sup> This implies that, in aggregate, the impact on investment of an exchange rate-induced increase in the cost of imported capital and other inputs outweighs the impact of any exchange rate-induced rise in the demand for domestic output.

The effects, however, can differ by sector.

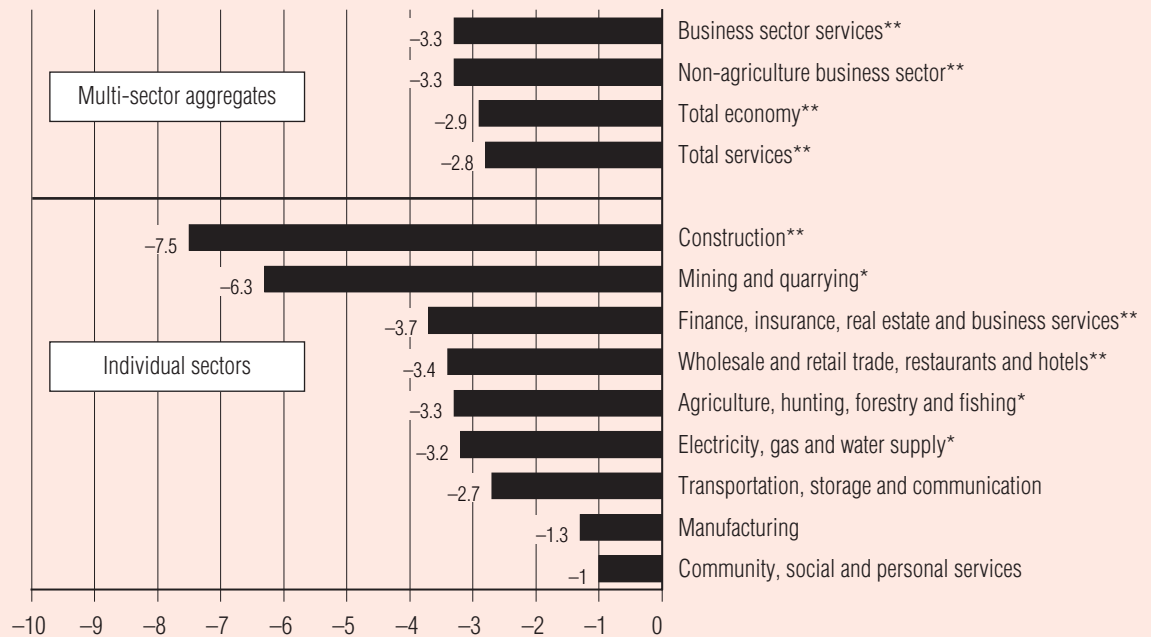
### SHORT-RUN EFFECTS

The estimated current year effect of a currency depreciation on investment in the total economy, as well as in the three other multi-sectoral aggregates (non-agriculture business sector, total services, and business sector services), is negative. Chart 4 shows the impact of a 10 per cent currency depreciation on investment in the three multi-sectoral aggregates and in the total economy, as well as in the nine individual sectors.<sup>3</sup> For example, a 10 per cent currency depreciation results in a 2.9 per cent decline in investment in the total economy.

While the estimated short-run effect in the nine individual sectors is negative in all cases, there is considerable variation in the magnitude and significance of this effect across sectors:

- The estimated effect of a 10 per cent currency depreciation on construction investment is 2.5 times as large as that on investment in the total economy (–7.5 per cent versus –2.9 per cent).

**Chart 4**  
Short-Run Effect on Investment of a 10 Per Cent Currency Depreciation  
(per cent)



\* Significant at 10 per cent

\*\* Significant at 5 per cent

Source: Stuart Landon and Constance E. Smith.

- The effect on mining and quarrying investment is twice as large as on investment in the total economy (–6.3 per cent versus –2.9 per cent).
- In contrast, the short-run response in three sectors is insignificantly different from zero: community, social and personal services; manufacturing; and transportation, storage and communication.

### LONG-RUN EFFECTS

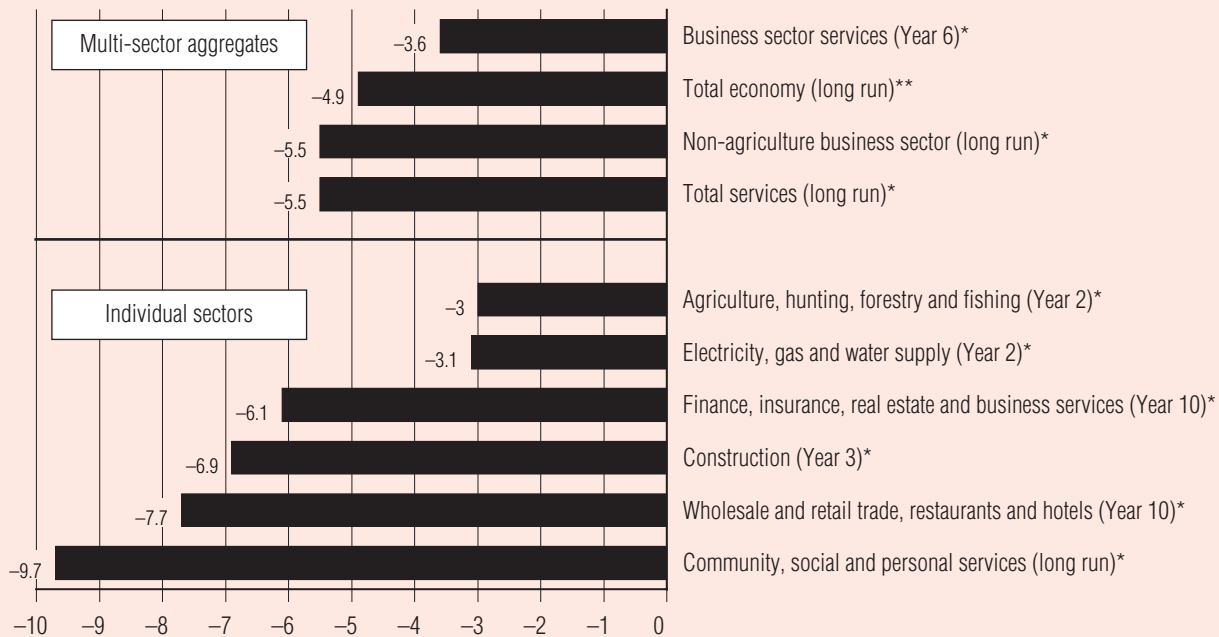
The effect of a permanent currency depreciation on investment in the total economy, as well as in two of the three other multi-sectoral aggregates (non-agriculture business sector and total services), is negative and significant. Although the exchange rate has an insignificant long-run effect on investment in most individual sectors, the significant short-run response is often large and, at times, persists for three years or more.<sup>4</sup> Chart 5 shows the impact on investment of a 10 per cent currency depreciation in those sectors in which the impact is significant at the 10 per cent level.<sup>5</sup> The chart also shows how persistent the impact is by indicating the final year in which the impact is significant. For example, a 10 per cent currency depreciation results in a 3.6 per cent reduction in investment in business sector services, and this

effect persists into the sixth year. Investment in the total economy is reduced by 4.9 per cent, and this reduction persists in the long run. On the other hand, a 10 per cent currency depreciation results in a drop in investment in the electricity, gas and water supply sector, but this effect persists for only two years.

- The exchange rate effect persists for at least five years in the total services sector and business sector services as well as in three of the individual service sectors: finance, insurance, real estate and business services; wholesale and retail trade, restaurants and hotels; and community, social and personal services. These sectors typically have few exports and, thus, do not benefit from a direct increase in demand following a depreciation, but may be affected negatively by a rise in the prices of imported capital and other imported inputs. As these sectors make up a large part of the economy, they may be driving the significant and persistent coefficients for investment in the total economy and in the non-agriculture business sector.
- For manufacturing and transportation, storage and communication—two sectors that may produce inputs for other sectors—the impact of the exchange rate on investment is insignificant.



**Chart 5**  
 Long-Run Effect on Investment of a 10 Per Cent Currency Depreciation  
 (per cent)



\* Significant at 10 per cent

\*\* Significant at 5 per cent

Source: Stuart Landon and Constance E. Smith.

- On the other hand, the exchange rate has a significant impact on investment for at least two years in three sectors that are also likely to be input producers: electricity, gas and water supply; finance, insurance, real estate and business services; and construction. Given their position as input providers, the significant effect of the exchange rate on investment in these sectors may be important for economy-wide output growth and productivity.

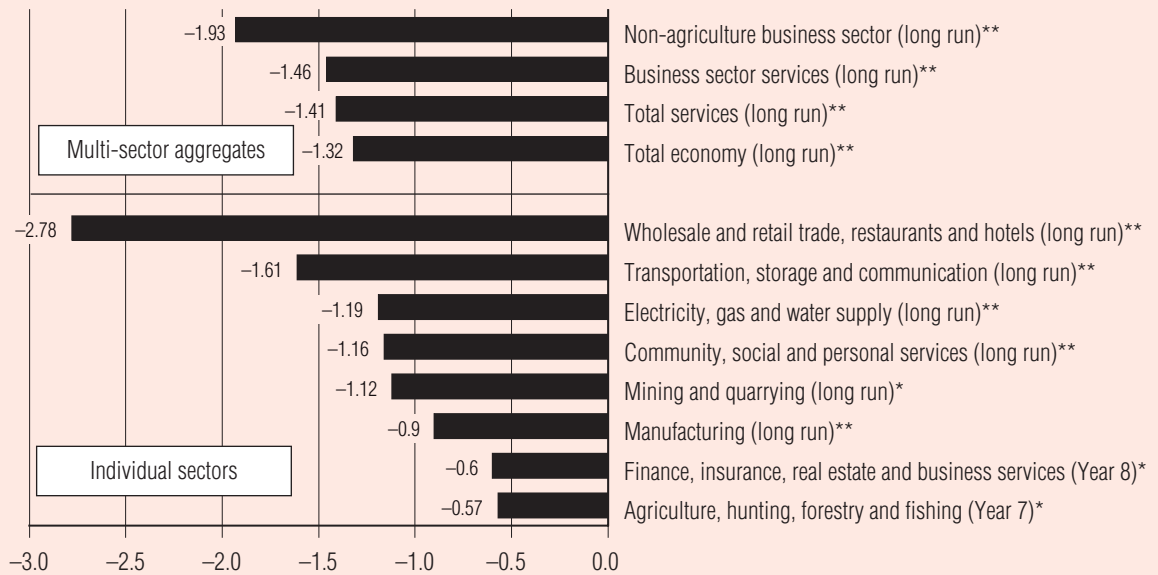
### WAGE INCREASES CAN HURT INVESTMENT

The estimates indicate that an increase in the real wage reduces investment in most sectors and that this effect tends to strengthen over time. Chart 6 shows the impact on investment of a 1 per cent increase in the real wage. The chart also shows how persistent the impact is by indicating the final year in which the impact is significant. The real wage coefficient is often insignificant in the short run, but in the long run a rise in the real wage is predicted to have a negative and significant effect on investment in the total economy as well as on investment in six of the nine individual sectors. While the negative effect of the real wage on investment is

consistent with labour and capital being complements, it is also possible that a rise in labour costs may cause a fall in investment by reducing firm cash flow.<sup>6</sup>

Although the real wage is generally an insignificant determinant of investment in the short run, relatively little time is typically required for a significant effect to materialize. A change in the real wage does not have a significant impact on investment in the total economy in the year in which the change occurs. But in the following year—and in all succeeding years—the impact of the real wage change is significant and the magnitude of this impact rises quickly over time. In the long run, a 1 per cent increase in the real wage leads to a 1.32 per cent decline in investment in the total economy. Chart 6 does not show year-to-year changes, but the impact of the real wage on investment takes several years to become significant in some sectors. For example, the impact of a 1 per cent increase in the real wage on investment in manufacturing is not significant until the fifth year. In the long run, as is shown in Chart 6, the 1 per cent increase in the real wage leads to a 0.9 per cent decline in investment in the manufacturing sector.

**Chart 6**  
Long-Run Effect on Investment of a 1 Per Cent Increase in the Real Wage  
(per cent)



\* Significant at 10 per cent

\*\* Significant at 5 per cent

Source: Stuart Landon and Constance E. Smith.

At the sector level, there is some variation in the speed with which changes in the real wage affect investment (not shown in Chart 6).

- For the three sectors that make up business sector services (transportation, storage and communication; wholesale and retail trade, restaurants and hotels; and finance, insurance, real estate and business services), a significant effect materializes either immediately or within a year.

- On the other hand, it takes the real wage from three to four years to have a significant effect on investment in the goods-producing sectors: mining and quarrying; electricity, gas and water supply; and manufacturing.
- The most rapid response of investment to the real wage, and the largest long-run impact, is in wholesale and retail trade, restaurants and hotels. This is perhaps not surprising, given that production in this sector is likely to be relatively labour-intensive. Therefore, we would expect investment in this sector to be more responsive to real wage changes.

1 The estimated effect is considered to be "significant" if it is statistically significant at the 10 per cent level.

2 The full model and empirical results are available in the background paper by Stuart Landon and Constance E. Smith, "Investment in an Open Economy: Aggregate and Sector-Level Estimates." [www.conferenceboard.ca/canadaproject/research.htm](http://www.conferenceboard.ca/canadaproject/research.htm).

3 These effects are for a country of average openness in the sample. Canada is slightly less open than the average.

4 The effect of a permanent currency depreciation (holding all other variables constant) is significant at the 5 per cent level in the long run for investment in the total economy. The effect is significant at the 10 per cent level for the non-agriculture business sector; total services; mining and quarrying; and community, social and personal services. The effects in all other sectors were not significant in the long run.

5 The mining and quarrying sector was dropped from the chart because the coefficient changed sign in Year 3, was not significant in years 2 to 7, and was significant at the 10 per cent level only in years 8 and 9, and in the long run. The effect was not significant in any year for the manufacturing sector or the transportation, storage and communication sector; these sectors were thus not included in the chart.

6 The importance of cash flow is shown by S. Gilchrist and C.P. Himmelberg, "Evidence on the Role of Cash Flow for Investment," pp. 541–72. A rise in the wage can also reduce investment even if labour and capital are substitutable by reducing the marginal profitability of capital, as noted by A. Alesina, S. Ardagna, R. Perotti and F. Schiantarelli, "Fiscal Policy, Profits, and Investment," pp. 571–89.

## CHAPTER 5

# Implications for Individual Countries and the Canada–U.S. Investment Gap

### Chapter Summary

- Exchange rate movements will be less important to a country with a relatively closed economy (such as the United States) and more important to countries that are more open (such as Belgium).
- A large portion of the Canada–U.S. investment gap can be explained by differences in real wage movements, while a much smaller portion of the gap is explained by differences in real exchange rate movements.

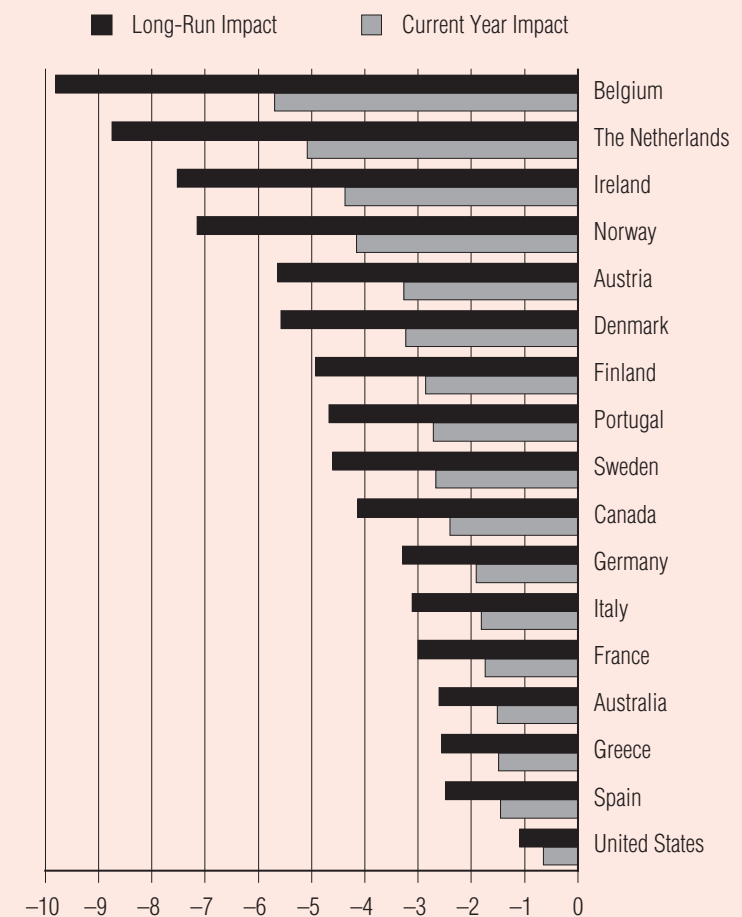
### IMPLICATIONS FOR INDIVIDUAL COUNTRIES

The results in Chapter 4 use a combined data set of 17 OECD countries (including Canada), and the results describe the average response for these countries. In order to gauge the magnitude of the response for individual countries, the estimates obtained from the empirical analysis for the average economy can be applied to the data for each of the 17 countries in the study. Chart 7 displays the effect of a currency depreciation on total investment for each of these countries.

The 17 countries are characterized by different degrees of export and import exposure. These differences cause variations across countries in the magnitude of the effect of the exchange rate on investment. For the country with the most open economy, Belgium, a 10 per cent real currency depreciation is predicted to cause a 5.7 per cent fall in investment in the total economy, in the current year. In contrast, for the country with the least open economy, the United States, this effect is equal to just 0.64 per cent. In Canada, a 10 per cent real currency

**Chart 7**

Impact on Investment of a 10 Per Cent Currency Depreciation, by Country (per cent)



Note: Based on the coefficient estimates for investment in the total economy.  
Source: Stuart Landon and Constance E. Smith.

depreciation is predicted to cause a 2.4 per cent decline in investment in the total economy in the current year and a 4.1 per cent decline in the long run.

From a policy perspective, even for sectors in which the exchange rate has a significant and persistent effect on investment, exchange rate movements will be less important to a country with a relatively closed economy (such as the United States) and more important to countries that are more open.

## IMPLICATIONS FOR THE CANADA–U.S. INVESTMENT GAP

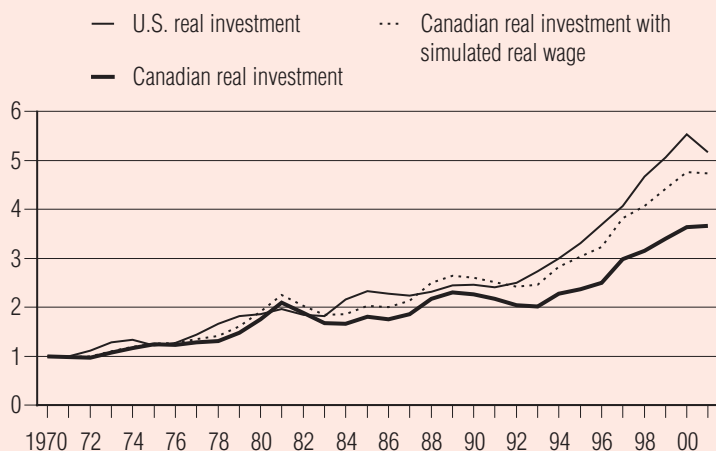
The estimates from Chapter 4 can also be used to predict what the path of investment in Canada would have been if the Canadian real wage and real exchange rate had followed the same growth rates as in the United States from 1971 to 2001. This exercise is useful in providing some insight regarding the difference between investment in Canada and the United States, as well as to illustrate the relative economic magnitude of the impact of the real wage and the exchange rate on investment.

We started with the results previously shown in Chart 2 (in Chapter 1), where each country’s real investment has been indexed to a base where 1970 equals 1. For almost the entire 1971–2001 period, investment in the United States is above that in Canada. By the end of 2001, the final year for which U.S. real investment data were available, U.S. investment is slightly more than 40 per cent greater than Canadian investment.

Canadian investment was then simulated, where the percentage change in the Canadian real wage was restricted to equal the percentage change in the U.S. real wage for each year from 1971 through 2001.<sup>1</sup> Chart 8 shows that the simulated level of Canadian investment is above the actual level for the entire period. This result follows since, as shown in Chart 9, the Canadian real wage rose relative to the U.S. real wage in the mid-1970s and then rose again relative to the U.S. real wage in the early 1990s. In 2001, the difference in real wages accounted for over 70 per cent of the Canada–U.S. investment gap. Hence, movements in real wages may be an important part of the explanation for the difference between Canadian and U.S. investment.<sup>2</sup>

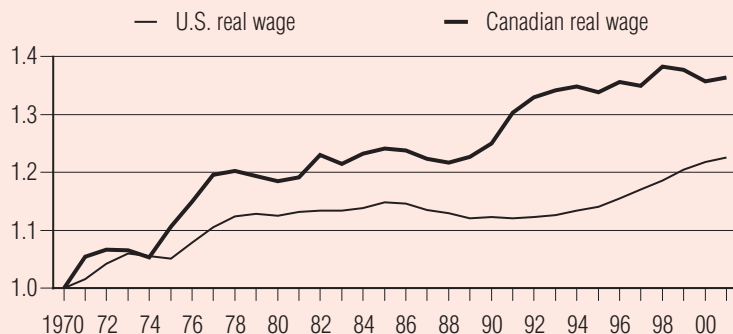
In a second exercise, the path of Canadian investment was simulated with the percentage change in the Canadian real exchange rate set equal to the annual percentage change in the U.S. real exchange rate. As can be seen in Chart 10, the simulated path for Canadian investment is relatively close to the actual level of investment.

**Chart 8**  
Real Investment in the Non-Agriculture Business Sector—Simulated Real Wage, 1970–2001  
(indexed to 1970=1)



Source: Stuart Landon and Constance E. Smith.

**Chart 9**  
Real Wage, 1970–2001  
(indexed to 1970=1)

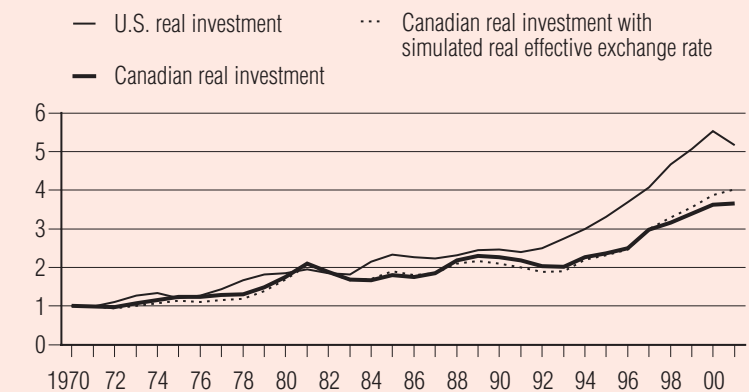


Source: Average hourly wage in manufacturing (OECD, Main Economic Indicators) divided by the GDP deflator (OECD, Economic Outlook database).

There are periods during which the simulated investment is above the actual level, for example, in the late 1990s. There are other periods during which the simulated value is below actual investment, such as in the late 1980s and early 1990s. The movements above and below the U.S. investment level are not surprising since over the sample period, the level of the Canadian real exchange rate fluctuated around the U.S. rate. (See Chart 3 in Chapter 3.) While the Canadian and U.S. real effective exchange rates were approximately equal in 1996 (when adjusted to a common 1970 base year), by 2001 the real value of the Canadian currency had fallen by 9 per cent, while the real value of the U.S. currency had appreciated by 22 per cent. The simulation indicates that if this gap had not appeared and the two real exchange rates had followed the same path, the gap between investment in Canada and the United States would have been 23 per cent smaller in 2001. This result suggests that large and lengthy real currency depreciations can have a negative impact on investment that is both statistically significant and relatively large in magnitude.

In summary, these simulations show that differences in real wage movements account for the largest portion of the gap in Canada–U.S. investment, while exchange rate movements account for a much smaller portion.

**Chart 10**  
Real Investment in the Non-Agriculture Business Sector—Simulated Exchange Rate, 1970–2001  
(indexed to 1970=1)



Source: Stuart Landon and Constance E. Smith.

1 The parameter estimates for the non-agriculture business sector were used.

2 While real wage growth in Canada was only 1.1 per cent in the period 1994–2001, compared with 8.1 per cent in the United States, real wages rose much more quickly in Canada than in the United States from 1989 through

1993 (9.3 per cent compared with 0.4 per cent). It would take several years of relatively higher U.S. real wage growth to offset this previously created differential. This, in addition to the slow adjustment of investment, accounts for the finding that real wage growth differentials account for a large proportion of the Canada–U.S. investment gap in the late 1990s and even into 2001.

## CHAPTER 6

# Conclusion and Policy Implications

### Chapter Summary

- Movements in the exchange rate and the real wage have important consequences for investment.
- Policy-makers interested in future growth may want to take into account the negative short- and medium-run impact that a currency depreciation can have on investment, especially in services sectors.
- An increase in real wages without a corresponding increase in labour productivity would reduce investment in the medium and long run. If policies that restrict labour market flexibility lead to higher wages, they may hinder investment and future growth.

Over the past several decades, Canada has experienced large and persistent changes in exchange rates and higher real wage growth relative to the United States. Given the potential significance of investment for Canada's future productivity and output growth, it is important to understand whether movements in the exchange rate or the real wage have an impact on investment, and the form and magnitude of this impact. For almost the entire 1971–2001 period, investment in the United States was above that in Canada. By the end of 2001, the final year for which U.S. real investment data were available, U.S. investment was slightly more than 40 per cent higher than Canadian investment.

The results in this study suggest that policies that generate movements in the exchange rate or the real wage have important consequences for investment. While a currency depreciation can have a positive impact on exports and domestic demand, policy-makers interested in future growth may want to take into account the negative short- and medium-run impact that a depreciation can have on investment, especially in services sectors. The impact of the exchange rate on investment in these sectors may be particularly important as faster productivity growth has been observed in services sectors. Further, as noted by Jack Triplett and Barry Bosworth, most of the post-1995 productivity growth in the United States occurred within services sectors.<sup>1</sup>

From a policy perspective, exchange rate movements will have a greater effect on a country with a relatively open economy and a lesser effect on a country that is more closed.

The results of this study show that an increase in real wages without a corresponding increase in labour productivity would reduce investment in the medium and long run, particularly in the non-agriculture business sector. These results imply that policies that increase the real wage costs of firms, such as policies to inhibit labour market flexibility, may hinder investment and future growth. Further, differences in real wage movements explain much more of the Canada–U.S. investment gap than do exchange rate movements. A study by Johnson and Kuhn (2004) found evidence consistent with a higher degree of labour market inflexibility in Canada than in the United States which, the authors suggested, may be due to differences in minimum wages, social programs and the degree of worker unionization. This is backed up

by evidence, given in a working paper by Card, Lemieux and Riddell (2003), that the level of union membership for non-agricultural employees was 32.6 per cent in Canada, but only 13.5 per cent in the United States. These factors may have facilitated the relative increase in Canadian real wages shown in Chart 9 (in Chapter 5).

These results should sound a warning bell to policy-makers concerned about Canadian competitiveness. Policies that restrict labour market flexibility may lead to higher wages and may hinder investment and future growth. Further, policies that lead to a currency depreciation may have a negative short- and medium-run impact on investment, especially in services sectors, and this may have consequences for future growth.

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1 Jack E. Triplett and Barry P. Bosworth, *Productivity in the U.S. Services Sector*, p. 4.

## APPENDIX A

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## APPENDIX B

# Canada Project Research and Dialogue Activities

### Research Activities

- Canada's Hub Cities: A Driving Force of the National Economy
- Clusters of Opportunity, Clusters of Risk
- Course Correction: Advice on Canada's Future Foreign Policy
- Death by a Thousand Paper Cuts: The Effect of Barriers to Competition on Canadian Productivity
- In Search of a New Equilibrium in the Canada-U.S. Relationship
- Lost Over the Atlantic? The Canada-EU Trade and Investment Relationship
- Open for Business? Canada's Foreign Direct Investment Challenge
- Opportunity Begins at Home: Enhancing Canadian Commercial Services Exports
- Performance and Potential 2003-04: Defining the Canadian Advantage
  - Chapter 2—Explaining the Canada-U.S. Income Gap: What It Is and Why It Matters
  - Chapter 3—Understanding the Impact of Population Ageing: How It Will Affect the Supply of Labour and Health Care Costs
  - Chapter 4—Revitalizing Canadian Foreign Policy: Carving Out a New Role
  - Chapter 5—Assessing Canada's Fiscal Capacity to 2015: Tough Choices Remain
- Performance and Potential 2004-05: How Can Canada Prosper in Tomorrow's World?
  - Chapter 2—The Canada-U.S. Productivity Gap: Deepening Our Understanding
  - Chapter 3—Canadian Trade: Scenarios and Policy Options in an Insecure World
    - Chapter 4—Foreign Direct Investment: Ins, Outs and Implications for Canada
    - Chapter 5—Immigration: A New Deal for Newcomers
    - Chapter 6—Canada's Cities: In Need of a New Fiscal Framework
- Performance and Potential 2005-06: The World and Canada—Trends Reshaping Our Future
  - Chapter 2—Making Connections: The New World of Integrative Trade and Canada
  - Chapter 3—Pursuing Sustainability: Global Commodity Trends and Canada
  - Chapter 4—Rethinking the Workforce: Aging Populations and Canada
  - Chapter 5—Facing the Risks: Global Security Trends and Canada

### Dialogue Activities

- Canada-U.S. Roundtable on the Future of Canada-U.S. Relations
- Capturing the Vision Advisory Panel
- Commodities Research Advisory Panel
- Consultative Forum on Canada's Role in the World
- Countries Research Advisory Panel
- Panel on Barriers to Competition
- Round Table on Canada's Value Within the Global Services Supply Chain
- Urban Research Advisory Panel
- Workshop on Enlargement of the European Union
- Workshop on International Aviation Policy for Canada

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