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CANADA

Selected Issues

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Approved by the Western Hemisphere Department

February 2, 2004

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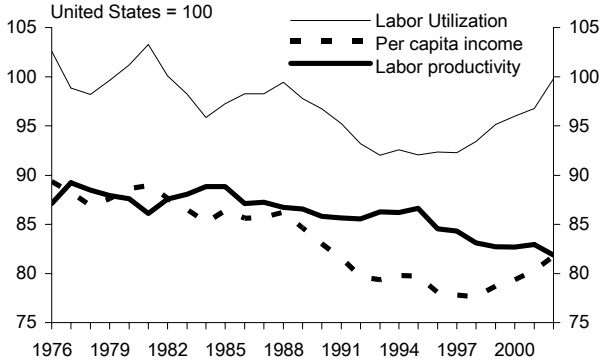
I. THE CANADA – UNITED STATES PRODUCTIVITY GAP: EVIDENCE FROM INDUSTRY DATA[1]

1. ***Despite the close integration between the Canada and U.S. economies, the labor productivity gap between the two countries has widened over the last two decades*** (Figure 1). While a greater utilization of labor resources has allowed Canada to narrow the gap with the United States in terms of per capita income from the mid 1990s, convergence has been held back by the more modest pace of Canadian labor productivity growth.

Figure 1. United States and Canada: Income and Productivity Indicators



Source: OECD. Labor Productivity: GDP in millions of 1999 US$ (converted at EKS PPPs) per hour worked. Labor Utilization: hours worked per person.

2. ***This chapter explores the factors that have led to the Canada-U.S. productivity gap using a sectoral growth-accounting approach***. Building on the approach of Faruqui, *et al.* (2002), this chapter constructs a sectoral database with comparable data on value added, labor, and capital inputs for 23 industries over the 1981–2000 period, in order to assess the extent to which this gap reflects differences in the industrial structure of the two countries.[2]

3. The chapter's main results are that

- ***The post-1995 labor productivity growth gap largely reflects the performance of two key service sectors, trade and "finance, insurance, and real estate" (FIRE)***. The manufacturing sector, in particular the information and communication technologies (ICT)-producing industries, also continued to contribute to the gap, but no more than in the previous period.

- ***Differences in industrial structure explain the majority of the productivity growth gap over the second half of the 1990s***. The United States appears to have been more successful in shifting resources toward high-productivity sectors, compared to Canada.

- ***The lower contribution from ICT capital accumulation to productivity growth in Canada may also reflect differences in realizing the productivity benefits of ICT investments***. In particular, Canadian productivity growth may have been held up by

[1] Prepared by Roberto Cardarelli.

[2] Data for Canada are from Statistics Canada, while data for United States are from several industry data sources, including the database used by Jorgenson, Ho, and Stiroh (2002) in their latest study on the U.S. productivity performance. See appendix I for a description of the database.

the delays in introducing organizational changes necessary to complement ICT capital.

- ***The increased economic integration with the United States has allowed Canadian firms to benefit from economies of scale and technology transfers***, something that appears to have positively contributed to their productivity performance over the last two decades.

A. Review of the Literature

4. A copious number of studies have sought to analyze the factors behind the productivity gap between Canada and the United States (for a survey, see Crawford, 2002, and Macklem, 2003). Among the explanations offered are the following:

- ***Different size of the ICT-producing sector:*** Some studies have attributed most of the post-1995 acceleration of labor productivity in the United States to the exceptional total factor productivity performance of the ICT-producing sector (e.g., Gordon, 2003, and Harchaoui and Tarkhani, 2002). Given its smaller ICT-producing sector, these studies suggest that Canada is at a relative disadvantage in reaping the benefit of the ICT productivity wave.[3]

- ***Different contribution from ICT capital accumulation***: The widespread adoption of ICT capital assets has been regarded as a key factor behind the strong labor productivity growth in the United States.[4] Harchaoui and Tarkhani (2002) show that Canada's business sector also experienced solid growth in ICT capital services over the 1981–2000 period, at levels comparable if not higher than the United States (Table 1).[5] Nonetheless, the contribution from ICT capital deepening to labor productivity growth is generally estimated to be lower in Canada than in the United States, mainly reflecting the lower estimated marginal productivity of ICT capital and the lower ICT capital intensity in Canada.[6]

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[3] Harchaoui and Tarkhani (2002) show that the size of Canada ICT-producing sector increased from around 2½ percent of GDP in 1981 to around 4 percent of GDP on average over the second half of the 1990s, but remained below the U.S. share, which was around 6 percent of GDP over this period.

[4] See, for example, Oliner and Sichel (2002) and Jorgenson, Ho, and Stiroh (2002).

[5] The faster growth in ICT capital services in Canada might be partly explained by differences in the capital asset depreciation rates used by Statistics Canada and the BLS. In particular, Statistics Canada uses higher depreciation rates for ICT assets, something that might lead to a faster growth of their capital services (see Ho, Rao, and Tang, 2003).

[6] See Khan and Santos (2002), Harchaoui and Tarkhani (2002), Armstrong, *et al.* (2002), and Ho, Rao, and Tang (2003). Both Armstrong, *et al*. and Harchaoui and Tarkhani find that ICT-capital deepening has contributed around ¼ percent to the average annual labor productivity growth in Canada over the 1995-2000 period, up only slightly compared to the 1981-2000 period. The equivalent figure for the United States is estimated between ½ percent (Oliner and Sichel, 2002) and ⅔ percent (Jorgenson, Ho, and Stiroh, 2002).

- ***Differences in the share and productivity performance of small and medium size enterprises (SMEs)***: In the Canadian manufacturing sector, SMEs (i.e., firms with less than 500 employees) accounted for 75 percent of total manufacturing employment, compared to around 60 percent in the United States in 1997. Not only has the weight of SMEs in the Canadian economy increased over the last two decades, but some studies have found these firms to be less productive relative to their U.S. counterparts.[7]

Table 1. Canada and the United States: ICT Capital Accumulation
(In percent)

	1981-1995		1995-2001	
	Canada	United States	Canada	United States
Investment (average rate of growth) 1/				
Computers	25.8	28.0	39.8	39.3
Software	19.2	16.6	10.2	19.8
Communications	4.5	4.8	17.9	12.2
Capital services (average rate of growth) 2/				
All assets	3.0	3.4	4.3	5.4
ICT	16.9	14.9	18.4	21.3
Computers	27.1	23.9	32.9	41.8
Software	14.5	15.0	7.2	16.4
Communications	7.4	6.3	12.2	8.5
ICT share of capital income 2/	6.3	10.9	8.3	15.3
ICT share of capital stock 3/	3.9	7.0	6.4	11.7

1/ Source: Haver Analytics.
2/ Source: Harchaoui and Tarkhani (2002).
3/ Sources: Armstrong et al. (2002) for Canada and BEA for the United States. Values are for 1981 and 2000.

- ***Differences in the share and income of self-employed***: The difference in labor-productivity growth between Canada and the United States in the 1990s has also been attributed to the faster growth of self-employment in Canada and the poorer income performance of this group compared with the United States (Baldwin and Chowhan, 2002).

5. Less relevant factors include:

- ***Differences in national accounts statistics***: While differences still remain, the methodology used by national statistical agencies to measure labor and total factor productivity has been converging. In particular, both U.S. Bureau of Labor Statistics and Statistics Canada now use hedonic prices and include purchase of computer software in the national account measures of investment.

- ***Differences in the regulatory burden in labor and product markets***: Gust and Marquez (2004) find that countries with a more burdensome regulatory framework tend to have lower total factor productivity growth. However, notwithstanding the difficulties in building comparable indexes of regulatory burden across countries,

[7] Baldwin and Tang (2003) show that around ¼ percentage point of the labor productivity gap in the manufacturing sector in 1997 was due to the larger share of SMEs in Canada compared to the United States, and ½ percentage point to the lower productivity of SMEs in Canada.

empirical evidence does not reveal a large difference between Canada and the United States in terms of labor and product market legislation and institutions.[8]

6. ***Few studies have examined the contribution of different industries to the business sector labor productivity gap between Canada and the United States.*** The majority of the literature has focused either on the labor productivity gap in the manufacturing sector, or used the growth accounting framework at an aggregate level. This chapter examines the extent to which productivity differences between the two countries reflect differences in their industrial structure and the performance of specific industries.

B. Results from Sectoral Growth Accounting

7. ***The analysis below uses a traditional growth accounting framework***. This approach attributes labor productivity growth (value added per hours worked, y_t) to the contribution of three factors: the improvement in labor quality (H_t), weighted by the labor income share of value added (α_t); capital deepening (proxied by the flow of capital services per hours worked, k_t), weighted by the capital income share of value added (β_t); and total factor productivity (TFP, denoted by A_t)[9]

$$\dot{y}_t = \alpha_t \dot{k}_t + \beta_t \dot{H}_t + \dot{A}_t \qquad (1)$$

8. ***Labor and capital inputs for both Canada and the United States are adjusted for quality changes using the same methodology.*** In particular, labor quality (H_t) is the difference between the growth of hours worked and the growth of labor input, obtained by weighting the hours of different types of labor (in terms of educational attainment, age, and gender) by their marginal productivity (proxied by their relative compensation). Similarly, capital services are obtained by weighting the growth rates of different capital assets, using their estimated marginal productivity (proxied by rental prices) as weights. Within this framework, the estimates of labor and capital inputs capture the effect of substituting toward inputs with a higher marginal productivity (e.g., ICT capital and higher educated labor). In turn, this allows the estimates of TFP to better proxy the impact of technical and organizational changes on productivity.[10]

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[8] Based on the regulatory variables they use, Canada is lagging the United States according to the OECD employment protection legislation index, but is leading the United States according to the World Economic Forum's regulatory burden index.

[9] The dot over the variables denotes percentage growth rates. For a more detailed discussion of the methodology see Jorgenson, Ho, and Stiroh (2002).

[10] Industry value-added measures of TFP reflect technological changes only assuming that the production function is separable in primary (capital and labor) and intermediate inputs. Loosely speaking, this amounts to assuming that firms' decisions on the capital-labor mix are not affected by decisions regarding intermediate inputs. If this is not the case, industry value-added TFP would capture not only technical changes, but also the productivity improvements that derive from more efficiently produced intermediate inputs. Hence, while TFP

9. Appendix II shows Canadian and U.S. industries' average labor productivity growth, and the contribution from the three proximate causes. The results are shown separately for the period 1981–2000, as well as the pre- and post-1995 period. The appendix also shows average labor productivity growth for the entire business sector, aggregated over the 23 sectors considered.[11] The main results may be summarized as follows:

- ***Canadian aggregate labor productivity grew by an average annual 0.3 percentage points less than in the United States over the whole period, but the gap in growth rates widened to an average 0.8 percentage points in the post-1995 period***. These estimates are broadly consistent with the estimates obtained by conducting growth accounting at an aggregate level (see Macklem, 2003)[12].

- ***In the post-1995 period, the labor productivity gap between the two countries widened not only in the ICT-producing sector, but also in sectors that intensively used ICT capital.***[13] Canada's non–ICT producing manufacturing industries appear to have performed as well, if not better, than their U.S. counterparts. However, a gap emerged in sectors that have been most intensively using new technologies, like the trade and FIRE sectors. In particular, labor productivity growth in Canada's trade sector was well below that in the United States, reflecting shortfalls in both TFP and capital deepening. A gap also opened in the FIRE sector, reflecting a smaller contribution of capital deepening than in the United States.

The impact of industrial structure on the aggregate labor productivity growth gap

10. ***Conducting growth accounting at a sectoral level allows to decompose the aggregate labor productivity growth gap between Canada and the Unites States into three components***, which correspond to the three terms on the right hand side of equation (2):

- a "direct" effect, which reflects the contribution from industry *i*'s different labor productivity growth performance, weighted by its average value-added share (va_i);

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would still reflect technological changes at an aggregate level, its breakdown across industries would be affected. The OECD (2001) suggests interpreting more widely the industry value-added measure of TFP as an indication of the industry's ability to translate technical changes into overall income.

[11] Consistently with the OECD (2001), total labor productivity growth is obtained as the weighted average of labor productivities across industries using value-added shares as weights, plus a reallocation term that reflects the economy's ability to move labor resources to those sectors with a higher-than-average level of labor productivity (see equation 2 below). Given that aggregate TFP and contributions from labor quality and capital deepening are obtained as weighted average of industries figures using value-added shares as weights, their sum is different than total labor productivity, the difference being the reallocation factor.

[12] Recent data revisions by Statistics Canada suggest that the aggregate labor productivity growth gap between Canada and the United States in the 1995–2000 period has been smaller, about ½ percent, than the data used in this chapter.

[13] The ICT-producing sector is proxied by the industrial machinery and electrical and electronic product sectors.

- a "structural" effect, which reflects the contribution from the industry *i*'s different relative size across the two countries, weighted by its average labor productivity growth;

- and a "reallocation factor", that reflects the different ability of the two economies to direct labor resources (hours worked, h_i) toward sectors with a value-added share that exceeds the labor compensation share (ls_i) (that is, toward sectors with higher-than-average labor productivity level):[14]

$$\dot{y}_{Can} - \dot{y}_{US} = \sum_i \left(\frac{va_{i,Can} + va_{i,US}}{2} \right) \left(\dot{y}_{i,Can} - \dot{y}_{i,US} \right) + \sum_i \left(\frac{\dot{y}_{i,Can} + \dot{y}_{i,US}}{2} \right) \left(va_{i,Can} - va_{i,US} \right) + \left[\sum_i \left(va_{i,Can} - ls_{i,Can} \right) \dot{h}_{i,Can} - \sum_i \left(va_{i,US} - ls_{i,US} \right) \dot{h}_{i,US} \right] \quad (2)$$

11. ***This decomposition shows that a significant part of the widening labor productivity gap between Canada and the United States over the post-1995 period is explained by structural differences between the two economies***. Table 2 shows that the negative contribution from the "direct" effect has remained relatively constant over the two periods, whereas the other two effects have become a negative contributor in the post-1995 period. This seems to suggest that the widening of the Canada-U.S. labor productivity gap over the second half of the 1990s was mostly due to a shift in the relative pattern of industry specialization. In other words, rather than having become less productive than the United States, Canada has tended to be less successful in directing resources toward high-productivity sectors.

Table 2. Canada - U.S. Labor Productivity Growth Gap
(In percent)

Contribution from:	1982-2000	1982-1995	1995-2000
Direct Effect	-0.2	-0.1	-0.2
of which:			
Industrial Mach. and Electrical and Electronic equip.	-0.1	-0.1	-0.2
Transportation equipment	0.1	0.0	0.1
Other manufacturing industries	0.0	0.0	-0.1
Communications	0.0	0.0	0.0
Utilities	-0.1	0.0	0.0
Trade	-0.2	0.0	-0.4
FIRE	0.1	-0.1	0.0
Other Services	0.0	0.0	0.1
Structure effect	0.0	0.1	-0.2
Reallocation effect	0.0	0.1	-0.2

Source: Fund staff estimates.

[14] See Faruqui, *et al*. (2002) for a similar decomposition formula. Their conclusion is that most of the business sector labor productivity growth gap between Canada and the United States in the 1987-2000 period is explained by the direct effect. Moreover, the manufacturing sector is the main contributor to the aggregate gap in the post-1996 period, while the service sector is more relevant in the period 1987-1996. However, these results are obtained at a rather coarse level of disaggregation (4 large sectors are identified, namely, primary, manufacturing, construction and services), something that (as admitted by the same authors) might conceal the contribution from the structural and reallocation effects.

12. ***The widening of the aggregate labor productivity gap between Canada and the United State over the second half of the 1990s has been mainly driven by two major service sectors, trade and FIRE***. Figure 2 shows the industries' contribution to the aggregate labor productivity growth gap in the two sub periods, 1981–1995 and 1995–2000. Each industry's contribution is given by the sum of its contribution to the "direct," "structure," and "reallocation" effects. While the negative contribution from the ICT-producing sector increased only slightly in the second half of the 1990s, the negative contribution from the trade and FIRE sectors rose significantly. The negative contribution from the ICT-producing manufacturing and trade sectors mainly reflected lower labor productivity growth, whereas the negative contribution from the FIRE sector was largely the result of the lower relative size of the sector in Canada.[15]

Why has the contribution from ICT capital accumulation in Canada been more muted?

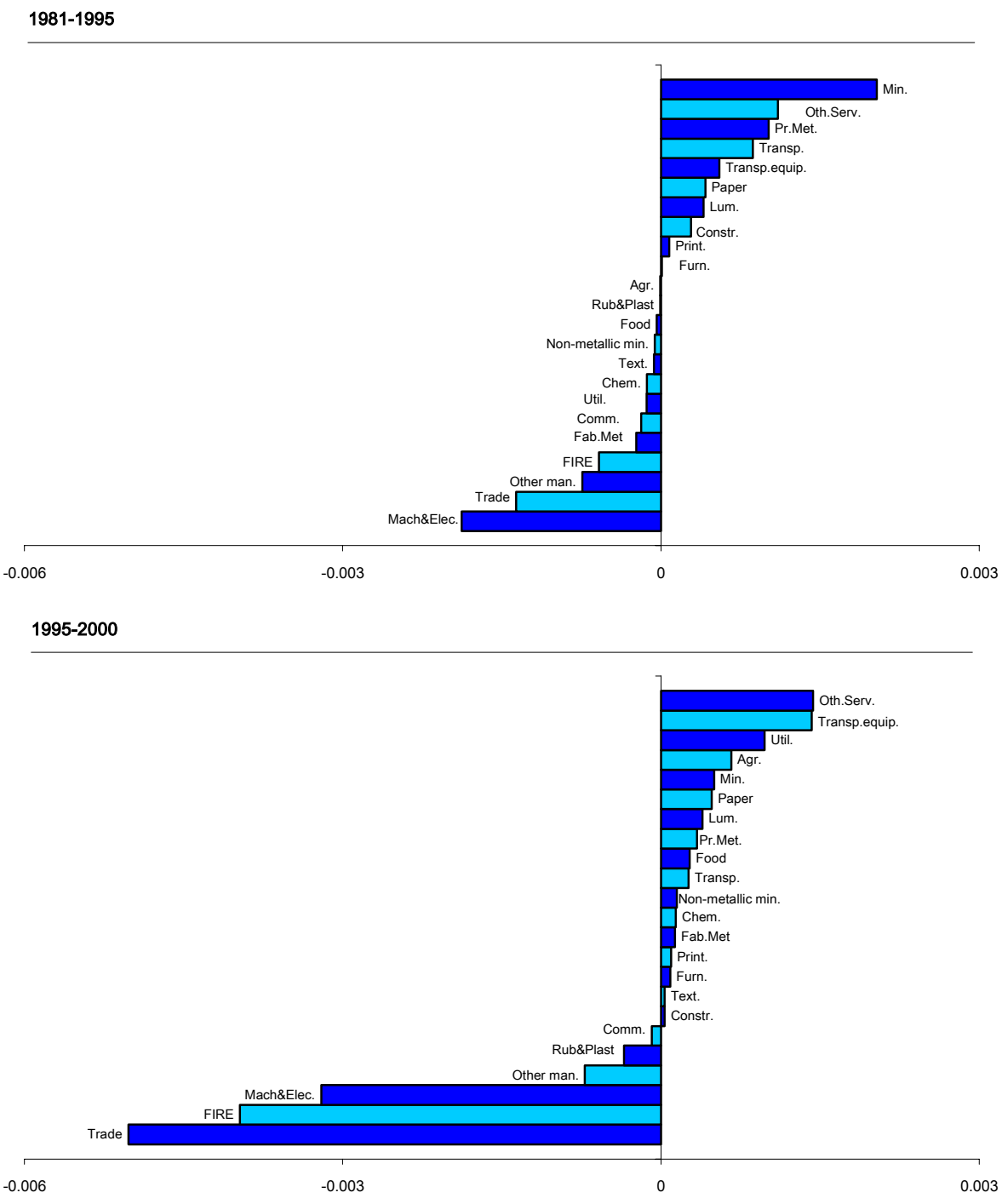
13. ***The more muted contribution of ICT capital accumulation to productivity growth in Canada may reflect the different timing of Canadian and U.S. ICT investments***. ICT investments affect labor productivity not only through capital deepening. They also affect TFP growth by inducing additional investments in intangible assets, such as organizational changes and the accumulation of knowledge. However, the payoff of these investments in terms of measured output can be delayed considerably, given the time and resources required to reorganize production after investing in ICT capital. Basu, *et al.* (2003) find that the post-1995 TFP acceleration in the United States is correlated with ICT investments in the 1980s and early 1990s, and negatively correlated with ICT investments in the same period.

14. ***Empirical evidence is supportive of the existence of relatively long lags between ICT capital accumulation and TFP growth in Canada***. Following Basu, *et al.* (2003), a simple OLS regression is run to relate TFP average growth in the post-1995 period to ICT capital service growth in the 1980s, the mid-1990s and the late 1990s, taking each industry as a cross-sectional observation. Table 3 shows that Canadian TFP growth in the late 1990s is negatively correlated to ICT capital investments in both halves of the 1990s, but is positively correlated to ICT investment in the 1980s.[16] For the United States, the results are qualitatively similar to Basu, *et al.* (2003), with post-1995 TFP growth negatively correlated to ICT capital accumulation over the same period, but positively correlated to ICT capital accumulation in the 1980s and early 1990s. This result suggests that Canada's slower TFP

[15] The comparison between the trade sectors in the two countries may be blurred by the fact that eating and drinking places are included in the U.S. trade sector, while they are part of the "other service" sector for Canada (as they are in the "accommodation, food, and beverage" sector). However, the results do not change substantially when the Canadian trade sector is adjusted to include that fraction of the "accommodation, food, and beverage" sector that can be attributed to eating and drinking places.

[16] As stressed by Basu, *et al.* (2003), the OLS regression and the simple specification used do not allow to infer causation from the results, but only whether a correlation exists between lagged ICT capital and TFP growth. The results in Table 3 are robust to the exclusion of key sectors, such as the ICT-producing, trade, and FIRE sectors.

Figure 2. Sectoral Contributions to the Canada - U.S. Aggregate Labor Productivity Growth Gap
(In percent)



Source: Fund staff calculations.

acceleration in the post-1995 period may reflect the fact that Canadian firms invested in complementary capital later than U.S. firms and/or that this process has taken a longer period of time for Canadian firms. It also suggests, however, that Canadian firms might benefit from faster TFP growth in the near future.[17]

Table 3. Canada and United States: TFP Growth Regression with Current and Lagged ICT Capital Services Growth 1/

	Canada	United States
Constant	1.79	-0.80
	(0.73)	(0.93)
ICT_CAP_95-00	-0.24	-2.41
	(0.54)	(1.03)
ICT_CAP_90-95	-1.53	2.50
	(1.02)	(1.09)
ICT_CAP_80-90	1.82	0.43
	(1.48)	(0.46)
R-squared	0.11	0.24
Observations	24	21

Source: Fund staff estimates.

1/ Dependent Variable: Average annual TFP growth in 1995-2000. White Heteroskedasticity-Consistent standard errors in parenthesis.

C. Productivity Growth and Trade

15. ***The labor productivity gap between Canada and the United States widened despite the marked deepening of trade linkages between the two countries***. Some authors have argued that this reflected Canada's increased specialization in the natural resource and resource-based manufacturing sectors, where Canada has had a comparative advantage (see, for example, Jackson, 2003). This reallocation of resources could have dampened the aggregate growth of Canadian productivity.

16. ***However, the labor productivity gap is unlikely to be related to increased economic integration***. First, the results shown above attribute nearly the entire structural labor productivity gap to the service (i.e., nontradable) sector. Second, over the second half of the 1990s, Canada's tradable sector seems to have evolved rapidly in the direction of high-tech productions. In particular, while it remains lower than in the United States, Canada's ICT-producing sector has increased its share of aggregate GDP over this period (Table 4). Finally, several studies have shown that, over the last decade, Canadian trade has

Table 4. Canada and the United States: Value-Added, Shares of Total
(In percent)

	Canada		United States	
	1981-1995	1995-2000	1981-1995	1995-2000
Agriculture	3.2	2.5	2.3	1.8
Mining	6.9	5.6	2.5	1.5
Construction	8.5	6.9	5.3	5.3
Manufacturing	24.0	25.1	22.4	19.5
of which				
Industrial Mach. and Electrical and Electronic equip.	2.7	2.9	5.0	4.4
Transportation	5.5	5.2	4.0	3.8
Communications	3.9	3.7	3.1	3.1
Utilities	4.5	4.5	3.2	2.6
Trade	14.7	14.3	16.4	16.0
FIRE	12.8	14.3	19.0	21.1
Other Services	15.9	18.0	21.9	25.3

Source: Fund staff estimates.

[17] Leung (2004) finds that investments in new technologies in Canada have their strongest impact on TFP growth only after three years. Robidoux (2003) also suggests that the contribution of ICT capital to the acceleration of TFP growth in the service sector in late 1990s reflects the successful incorporation of ICT in the production and management processes in the 1980s and early 1990s.

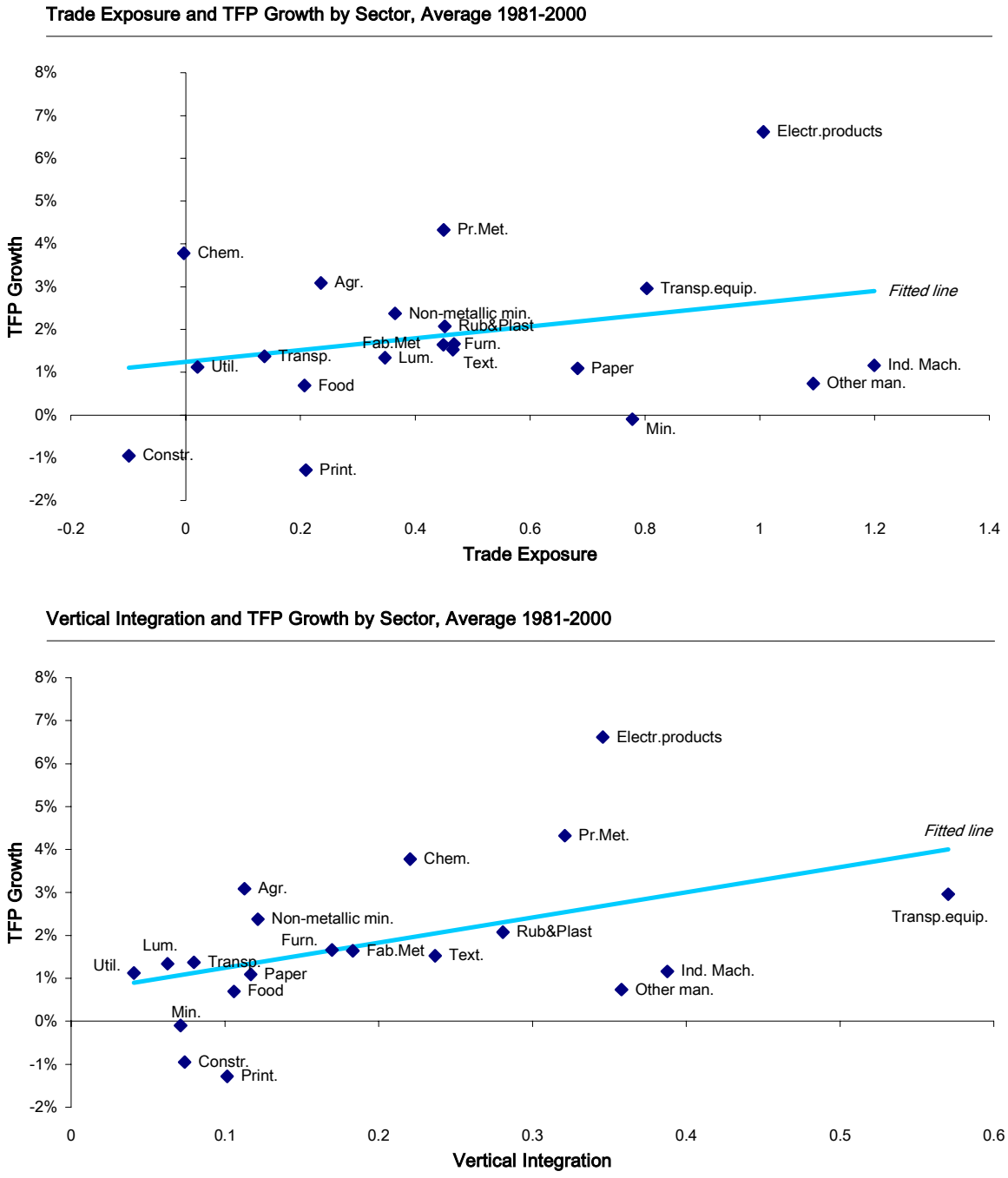
increased mainly in two-way trade in similar products, rather than among different industries.[18]

17. ***On the contrary, Canadian TFP growth is positively correlated with trade***. Plotting average TFP growth against (1) the degree of vertical specialization and (2) the degree of trade exposure of Canadian sectors over the 1981–2000 period shows that TFP growth is positively correlated with openness to trade (Figure 3).[19] In particular, the ICT-producing and transportation equipment sectors seem to have most benefited from exposure to trade and inter-industry specialization over this period. Moreover, the extent of the correlation has increased since the inception of the free trade agreement with the United States.

[18] See Dion (2000) and Acharya, Sharma, and Rao (2003).

[19] Both indexes of openness to trade are from Dion (2000) (the data, originally up to 1996, have been extrapolated to 2000). The degree of vertical specialization measures the extent to which an industry's trade is accounted for by inputs that are imported and embodied in exports. The degree of trade exposure is the algebraic sum of three different indicators: the share of an industry's exports in its gross output (capturing its degree of export orientation); the share of an industry's imported intermediate inputs in its gross output (capturing the exposure of an industry on the cost side); and the share of an industry's competing imports in the domestic markets for its core products (measuring the exposure to foreign penetration of the domestic market).

Figure 3. Canada: Sectoral TFP Growth and Openness to Trade



Source: Fund staff calculations.

Data Sources

Data for Canada

Real (chain Fisher weighted) value added, hours worked, labor input, and capital services data were obtained from Statistics Canada and were based on a SIC-80 industry classification.

For the manufacturing sectors, however, the data ended in 1997. They were extrapolated to 2000 using the growth rates from the KLEMS input and output database which follows a NAICS industry classification (starting from 1997).

Comparing the 1997 industries' value added based on the two industry classifications shows that the difference is generally around 15 percent, except for "other manufacturing sector" and "furniture and fixture", for which the difference is around 30 percent. The results for these sectors should then be interpreted with greater caution than others.

Data for the United States

Industry data for the United States follows the US SIC 87 industry classification.

Real (chain Fisher weighted) value added industry data for the United States were obtained from Bureau of Economic Analysis's "gross product originating" by industry (GPO). As these figures are on a market-price basis, value-added data at basic prices were obtained by subtracting the indirect business tax and nontax liability from GPO.

GDP by industry is obtained from industries components of domestic income which, as it is well known, tend to falls short of GDP measured on an expenditure basis. The difference is named "statistical discrepancy", and is attributed to the industries based on their share of total GDP.

Hours worked, labor input and capital services were obtained from Jorgenson, Ho, and Stiroh (2002), and are based on methodologies that are largely comparable with those adopted by Statistics Canada.

Industry classification

To obtain the same level of industry classification for the two countries a number of subsectors were aggregated into larger sectors. As an example, a "mining" sector was obtained for the Unites States by aggregating four subsectors (namely, metal mining, coal mining petroleum and gas and nonmetallic mining).

The aggregation was needed also to obtain comparable sectors for the two countries. For example, US SIC 87 classification places computers and office equipment in Industrial Machinery, while Canada SIC 80 classification places it in the Electrical and Electronic

equipment. For the sake of comparison, the two sectors were aggregated into one large sector, which is taken as a proxy for the ICT-producing sector in the chapter.

The following aggregation criteria were utilized: sub-industries value-added were aggregated using value-added shares as weights; labor and capital inputs were aggregated using relative shares in aggregate labor compensation and capital income, respectively, as weights; and hours worked were aggregated through the unweighted sum.

Despite following these aggregation procedures allows to obtain reasonably comparable sectors for the two countries, some minor differences still persist, particularly in the service sectors. In addition to the different treatment of eating and drinking places (see footnote 14 in the text), another difference which is worth mentioning regards postal services, which are placed in the Communication sector for Canada but in the Transportation sector for the United States.

Canada and the United States: Productivity Growth, 1982-2000
(In percent)

	Canada				United States			
	Labor productivity	Contribution from:			Labor productivity	Contribution from:		
		Capital	Labor quality	TFP		Capital	Labor quality	TFP
Agriculture	3.7	0.1	0.5	3.1	4.3	0.3	0.3	3.7
Mining	2.2	2.1	0.2	-0.1	1.8	2.9	0.2	-1.3
Construction	-0.6	0.1	0.3	-1.0	-0.1	-0.1	0.4	-0.4
Food Beverage and Tobacco	1.3	0.5	0.1	0.7	0.6	0.9	0.2	-0.5
Rubber and Plastic	2.2	0.0	0.1	2.1	4.3	0.6	0.3	3.3
Textiles, Apparel and Leather	2.5	0.5	0.5	1.5	3.0	1.0	0.5	1.5
Lumber and Wood	2.0	0.3	0.4	1.3	0.1	-0.6	0.4	0.2
Furniture and fixture	1.3	-0.5	0.2	1.7	1.0	0.3	0.6	0.2
Paper and allied products	3.2	1.9	0.2	1.1	1.5	1.0	0.3	0.2
Printing and publishing	-0.7	0.3	0.3	-1.3	-1.0	1.1	0.3	-2.3
Primary metal	5.2	0.7	0.3	4.3	2.1	0.7	0.4	1.0
Fabricated metal	1.5	-0.4	0.2	1.6	2.2	0.4	0.4	1.3
Ind. Mach. & Elect. Equipment	5.8	1.3	0.3	4.2	11.0	1.3	0.5	9.2
Transportation equipment	4.2	1.1	0.1	3.0	2.2	0.5	0.2	1.5
Non-metallic mineral products	2.2	-0.4	0.2	2.4	2.2	0.3	0.4	1.5
Chemical and chemical products	4.1	0.1	0.2	3.8	3.7	1.4	0.3	2.0
Other manufacturing industries	1.4	0.4	0.3	0.7	5.7	1.1	0.4	4.2
Transportation	2.3	0.5	0.4	1.4	1.7	-0.1	0.3	1.5
Communications	3.1	1.8	0.8	0.5	3.9	2.8	0.2	0.9
Utilities	1.3	0.1	0.1	1.1	3.1	2.0	0.1	0.9
Trade	2.4	0.5	0.5	1.3	3.5	1.2	0.2	2.0
FIRE	1.7	1.5	0.5	-0.3	1.2	1.5	0.2	-0.5
Other Services	-0.2	0.8	0.7	-1.7	-0.2	0.6	0.2	-1.1
Total	1.6	0.8	0.4	0.6	1.9	1.1	0.3	0.8

Canada and the United States: Productivity Growth, 1982-1995
(In percent)

	Canada				United States			
	Labor productivity	Contribution from:			Labor productivity	Contribution from:		
		Capital	Labor quality	TFP		Capital	Labor quality	TFP
Agriculture	3.0	-0.7	0.6	3.1	3.7	0.1	0.4	3.2
Mining	3.3	1.8	0.2	1.2	3.0	3.1	0.3	-0.4
Construction	-0.6	0.2	0.3	-1.1	-0.1	-0.3	0.5	-0.3
Food Beverage and Tobacco	1.6	0.3	0.3	1.0	2.5	0.7	0.2	1.5
Rubber and Plastic	3.2	0.5	0.3	2.4	4.1	0.3	0.4	3.4
Textiles, Apparel and Leather	2.5	0.6	0.6	1.3	3.1	0.7	0.6	1.8
Lumber and Wood	1.9	0.2	0.4	1.3	0.5	-0.9	0.5	0.9
Furniture and fixture	0.8	-0.1	0.3	0.6	0.9	0.2	0.7	0.0
Paper and allied products	3.1	1.8	0.4	0.9	1.5	0.9	0.4	0.2
Printing and publishing	-1.2	0.4	0.4	-2.0	-1.4	0.8	0.3	-2.6
Primary metal	5.8	0.7	0.4	4.6	1.9	0.7	0.4	0.8
Fabricated metal	1.3	-0.1	0.3	1.0	2.5	0.4	0.4	1.7
Ind. Mach. & Elect. Equipment	5.4	1.1	0.7	3.6	9.0	0.9	0.5	7.6
Transportation equipment	4.1	0.8	0.3	3.0	2.2	0.4	0.2	1.5
Non-metallic mineral products	1.3	-0.2	0.3	1.2	2.6	-0.1	0.4	2.2
Chemical and chemical products	4.2	0.1	0.3	3.8	4.2	1.2	0.3	2.7
Other manufacturing industries	1.6	0.7	0.4	0.4	5.3	1.0	0.4	4.0
Transportation	2.5	0.4	0.5	1.7	1.5	-0.6	0.3	1.7
Communications	2.9	1.3	0.3	1.2	4.5	3.0	0.2	1.3
Utilities	0.5	0.4	0.2	-0.1	3.0	1.8	0.2	1.1
Trade	1.9	0.4	0.5	1.0	2.3	1.0	0.3	1.0
FIRE	1.4	1.6	0.6	-0.8	0.7	1.3	0.2	-0.9
Other Services	-0.4	0.9	0.7	-1.9	-0.4	0.5	0.2	-1.0
Total	1.6	0.8	0.5	0.5	1.6	0.9	0.3	0.6

Canada and the United States: Productivity Growth, 1995-2000
(In percent)

	Canada				United States			
		Contribution from:				Contribution from:		
	Labor productivity	Capital	Labor quality	TFP	Labor productivity	Capital	Labor quality	TFP
Agriculture	5.3	2.2	0.3	2.8	3.2	0.6	0.2	2.4
Mining	-0.8	2.5	0.1	-3.4	-1.0	1.9	0.0	-2.9
Construction	-0.4	0.0	0.2	-0.6	-0.5	0.5	0.2	-1.2
Food Beverage and Tobacco	0.7	1.0	-0.4	0.1	-0.7	1.3	0.1	-2.2
Rubber and Plastic	-0.6	-1.1	-0.3	0.8	4.3	1.4	0.2	2.8
Textiles, Apparel and Leather	2.9	0.0	0.1	2.8	2.5	1.7	0.2	0.6
Lumber and Wood	1.5	1.3	0.3	0.0	0.2	0.5	0.2	-0.5
Furniture and fixture	2.6	-1.4	-0.2	4.2	1.6	0.5	0.3	0.9
Paper and allied products	2.2	1.9	-0.2	0.5	-1.2	1.1	0.2	-2.4
Printing and publishing	0.4	0.1	0.0	0.3	-0.3	1.5	0.2	-2.0
Primary metal	2.8	0.2	-0.1	2.7	1.8	0.7	0.2	0.9
Fabricated metal	1.9	-1.0	0.0	2.9	1.4	0.6	0.3	0.5
Ind. Mach. & Elect. Equipment	7.4	1.5	-0.4	6.3	16.9	2.3	0.4	14.2
Transportation equipment	3.7	1.8	-0.3	2.2	2.0	0.8	0.1	1.1
Non-metallic mineral products	3.0	-1.2	-0.1	4.3	1.3	1.3	0.3	-0.2
Chemical and chemical products	3.9	-0.2	-0.1	4.1	2.3	1.9	0.2	0.2
Other manufacturing industries	1.0	-0.8	0.0	1.7	6.2	1.3	0.4	4.5
Transportation	1.7	0.8	0.3	0.6	1.7	0.9	0.2	0.5
Communications	3.3	2.7	2.0	-1.3	2.3	2.2	0.1	0.1
Utilities	3.3	-1.0	-0.2	4.5	4.0	2.6	0.1	1.4
Trade	3.0	0.8	0.6	1.6	5.4	1.7	0.1	3.6
FIRE	2.7	1.3	0.2	1.2	2.8	2.0	0.2	0.6
Other Services	0.6	0.5	0.7	-0.7	0.0	1.0	0.3	-1.3
Total	1.8	0.8	0.3	0.9	2.6	1.5	0.2	1.1

Source: Fund staff estimates.

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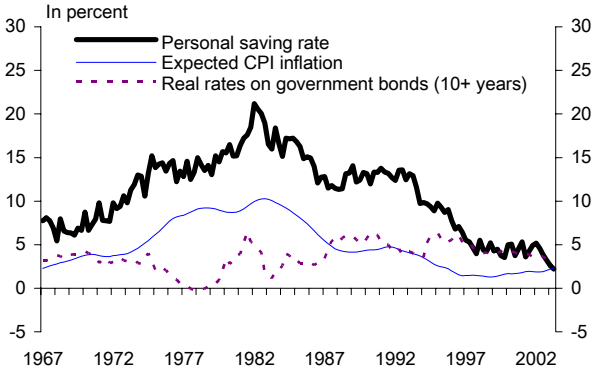
II. Canadian Household Saving—Developments and Risks[1]

1. ***The Canadian household saving rate has recently fallen to unusual lows.*** The saving rate remained in the range of around 5 percent during the 1997–2001 period, after having fallen steadily from its peak of just over 21 percent of disposable income in early 1982 (Figure 1). However, the saving rate plunged in late 2002 and 2003, dropping to a record-low of 1¼ percent in 2003Q2, and now stands below even the U.S. personal saving rate.

Figure 1. Saving, Interest Rates, and Inflation

Long-term gov't bond rates and 5-year avg. CPI inflation



Source: Haver Analytics.

2. ***The drop in the saving rate raises question about the prospects for household spending.*** The suddenness of the decline in the saving rate, especially over the past two quarters, suggests that future consumption could slow as households seek to return the saving rate to higher levels.

3. ***In order to address this question, this chapter examines the extent to which saving has fallen below levels consistent with long-run "fundamentals."*** An econometric model of the long-run relationship between the saving rate and household net worth, inflation, interest rates, and government spending is estimated. The results suggest that the secular decline in the saving rate since the early 1980s has reflected a response to the strength of macroeconomic policies in Canada, namely the improvement in the fiscal balance and the success in reducing inflation. However, the model is less successful in explaining the more recent decline and suggests that a saving rate consistent with economic fundamentals would be around 4½ percent, well above the present rate of 1¼ percent.

A. Trends in the Determinants of Household Saving[2]

4. ***The household saving rate is closely correlated with the expected inflation rate (Figure 1)***. From the mid-1960s to the late 1970s, the saving rate rose from around 5 percent to 15 percent, a period in which expected inflation rose from just over 2 percent to nearly 10 percent. The decline in expected inflation rate from the early 1980s to the very low levels achieved in the 1990s was also concurrent with a similar drop in the saving rate. However, as noted by Bérubé and Côté (2000), explanations for this correlation center on the fact that inflation tends to impart an upward bias to measured saving rates since incomes, as measured in the national accounts, include interest income, which tends to increase in nominal terms

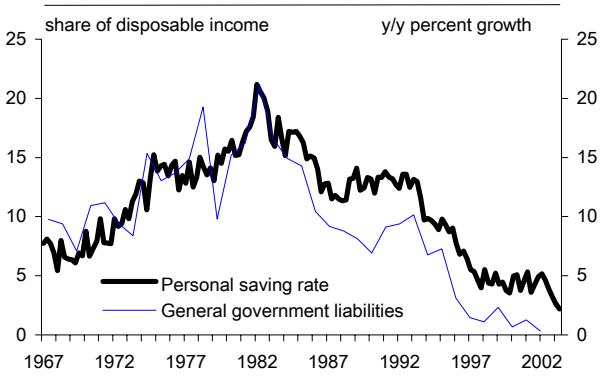
[1] Prepared by Christopher M. Faulkner-MacDonagh (WHD).

[2] See the data appendix for the definitions of the variables.

with inflation." In addition, risk-averse households may tend to boost their saving during periods of high inflation, in order to shield themselves from further inflationary shocks.[3]

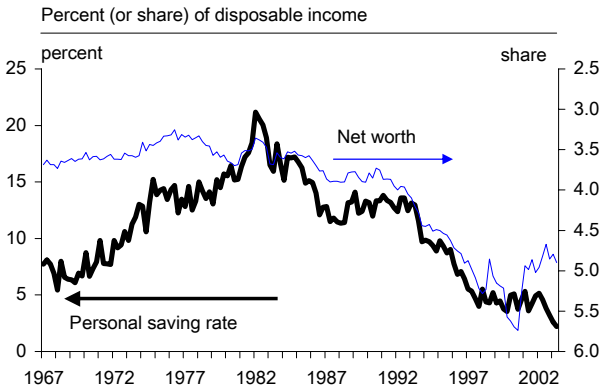
5. ***The Canadian personal saving rate also moves closely with the growth in gross government debt.*** The Canadian government ran persistent fiscal surpluses, averaging around 2¼ percent of GDP on a general government basis from 1962 to 1975. During the late 1970s and early 1980s, however, the budget swung to persistent deficits, averaging 3 percent of GDP. This deterioration in the fiscal position led to rapid debt growth, which was matched by a rise in the household saving rate (Figure 2). Similarly, the decline in the saving rate from its 1982 peak was matched by a marked improvement in the fiscal position, with the general government balance shifting from a deficit of 7 percent of GDP in 1985Q1 to a surplus of 3¾ percent in 2000Q3. The apparent inverse relationship between personal and public saving rates suggests that Canadian households are relatively "Ricardian" and increase their saving in periods of high fiscal deficits in order to prepare for expected future tax hikes.

Figure 2. Personal and Government Finances



Source: Haver Analytics.

Figure 3. Personal Saving and Net Worth



Source: Haver Analytics.

6. ***A strengthening of household balance sheets also appeared to have contributed to the drop in the saving rate during the 1990s (Figure 3).*** The ratio of household net worth to disposable income remained roughly stable from the late 1960s to the late 1980s averaging around 3½. Starting in the 1990s, this ratio rose sharply, peaking at around 5¾ during the equity market bubble in 2000Q1, before dropping back to an average of just under 5 in 2001Q2 to 2003Q2.

7. ***The rise in household net wealth resulted from a rapid increases in the value of household holdings of equities and land, which more than offset rising debt.*** Since 1990, real household net worth has grown by 58 percent, with most of the growth occurring during

[3] Revisions to the national accounts have also adjusted upward the estimate of income and saving, suggesting that the saving rate may be higher than currently reported. For example, staff at Statistics Canada has noted that the initial estimate of the 2000 saving rate was 3.2 percent; it has subsequently been revised to 4.6 percent.

the first half of the 1990s (Table 1). Increases in the holdings of equities and land accounted for around two-thirds of the growth in real wealth, despite accounting for only around one third of the total value of household wealth. Although household liabilities have also increased significantly since 1990, largely owing to the accumulation of mortgage debt during the early 1990s, real debt rose by only 50 percent during 1990-2003, much slower than the rise in assets (Table 1).

Table 1. Growth in Selected Components of the Household Balance Sheet

	1990-1995	1995-2003	1990-2003	1990	2003
	(percent growth)				
Net worth	80.1	25.1	58.2		
Assets	80.3	26.4	56.9		
	(contribution to growth)			(as share of total)	
Real estate	33.9	13.3	22.6	50.0	46.5
Residential structures	15.0	5.0	9.4	23.5	21.2
Land and other real estate	14.3	6.2	10.6	16.6	17.2
Other non-financial	4.6	2.1	2.6	10.0	8.1
Financial	46.3	13.0	34.2	50.0	53.5
Currency	11.7	3.9	8.5	10.3	12.3
Bonds and other holdings	9.6	-0.5	4.2	29.6	21.7
Equity	25.0	9.6	21.5	10.1	19.4
	(percent growth)				
Liabilities	81.0	31.8	51.4		
	(contribution to growth)			(as share of total)	
Mortgages	46.9	13.9	28.7	63.6	60.9
Other	34.1	17.9	22.6	36.4	39.1

Sources: Haver Analytics; and Fund staff calculations. Equity wealth are imputed (see appendix).

B. Determinants of the Canadian Personal Saving Rate

8. ***The household saving rate is typically viewed as being tied in the long run to household wealth and income.*** For example, the Permanent Income Hypothesis posits that household consumption and saving decisions reflect expected levels of permanent income and wealth.[4] Since saving (s_t) is income (y_t) less consumption, the saving rate should reflect the share of household net worth (nw_t) to income. This suggests the following long-run relationship:

$$\frac{s_t}{y_t} = c + \alpha \frac{nw_t}{y_t} + \varepsilon_t, \qquad (1)$$

where y_t is measured as personal disposable income.[5]

[4] The literature on consumption behavior, including with regard to the PIH, is reviewed in Attanasio (1999).

[5] Table 2 shows that the saving rate and net worth-income ratios both have a unit root (that is, they are I(1)), using either the Phillips-Perron test (Phillips and Perron, 1988) or the Augmented Dickey Fuller test (Said and Dickey, 1984). Both tests fail to reject the null hypothesis of a unit root at the 5 percent level. Because they are I(1), the Fully-Modified OLS (FM-OLS) estimation procedure in Microfit 4.1 is used to obtain the parameter estimates, similar to estimation used for the U.S. saving rate in Cerisola and De Masi (1999). The FM-OLS parameter estimates and standard errors are corrected to fix statistical problems (Phillips and Hansen, 1990).

9. ***The apparent close relationship between the saving and inflation, interest rates, and government fiscal policy suggests the following augmented equation:***

$$\frac{s_t}{y_t} = c + \alpha \frac{nw_t}{y_t} + x_t'\beta + u_t, \tag{2}$$

where x_t is a vector of additional, explanatory variables, including the real interest rate, the government fiscal balance as a percent of GDP, and the expected inflation rate. The inclusion of these additional variables can be justified by arguing that measured household net worth and income are imperfect proxies for household permanent income. The equation is estimated using the Phillips-Hanson Fully Modified Least Squares estimator, and a chi-squared test of the joint significance of the variables suggests that a broad model, which includes all the additional variables, fits the data well (Table 3, Column 5).[6]

Table 2. Unit Root Tests: Saving and Wealth

	ADF	Phillips-Perron
	Null hypothesis: data contain a unit root. (p-values in parentheses)	
Saving rate	-0.156	-0.164
	(0.939)	(0.938)
	lag=3	
Net worth: share of disposable income	-0.765	-0.912
	(0.824)	(0.781)
	lag=7	

Source: Fund staff estimates.
Lag lengths were selected using the Modified AIC.
One-sided p-values from MacKinnon (1996).

10. ***The estimates confirm the important role of household wealth (Table 3).*** Household net worth is highly statistically significant, regardless of which of the additional explanatory variables are included. However, the parameter estimates are not stable across regressions, suggesting that other variables beyond wealth are important determinants of the saving rate—especially monetary variables, such as expected inflation and interest rates.[7]

11. ***The fiscal deficit and inflation also are highly significant.*** In the broadest version of the equation, the coefficient on the deficit/GDP ratio is -0.36, suggesting that a 1 percentage point increase in the deficit ratio lowers the saving rate by this amount. This confirms the earlier conjecture that Canadian households have to some extent been Ricardian in their response to fiscal policy, insofar as they have tended to view an improvement in the general government fiscal position as having increased household net wealth. The expected inflation rate also exhibited a strong, positive correlation with the saving rate, entering with a coefficient that appears close to unity. Furthermore, the coefficients on the real interest rate

[6] An advantage of the FM-OLS approach is that it does not require knowledge of which, if any, of the variables in x_t are I(1) or I(0), and whether there are any cointegrating relationships.

[7] The low personal saving rate may also reflect a high level of *expected* wealth. Pichette and Tremblay (2003) construct such a measure and shows that it is important in determining consumption and saving patterns.

and expected inflation are statistically different from one another, suggesting that each plays an important, independent role.[8]

Table 3. Fully-Modified OLS Regressions

	(1)	(2)	(3)	(4)	(5)
Constant	**28.78**	**30.56**	**24.82**	3.52	**6.66**
	(1.94)	(2.79)	(1.61)	(2.34)	(1.98)
Net worth 1/	**-0.05**	**-0.03**	**-0.04**	**-0.01**	**-0.01**
	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
Government saving 2/			**-0.66**		**-0.36**
			(0.08)		(0.06)
Real long-term interest rates				**1.17**	**0.77**
				(0.16)	(0.14)
Expected inflation				**1.53**	**1.18**
				(0.12)	(0.11)
Access to credit 1/		-0.13			
		(0.08)			
Chi-squared 3/	87.99	63.59	194.42	411.29	660.92
Sample period: 1967Q1-2003Q2					

Source: Fund staff estimates. Standard errors in parentheses.
Bolded variables are significant at the 5 percent level.
1/ As a share of personal disposable income
2/ As a share of GDP
3/ Joint significance test of all of the variables in the regression

12. ***The results suggest that the current saving rate is well below its equilibrium level.*** The results from the model in Column 5 confirm the tight fit of a model in which household net worth, government saving, interest rates, and inflation expectations all influence saving behavior (Figure 4). However, the results also indicate that the recent decline in saving rate has been anomalous. The estimated equilibrium saving rate is 4.6 percent in 2003Q2— almost 2¼ percentage points higher than the actual saving rate in that quarter.

13. ***The estimates suggest that the decline in inflation expectations has had the largest role in the longer-run decline in the household saving rate.*** Figure 5 displays the effects of each of the variables on the saving rate. Inflation expectations fell from a peak of 10¼ percent in the early 1980s to 2¼ percent in 2003H1; this decline helped to lower saving rates by around 9½ percentage points. The swing in the fiscal balance from around -9 percent of GDP to around 1½ percent of GDP accounted for a 3¾ percentage point decline in the saving rate. Despite the significant correlation between the household net worth and the saving rate, net worth played a relatively minor role in explaining changes in the saving rate over the past 25 years, and in the past 10 years subtracted only around 1¼ percentage points from the saving rate.

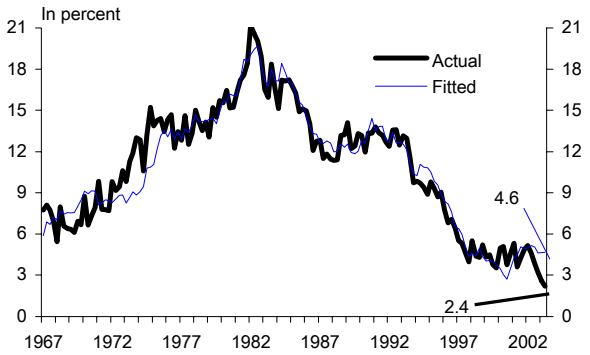
14. ***Surprisingly, improvements in household access to credit are not found to have had a significant impact on the saving rate.*** Similar to the results reported by Bérubé and Côté (2000), a simple model that includes just wealth and a measure of household access to credit (Table 3, Column 2) finds that credit measure is statistically insignificant. The decline in the chi-squared test statistic (from Column 1) also suggests that we could drop the variable from

[8] If the coefficients were not statistically different, then they could be combined into a single term that would merely reflect the impact of nominal interest rates on saving, with no independent role for expected inflation.

the regression. Moreover, regressions similar to those in Columns 3-5, which include the household access to credit term, also find that the credit term is statistically insignificant. However, regressions over the shorter sample starting in the early 1980s find that the household access to credit term is statistically significant, suggesting that financial innovation may have been an important factor in explaining the drop in the saving rate in the more recent period.

Figure 4. Long-Run Estimates of Saving

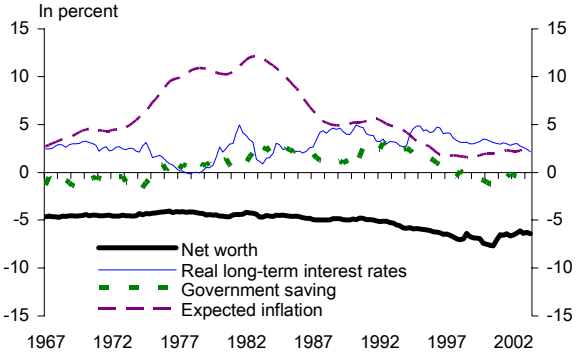
Actual and estimated values for the personal saving rate



Sources: Haver Analytics; Fund staff estimates.

Figure 5. Determinants of the Saving Rate

Contributions to the equilibrium saving rate, ex. constant term



Source: Fund staff estimates.

C. Conclusions

15. ***The results above suggest the following two conclusions:***

- ***The current saving rate appears well below its long-run equilibrium.*** The broadest model fits the data well although the errors—of almost 2¼ percentage points—in the past two quarters have been the largest in almost thirty years. The historical experience also suggests that the saving rate could return to its "equilibrium" relatively quickly.

- ***Both fiscal and monetary policies appear to have had significant effects on the saving rate in the long-run.*** Increases in the expected inflation rate—to the extent that it is not reflected in nominal interest rates—has been associated with higher saving and lower consumption. Similarly, past episodes of budget deficits had the effect of raising saving and dampening household demand.

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Data Sources

Expected inflation is measured using a five-year rolling average of CPI inflation.

Government saving is the ratio of general government saving (in the National Income and Expenditure Accounts) to GDP.

Household saving rates are taken from the National Income and Expenditure Accounts, which calculate saving as the difference between personal income and consumption.

Household access to credit is proxied by the total value of consumer credit outstanding, excluding mortgages (as a share of personal disposable income). Consumer credit (as opposed to mortgages) is typically not backed by a real asset, and increases in credit provisioning implies improved monitoring of default risk and credit pricing.

Real interest rates are defined as the nominal interest rate on 10-year government bonds less expected inflation.

Household net wealth: The *National Balance Sheet* (NBS) provides the basis for a detailed breakdown of the net wealth position of persons and unincorporated businesses. This chapter uses the NBS definitions for nonfinancial assets, non-equity financial assets, and total liabilities. All of the data are interpolated to a quarterly basis (prior to 1990) using the quarterly flow data to create a "synthetic" stock value; the difference between the synthetic stock value at the end of the year, and the actual EOP value of the data represents the valuation change. This valuation change is distributed, proportionate to the synthetic stocks, throughout the year. Finally, the data are seasonally adjusted using the additive X-12 routine in Eviews 4.1.

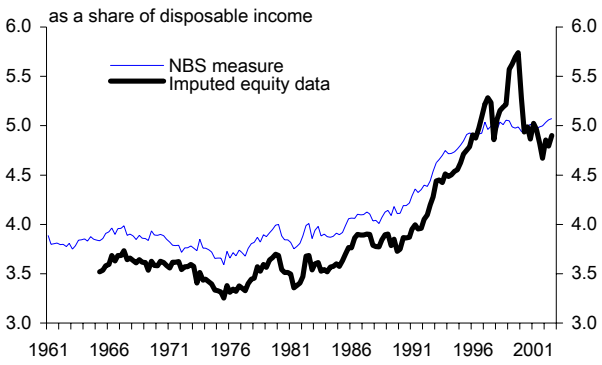
In addition, this chapter imputes the value of equity assets indirectly because of statistical problems in the NBS. The equity data (along with other securities) are currently estimated in the NBS as a residual from total assets, and as such, are close in definition to the book value. Because equity wealth rose sharply in the late 1990s, and subsequently fell, this chapter indirectly estimates the total value of equity assets held by households.

Household holdings of equity wealth are assumed to be a fraction of the overall market capitalization of the Toronto Stock Exchange (TSE). Using the NBS data, the fraction of household ownership of equities (at market value) is assumed to be the ratio of personal holdings of equities (in the NBS) to the total, economy-wide holdings of equities. This fraction is then multiplied by the total stock market capitalization (using data from 1965–2002) to arrive at a market-value measure of current household holdings of equities. For 2003, the quarterly growth in household holdings is assumed to match the growth of the TSE300 since end-2002.

Despite shortcomings, this imputation produces estimates of total net worth that more closely capture the trends during the late 1990s, when the saving rate began to decline (Figure 6). The NBS measure of net worth has been relatively smoother. In particular, the NBS data miss the sharp spike in equity values in 2000, which is captured in this new data.

Figure 6. Household Net Worth

From the National Balance Sheet and from equity-imputed data



Sources: Haver Analytics; Toronto Stock Exchange.

III. THE CANADIAN DOLLAR: BACK TO FUNDAMENTALS?[1]

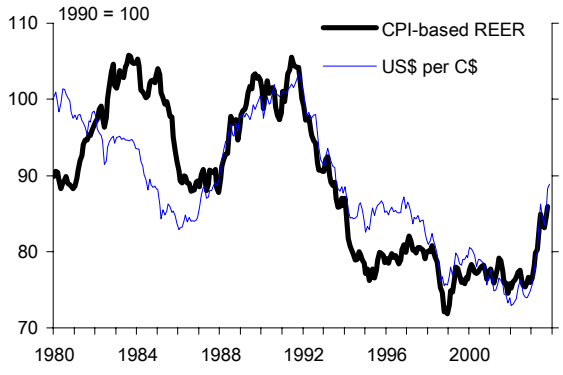
1. ***The Canadian dollar's appreciation during 2003 followed a protracted period of exchange rate weakness.*** In particular, from late 1991 to early 2002, the Canadian dollar fell by almost 35 percent in real effective terms and reached historical lows against the U.S. dollar, despite the economy's favorable fiscal and growth performance. The more recent appreciation of the Canadian currency—while unusually rapid—has only recouped roughly half of this earlier depreciation, which still leaves the dollar about 10 percent below its 1980–1991 average in real effective terms. Nonetheless, the recent appreciation has raised concern regarding the impact on the competitiveness of Canadian firms and short-term growth prospects.

2. ***These developments have underscored long-standing questions about where the Canadian dollar stands relative to underlying economic fundamentals.*** The analysis below suggests that while the dollar's slide during the 1990s was broadly consistent with a number of fundamentals—including commodity prices and productivity differentials—the dollar had fallen to levels that appeared somewhat undervalued. Estimates based on a modified purchasing power parity (PPP) framework suggest that the 2003 appreciation has brought the exchange rate more closely in line with fundamentals.

A. Recent Developments

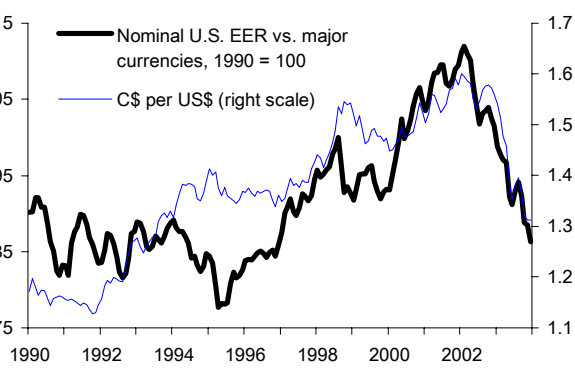
3. ***In 2003, the Canadian dollar appreciated sharply against the U.S. dollar and other major currencies***. The dollar rose to US$0.787 in early January 2004, a 25 percent increase since late 2002 (Figure 1). Within the space of only a year, the Canadian dollar has thus recouped almost 60 percent of a decade's worth of cumulative losses against the U.S. dollar.[2]

Figure 1. Real Effective Exchange Rate



Sources: Haver Analytics; and IMF's *Information Notice System*.

Figure 2. Nominal Exchange Rates



Sources: Haver Analytics; and IMF's *Information Notice System*.

[1] Prepared by Jaewoo Lee (RES) and Martin Mühleisen.

[2] The last major peak against the U.S. dollar was reached at $0.89 in October 1991.

These recent gains partly reflected the U.S. dollar's broader weakness against other major currencies (Figure 2). However, the Canadian dollar also increased in value relative to other major currencies during 2003 (with the exception of the euro), which translated into a 15 percent appreciation in real effective terms since early 2002.

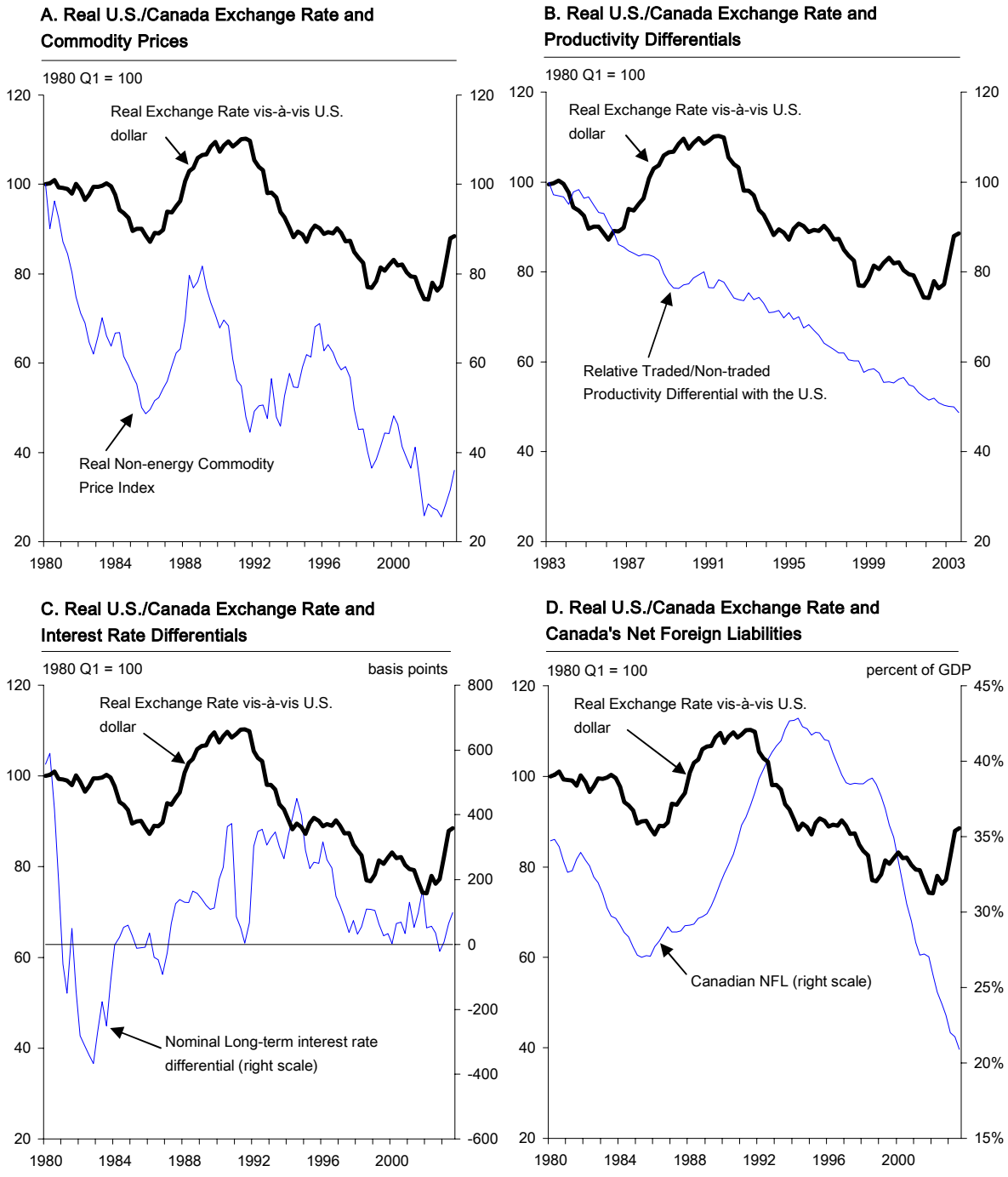
4. ***The Canadian dollar's weakness during the 1990s has been partly ascribed to the decline in global commodity prices*** (Figure 3). Empirical specifications have generally identified a strong short- to medium-run relationship between non-energy commodity prices and the dollar (Cerisola, Swagel, and Keenan, 1999; Gauthier and Tessier, 2002). The Canadian dollar is often termed a "commodity currency" along with the Australian and New Zealand dollars. This view has held despite evidence by Chen and Rogoff (2003) suggesting that the relationship between the Canadian dollar and commodity prices is not as strong as for the other two countries, and the fact that the share of commodities in Canadian exports has dropped from 45 percent in 1970 to about 30 percent in 2002.

5. ***Movements in interest rate differentials and net foreign liabilities have also favored a weaker exchange rate in recent years***. Fiscal consolidation, among other factors, contributed to a decline in long-term interest rates in Canada relative to the United States since the mid-1990s, which may have dampened the demand for Canadian securities by foreign investors. Moreover, a substantial increase in Canada's net foreign liabilities in the early 1990s, which led to higher external debt service costs for most of the 1990s, has only been reversed in recent years.

6. ***In addition, productivity differentials relative to the United States appear to have contributed to a long-term downward trend in the Canadian dollar***. The studies cited above uniformly identify the U.S./Canada productivity gap as a key factor in explaining the downward trend in the Canadian dollar over the past decade. Indeed, this productivity differential has meant that—despite the depreciation of the nominal exchange rate—the real exchange rate in the machinery and equipment manufacturing sector appreciated vis-à-vis U.S. competitors (Figure 4).[3] By contrast, higher productivity growth in the Canadian service sector has led to a depreciation of the sectoral real exchange rate in that sector.

[3] As explained more fully in Chapter 1 in this *Selected Issues* paper, the different classification of the IT producing sector required combining the manufacturing and electronic goods producing sector for the purpose of sectoral comparison. The strong productivity increase in this sector in the United States has driven the sharp appreciation of the sectoral real exchange rate.

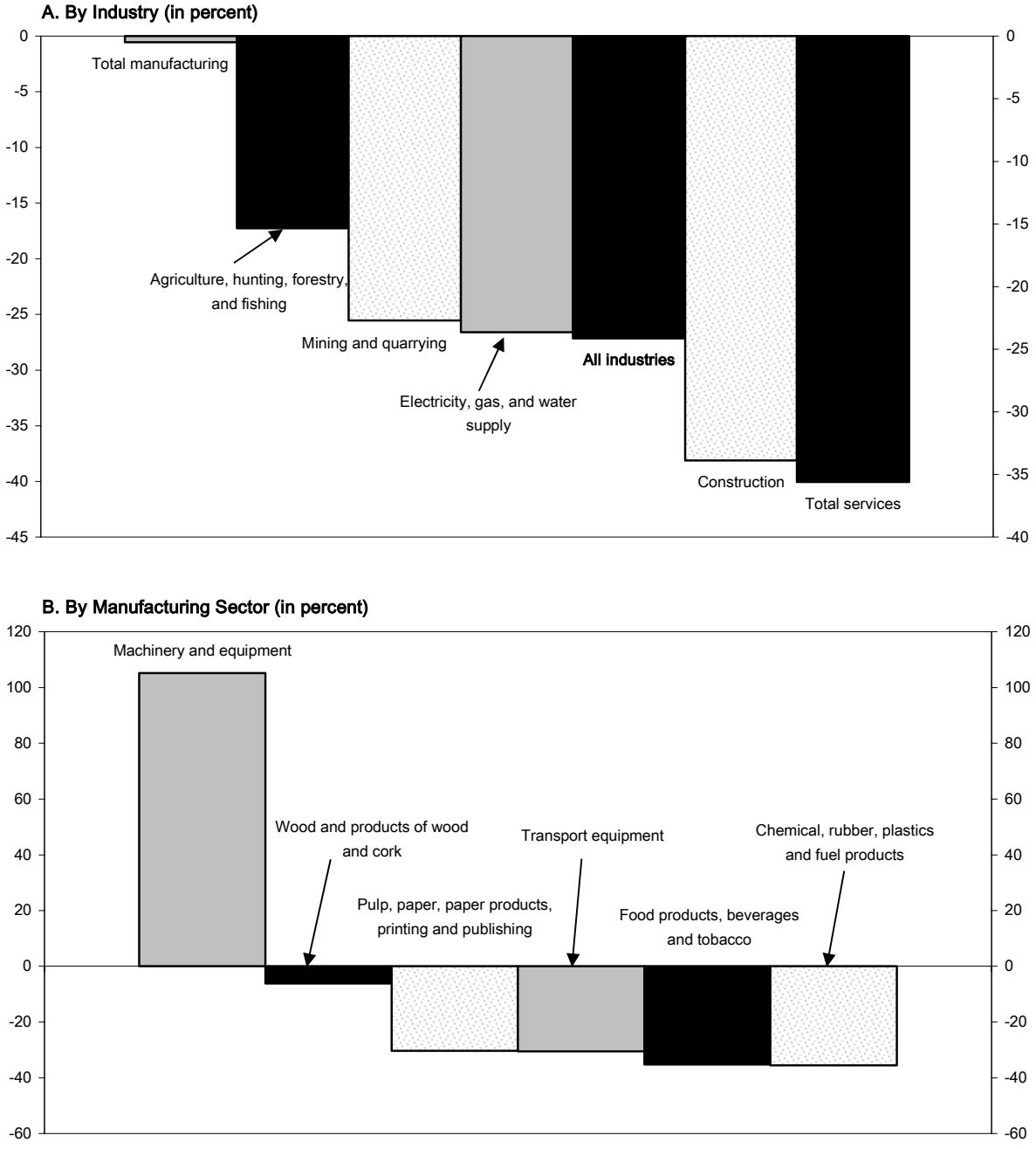
Figure 3. Real U.S./Canada Exchange Rate and Selected Variables, 1980 - 2003 1/



Sources: Haver Analytics; and Fund staff calculations.

1/ An increase in the RER implies an appreciation of the Canadian dollar against the U.S. dollar in real terms.

Figure 4. Canada vs. United States: Change in Sectoral Real Exchange Rates, 1990 - 2001 1/



Sources: OECD's Structural Analysis Database; and Fund staff calculations.

1/ An increase in the RER implies an appreciation of the Canadian dollar against the U.S. dollar in real terms.

B. Modeling Exchange Rate Fundamentals

7. ***To assess the contribution of economic fundamentals to the Canadian exchange rate, this paper turns to a model that incorporates recent refinements of the traditional Balassa-Samuelson approach***. The model is first cast in terms of the standard decomposition of the real exchange rate:

$$p - e - p^* = \left[(p - p_M) - (p^* - p_M^*) \right] + (p_M - e - p_M^*) \quad (1)$$

where p (p^*) denotes the log of domestic (foreign) aggregate price level, p_M (p_M*) denotes the log of domestic (foreign) traded goods price, and e denotes the log of the nominal exchange rate. The first bracketed term $[(p - p_M) - (p^* - p_M^*)]$ captures the differential in relative domestic prices between traded and nontraded goods, i.e., the traditional Balassa-Samuelson effect. The second term $(p_M - e - p_M^*)$ is the relative price between traded goods, which is the starting point of recent refinements.

8. ***The model traditionally assumes that nontraded goods are not subject to international arbitrage, and that strict PPP applies to traded goods***. In that case, the second term in the equation vanishes, and the long-term exchange rate is determined only by the relative price between traded and nontraded goods. The traded goods sector is typically characterized by higher productivity growth, which leads to a decline in production costs of traded goods relative to those of nontraded goods. In this framework, productivity gains cause the relative price of nontraded goods to rise, leading to an appreciation of the real exchange rate.

9. ***The traditional model has failed to hold up empirically, however***. Work by Rogoff (1996) and Engel (1999) finds that PPP fails to hold even for traded goods (i.e., the second term in the equation does not vanish) and that, in fact, changes in relative prices between traded goods account for the bulk of exchange rate fluctuations. These results led to work that augmented the traditional model with factors explaining changes in relative prices between traded goods.

10. ***More recent approaches have sought to augment the traditional PPP model to include explanations for price differentials among tradable goods.***[4] They relax the assumption that strict PPP holds for tradables, and allow for the fact that traded goods are imperfect substitutes, reflecting both physical characteristics and asymmetry of tastes. As the result, the relative price between traded goods—the second term in equation (1)—is affected by economic fundamentals that affect relative supplies and demand. In the framework put forward by Bayoumi, Faruqee, and Lee (2003), relative prices between traded goods are driven by three factors:

[4] Recent work on exchange rate determination includes, for example, Benigno and Thoenissen (2002), Lane and Milesi-Ferretti (2002), MacDonald and Ricci (2002), Chen and Rogoff (2003), and Lee (2004).

- ***Relative supply***. An increase in the relative productivity of the domestic traded goods sector contributes to a depreciation of the real exchange rate, as the resulting increase in the relative supply of traded goods can only be absorbed through a decline in relative traded goods prices. This effect, which is proxied empirically by the *difference between real manufacturing output at home and abroad (RYM)*, is separate from (and of opposite sign to) the Balassa-Samuelson effect based on the productivity differential between the traded and nontraded sector.

- ***Commodity prices***. A long-term increase in net commodity export revenues boosts the purchasing power of a country, thereby increasing the country's demand for the traded goods it produces.[5] Under imperfect substitutability between traded goods, this demand increase leads to an appreciation in the real exchange rate, owing to a rise in the price of traded goods produced by the country itself. Commodity effects are proxied by the *terms of trade (TOT)*, here calculated as the difference between prices of commodity exports and imports, scaled by the ratios of commodity exports and imports to manufacturing imports.

- ***Net foreign assets***. Similarly, an increase in the level of net foreign assets (and thus net income flows on foreign assets) will tend to lead to real exchange rate appreciation. In the estimation, *net income on foreign assets (NFA)* is captured by multiplying foreign assets and liabilities with the average rate of return for each country. The difference between receipts and payments, scaled to manufacturing imports, is the measure used in the estimation.

11. ***This conceptual framework leads to an exchange rate equation that includes the Balassa-Samuelson effect together with the three factors explaining the relative price of traded goods***. The estimated equation is of the following format:

$$REER_{it} = \beta_{oi} + \beta_1 TNT_{it} + \beta_2 RYM_{it} + \beta_3 TOT_{it} + \beta_4 NFA_{it} + u_{it} \qquad (2)$$

where *REER* refers to the CPI-based real effective exchange rate, *TNT* to the Balassa-Samuelson effect, and other variables are as defined in the preceding paragraph. Allowing for country-specific fixed effects, the equation was estimated for a group of 10 major currencies covering two decades worth of data. Estimates were obtained using panel dynamic OLS—a panel extension of the method proposed by Stock and Watson (1988) and advocated by Mark and Sul (2001) among others. This approach corrects for the finite sample bias generated by endogeneity among some of the variables, and provides corrected standard errors. The estimated parameters represent a co-integration relationship among non-stationary variables.

[5] This result assumes a (generalized) home bias that causes a relatively larger increase in demand for domestically produced goods in response to favorable income and other shocks (Lee, 2004).

C. Estimation Results and Assessment

12. ***The estimation results are largely as predicted by the theoretical model, but differ somewhat depending on which variable is used to capture the Balassa-Samuelson effect***. The literature suggests two alternative measures: (1) the ratio of the consumer price index (CPI) relative to the wholesale price index (WPI); and (2) the ratio of the GDP deflator to the manufacturing deflator. The first measure provides greater homogeneity in cross-country analysis, but the second measure may better reflect the domestic productivity differential.[6] Therefore, the model was estimated separately for each of the two variables. The results of both specifications are reported in Table 1.

Table 1. Long-Run Equation for the Real Effective Exchange Rate, 1980-2002

(Panel Data, N=10, T=23)

	CPI-based REER	Relative Deflators
Relative price of traded to non-traded goods:		
- Measured by ratio of CPI to WPI	1.10 (3.77)	
- Measured by ratio of GDP deflator to manufacturing deflator		0.45 (2.36)
Relative supply effect	-0.10 (-0.60)	-0.55 (-2.74)
Commodity price effect	0.72 (2.51)	0.78 (2.56)
Net income on foreign assets	0.77 (1.91)	1.10 (2.25)

Panel estimates based on Dynamic OLS estimator; corrected *t*-statistics are presented.

- ***When using the CPI/WPI ratio to capture the Balassa-Samuelson effect, the coefficient is close to one and statistically significant***. The coefficient for the relative supply effect is of the expected sign, but numerically small and statistically insignificant. By contrast, the coefficients on commodity prices and net income on external assets are significant and suggest that a one percent increase in either variable would, ceteris paribus, result in a 0.7–0.8 percent appreciation of the real exchange rate.

- ***The alternative specification affords greater weight to the relative supply effect***. The Balassa-Samuelson effect, as captured by the relative manufacturing deflator, is less than half the size compared to the first specification. On the other hand, the coefficient for relative manufacturing output is statistically significant and larger than the Balassa-Samuelson coefficient. Coefficients on commodity prices and net income on external assets are almost unchanged.

[6] It is common practice in the literature to use manufacturing output and prices to approximate those of traded goods.

13. ***The results indicate that productivity gaps and the Balassa-Samuelson effect appear to have been the dominant factor weighing on the Canadian exchange rate over the past decade***. Although the two estimated equations differ somewhat in the weights allocated to Balassa-Samuelson and relative supply effects, they suggest that these two productivity-related factors have driven the fundamental level of the exchange rate down over the past two decades (Figure 5). From a theoretical viewpoint, the results of the second specification are more intuitive, since they confirm the presence of a relative supply effect; are based on a better measure of the Balassa-Samuelson effect; and are consistent with the observed absolute improvements in Canadian productivity. Even in the second specification, however, the long underlying downward trend in exchange rate fundamentals caused by Balassa-Samuelson is clearly evident.

14. ***Although the contributions of commodity prices and net external income have been relatively minor in comparison, they have helped arrest the downward trend in recent years***. The drop in Canada's net foreign liabilities from the high level that emerged during 1985-1995 has reduced debt service costs and helped to return the current account balance into surplus, but this factor offset at most about a third of the impact of the Balassa-Samuelson effect. As for commodity prices, the contribution of the terms–of–trade effect explains a large share if not most of the 2003 increase in Canadian exchange rate fundamentals.

15. ***The results also suggest that the recent appreciation of the dollar has brought the exchange rate closer to underlying fundamentals***. Figure 6 plots the real effective exchange rate against the estimated trends that correspond to the two measures of the Balassa-Samuelson effect. Both charts suggest that the exchange rate had been considerably undervalued relative to fundamentals since the early 1990s, but that the gap has either closed or narrowed significantly in 2003. Indeed, with the model based largely on data through the first half of 2003, the appreciation of the exchange rate since then may have taken it above fundamentals.

Figure 5. Contributions to Changes in Real Effective Exchange Rate, 1980 - 2003

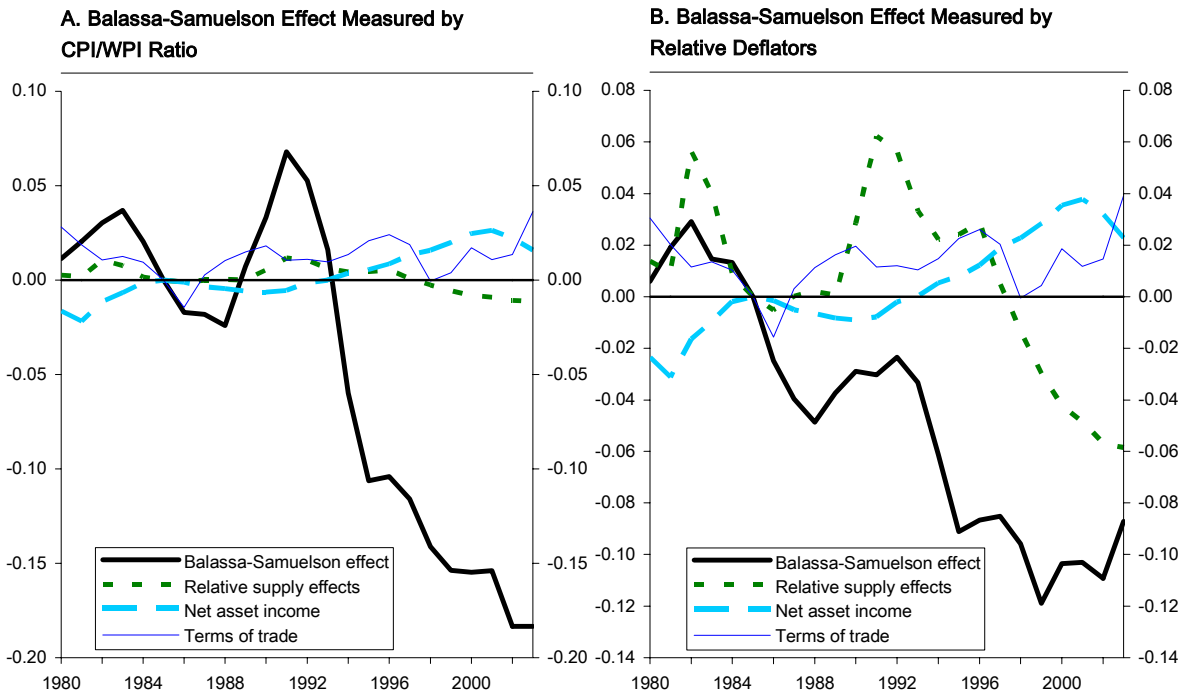
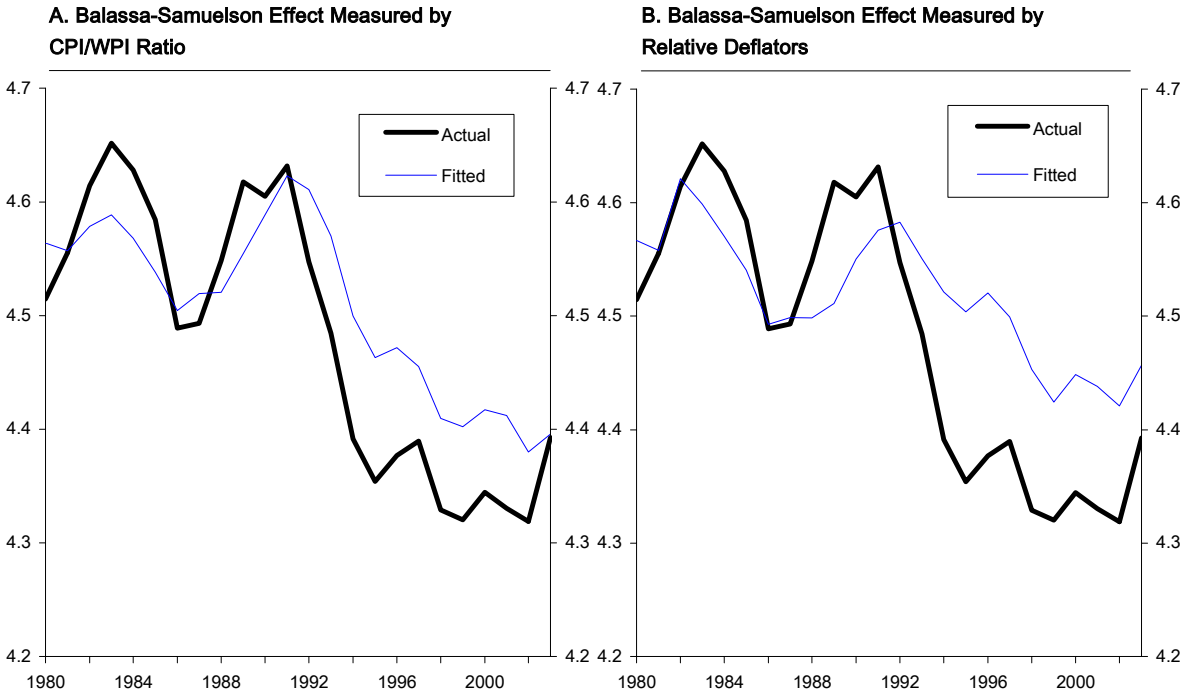


Figure 6. Actual and Fitted Real Effective Exchange Rates, 1980 - 2003



Source: Fund staff calculations.

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IV. The Information Content of Real Return Bonds[1]

1. ***Fiscal surpluses in Canada have raised new challenges for debt management.*** Since 1997, the government's commitment to prudent fiscal policy has led to a decline of $47 billion in the total outstanding market debt, about 10 percent of the total stock. With reduced financing needs expected over the medium term, Canadian authorities face the challenge of maintaining liquidity in nominal benchmark bonds, especially for longer-dated securities, without reducing the depth of other segments of its debt program.[2]

2. ***These considerations have led the government to initiate a review of its Real Return Bond (RRB) program.***[3] The objective of the review is to assess the value and demand of the program, its cost effectiveness, and its effects on investor diversification and financial market deepening. Given the original goals of the program, some observers have also drawn attention to its usefulness as a signal to the market of the government's anti-inflation stance, and as an instrument setting a market indicator of real returns and long-term inflation expectations.

3. ***Against this background, this chapter reviews the extent to which Canada's RRB program has provided useful information regarding inflation expectations and the transmission of domestic and international monetary shocks.*** Section A briefly describes the main features of Canada's RRB program and the development of the global market for sovereign real return bonds. Section B considers whether Canadian RRB yields provide useful proxies for market expectations of real returns and inflation expectations. Section C reviews the relationship between sovereign RRB yields and monetary policy for a sample of industrial countries, and section D analyses the responsiveness of monetary policy to changes in inflation expectations as measured by break-even inflation (BI) spreads.

A. Canada's Real Return Bond Program

4. ***Canada's RRB program began with the issue of 30-year bonds in December 1991***. Since then, the authorities have issued three new 30-year bonds at four-year intervals, and have reopened each of the existing issues several times. As of December 2003, total RRBs outstanding amounted to C$17 billion, or 4¼ percent of total marketable debt. RRBs are issued according to the

Table 1. RRB Gross Issuance 1/

Maturity date	Amount (in C$ M)	Coupon Rate (in percent)
Dec. 2021	5,175	4.25
Dec. 2026	5,250	4.25
Dec. 2031	5,800	4.00
Dec. 2036	800	3.00
Total	17,025	

Source: Bank of Canada.

1/ Excluding CPI adjustment.

[1] Prepared by Rodolfo Luzio.

[2] In addition to the drop in total net issue amounts, the February 2003 Budget announced that the target of the fixed-rate share of the debt would be reduced from two-thirds to 60 percent over the next five years.

[3] See the Government of Canada's Summer 2003 Consultation Document (Bank of Canada, 2003a).

government's quarterly funding schedule, with issue amounts of about C$300 million.

5. ***The design of Canada's RRBs is similar to those in other countries.*** RRBs are constructed in a manner that provides certainty regarding real returns at purchase, and all cash flows, both coupon and principal, are adjusted to accumulated consumer price inflation between the date of issuance and the date of payment. This structure allows the coupon and principal payments to be stripped as individual zero-coupon RRBs.

6. ***Canadian RRBs have been innovative in indexing bond returns to inflation.*** A key feature of Canadian instruments has been the use of an Index Ratio to adjust both principal and coupon to inflation for a given settlement date. This methodology simplifies the valuation of the instrument and the comparison of RRB and conventional yields. This approach has since been adopted by other countries, including Sweden, the United States, and France.

7. ***Traditionally, demand for RRBs has been largely concentrated among institutional investors such as pension funds and insurance companies***. The interest of these investors has reflected their need for a long-term inflation hedge, given that their liabilities typically are of a long-term nature and are linked to inflation. Since the annual inflation accretion on RRBs is treated as taxable income in the year it accrues, RRBs are also favored by tax-deferred investment plans.

8. ***More recently, interest in RRBs appears to have grown.*** The bid-coverage ratio for RRBs has recently been higher than for long-term nominal bonds, and the consistent decline of RRB yields following auctions has also suggested increased investor demand. Most of this interest appears to be concentrated in individual investors; the share of dealers' winnings at RRB auctions has been significantly lower than in nominal bond auctions, with investors winning about half of bids at RRB auctions. Part of the recent increase in the demand of RRBs is due to the trend of pension fund plan sponsors to recommend holding RRBs. There has been some additional increase in demand due to tactical trading, often from international participants. Strategic demand for RRBs is expected to continue growing as pension funds and other long-term funds increasingly use RRBs in order to match their long–term liabilities.

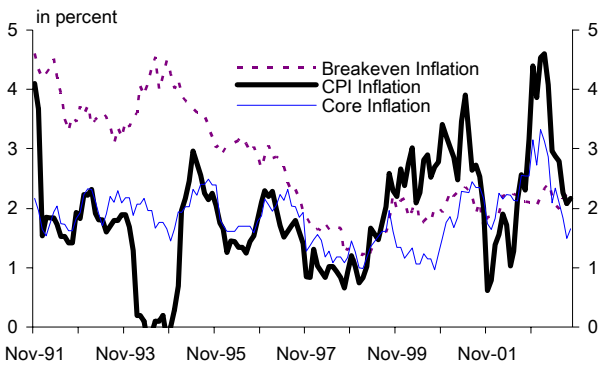
9. ***Secondary market activity has remained limited.*** The lower liquidity of RRBs is a result of the large share of buyers that hold RRBs to match long–term liabilities and the difficulty investment dealers face in hedging RRBs. Since the mid–1990s, secondary trading in RRBs has increased, although RRB turnover has modestly declined compared with nominal bonds.

10. ***RRBs have provided a cost-effective source of government funding***. From the inception of the program to the mid-1990s, actual inflation was significantly lower than the break-even inflation rate implied by nominal and RRB yields (Figure 1), implying that the nominal yield paid on these instruments was lower than on conventional bonds. The Bank of

Canada has estimated that the RRB program resulted in debt service savings of C$1.5 billion.[4] However, with the increased credibility of the authorities' inflation target, the break-even inflation rate implied by RRB yields has begun to closely match actual inflation, and the Bank of Canada estimates that RRBs would remain only marginally cost-effective relative to nominal bonds if future inflation remains close to the mid-point of the inflation target range.

Canadian RRB yields in the international context

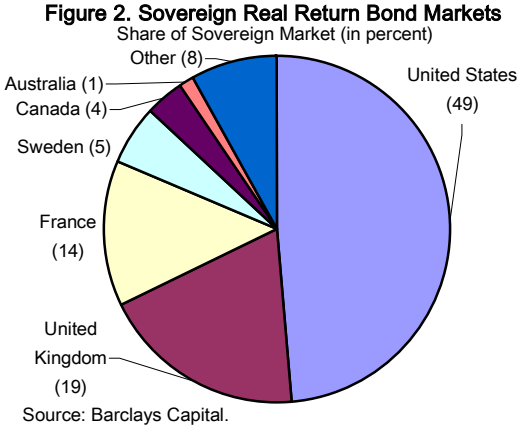
Figure 1. Breakeven Inflation and Actual Inflation



Source: Haver Analytics.

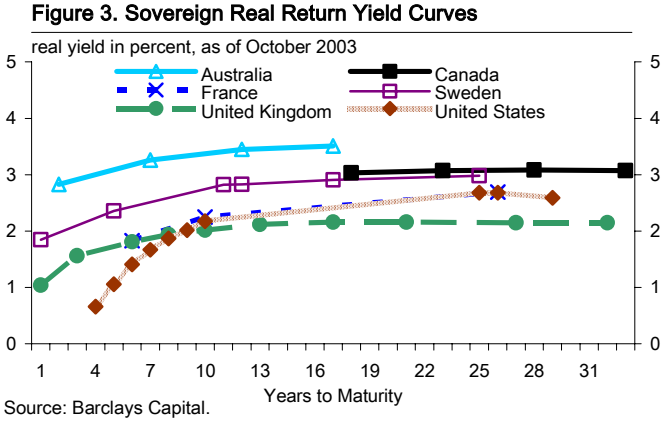
11. ***In the past decade, sovereign issuances of inflation-indexed bonds have experienced remarkable growth.*** Following the lead of the United Kingdom (1981), Australia (1985), Canada (1991) and Sweden (1994), new markets in developed economies have been established in the United States (1997), France (1998), and most recently Italy (2003). As a result, the total value outstanding surpassed $450 billion in 2003, nearly four times its size in 1997. The United States and United Kingdom are the two main issuers accounting for 68 percent of the market, with a large presence in the medium- and long-term range of the market (Figures 2 and 3). Because many major countries have very young markets and will continue to expand their market for inflation-indexed bonds toward a higher target, inflation-indexed bonds as a global asset class will continue to grow at a rapid pace for the next several years.[5]

Figure 2. Sovereign Real Return Bond Markets



Source: Barclays Capital.

Figure 3. Sovereign Real Return Yield Curves



Source: Barclays Capital.

[4] See Bank of Canada (2003a).

[5] The current size of the sovereign inflation-indexed bond market is about twice that of emerging market debt, and roughly equal size of global high yield, and European corporate bonds.

12. ***The growth of inflation-indexed instruments has enhanced the scope for diversification.*** The correlation of inflation-indexed returns with those of conventional bonds and equities are low or negative in most markets, enabling investors to improve the efficiency of their portfolios.[6] Also, inflation-indexed bonds are more correlated across markets than to domestic nominal bonds. With the rapid growth of sovereign inflation-indexed bond market, these bonds are increasingly considered as a separate and global asset class, and a separately designated part of the portfolios of global investors.

13. ***The structure and mechanics of inflation-indexed bonds is similar across countries, facilitating investors' understanding and pricing of these instruments across markets.*** The similarity in the structure of inflation-linked bonds reflects the fact that the real rate of return of these instruments must be known and fixed in advance. This feature makes this type of bonds the only instrument whose income flows are truly cost-of-living adjusted.

14. Nonetheless, differences do occur across markets:

- *Deflation protection*: Australia, France, and the United States offer a floor protection at par for the principal, whereas Canada and other markets do not.

- *Inflation lag*: All bond programs are linked to inflation with a lag, allowing time for the compilation of inflation statistics. In Canada, France, and the United States, this lag is three months, while the lag is eight months in the United Kingdom.

- *Inflation index*: Canada, the United States, and the United Kingdom use a non-seasonally-adjusted headline CPI for inflation adjustment, while France uses a CPI excluding tobacco prices.

- *Taxation*: Coupon income and principal appreciation are taxed as interest for most of the major issuing countries including Canada, either on an accrual or cash-flow basis. For the United Kingdom, however, coupons are taxed after adjusting for inflation. In France, principal appreciation is taxed as interest on an actuarial, smoothed basis.

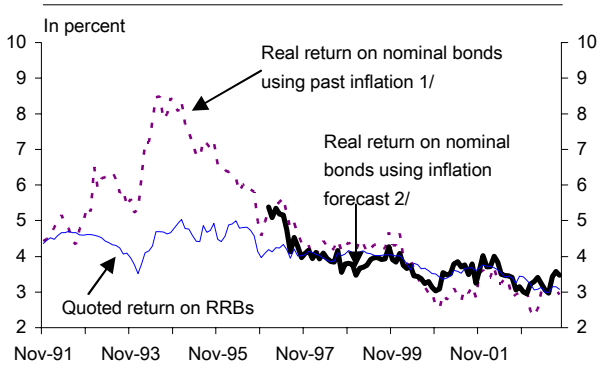
- *Coupon frequency*: Canada, the United States, and the United Kingdom pay coupons on a semi-annual basis, while Australia and France do so on a quarterly and annual basis, respectively.

[6] See Bridgewater (2002) for an efficient frontier analysis showing the degree to which inflation-linked (IL) bonds merit inclusion and that they tend to displace nominal bonds within a typical portfolio. Bodie (1990) shows how the introduction of IL bonds can improve portfolio efficiency, and why these instruments are the only hedge against long-run inflation risk.

B. The Information Content of Canadian RRBs

15. ***Canadian RRB yields have recently moved closely with proxies for real yields on conventional bonds*** (Figure 4). Prior to 1996, deviations were significant, possibly reflecting the evolving depth and liquidity in the RRB market and an inflation risk premium that may still have been attached to nominal bonds. Since this period, however, the real yield on nominal bonds—whether constructed by deflating by recent inflation or consensus forecasts for future inflation—has closely tracked RRB yields.

Figure 4. Real Bond Yields



Sources: Haver Analytics; and Fund staff calculations.
1/ Calculated as quoted nominal yield on benchmark 10-year bond less annualized inflation over past two years.
2/ Calculated as quoted nominal yield on benchmark 10-year bond less consensus forecast for inflation.

16. ***Several technical factors, however, may reduce the extent to which the quoted "real yield" on RRBs provides a market measure of real returns and inflation expectations***.[7]

- *Inflation-risk premiums*: Yields on nominal bonds may be driven upward by an inflation risk premium that is not required on RRBs, implying that spreads between nominal bonds and RRBs may provide an upwardly biased proxy for inflation expectations.[8]

- *Liquidity premium:* Conversely, if investors require a higher RRB yield to compensate for the relatively low liquidity of RRBs, the spread may be biased downward.[9]

- *Differences in duration:* Since coupon payments on RRBs rise with inflation, the cash-flow profile of RRBs and nominal bonds with the same maturity would differ.[10]

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[7] See for instance, Craig (2003), Sack (2002), Shen and Corning (2001), Emmons (2000), and Côté, Nelmes, and Whittingham (1996).

[8] Campbell and Shiller (1996) estimate that the risk-aversion premium is about ½ - 1 percentage point for the United Kingdom.

[9] Sack (2000) suggests using off-the-run long-term nominal securities which would have liquidity levels closer to inflation-indexed securities. On-the-run securities maintain high liquidity owing to their extensive use as hedging and other trading intensive investment activities.

[10] Sack (2000) derives a measure of inflation compensation based on a portfolio of zero-coupon securities constructed to match the back-loaded payments of inflation-linked securities. However, as demonstrated in that paper, the resulting measure differs only modestly from simple BI spreads.

- *Market segmentation:* Since RRBs are especially attractive to a particular class of investor with a stronger aversion to inflation uncertainty and possibly higher inflation expectations than the average market participant, RRB yields may be lower than otherwise, raising the BI spread and the implied inflation expectation.

17. ***Despite these technical factors, a simple regression analysis confirms that RRB yields appear to be reasonable proxies for the underlying real yield expectation in the nominal bond market.*** Table 2 summarizes regressions relating proxies for the real return on nominal bonds to RRB returns during the 1997–2003 period. Regardless of whether the real yield proxy is derived using actual past inflation or consensus inflation forecasts, the coefficient on the contemporaneous RRB yield is found to be significant and close to unity.[11]

Table 2. Canada: Regression of Inflation-Adjusted Nominal Bond Yields on RRB Yields

	Real Return on Nominal Bonds Using Consensus Inflation forecast 1/			Real Return on Nominal Bonds Using Past Inflation 2/		
	Coefficient		t-statistic	Coefficient		t-statistic
Constant	-1.10		-0.66	-0.94		-1.10
RRB Yield	1.16	**	3.61	1.33	*	2.38
Lagged RRB Yield 3/	-0.53		-0.57	-0.84		-1.46
Lagged Dependent Variable 3/	0.65		1.11	0.75	**	7.79
AR correction	0.62		0.85	-0.48		-1.34
MA correction	-0.36		-1.12	0.67	*	2.36
Adjusted R-squared	0.89			0.83		
Durbin-Watson stat	2.07			2.04		

Note: The Sample period is from January 1997 to November 2003. (*) denotes significance at the 5 % level and (**) at the 1 % level. ADF and Phillip-Peron unit root tests indicate that RRB and real yields are stationary. AR and MA corrections included to reduce the possibility of spurious correlation.

Source: Fund staff estimates.

1/ Calculated as quoted nominal yield on benchmark 10 year bond less annualized inflation over past two years.

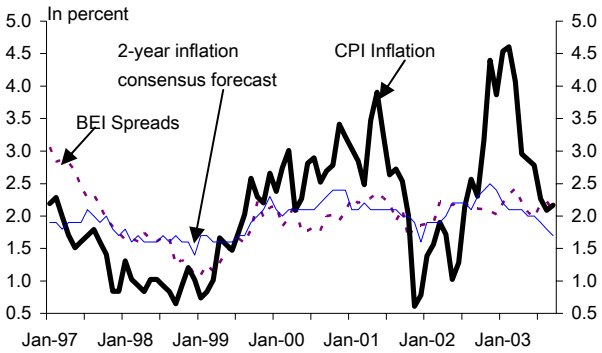
2/ Calculated as quoted nominal yield on benchmark 10 year bond less consensus forecast for inflation.

3/ Other lagged variables are not significant, and so not included.

[11] Interestingly, the results of regressions using real return proxies calculated with two year inflation forecasts suggest that lagged RRB yields are also significant but show an opposite sign.

18. ***Break-even inflation (BI) rates (implied by spreads between RRB and nominal yields) have tracked inflation forecasts more closely than actual CPI inflation*** (Figure 5.)[12] BI spreads have remained within the Bank of Canada's target range since 1997, with significantly lower volatility than inflation. Nonetheless, BI spreads have tended to be less stable than the two-year ahead consensus inflation forecast. The higher volatility of the BI spread would seem inconsistent with the 10-30 year maturity of the underlying instrument and the fact that the BI spread should reflect expectations of inflation over a longer horizon.

Figure 5. Breakeven Inflation Spreads and Inflation Expectations



Sources: Haver Analytics; and Fund staff calculations.

19. ***Despite a lack of correlation with actual inflation, BI rates appear to reflect forward looking inflation expectations.*** Using consensus forecasts as a proxy for inflation expectations, the first equation in Table 3 shows the results from a regression of changes in inflation expectations on changes in BI rates and past inflation. The coefficient on current and 3-month lagged changes in BI rates is significant with a positive sign, suggesting that a positive change in BI rates would translate in increasing inflation expectations. Similarly, the second equation in Table 3 uses the one-year ahead inflation forecast derived from monthly rolling regressions based on an AR inflation model over the period from January 1983 to November 2003, with the rolling forecast period starting in January 1997. BI rates with a one-period lag show again a positive and significant coefficient, indicating that BI rates would be a valuable instrument in gauging forward-looking expectations of inflation.

[12] Changes in BI rates show little useful information about actual inflation or inflation dynamics. A simple inflation AR model shows that BI rate add no information to inflation dynamics. Similarly, in the period from 1992 to November 2003, the presence of unit root for inflation can be rejected using both Phillips-Perron and Augmented Dickey-Fuller tests at a 5 percent confidence level, suggesting that long-term inflation is not significantly affected by short-term fluctuation in inflation.

Table 3. Inflation Forecast and Breakeven Inflation

	Inflation Consensus Forecast 1/			Inflation Forecast Using AR Model 2/	
Variables	Coefficient	t-statistic	**Variables**	Coefficient	t-statistic
Breakeven Inflation (-1) 3/	0.05	0.39	Breakeven Inflation (-1) 3/	0.22 **	2.21
Breakeven Inflation (-2)	-0.07	-0.61	Breakeven Inflation (-2)	-0.10	-0.84
Breakeven Inflation (-3)	0.47 **	4.31	Breakeven Inflation (-3)	0.01	0.15
Inflation (-1) 4/	-0.01	-0.25	Dependent Variable (-1)	1.04 **	9.48
Inflation (-2)	0.22 **	5.42	Dependent Variable (-2)	-0.56 **	-3.70
Inflation (-3)	0.13 **	2.98	Dependent Variable (-3)	0.39 **	3.72
MA Correction	0.17	1.41	MA Correction	-0.99 **	-77.33
Adj.R-squared	0.49		Adj.R-squared	0.29	
DW statistic	2.00		DW statistic	2.04	

Note : The sample period is from January 1997 to November 2003. All variables in the regressions are specified as first differences. ADF and Phillip-Peron unit root tests on the first differences of all variables indicate stationarity over the sample period. (*) denotes significance at the 5 % level and (**) at the 1 % level. (-1) means one-period lag

Source: Fund staff estimates.

1/ The dependent variable is calculated using 1-year ahead inflation consensus forecast.

2/ The dependent variable corresponds to the one-year ahead inflation forecast based on a AR inflation model over the period from January 1983 to November 2003. The inflation forecast is derived from rolling regressions over the sample period. The model uses 12-month price differences of the non-seasonally adjusted CPI.

3/ Breakeven inflation rates are caculated as the difference of the long-term benchmark nominal bond yields and RRB yields.

4/ The inflation rate corresponds to the 12- month difference of non-seasonally adjusted CPI.

C. What Effect Does Monetary Policy Have on Real Yields?

20. ***Economic theory is ambiguous regarding the extent to which monetary policy affects long-term real interest rates.*** At one extreme, some models argue that monetary policy is "super neutral" and has no impact on real activity or real interest rates. However, models that allow for frictions or incomplete markets show the effects of monetary policy through its effects on real interest rates. Empirical evidence has confirmed at least a short-run response of macro-economic variables to monetary policy shocks using vector autoregressive (VAR) models and data of many countries and across varied monetary regimes.[13]

21. ***This paper uses a simple VAR specification to model the response of RRB yields to short-term nominal rates for a sample of developed economies.***[14] The specification is similar to that used by Kahn, Kandel, and Sorig (2002) and consistent with the standard

[13] See Bagliano and Favero (1998) for an example.

[14] The econometric analysis below does not take into account the pricing implications of the structural differences across markets described in section A; neither does it make adjustments to account for the technical factors described in section B.

reference model used in the analysis of the monetary transmission mechanism. The model specification is as follows.

$$x_t = A(L)x_{t-1} + u_t$$

where x_t is a vector which includes the first difference of (i) log real GDP, (ii) log CPI, (iii) RRB yields, and (iv) short-term nominal rates, which are used as a proxy to monetary policy conditions; $A(L)$ is the standard lag operator; $u_t = Ce_t$ is the vector of residuals and C is the unique lower triangular decomposition of the covariance matrix of u_t.[15] A key identifying assumption is that the short-term nominal rates have no contemporaneous effect on other variables. Correspondingly, a triangular factorization of the residual matrix is imposed to be consistent with the assumption above.

22. ***The results indicate limited interaction between short-term rates and real yields, at least in the short run (Table 4).*** The estimated impact of short-term interest rates on RRB yields is not significant for any country in the sample, except for Australia (where the one-period lag is significant at the 10% level). Conversely, the coefficients in the short-term rate regression are found to be significant for Sweden, the United Kingdom, and the United States, suggesting that changes in short-term rates reflect changes in RRB rates.[16] Nonetheless, Granger causality tests show that neither RRB yields nor short-term rates can be treated as exogenous variables, indicating the absence of one-directional causality between real yields and short-term rates.

[15] We use various measures of short-term rates including central bank interest rate target rates, one-month and three-month sovereign bonds, but found no material differences on the results.

[16] It remains difficult to explain what type of information RRB yields would contain that would affect short-term rates after controlling for inflation and output growth, given the little dynamic interaction between RRB yields and inflation and output growth in the short run

Table 4. Coefficient Estimates in Basic VAR Model Including RRB Yields

	Australia		Canada		Sweden		United Kingdom		United States	
	RRB Yield	ST Rate	RRB Yield	ST Rate	RRB Yield	ST Rate	RRB Yield	ST Rate	RRB Yield	ST Rate
GDP Growth (-1)	0.01	0.07	0.01	-0.01	0.01	-0.05	-0.11	0.02	0.02	0.05 *
	0.21	*1.14*	*0.30*	*-0.29*	*0.19*	*-0.66*	*-0.95*	*0.08*	*0.79*	*1.62*
GDP Growth (-2)	-0.07	-0.21 ***	0.02	0.05	-0.01	0.01	0.21	0.16	0.00	0.03
	-1.03	*-2.53*	*0.81*	*1.00*	*-0.13*	*0.04*	*1.12*	*0.44*	*-0.11*	*0.90*
GDP Growth (-3)	0.05	0.17 ***	-0.03 *	0.04	0.00	0.05	-0.06	-0.06	-0.02	0.07 **
	1.14	*3.40*	*-1.63*	*0.89*	*0.07*	*0.74*	*-0.51*	*-0.25*	*-0.91*	*1.98*
CPI Inflation (-1)	-0.06	0.12 **	-0.05 **	-0.04	0.01	-0.01	-0.02	0.12	-0.05	0.05
	-1.14	*1.84*	*-1.90*	*-0.74*	*1.13*	*-0.51*	*-0.45*	*1.18*	*-0.95*	*0.66*
CPI Inflation (-2)	0.16 **	0.02	0.01	0.05	-0.01 *	0.02 *	-0.03	-0.22 *	0.04	0.07
	1.73	*0.15*	*0.42*	*0.74*	*-1.35*	*1.41*	*-0.43*	*-1.54*	*0.45*	*0.59*
CPI Inflation (-3)	-0.11 **	-0.09 *	0.01	-0.07 *	0.00	0.02 *	0.08 *	0.05	-0.02	0.04
	-2.00	*-1.43*	*0.51*	*-1.38*	*0.51*	*1.65*	*1.34*	*0.41*	*-0.37*	*0.39*
RRB Yield (-1)	1.08 ***	0.10	0.97 ***	-0.27	1.41 ***	0.29 *	1.01 ***	0.49 **	0.97 ***	0.35 **
	8.51	*0.65*	*7.97*	*-0.95*	*9.56*	*1.48*	*7.88*	*1.96*	*6.74*	*1.70*
RRB Yield (-2)	-0.15	-0.12	-0.10	-0.10	-0.54 **	-0.55 **	-0.26 *	-0.65 **	-0.37 **	0.31
	-0.79	*-0.51*	*-0.60*	*-0.26*	*-2.26*	*-1.70*	*-1.48*	*-1.87*	*-1.82*	*1.07*
RRB Yield (-3)	-0.03	0.20	0.06	0.34	0.05	0.44 **	0.22 **	0.25	0.30 **	-0.06
	-0.21	*1.11*	*0.49*	*1.12*	*0.36*	*2.14*	*1.75*	*1.04*	*1.73*	*-0.23*
ST Rate (-1)	-0.15 *	1.19 ***	0.00	1.01 ***	0.06	1.24 ***	-0.01	1.06 ***	0.05	0.86 ***
	-1.48	*9.79*	*-0.04*	*8.00*	*0.63*	*9.77*	*-0.20*	*7.88*	*0.49*	*6.01*
ST Rate (-2)	0.11	-0.20	-0.02	0.04	-0.14	-0.37 **	0.03	0.05	0.00	-0.26 *
	0.69	*-1.01*	*-0.20*	*0.19*	*-0.92*	*-1.85*	*0.26*	*0.26*	*-0.02*	*-1.38*
ST Rate (-3)	0.01	-0.16 *	0.04	-0.13	0.03	0.11	-0.08	-0.16	0.00	0.16 *
	0.07	*-1.31*	*0.78*	*-1.13*	*0.29*	*0.90*	*-1.09*	*-1.17*	*-0.04*	*1.31*
Constant	0.58 *	-0.07	0.23	0.28	0.50 **	-0.70 **	0.26 ***	-0.14	0.30	-2.09 ***
	1.50	*-0.15*	*1.07*	*0.55*	*1.89*	*-2.00*	*2.72*	*-0.75*	*0.88*	*-4.36*
Adj. R-squared	0.91	0.96	0.95	0.97	0.91	0.93	0.97	0.97	0.94	0.99

Note: The estimates shown are of a fully recursive VAR model with the following variables: 12-month GDP growth; 12-month CPI inflation; RRB rate of return, 3-month treasury bill yields. The table omits the estimates for GDP growth and CPI inflation equations since they are not relevant to the analysis. (***) denotes significance at 1 percent level, (**) at the 5 percent, and (*) at the 10 percent. The sample period is from January 1997 to September 2003. (-1) denotes the lag of the variable. The numbers in italics are estimated t-statistics.

Source: Fund staff estimates.

23. ***Impulse response function estimates from the VAR system also show a weak response of real yields to short-term rates.*** For most countries in the sample, a one standard deviation increase in short-term rates leads to a small drop in RRB yields, but the effect remains insignificant. Hence, RRB yields appear to be largely invariant to current monetary conditions.

D. Do Break-Even Inflation Spreads Affect Short-Term Interest Rates?

24. ***Break-even inflation spreads are often used as a measure of inflation expectation by markets and policymakers.*** The analysis above illustrates that BI spreads provide a relatively weak predictor of inflation, but do offer a useful (if imperfect) signal of inflation expectations. Unsurprisingly, therefore, the Bank of Canada lists the spread between nominal and real return bonds as one of its indicators of inflation expectations, and these spreads are

often used for similar purposes in other countries. This raises the question of how central banks and short-term interest rates have responded to changes in BI spreads.

25. ***VAR analysis suggests that changes in BI spreads have had only a limited effect on short-term rates in most countries.***[17] The VAR specification is similar to the one described in the previous section and assumes that BI spreads have no contemporaneous effects on output or inflation. Table 5 shows only the coefficient estimates for the specification of BI spreads and short-term rates as dependent variables. Focusing on the effect on short-term rates, the coefficients on BI spreads are found significant at a 5 percent level only for Australia and the United Kingdom, both with positive lagged coefficients. The results suggest that BI spreads do not appear to contain information that could significantly impact policy-related interest rates. Conversely, however, short-term rates enter as significant and negatively in the equation explaining BI spreads in Canada, Sweden, and the United States with negative coefficients. This finding would indicate that changes in monetary conditions affect inflation expectations, as proxied by BI spreads, although the effect appears to be temporary and fully dissipates after few months.

26. ***Impulse response functions indicate a positive, but weakly significant and only temporary, reaction of short-term rates to BI spread innovations*** (Figure 6). The evidence is weakest for Canada, where the reaction of short-term rates to an innovation in BI spreads is muted. The dynamic responses for other countries are stronger, and appear to peak in the first quarter following the shock. The reaction of short-term rates is strongest for Sweden and the United Kingdom, where a 1 percentage change in BI spread would lead to about ½ and ¼ percentage change in short-term rates, respectively. Nonetheless, the effect of the innovations dies out within the second quarter for all countries.

E. Concluding Remarks

27. ***This chapter reviews the institutional aspects of Canada's RRB program draws three empirical conclusions.*** First, yields on RRBs appear to provide some useful information regarding market expectations of real yields and inflation. Second, RRB yields are largely invariant to current monetary conditions. Third, monetary policy makers do not appear to respond to BI spreads in setting short-term interest rates with short-term rates responding weakly and only temporarily to changes in BI spreads.

[17] This analysis supports findings by Sack (2000) and Kahn, Kandel, and Sarig (2002) on the effect of BI spreads on past policy actions and its implications for short-term rates.

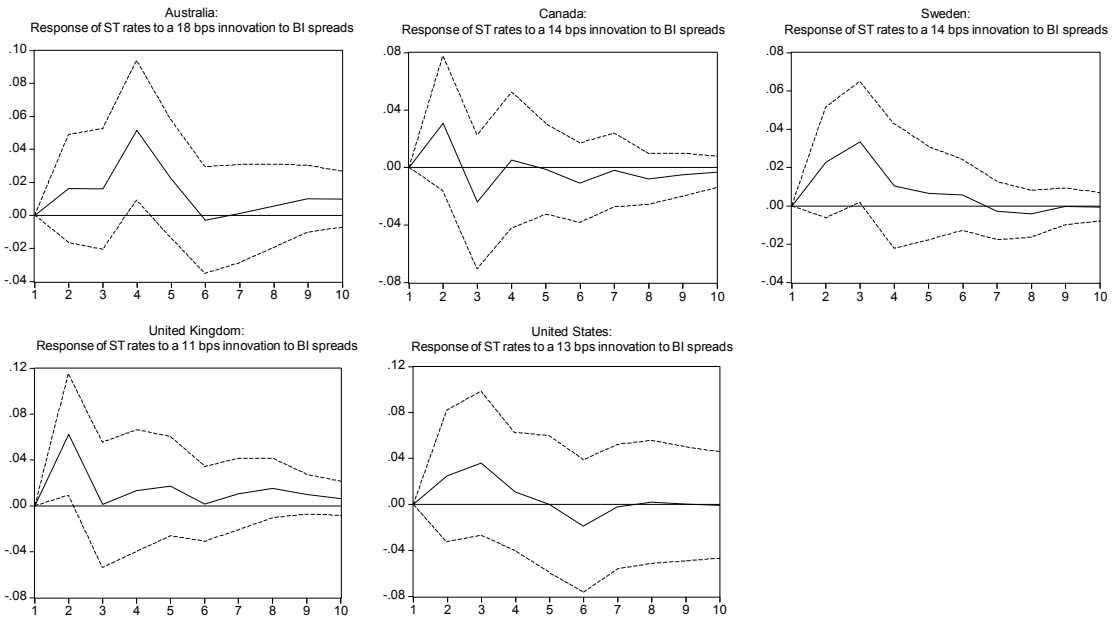
Table 5. Coefficient Estimates in Basic VAR Model Including BI Spreads

	Australia		Canada		Sweden		United Kingdom		United States	
	ST Rate	BI Spread	ST Rate	BI Spread	ST Rate	BI Spread	ST Rate	BI Spread	ST Rate	BI Spread
GDP Growth (-1)	0.01	0.01	0.01	0.03	-0.01	-0.09 *	0.03	0.00	0.06 *	0.01
	0.34	*0.20*	*0.27*	*1.17*	*-0.10*	*-1.47*	*0.37*	*0.03*	*1.54*	*0.58*
GDP Growth (-2)	-0.12 ***	-0.03	0.06 *	0.01	0.07	0.06	0.04	-0.04	0.08 **	0.02
	-3.18	*-0.52*	*1.41*	*0.42*	*1.15*	*0.83*	*0.38*	*-0.79*	*2.00*	*0.72*
GDP Growth (-3)	0.13 ***	0.04	0.06 *	-0.01	0.00	-0.04	0.32 **	-0.01	0.13 ***	0.03 *
	2.80	*0.55*	*1.41*	*-0.43*	*-0.04*	*-0.52*	*1.85*	*-0.13*	*3.70*	*1.33*
CPI Inflation (-1)	0.10 *	0.06	-0.02	0.06 **	-0.01	-0.01	0.19 **	0.02	0.16 *	0.03
	1.54	*0.59*	*-0.28*	*1.71*	*-0.86*	*-0.50*	*1.95*	*0.38*	*1.55*	*0.35*
CPI Inflation (-2)	0.04	0.00	0.06	0.09 ***	0.00	0.01	-0.03	0.06	0.12 *	0.00
	0.48	*-0.03*	*1.20*	*2.68*	*-0.28*	*0.59*	*-0.30*	*1.09*	*1.29*	*-0.04*
CPI Inflation (-3)	-0.01	0.04	-0.01	0.05	0.01	0.02 **	-0.08	0.08 *	0.07	0.05
	-0.14	*0.39*	*-0.11*	*1.24*	*0.95*	*1.69*	*-0.75*	*1.46*	*0.68*	*0.61*
ST Rate (-1)	0.45 ***	0.05	0.23 **	-0.17 **	0.40 ***	-0.05	0.11	-0.09	0.24 **	-0.22 **
	3.54	*0.26*	*1.75*	*-2.01*	*3.09*	*-0.37*	*0.83*	*-1.28*	*1.74*	*-2.24*
ST Rate (-2)	0.02	0.08	0.34 ***	0.18	-0.03	0.09	0.22 *	-0.01	-0.04	0.09
	0.14	*0.44*	*2.49*	*0.20*	*-0.24*	*0.56*	*1.59*	*-0.10*	*-0.27*	*0.84*
ST Rate (-3)	-0.12	-0.29 **	-0.06	-0.19 **	0.00	-0.29 **	-0.01	-0.14 **	0.18	-0.01
	-0.96	*-1.67*	*-0.42*	*-2.11*	*-0.03*	*-2.02*	*-0.11*	*-1.95*	*1.25*	*-0.12*
BI Spread (-1)	0.09	0.20 *	0.25 *	0.08	0.17 *	0.20 **	0.55 ***	0.26 **	0.20	1.18
	0.99	*1.49*	*1.30*	*0.66*	*1.58*	*1.67*	*2.38*	*2.04*	*0.87*	*7.33*
BI Spread (-2)	0.02	-0.12	-0.26 *	-0.18 *	0.14 *	-0.21 **	-0.21	-0.27 **	-0.08	-0.31 *
	0.20	*-0.93*	*-1.44*	*-1.47*	*1.41*	*-1.86*	*-0.90*	*-2.11*	*-0.25*	*-1.33*
BI Spread (-3)	0.27 ***	0.19 *	0.07	0.25 **	-0.02	0.32 ***	0.25	0.19 *	-0.15	0.01
	2.88	*1.39*	*0.39*	*2.18*	*-0.22*	*2.77*	*1.13*	*1.57*	*-0.63*	*0.09*
Adj. R-squared	0.51	0.13	0.32	0.33	0.31	0.32	0.30	0.25	0.44	0.79

Note: The estimates shown are of a fully recursive VAR model with the following variables: 12-month GDP growth; 12-month CPI inflation; breakeven inflation spreads using long-term benchmark nominal bond yields and long-term inflation-linked bond yields, 3-month treasury bill yields. All variables in the VAR estimation are specified as first differences. The table omits the estimates for GDP growth and CPI inflation equations since they are not relevant to the analysis. (***) denotes significance at 1 percent level, (**) at the 5 percent, and (*) at the 10 percent. The sample period is from January 1997 to September 2003. (-1) denotes a one-period lag. The numbers in italics are estimated t-statistics.

Source: Fund staff estimates.

Figure 6. Impulse Response Functions to BI Spread Innovations



Source: Fund staff estimates.

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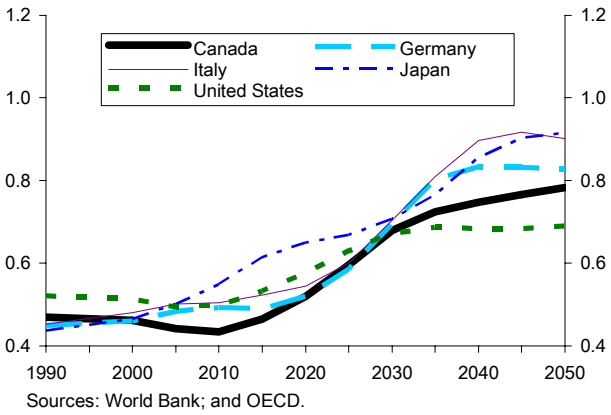
V. Canada's Pension System: Status and Reform Options[1]

1. ***Canada has a comprehensive three-pillared pension system*** (Box 1). The public pillars consist of an old-age security benefit, financed through the federal budget, and the Canada Pension Plan, which is funded partly by employer/employee contributions, and partly by the returns on accumulated trust fund assets.[2] The private pillar of the system consists of corporate pension plans and individual savings plans.

2. ***The Canadian system provides a successful model for pension reform, but challenges remain.*** As a result of a series of reforms introduced since the mid-1980s, most elderly Canadians at the low- to middle-income level are provided with the means to broadly maintain living standards in retirement. At the same time, public pension benefits remain relatively modest, providing an incentive for middle- to high-income households to accumulate sufficient assets to fund their retirement. With the retirement of the baby boom generation expected to begin at the end of the decade (Figure 1), this paper discusses the state of the Canadian pension system and explores the scope for further policy action. Among other issues, the paper touches on the role of private saving vehicles, governance of corporate pension plans, incentives for labor market participation of elderly workers, and trends in public pension benefit levels.

Figure 1. Old-Age Dependency Ratios in Selected G7 Countries



Sources: World Bank; and OECD.

A. The Public Pension System and Issues

Old-Age Security

3. ***The Old-Age Security (OAS) system is targeted mainly at lower-income seniors***. The OAS was initially provided as an universal retirement benefit, with additional benefits provided through the attached Guaranteed Income Supplement (GIS) from 1967 and Spouse's Allowance (SPA) from 1975 (see Box 1). However, fiscal pressures prompted some cutbacks in the mid-1980s, including through the partial deindexation of income tax brackets, exemptions, and deductions that increasingly brought lower-income seniors into the tax net (but have since been reversed). Moreover, maximum pension levels have remained frozen in real terms since 1984, and means-tests (or "clawbacks") for OAS benefits were introduced for higher-income retirees in 1989, which effectively ended the universality of public pension benefits. These measures

[1] Prepared by Martin Mühleisen.

[2] Residents of the province of Quebec are covered by the separate Québec Pension Plan (see below).

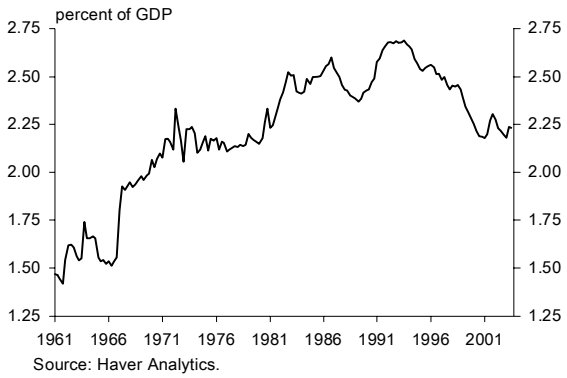
Box 1. Canada's Three-Tiered Pension System

- ***The first tier consists of universal basic pension benefits financed through the federal budget***. They include **Old-age Security** (OAS); the **Guaranteed Income Supplement** (GIS); and **Spouse's Allowance** (SPA) for 60-64 year old spouses (the term OAS is also often used to refer to the three benefits together). In total, these benefits provide a maximum income of about C$12,000 per year, which is indexed every three months to the consumer price index. These benefits are taxable, but retirees also receive an age-related tax credit. GIS and SPA benefits are tax-free, but are reduced ("clawed back") by 50 cents and 75 cents for every dollar of other income, respectively, which makes the benefit structure highly progressive. Finally, retirees receive a tax credit worth around C$1,000, which is reduced for higher-income seniors, and half of all provinces provide additional income supplements to seniors with low incomes.
- ***The second tier is formed by the Canada Pension Plan (CPP), a compulsory pension plan covering all employed and self-employed Canadians***. Premiums are split equally between employers and employees (self-employed pay both parts). The maximum CPP benefit roughly equals one quarter of the past five years' average industrial wage; survivor, disability, and death benefits are also provided. Benefits are indexed to the CPI and fully taxable. The CPP is a joint federal-provincial program, with changes requiring the agreement of two-thirds of the provinces carrying two-thirds of the population.
- ***The third tier comprises the private pension system, much of which receives favorable tax treatment***. These include corporate pension plans (**Registered Pension Plans**; or RPPs) and individual retirement savings vehicles (**Registered Retirement Savings Plans**, or RRSPs). The income tax system provides tax deductions for contributions to RPPs and RRSPs, and although only about a third of the workforce are covered by RPPs, survey results suggest that some 71 percent of households had either RPP or RRSP assets in 1999. Benefits are fully taxable, except for a C$1,000 private pension exemption..

caused benefits to drop in real terms for all but the poorest seniors, and placed government spending on old-age security on a downward trend relative to GDP since 1994 (Figure 2).[3]

4. ***However, the means tests have come under criticism***. In particular, OAS benefits are tested against personal income only, which raises questions about horizontal equity, given the advantage the system provides to retirees with working spouses. The sharp clawback rate of GIS and SPA benefits and the progressive nature of the old-age income tax credit imply relatively large marginal disincentives to work. Finally, the existence of a large number of tax credits and benefits, with different clawback rates, has been viewed as unnecessarily cumbersome and complex.

Figure 2. Government Spending on Old-Age Pensions



Source: Haver Analytics.

[3] For a discussion, see Hoffman and Dahlby (2001) and Battle (2003).

5. ***The last attempt at reforming the OAS system in 1996 failed in the face of widespread political opposition***. In 1995 and 1996, the government proposed a "Seniors Benefit" that would combine OAS, GIS, and age and pension income tax credits. This benefit would have been tested against full family income and clawback rates would have been even more progressive than for existing benefits. Taking into account changes in the tax system that were also envisaged, the plan was not expected to have had a significant immediate impact on retirement incomes, but would have produced considerable savings over time. However, as a result of strong political opposition, a lessening of fiscal pressures owing to improving government finances, and a successful CPP reform, the proposal was withdrawn in 1998 (Battle, 2003).

Canada Pension Plan

6. ***Successful implementation of a 1998 reform plan has put the Canada Pension Plan (CPP) on a sound actuarial footing***. Prior to the reforms, it was expected that the combined employer/employee contribution rate would need to rise from 5.6 percent of pensionable earnings in 1996 to more than 14.2 percent by 2030 to preserve the system's long-term actuarial balance. In order to avoid this sharp increase in contribution rates and the associated intergenerational inequities, the reform package contained the following elements (Battle, 2003):

- ***Benefit cuts***. A number of modest changes to the way benefits are calculated (including with regard to pensionable earnings, eligibility for disability benefits, and the amount of death benefits) were estimated to reduce annual benefit payments by 2 percent initially.[4] However, these measures were expected to reduce total benefit payments—already low by international standards—by almost 10 percent by 2030.

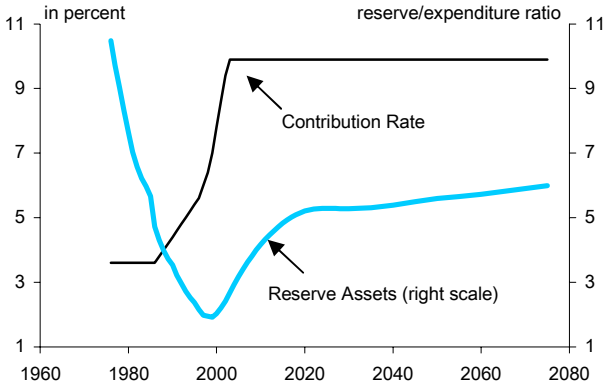
- ***Base broadening***. For the purpose of calculating pension contributions, the yearly basic exemption (YBE) was frozen at C$3,500. However, with the maximum amount of yearly maximum pensionable earnings (YMPE) continuing to rise with average wages, the amount of earnings subject to premium payments was gradually increased.

- ***Contribution hike***. The CPP contribution rate was gradually raised to a "steady-state" level of 9.9 percent, with the increase completed in January 2003. At this level, the CPP was deemed to be in actuarial balance, and no further rate increases were expected pending regular actuarial reviews.

[4] CPP premiums are tied to an individual's pensionable earnings, defined as earnings up to Yearly Maximum Pensionable Earnings (YMPE)—which grows in line with the average industrial wage—less the Year's Basic Exemption (YBE). Prior to the 1998 reforms, the YBE was set at one tenth of YMPE. CPP benefits are calculated by the following formula: CPP pension = 0.25 x (average YMPE over the previous 5 years) x (average ratio of pensionable earnings to YMPE over 85 percent of the individual's working life). The working life is calculated by subtracting 18 years from the age when CPP benefits are first drawn, with up to 7 years of "drop-outs" being provided for periods when the individual is caring for a young child.

- ***Market investments***. The reforms have resulted in a significant buildup of CPP assets, expected to reach around five years' worth of benefits by 2010 (Figure 3). In addition, prior to 1998, surpluses had been lent to the provinces at a subsidized rate—the market rate paid by the federal government. With the reforms, provinces are now required to pay their own market rates of interest when borrowing from the CPP. Additionally, the provinces' access to surplus CPP funds is gradually being eliminated. The CPP Investment Board (CPPIB) was established with a mandate to invest future surpluses in a diversified portfolio of market investments, including equity and real estate. By 2005, management of the CPP's fixed-income portfolio will also have shifted from the Finance Department to the CPPIB, allowing public pension assets to be managed in a manner consistent with employer pension funds in Canada and elsewhere.[5]

Figure 3. Projected CPP Contribution Rates and Pension Reserves



Source: OSFI, 2001.

7. ***The 2002 Actuarial Report has confirmed the long-term viability of the CPP through 2075*** (OSFI, 2002). The report found that the steady-state contribution rate required to achieve long-term balance was only 9.8 percent as of end-2000, and that the legislated rate of 9.9 percent would result in a larger-than-anticipated buildup of surpluses. Consequently, CPP assets are projected to reach six times annual plan expenditures by 2075 (see Figure 3). These results appear to be relatively insensitive to changes in underlying assumptions.[6]

Table 1. CPPIB Operations

	Net investment income		Net assets (C$ bn)	
Fiscal year	C$ billion	Rate of return (In percent)	CPP	*Of which*: CPPIB
1999H2	0.0	5.0	39.1	0.0
2000	0.5	40.1	41.3	2.4
2001	-0.9	-9.4	45.7	7.2
2002	0.3	3.4	51.9	14.3
2003	-4.2	-21.1	55.6	17.5
2004H1	3.1	14.5	64.4	27.4

Source: CPP and CPPIB Annual Reports.

8. ***CPP assets have grown rapidly, notwithstanding investment losses in recent years***. As of September 2003, CPP assets amounted

[5] Provinces have the choice of rolling over non-marketable bonds placed with the CPP one more time until 2033. OSFI (2001) assumes that the ultimate asset mix will consist of 50 percent bonds and 50 percent equity.

[6] The actuarial estimates assume a real rate of return of 4.5 percent and 5 percent on Canadian and U.S. equities, respectively, and of a 3.8 percent real return on bonds. Real average earnings are projected to grow at 1.1 percent over the long-run, and the steady-state inflation rate is projected at 3 percent. A 20 basis point increase in contribution rates would be required if the inflation rate were to equal 2 percent, *ceteris paribus*. Similarly, the contribution rate would have to increase by 40 basis points if the real rate of return were 1 percentage point lower.

to C$64.4 billion (5 percent of GDP), of which the CPPIB held C$27.4 billion in stocks and real estate (Table 1). Since beginning operations in October 1999, the CPPIB has registered a cumulative loss of C$1.2 billion in its active portfolio—mostly a result of heavy stock losses between mid-2002 and early 2003 (Table 1). For the most part, stock losses were offset by gains in the CPP's bond portfolio, but the CPP as a whole also registered a loss of C$1.1 billion in FY2003. Results improved between March and September 2003, with the CPPIB achieving a 14½ percent rate of return and the CPP's bond portfolio also gaining 5 percent in value.

B. Private Pension Schemes

Employer pension plans

9. ***Accounting for about a third of total household assets, private pension assets are the second most important source of private wealth next to primary residences***. As of 1999, households held an estimated C$604 billion (50 percent of GDP) worth of assets in corporate registered pension plans (RPPs) and C$408 billion in individual retirement plans (Statistics Canada, 2001). As of 2003, there were some 15,400 RPPs, covering 5.4 million workers, about a third of the workforce.[7] Included in this number are pension plans for employees of the federal, provincial, and municipal governments, which account for almost half of all workers covered by RPPs. Indeed, some 89 percent of public sector employees are members of an RPP, compared to only 30 percent of workers from the private sector.

10. ***The scope of employer-sponsored pension plans has increased in recent years***. In most provinces, vesting in RPPs must now occur after only two years of employment, after which plan members become entitled to employer contributions made on their behalf. Employers also have to offer coverage for part-time workers, subject to certain conditions, and must allow early retirement at actuarially-reduced pensions. Indeed, half of all plans are thought to offer unreduced benefits in the case of early retirement once minimum service requirements are met (OECD, 2001). Portability provisions were also improved, and plans also have to provide survivor benefits. The FY2004 budget also raised ceilings for tax-deductible employer contributions in real terms for the first time in 25 years.[8] However, less than half of RPP members are in plans that provide some form of benefit indexation, and only one in seven plan members enjoys full CPI indexation of pension benefits (Battle, 2003).

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[7] These plans are typically registered at the provincial level, except for some 1,200 plans of companies operating in federally regulated areas of employment. These plans cover about 550,000 employees and are registered with and supervised by the Office of the Superintendent of Financial Institutions (OSFI, 2003).

[8] The budget contained an increase in the amount of contributions to defined-contribution plans that can be deducted from taxable income from C$14,500 to C$18,000 by 2005. The maximum pension benefit permitted under defined-benefit plans was raised to C$2,000 per year of service by 2005 from the present ceiling of C$1,722. Both limits are indexed to average wage growth for subsequent years.

Table 2. Membership in Registered Pension Plans

(In percent of all employees)

	1989	1991	1993	1995	1997	1999	2001
Total	45.7	48.5	48.1	45.7	44.6	43.6	43.5
Defined contributions	3.8	4.3	4.7	4.8	5.6	5.9	...
Defined benefits	41.4	43.6	42.9	40.3	38.3	36.9	...
Mixed	0.4	0.7	0.6	0.7	0.7	0.8	...
Public sector	83.5	89.4	87.4	84.6	83.9	82.2	...
Private sector	33.6	34.1	33.6	32.1	31.4	31.1	...

Source: Statistics Canada.

11. ***Recent years have also seen an increase in the importance of defined contribution (DC) plans, which shift investment risks to employees*** (Table 2). DC plans remain the preferred choice of small companies, in part because individual accounts are easily transferable to individual or group retirement accounts.[9] By contrast, defined benefit (DB) plans are generally sponsored by large companies such as banks, railroads, and telecommunication organizations. While the majority of private pension plan members still belong to DB plans, employers are increasingly offering members the option of accruing future benefits on a DC basis and, in some cases, of converting accrued benefits to cash for transfer into a DC account. However, almost all public pension plans have remained on a DB basis, typically offering 2 percent of salary for each year of service up to a maximum of 35 years.

12. ***The financial position of many DB pension plans has deteriorated as a result of market losses***. Comprehensive information is not available, owing to the fragmented nature of pension fund supervision, but several reports suggest that among larger companies with DB pension plans, the degree of underfunding is similar or slightly worse than in the United States.[10] For those plans supervised by OSFI, a solvency test in June 2003 found that about 210 plans (more than half of all DB plans under OSFI supervision) were not fully funded on a solvency basis—i.e., the net present value of future pension obligations exceeded the market value of plan assets—compared with about 180 plans in December 2002. When assessing pension assets at liquidation value—a more stringent criterion—the aggregate solvency ratio remained around one, reflecting plan surpluses of some large pension plans. Nevertheless, the number of companies on OSFI's watch list increased from 50 to around 90 through the first half of 2003. Since then, pension plans are likely to have benefited from the recovery in equity markets, but relatively low long-term interest rates continue to keep the discounted value of future liabilities at a high level.[11]

13. ***OSFI has responded to recent developments by strengthening its regulatory oversight***. OSFI has tightened regulations on contribution holidays, refined its supervisory

[9] Two thirds of pension plans supervised by OSFI are DC plans.

[10] According to a widely quoted UBS study, 49 of the largest 60 companies listed on in the TSX have DB plans. These plans had a combined funding shortfall of 3.2 percent of market cap at end-2002, compared with only 2.4 percent for S&P 500 companies.

[11] Members of defined benefit plans are not insured against plan insolvency, except in the province of Ontario where the first C$1,000 per month of pension benefits is covered by a pension benefits guarantee fund.

tools, and taken a more proactive stance in dealing with severely underfunded pension plans. For example, corporate plans are now subjected to semiannual stress tests, and actuarial reports are requested on an annual basis (instead of every three years) as long as plans are underfunded. Moreover, regulatory changes are currently being considered which would have the effect of limiting benefit improvements that would unduly affect the solvency ratio of a plan. This proposed change is currently under development and will be subject to industry consultation through the early part of 2004. A proposed regulatory change that would require full funding of a pension plan deficit on plan termination will also be subject to further consultation through 2004.

Private retirement accounts

14. ***Registered Retirement Savings Plans (RRSPs) were introduced in 1957 to provide nonparticipants in employer pension plans, such as the self-employed, with a tax-preferred vehicle for retirement savings***. RRSP contributions are deductible from taxable income, and income earned within RRSPs is tax exempt. Cash withdrawals, however, are treated as ordinary income and are taxable in the year of withdrawal. Contributions to a spouse's RRSP are also tax deductible and since 1991 any unused contribution room can be accumulated and carried forward indefinitely. Workers covered by corporate pension plans are also allowed to contribute to RRSPs, but in recent years the contribution limit was set at C$14,500 per year (including contributions to RPPs), somewhat lower than for corporate plans. The 2004 budget increased the annual cap to C$18,000 by 2006 (equal to the RPP limit), and also provided for the cap's annual indexation in line with average wage growth.

15. ***RRSP contributions have dropped in recent years***. The participation rate in the RRSP (defined as the percentage of eligible tax filers making a contribution in a given year) steadily increased from the system's inception to reach close to 50 percent in the late 1990s, and the amount of RRSP contributions reached 6½ percent of total wages and salaries in 1998. However, both participation levels and average contribution size have declined since about 1997 (OECD, 2003). In 2002, close to six million workers contributed about C$27 billion to an RRSP, down 7 percent from the peak of C$29.3 billion in 2000. Tax statistics also indicate that only one third of all tax filers contributed to an RRSP in 2002, out of about 80 percent of filers that were eligible.

16. ***RRSPs are most heavily utilized by high-income groups***. Marginal incentives to save for retirement are highest at the very low and middle-to-high ends of the income scale, owing to the sharp reduction of public pension benefits above the low-income threshold. This is confirmed by a recent Statistics Canada study that found relatively high contribution rates both among low and high-income wage earners (Palameta, 2003). Nevertheless, a Statistics Canada (2001) survey found that 80 percent of those families without any private pension assets earned less than C$30,000 per year, and households with more than C$100,000 in accumulated retirement savings account for 84 percent of all private pension savings.

C. Pension Incomes and Retirement Trends

Pension income levels and distribution

17. ***Canada's old-age security system has achieved considerable success in reducing poverty among the elderly***. Although public expenditures on income security for seniors have remained modest by international standards—and are projected to peak at levels well below those anticipated by other industrialized countries in the next century—low-income rates among elderly Canadians are now among the lowest in the OECD (Smeeding and Sullivan, 1998; Table 3).[12] The success in raising retirement incomes for poorer Canadians has also been reflected in a reduction in domestic inequalities, with virtually all of the relative income gains since the early 1980s taking place at the lower end of the income distribution (Table 4).

Table 3. Old-Age Income and Labor Market Participation

	Low-income rate of elderly (Percent of the elderly with income less than 50 percent of median disposable income)	Relative disposable income of the elderly (Percent of the disposable income of all individuals)	Private pension funds, 1999 (Percent of GDP)	Participation rate, 2001, percent		
					Aged 55-64	
				Aged over 65	Male	Female
Australia	16.1	67.6	63.8	6.0	60.0	36.9
Canada	**2.5**	**97.4**	**45.7**	**6.0**	**61.3**	**41.7**
France	10.7	89.7	6.3	1.2	43.8	34.1
Germany	10.4	85.6	3.2	3.0	50.6	32.4
Italy	15.3	84.1	3.0	3.4	57.8	26.6
Japan	..	..	18.7	21.8	83.4	49.2
Netherlands	1.9	86.3	119.3	3.1	52.0	26.9
Spain	11.3	..	2.3	1.6	61.4	23.6
Sweden	3.0	89.2	..	9.4	73.5	67.4
United Kingdom	11.6	77.8	84.1	4.8	64.4	44.6
United States	20.3	91.7	74.4	13.1	68.1	53.0

Source: OECD, 2003.

18. ***The reduction in poverty among seniors reflects a strong increase in public pension benefits, partly offset by declining labor income***. Between 1980 and 1999, the combined share of retirement income provided by OAS benefits and the CPP rose from one third to about 43 percent (Table 5). A large part of the increase in public pension payouts is related to the maturation of the CPP, but the relatively constant share of OAS income suggests that a substantial increase in basic pension benefits has also allowed poorer retirees to keep up with overall income growth. At the same time, the share of employment income has declined to only about 10 percent in 1999, reflecting the trend toward earlier retirement and falling labor participation rates among the elderly (see below). Table 5 also illustrates that the share of

[12] The low-income rate is defined as the share of the population with disposable income less than half the median of the entire population.

income from private assets has essentially been stable over the past two decades, except that there has been a major shift of privately invested funds into retirement saving schemes.

Table 4. The Distribution of the Elderly by Population Income Quintile, 1980–95
(In percent)

Quintile	1980	1990	1995	Change, 1980-95
Bottom	39.7	25.2	17.5	-22.2
2nd	22.1	29.7	32.5	10.5
3rd	12.2	16.2	20.0	7.8
4th	13.3	14.9	16.0	2.7
Top	12.8	13.9	14.0	1.2

Source: Myles (2000).

Table 5. Sources of Pre-Tax Income for the Elderly
(Shares of total, in percent)

	1980	1985	1990	1995	1999
Employment income	26.4	20.1	17.3	16.7	10.0
Investment income	23.4	22.6	21.2	14.9	13.1
Retirement income	11.6	13.0	16.2	21.0	28.5
C/QPP benefits	7.7	10.9	14.3	17.3	19.0
OAS/GIS/SPA	25.9	28.0	25.1	23.6	24.0
Other	4.9	5.5	6.0	6.4	5.3

Source: Statistics Canada, *Income Trends in Canada, 1980–1999*.

Participation rates and retirement age

19. ***The average retirement age for Canadian workers has fallen sharply over the past twenty years***. Household survey data suggest that the labor force participation rate of 55–64 year old males has steadily declined from 86 percent in the early 1960s to 60 percent in the 1990s (Hoffman and Dahlby, 2001).[13] Notwithstanding some increase in the labor participation rate in recent years, especially among 60–64 old males, Canada has moved to the middle of the retirement age distribution for major industrial countries. On average, Canadians retire earlier (and stay in retirement longer) than workers in the United States or Japan, but later than many of their peers in continental Europe (Table 6).

Table 6. Withdrawal from Labor Force and Retirement Duration, 1999

	Age of Male Labor Market Withdrawal (In years)			Duration of male retirement (In months)
	First Quartile	Median	Third quartile	
Italy	54.5	**58.8**	63.4	20.7
Finland	56.0	**59.6**	63.0	18.9
Germany	57.4	**60.3**	63.9	18.8
Netherlands	57.8	**60.4**	64.1	18.2
Canada	**57.8**	**62.4**	**66.5**	**18.2**
United Kingdom	57.8	**62.6**	66.5	16.8
Sweden	59.9	**63.7**	66.7	17.5
United States	59.4	**64.6**	71.4	16.3
Japan	62.7	**68.5**	77.7	14.9
Average	58.1	**62.3**	67.0	17.8

Source: OECD (2001).

20. ***The public pension system contains a number of disincentives to work beyond the early retirement age***. Gruber (1999) illustrates the choice between continuing to work and taking up retirement for Canadian men under a range of factors. Although the results are somewhat sensitive to the amount of nonpension income received by a retiree, marginal incentives to work drop sharply beginning at age 55, and specially after age 60 when (reduced) CPP benefits kick in. The steepest disincentives are for workers with little spousal and other income, owing to the sharp

[13] The respective drop for males aged 65-69 is from 50 percent to 16 percent. For women, the trend toward earlier retirement is generally dominated by an age cohort effect in favor of higher participation in the labor market (Gruber, 1999).

clawback of GIS benefits.[14] However, Gruber also finds that the actuarial adjustment of CPP benefits for workers retiring after the statutory retirement age of 65 is insufficient.[15]

Are Canadians saving enough for retirement?

21. ***Lise (2001) suggests that Canadian pension arrangements will remain adequate for the foreseeable future, with even lower-income Canadians able to meet basic needs***. On the basis of cohort-specific income and consumption data, Lise finds that elderly Canadians experience no sudden decline in consumption as they enter into retirement age, implying that existing pension arrangements are sufficient to maintain living standards in old age. These findings, which are robust across different income quartiles, are supported by evidence that saving rates are also broadly maintained and that even low-income households continue to make gifts as they age. Lise also observes that the saving behavior of those expected to reach retirement during the next two decades has so far been similar to that of previous generations. Therefore, he concludes, future pensioners should also be able to maintain consumption and living standards in retirement.

22. ***Nonetheless, another study suggests that a large share of Canadians have failed to amass sufficient retirement savings to avoid a dependence on public pension schemes***. A survey by Statistics Canada (2001) indicates that about 3½ million family units (close to a third of all families) had no private retirement savings at all. Moreover, even among families with household head approaching retirement (aged 45 and above), one third may not have saved enough to replace two-thirds of their earnings or secure an income above Statistics Canada's Low Income Cut-Off (LICO) line. To be sure, this group includes a significant number of high-income households that may experience lower income after retirement but are still able to live relatively comfortably. Yet, about a quarter of households with income between C$20,000–40,000 was also found with insufficient savings, and thus remains dependent on retirement income from public sources. Although this study did not consider nonfinancial retirement assets or the continued accrual of benefits under DB pension schemes, which may alleviate the financial situation of many households, these findings have raised concern.

23. ***Other factors suggest a risk that relative poverty levels among the elderly could increase again***.[16] Seniors depending on public pension benefits are likely to see their relative incomes shrink, both vis-à-vis other retirees and the general working population, because:

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[14] For example, a worker in the tenth income percentile (no outside income) achieves a replacement ratio from public pension income of 42 percent if retiring at age 62, but would be subject to an effective 16 percent marginal tax rate if continuing to work. By contrast, the replacement rate for workers in the ninetieth percentile (with outside income) is 15 percent, and marginal tax rate 4 percent. At age 65, the low-income (high income) case receives a pension of 124 (32) percent of income at a 64 (18) percent marginal tax rate.

[15] CPP benefits are reduced by 0.5 percent for each month that they are received before age 65, and increased by 0.5 percent for each month that retirement is postponed after age 65.

[16] Most of the reductions in old-age poverty took place during the 1980s, owing to factors that are expected to weaken in the future (Myles, 2000). Chiefly among those is that public pension schemes reached maturity while

- The income replacement value of OAS benefits—which are adjusted to cost-of-living increases rather than wages—would be expected to decline over time.
- Similarly, CPP benefits are wage-based at the point of retirement, but subsequent adjustments are also linked to the price level, implying a stronger decline in relative incomes as the duration of retirement increases with life expectancy.
- Moreover, if industrial wage incomes were to fall relative to other incomes, e.g., in the service sector, an increasing share of CPP beneficiaries could see effective replacement ratios shrink.

D. Policy Issues

24. ***Although the Canadian pension system appears sound, there may be scope for further reforms ahead of the retirement of the baby boom generation***. Consideration could be given to strengthening the private pension pillar, including by reviewing the structure of retirement saving vehicles and strengthening governance of corporate pension schemes. Amendments to the public pension system could also assist in fostering labor market participation among older workers, boosting pension saving, and relieving impending fiscal pressures. Moreover, over the longer term, care will be needed to ensure that the support provided by the basic public pension system is kept at adequate levels to avoid a rise in old-age poverty.

Reviewing personal saving vehicles

25. ***Tax incentives appear to have had only a marginal impact on private saving.*** For example, Burbridge, Fretz, and Veall (1997) suggest that the tax treatment of RPPs and RRSPs has mainly led to a re-allocation of savings into these vehicles. This view is supported by Veall (1999), who found that a substantial change in marginal income tax rates in 1988 had a negligible impact on RRSP contributions. Similarly, Milligan (2002) found that a 10 percentage point increase in marginal tax rates would increase the probability of RRSP participation by only 8 percent. This result implies that tax increases between 1982 and 1996 explain only 5 percent of the increase in RRSP contributions during the same period.

26. ***Nevertheless, the recent focus on increasing RRSP contribution limits appears appropriate.*** Against the background of increased labor market mobility and a trend away from lifetime attachment to a single employer, gradual increases in RRSP contribution limits, at least in line with incomes and other pension parameters, provide room for personal saving to increase, especially for those not covered by RPPs. The immediate fiscal implications of rising contribution limits would likely be minimal, and would likely be roughly matched in

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real incomes of the working population stagnated during most of the 1980s and early 1990s, raising relative incomes of the elderly. The income distribution among seniors also became more even as the decline in elderly employment reduced a source of income concentration, whereas growing public retirement benefits were of a more equitable nature.

the long run by the tax paid on withdrawals.[17] Moreover, these instruments also tend to improve the broader efficiency of the tax system by reducing the extent to which corporate income is double taxed, and by increasing the extent to which tax is paid on consumption rather than income.

27. ***Tax-prepaid savings plans (TPSPs) could usefully supplement existing private savings plans***. In contrast to RRSPs, contributions to TPSPs would not provide an immediate deduction from income tax, but would enable tax-free accumulation of capital gains and benefit payments as well as tax-exempt withdrawals. As detailed in Kesselman and Poschmann (2001), TPSPs would have the advantage of allowing households to optimize their retirement asset allocation free from tax considerations. The authors suggest that overall economic efficiency could be increased as households shift their investments away from (tax-preferred) life insurance policies or real estate holdings. Moreover, TPSPs could provide a saving incentive for low-income households particularly if TPSP earnings do not cause a clawing back of GIS and SPA benefits.

Strengthening governance of corporate pension plans

28. ***Safeguarding the soundness of corporate pension plans remains a key priority***. Recent changes in the federal supervisory regime—partly prompted by financial weaknesses among defined benefit (DB) plans—have already provided OSFI with the means to focus its surveillance more tightly on weaker pension funds. However, the extent to which supervisory practices at the provincial level have strengthened remains unclear. For example, most provinces have yet to follow OSFI in dealing with underfunded plans, and transparency about the state of provincial corporate pension funds could also be improved. These differences suggest that there exists a potential for closer harmonization of federal-provincial regulation and supervision, aimed at ensuring uniform adoption of best practices, improving system-wide transparency, and ensuring a more efficient use of supervisory resources.

29. ***For defined benefit plans, relaxing limitations on contributions to fully funded pension plans could strengthen their financial position over the cycle***. Although most DB plans would be expected to return to being fully funded in the course of the next economic upswing, recent experience illustrates that placing a ceiling on plan assets at a cyclical peak can leave assets at an insufficient level to cope with the ensuing downturn. Therefore, an increase in the permissible surplus of pension funds (currently two years worth of pension contributions, or 20 percent of liabilities) could help encourage full funding over the cycle.

Encouraging labor market participation among the elderly

30. ***Unlike in many other countries, the Canadian pension system does not seem to weigh significantly on labor market participation among the elderly***. Studies suggest that

[17] Milligan (2003) found that the option to accumulate unused contribution room has a negative short-term impact on RRSP contributions, as individuals attempt to smooth contributions over the life cycle.

the generosity of public pension benefits has a sizable effect on retirement decisions in many countries, in many cases encouraging early retirement (Baker, Gruber, and Milligan, 2003; Gruber and Wise, 1999; Johnson, 2000). In Canada, however, the system appears to be relatively neutral, with some estimates suggesting that only about 20 percent of the trend decline in average retirement age is explained by public pension incentives (Baker and Benjamin, 1999; OECD, 2003).[18] Indeed, while the CPP allows retirement from the age of 60, the OAS system does not provide an early retirement option at all. This contrasts with corporate pension plans, which have often been used to finance early retirement of employees in recent years, in an effort to mitigate the effect of corporate downsizing and restructuring programs.

31. ***Nevertheless, there appears scope to further reduce incentives for early retirement in the CPP***. For example, the upward adjustment to CPP benefits for retirement after the statutory pension age of 65 is somewhat too low relative to the adjustment that is made for early retirement.[19] Similarly, although eligibility requirements have been stiffened in recent years, disability benefits still seem to have dampened old-age labor participation rates (Campolieti, 2001). OECD (2003) research also suggests that disability insurance is being used as an exit route from the labor market by a significant share of male workers. Finally, recent proposals for reforming Quebec Province's QPP could also be reviewed for their applicability at the national level (Box 2).

32. ***Especially in view of projected increases in longevity, there would seem to be scope for increases in the statutory retirement age***.[20] Assuming that the increase would apply to both OAS and CPP, and that the entry age for early retirement would also be shifted upward, potential advantages include the following:

- ***Direct fiscal savings would accrue from a shorter period over which basic pension benefits are paid***. Moreover, additional tax revenues would be generated as working lives were extended. However, increasing the retirement age would also imply that workers for whom early retirement has been primarily a means to exit from unemployment would need to be supported longer through the social safety net.

- ***Increasing the retirement age could leave room for a reduction in CPP contribution rates***. This would reduce the wage wedge and could have positive effects on labor market participation across all age groups, as well as facilitating a more efficient allocation of labor resources.

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[18] Gruber (1999) and Tompa (1999) also found many early retirees to be already semi-detached from the labor market as a result of unemployment, part-time or low-income employment, or disability.

[19] To achieve actuarial fairness, the pension benefit would need to be raised from 0.5 percent to 0.7 percent for every month of retirement after reaching the age of 65.

[20] To ensure political acceptance and mitigate the impact on workers close to retirement age, any increase in the retirement age would need to be gradual and phased in over a longer time frame.

- ***The accumulation of additional wealth would relieve some of the pressure on the two public pension pillars***. The resources accumulated as a result of longer life-time employment could boost private pension assets and increase the share of retirement income from private sources after several decades of decline.

Box 2. Reform Proposals for the Québec Pension Plan (QPP)

The QPP—an independent public pension plan for the residents of Québec province—is designed to be very similar to the CPP. Both systems share the same basic parameters, including contribution rates, statutory retirement age, and maximum contribution and benefit levels. Minor differences include the design of disability and survivor benefits, which are slightly more generous in Québec.

The Québec government is currently considering more significant changes to the QPP, motivated by its less favorable actuarial position relative to the CPP. Owing to higher dependency ratios and lower immigration rates for Québec, the actuarially neutral contribution rate of the QPP has increased to around 10.1 percent, compared to 9.8 percent for the CPP. The relatively low level of projected reserves and the growing gap between the CPP and QPP's underlying contribution rates have led to calls for reforms.

The proposals aim at reducing the incidence of early retirement by providing commensurate financial incentives and allowing for a more flexible transition into retirement. Suggested measures include:

- Adjusting the formula for the calculation of benefits at retirement by increasing the number of years in employment required to receive full pension benefits;
- Providing an actuarially fair adjustment of pension benefits if retirement begins after the statutory age of 65;
- Allowing beneficiaries to continue to work without financial penalty, and crediting additional pension contributions toward the beneficiary's account (allowing pension benefits to increase until the maximum benefit level is reached).

The reform proposals also take into account the growing incidence of divorce and the large number of children living with only one parent. Proposed measures would focus survivor benefits to a larger extent on surviving children and no longer provide lifetime benefits for younger spouses. By also introducing elements of income testing, effective survivor benefit levels would decline slightly. Additional measures would reduce disability pensions in some cases to bring them more closely in line with pension benefits.

Maintaining adequate basic public pension benefits

33. ***Basic pension benefits are projected to decline significantly in real terms in coming decades***.[21] Assuming continued price indexation, the average basic pension benefit could decline from around 20 percent of average incomes in 2001 to 14 percent by 2030, with lower income groups facing a still larger decline in percentage points (OECD, 2003). Even on this basis, however, public pension expenditure is projected to increase by 2–3 percent of GDP through 2050—higher than in some other G-7 countries, including Japan and the U.K.

[21] With population aging, voting power is shifting toward the elderly generation, possibly precipitating a reallocation of public spending toward meeting old-age needs.

Table 7). More generous benefit provisions would push spending considerably higher—a shift to wage indexation, for example, could result in an increase of 5 percent of GDP, comparable to some of the large continental European economies.

34. ***It therefore remains important to explore options for simplifying the existing system and targeting benefits more directly at the neediest group of elderly***. Despite failed attempts to reform the basic pension system in the late-1990s, there appears considerable scope for simplifying and unifying benefits that are currently provided through different programs (including GIS, SPA, and the tax code). Merging these programs into one, and testing benefits for family income instead of personal income would contribute to increasing intragenerational equity and make the benefit structure more transparent.

Table 7. Projected Increases in Old-Age Pension and Social Spending

	OECD (2003)	Gruber and Wise (2001)	
	Change in public pension expenditure, 2000-50 (in percent of GDP)	Old-age social spending, 1995 (percent of GDP)	Change in old-age social spending, 2000-50 (in percent of GDP)
Australia	1.6	3.1	3.3
Canada	2.0	4.6	2.9
France	3.9	12.3	2.7
Germany	5.0	11.1	4.0
Italy	-0.3	13.0	4.8
Japan	0.6	6.1	4.3
Netherlands	4.8	7.3	3.5
Sweden	1.6	8.8	1.3
United Kingdom	-0.7	8.1	2.7
United States	1.8	6.2	1.6

Sources: Gruber and Wise (2001); and OECD (2003).

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VI. CANADA-U.S. ECONOMIC INTEGRATION: DEVELOPMENTS AND PROSPECTS[1]

1. ***Important milestones have been reached this year in the history of bilateral economic relations between Canada and the United States.*** In particular, 2004 marks the 10th anniversary of the North American Free Trade Agreement (NAFTA) and the 15th anniversary of its precursor, the Canada-U.S. Free Trade Agreement (CUSFTA). These agreements have been exceptionally successful in promoting trade and financial flows between the two countries over the years, yielding one of the world's largest bilateral trade and bilateral direct investment relationships (USTR, 2003).

2. ***Some observers have recently called for deeper integration with the United States in order to eliminate remaining barriers to trade.*** The most ambitious proposals include calls for a "grand bargain," which would couple security and defense-related policies with deeper trade integration, possibly in the context of a customs union or common market (Dobson, 2002). Similarly, some proposals have included calls for a monetary union with the United States (Courchene, 2003).[2] However, more modest and immediately practical proposals have also been made, involving suggestions for greater effort toward harmonizing rules, standards, and regulations, in order to reduce the extent to which these arrangements impede trade and efficiency (Goldfarb, 2003).

3. ***This chapter analyzes the impact of the major Canada-U.S. trade agreements on trade and business cycles to shed some light on the debate about the future direction of economic integration.*** The chapter first reviews the key provisions of these agreements. Then, it examines their impact on trade and financial flows and shows that there has been a substantial increase in trade and financial flows between the two countries after the inception of CUSFTA.[3] Next, the extent to which there has been an effect on the comovement of Canada-U.S. business cycles is studied. The chapter concludes by arguing that while economic integration has been associated with a significant increase in business cycle synchronicity, the United States and Canada remain subject to substantial country-specific shocks. Although these results would seem to weigh against moves toward a monetary union, the still significant integration between the two countries suggests significant benefits could be reaped from further reducing other barriers to trade.

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[1] Prepared by M. Ayhan Kose.

[2] Arora and Jeanne (2001) argue that exchange rate flexibility has not slowed the pace of Canada-U.S. economic integration, and has been useful in isolating the Canadian economy from asymmetric external shocks. Murray, Schembri, and St-Amant (2003) also provide evidence in support of exchange rate flexibility.

[3] This chapter focuses on the impact of CUSFTA and NAFTA on the Canadian economy. Kose (2003) examines the impact of NAFTA on the Mexican economy.

A. Trade Agreements Between Canada and the United States

4. ***An important step toward promoting Canada-U.S. trade linkages was the 1965 Canada-U.S. Auto Pact.*** Prior to the Auto Pact, tariffs on cross-border trade in automotive products were high—roughly 7½ percent in Canada and 17½ percent in the United States. The Pact eliminated all tariffs faced by producers and led to a significant growth in the Canadian auto industry—the industry became highly integrated with the U.S. industry and transportation equipment became Canada's largest export to the United States.

5. ***The 1989 Canada-U.S. Free Trade Agreement (CUSFTA) introduced free trade in almost all sectors.*** CUSFTA eliminated most tariffs and other trade barriers in its first ten years, with the average Canadian tariff on manufacturing imports from the United States falling from 3 percent in 1989 to almost zero in 2001, and the average U.S. tariff on imports from Canada falling from around 4.5 percent to 0.5 percent during the same period (Figures 1 and 2). The agreement gave considerable preferential tariff advantage to the other country, since tariffs on imports from third countries remained relatively higher. In addition, CUSFTA substantially reduced nontariff barriers, provided ground rules covering trade in services and investment, and included various dispute settlement mechanisms.

Figure 1. United States: Average Tariffs on Imports from Canada and World

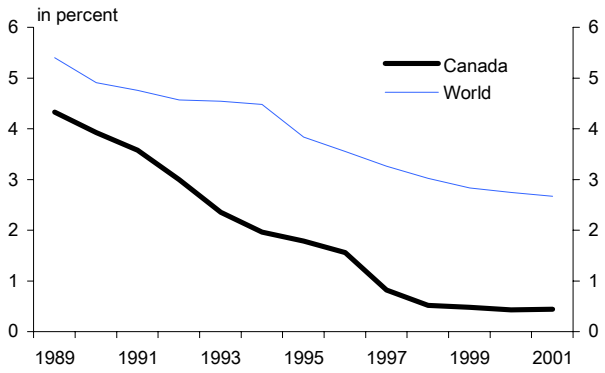
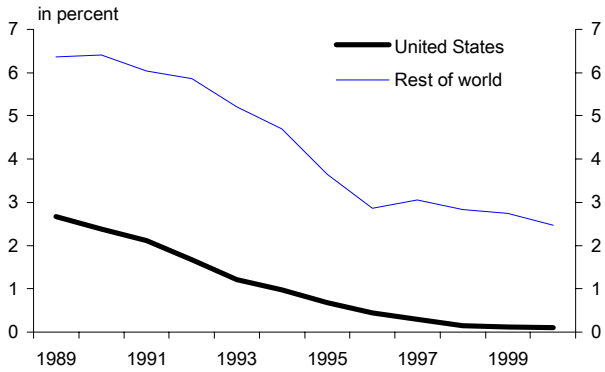


Figure 2. Canada: Average Tariffs on Manufacturing Imports from the U.S. and Rest of World



Source: Fund staff calculations.

6. ***The 1994 North American Free Trade Agreement (NAFTA) represented a further milestone.*** NAFTA expanded various provisions of CUSFTA and broadened the scope of the agreement by including Mexico (Hufbauer and Schott, 1992, and USITC, 2003). It eliminated the majority of tariffs and other trade barriers in its first ten years and will have phased out most remaining tariffs by 2008. Moreover, building on the provisions of CUSFTA, NAFTA included various provisions covering investment flows, financial services, government purchases, and protection of intellectual property rights.

7. ***In addition, NAFTA introduced unique mechanisms for settlement of disputes and included side agreements covering labor and environmental issues.*** In particular, NAFTA established processes dealing with various issues including appeals of antidumping and

countervailing duty determinations; resolution of investor-state disputes; and private commercial disputes. NAFTA included two important side agreements: the North American Agreement on Labor Cooperation, aimed at promoting enforcement of domestic labor laws; and the North American Agreement on Environmental Cooperation, established to ensure that trade liberalization and environment goals were mutually supportive.

B. Growth of Trade and Financial Flows

8. ***Trade flows between Canada and the United States increased significantly after the advent of CUSFTA.*** Canada's merchandise trade (the sum of exports and imports) to the United States more than doubled in U.S. dollar terms over the period 1988-2002, rising from around 30 percent of GDP to as high as 55 percent of GDP (Figure 3a). By 2002, roughly 90 percent of Canadian merchandise exports were directed to the United States, a 17 percentage point increase from 1988 (Figure 3b). By contrast, the share of Canadian imports from the United States remained roughly unchanged at around 65 percent during the same period.

9. ***The product mix of Canada-U.S. trade also shifted.*** Although transportation equipment along with machinery and electronics continued to represent a significant fraction of Canada's total trade with the United States, their importance decreased during the period 1989-1992 (Table 1). Notably, the share of Canada's exports to the United States associated with primary sectors, including metals and minerals and wood and pulp, also declined somewhat, with sharp increases in apparel and textiles and special transactions (DFAIT, 2003). These trends were accompanied by a significant increase in the share of Canada's exports from the agriculture and oil sectors, and to a lesser extent, the manufacturing and service sectors being directed to the United States (Figure 3c).

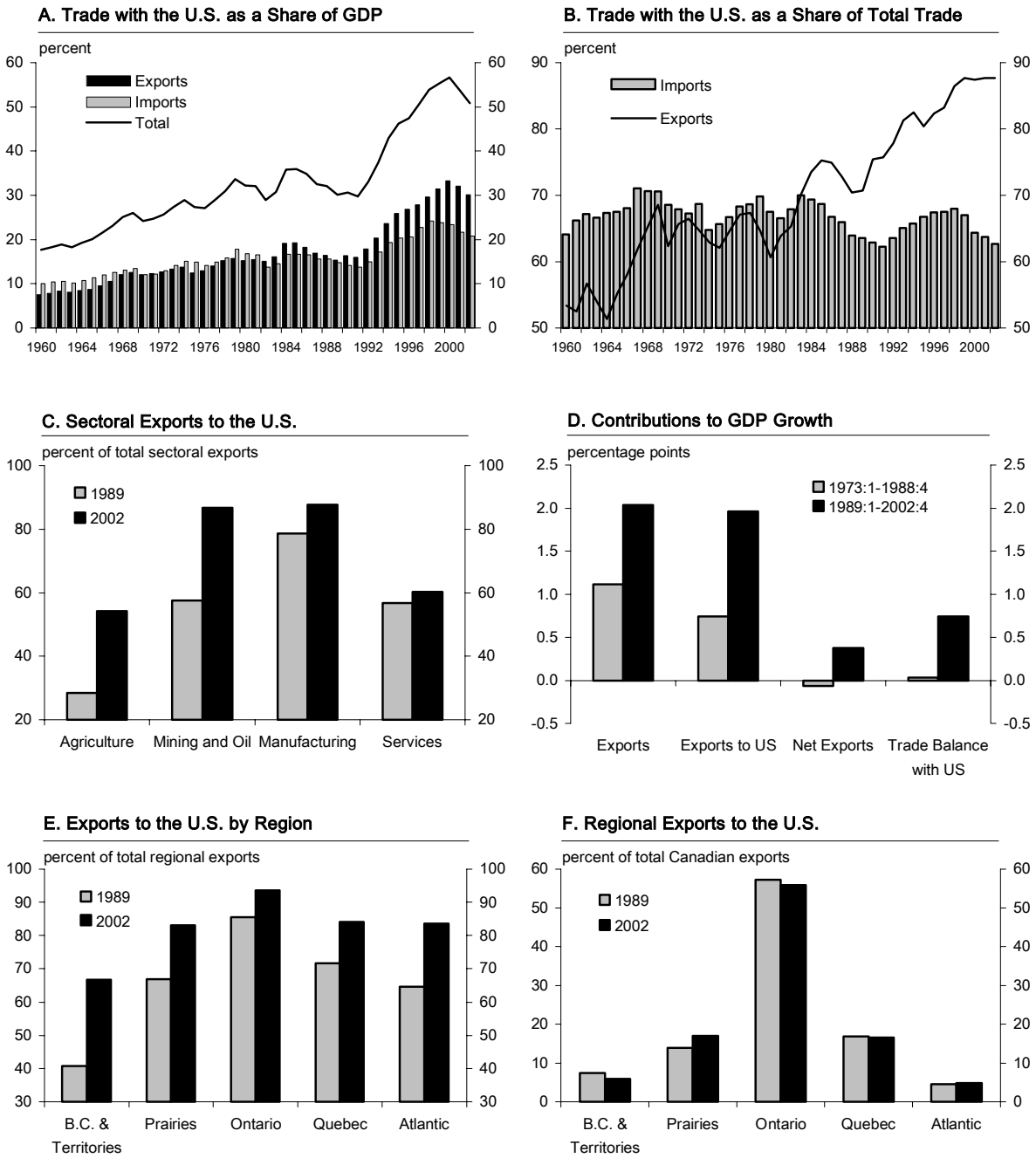
Table 1: Canada: Merchandise Trade with the United States
(Share of total exports and imports in percent)

Exports	1989	2002	Change (1989-2002)
Transportation Equipment	32.8	27.0	-5.8
Machinery&Electronics	14.6	13.7	-0.9
Metals&Minerals	21.3	21.7	0.4
Wood&Pulp	15.0	10.5	-4.5
All Others	16.4	27.1	10.7
Imports			
Transportation Equipment	28.1	25.6	-2.5
Machinery&Electronics	33.6	30.6	-3.0
Metals&Minerals	11.3	10.9	-0.4
Chemicals&Plastic&Rubber	10.0	14.8	4.8
All Others	17.0	18.2	1.2

Source: DFAIT (2003).

10. ***The inception of CUSFTA also had important national and regional effects in Canada.*** With exports to the United States rising much faster than imports, the contribution of net exports to GDP growth jumped from about zero during the period 1973-1988 to about 0.75 percentage points after the introduction of CUSFTA (Figure 3d).The growth in trade appeared to favor those regions—British Columbia, the Prairies, and the Atlantic region—which previously had relatively weak ties to the U.S. market (Figure 3e). These regions saw a sharp jump in the share of their exports being directed to the United States, narrowing the

Figure 3. Canada and the United States: Trade Linkages



Source: DFAIT (2003); and Fund staff calculations.

gap with Ontario and Quebec, which had already enjoyed strong trade links to the United States (Figure 3f).[4]

11. ***Recent research confirms the significant impact of CUSFTA on Canada-U.S. trade flows.*** Clausing (2001) analyzes the effect of CUSFTA on commodity-level tariff rates and concludes that more than half of the increase in Canada's exports to the United States during 1989-1994 was due to the agreement. Romalis (2002) also confirms that CUSFTA has had a large impact on Canada's trade share with the United States. Schwanen (1997) compares trade in sectors that were liberalized after CUSFTA and NAFTA with others and concludes that exports of Canada to the United States in these sectors rose by 139 percent and by only 64 percent in other sectors.[5]

12. ***Canada's trade appears to have become more geared toward manufactured goods as a result of the boom in Canada-U.S. trade linkages.*** The share of manufactures in total exports rose from less than 33 percent in 1960 to roughly 63 percent in 2001, with a correspondingly less prominent role played by agriculture and fuels (Table 2). The share of manufacturing imports also increased from less than 70 percent in 1960 to roughly 83 percent in 2001.

Table 2. Canada: Composition of Trade
(Share of total exports and imports in percent)

	Exports			Imports		
	1960	1980	2001	1960	1980	2001
Manufactures	32.5	48.1	62.4	69.0	71.7	82.9
Agriculture&Food	36.5	23.4	13.0	16.2	9.6	7.0
Fuel&Ores	30.4	28.1	18.5	12.3	17.2	7.9

Source: World Bank, *World Development Indicators.*

13. ***Trade liberalization has also spurred cross-border vertical integration.*** For example, the share of Canada's exports based on vertical trade—i.e., the share of export value that is due to the processing of imports at an earlier stage of production—rose by twofold since the inception of CUSFTA (Figure 4). Dion (1999) finds that there has been a dramatic increase in vertical specialization across manufacturing industries especially since the late 1980s (which coincides with the inception of CUSFTA).[6] Hummels, Rapaport, and Yi (1998) conclude that the 1965 U.S.-Canada Auto Agreement led to a substantial increase in vertical trade in auto industry.

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[4] Courchene (2003) emphasizes the growing importance of north-south trade in contributing to provincial GDP growth (especially in Quebec and Ontario) after the inception of CUSFTA. For example, Ontario's exports to the United States rose from 25 percent of its GDP in 1989 to almost 50 percent in 2001.

[5] Trefler (2001) and Head and Reis (2003) also find that CUSFTA appeared to have a positive impact on trade flows. Krueger (1999, 2000) also documents that there has been a substantial increase in trade flows between Canada and the United States after NAFTA. Clausing (2001) concludes that the agreement did not result in any sizeable trade diversion, i.e. the expansion of trade was not at the expense of other countries, while Romalis (2002) argues that the agreements induced substantial trade diversion.

[6] Intra-industry trade between Canada and the United States has also increased. However, recent research is unable to establish a clear link between CUSFTA/NAFTA and the increase in intra-industry trade between the two countries during the 1990s (Trefler, 2001, and Acharya, Sharma, and Rao, 2003). The free trade agreements also affected the productivity dynamics in Canada as discussed in Chapter I.

14. ***Trade liberalization has also been associated with a significant increase in foreign direct investment (FDI) flows between Canada and the United States***. Gross FDI flows increased by more than sevenfold between 1989 and 2002, with similar increases in both directions (Figure 5). The bulk of the FDI inflows to Canada came from the United States as the average share of inflows from the United States accounted for 68 percent of total inflows over the period 1989-2002. A tremendous increase in FDI flows occurred after the inception of NAFTA, associated with a small number of mega-mergers (DFAIT, 2003).[7] As a result, the average share of FDI inflows in Canada's domestic gross fixed capital formation (investment) rose from 6 percent in the 1986-1988 period to 26 percent over the 2000-2002 period.

Figure 4. Vertical Specialization

Processed Imports as a Share of Sectoral Merchandise Exports

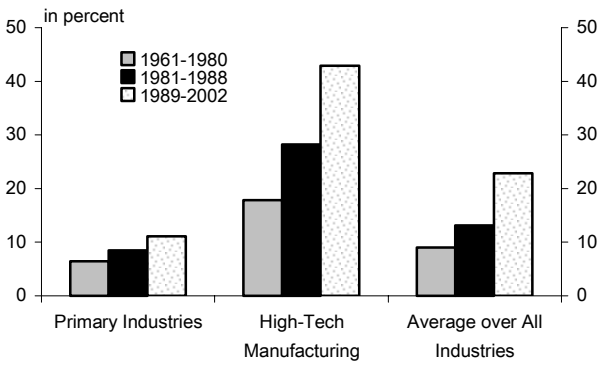
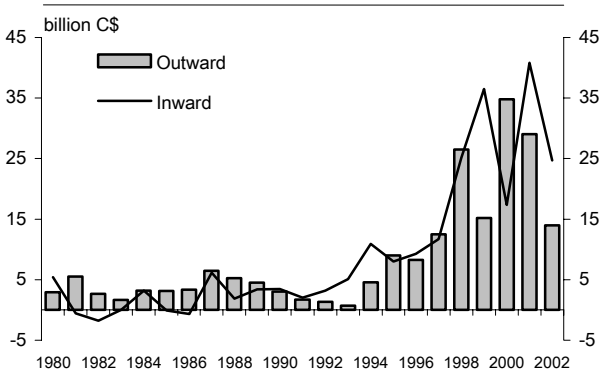


Figure 5. Canada-U.S. FDI Flows



Source: Fund staff calculations.

C. Changes in Business Cycle Dynamics

15. ***In theory, increased trade linkages have ambiguous effects on the comovement of business cycles.*** Stronger trade linkages can result in more highly correlated business cycles by increasing demand- and supply-side spillovers. Increased intra-industry specialization across countries can also increase cyclical comovement, if industry-specific shocks are important in driving business cycles. However, the degree of comovement might fall if inter-industry (rather than intra-industry) trade linkages are spurred and industry-specific shocks are important in driving business cycles (Kose and Yi (2001)).

16. ***The effect of financial flows on business cycle correlations also depends on the nature of shocks and specialization patterns.*** For example, stronger financial linkages could generate higher cross-country synchronization of output by allowing easier spillovers of demand-side shocks. However, financial linkages could help facilitate investment and specialization of production, thereby increasing countries' exposure to industry- or country-specific shocks. This could lead to a decrease in the degree of output correlations while

[7] Although there was a significant increase in the volume of FDI flows from the United States to Canada in the period 1989-2002, the U.S. share of Canadian FDI stock remained quite stable at around 65 percent. Recent research is unable to show that CUSFTA/NAFTA has had any discernible impact on FDI flows between the two countries (Schwanen, 1997, and Globerman and Shapiro, 2003).

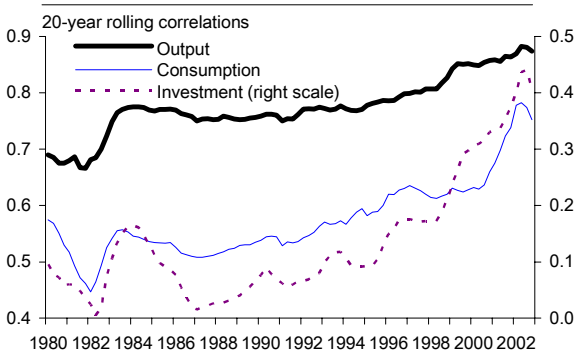
inducing stronger comovement of consumption across countries (Kalemli-Ozcan, Sorensen, and Yosha (2003)).

17. ***These competing factors complicate evaluations of the impact of trade agreements on Canada-U.S. business cycles.*** The increase in vertical specialization and intra-industry trade between Canada and the United States would typically be expected to strengthen business cycle linkages over time. However, inter-industry trade and differences in industrial structure are still considerable, implying that sector specific shocks could lead to divergence of cycles. For example, the fact that Canada experienced a shallower downturn and a relatively stronger recovery from the 2000 recession than the United States has often been ascribed to Canada's smaller IT sector, as well as to the effects of a relatively depreciated exchange rate and the improvement in global commodity prices.

18. ***Recent empirical studies are inconclusive regarding the extent to which business cycles in the two countries have become more synchronized.*** Kose, Prasad, and Terrones (2003, 2004), Kose, Otrok, Whiteman (2004) and Stock and Watson (2003) find that the importance of global factors in explaining business cycles in both countries has risen since the 1980s and conclude that business cycle linkages between Canada and the United States have become stronger over time. By contrast, Doyle and Faust (2003) show that there has been no statistically significant change in the correlations of the growth rates of GDP of Canada and the United States since the 1960s, with similar results reported by Helbling and Bayoumi (2003). Heathcoate and Perri (2003) show that the U.S. business cycle has become less correlated with the aggregate cycle of Europe, Canada, and Japan since the 1960s.

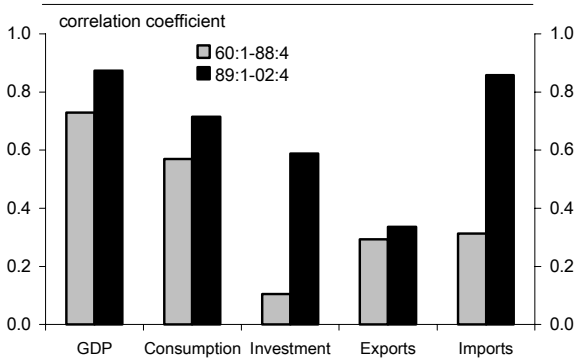
19. ***Inspection of simple correlations suggests an increase in the comovement of business cycles in Canada and the United States.*** For example, an increase is clearly evident in the 20-year rolling correlations in cyclical deviations of Canada's output, consumption, and investment and cyclical deviations in the United States, with a particularly sharp increase in the case of investment and imports after the inception of CUSFTA (Figures 6 and 7). At the same time, the Canadian and U.S. business cycles have become less correlated with cycles in other G-3 countries (Germany and Japan).

Figure 6. Canada and the United States: Comovement of Economic Variables



Source: Fund staff calculations.

Figure 7. Canada and the United States: Comovement of Economic Variables



Source: Fund staff calculations.

20. ***In order to better identify the source of this apparent increase in convergence of business cycles, a dynamic latent factor model is estimated.*** The model (employed in Kose, Otrok, and Whiteman, 2003) allows estimation of the extent to which common or country specifics factors explain the changes in the comovement, and also help take into account potentially important "leads" and "lags" in the cross-correlation of different macroeconomic variables.

21. ***The model focuses on the dynamic comovement of output, consumption, and investment across Canada and the G-3 countries.*** It decomposes macroeconomic fluctuations into (i) a "common" factor that is common across all variables/countries; (ii) "country-specific" factors, which are common across the main aggregates within a country; and (iii) "idiosyncratic" factors, which are specific to total output, consumption, and investment (idiosyncratic errors). In particular, there are three types of factors in the model: the common factor (f^{common}), four country-specific factors ($f_i^{country}$, one per country), and 12 factors specific to each variable ($\varepsilon_{i,t}$, the "unexplained" idiosyncratic errors). Observable variables are denoted by $y_{i,t}$, for i= 1,…,12, and t=1960Q1-2002Q4. Thus, for observable i:

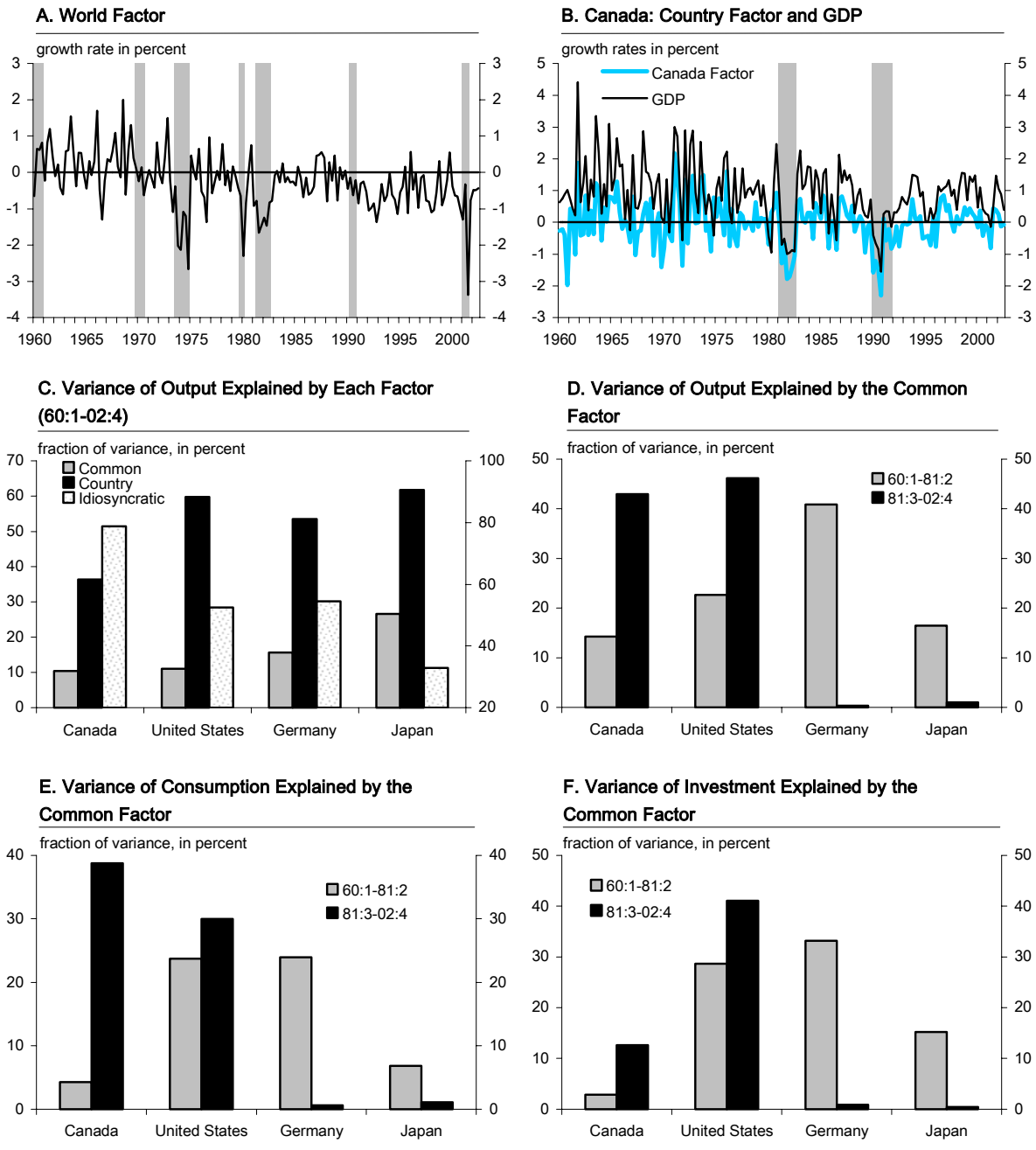
$$y_{it} = a_i + b_i^{common} f_t^{common} + b_i^{country} f_{n,t}^{country} + \varepsilon_{i,t} \qquad E\varepsilon_{i,t}\varepsilon_{j,t-s} = 0 \qquad for \quad i \neq j,$$

where n denotes the country number. Output, consumption and investment data for each of four countries are used as observables, so there are 12 time series to be "explained" by the five factors and 12 "regression" equations to be estimated.

22. ***The estimation results suggest that the common factor played an important role in explaining business cycles since the 1960s.*** For example, casual observation suggests that the common factor has been an important force behind most of the major business cycle episodes of the past 40 years. In particular, the behavior of the common factor is consistent with the steady expansionary period of the 1960s, the boom of the early 1970s, the recessions of the mid-1970s, the early 1980s and 1990s, the expansionary period of the late 1980s, and the global downturn of 2001-2002 (Figure 8a). At the same time, the Canada-specific country factor was also important in explaining some of Canada's major cyclical episodes, including the recessions of 1982 and 1991, the economic slowdown in 2001, and the booms of the 1960s, and the second half of the 1990s (Figure 8b). Indeed, while the common factor has been important, it explains only about 10 percent of Canada's output volatility, with the country and idiosyncratic factors explaining the bulk of the volatility for the period 1960Q1-2002Q4 (Figure 8c). By contrast, the common factor is relatively more important in Germany and Japan, explaining more than 25 percent of output volatility in Japan.

23. ***However, the common factor has played an increased role in explaining business cycles in Canada and the United States since the early 1980s.*** Comparing estimates of the model calculated over two separate sub-periods—1960Q1-1981Q2 and 1981Q3-2002Q4—shows that the share of Canada's output variance explained by the common factor roughly tripled in the later period (Figure 8d). Moreover, the share of investment due to the common factor rose by fourfold during the second period and the role of the common factor in explaining consumption variance increased from less than 5 percent to roughly 40 percent

Figure 8. Dynamic Factor Model: Factors and Variance Decompositions



Source: Fund staff calculations.

(Figures 8e and 8f). Although the importance of the common factor also increased for the United States, the increase was smaller than that for Canada.

24. ***Nonetheless, country specific and idiosyncratic factors remain important in Canada.*** The country-specific factor still accounted for more than 10 percent of volatility of each variable in the second period, and the majority of business cycle variation is still attributed to the idiosyncratic factor (Table 3). The country-specific and idiosyncratic factors also explained over 50 percent of business cycle variation in the United States.

25. ***By contrast, the common factor became less important in explaining output volatility in Germany and Japan***. This likely reflects the relative importance of domestic forces that have swamped the importance of increased trade and financial linkages during the past two decades. The Japanese economy has been struggling with a variety of structural problems as it has suffered from a sharp fall in asset prices and a severe banking crisis since the early 1990s. The German economy has been affected by the aftershocks of unification during the same period. In addition, the share of trade with these two countries has decreased in both Canada and the United States during the 1990s.[8]

Table 3. Variance Decompositions

(In percent)

Factors/Periods	Output			Consumption			Investment		
	33%	Median	66%	33%	Median	66%	33%	Median	66%
	Canada								
60:1-81:2									
Common	10.98	14.29	17.93	2.70	4.28	6.25	1.58	2.83	4.49
Country	13.64	17.96	22.49	15.06	19.65	24.56	16.95	22.13	28.01
Idiosyncratic	61.60	65.95	70.36	70.68	75.06	79.19	68.56	73.88	79.32
81:3-02:4									
Common	36.94	42.92	48.11	33.36	38.78	43.38	9.36	12.59	15.88
Country	6.34	10.60	15.39	8.13	13.08	18.91	5.04	10.30	15.92
Idiosyncratic	41.67	45.26	49.32	43.28	46.98	50.69	70.75	75.97	79.91
	United States								
60:1-81:2									
Common	18.54	22.65	27.37	19.78	23.72	28.36	24.55	28.60	32.76
Country	40.46	46.17	51.30	23.66	28.56	33.09	37.90	42.41	46.83
Idiosyncratic	28.15	30.55	33.17	44.70	47.25	49.49	25.91	28.59	31.51
81:3-02:4									
Common	40.18	46.18	51.48	25.80	29.97	33.64	35.83	41.07	46.44
Country	4.81	9.65	14.99	4.03	7.87	12.22	8.50	15.15	22.24
Idiosyncratic	39.69	42.88	46.00	58.32	61.09	63.84	38.13	42.39	46.90

Notes: 33% and 66% refer to the confidence intervals of the median.
Source: Fund staff calculations.

[8] There have also been important changes in the dynamics of volatility since the early 1990s. For example, the volatility of Canadian macroeconomic variables has diminished during the 1990s. Debb (2001) finds a statistically significant structural break in the volatility of Canadian real GDP growth in the first quarter of 1991, and others have found similar breaks for the U.S. and the rest of the G7, except for Japan, since the late 1980s.

D. Concluding Remarks

26. ***The results above illustrate that while free trade has helped promote the integration of the U.S. and Canadian economies, significant differences remain.*** Business cycles in Canada and the United States have certainly become more synchronized, and the importance of common factors in explaining business cycles in the two countries has increased, likely reflecting the significant increase in trade based on vertical specialization. Nonetheless, significant structural differences remain evident from two economies. Primary goods still account for more than 30 percent of Canada's total exports, and the analysis above shows that country-specific and idiosyncratic factors remain very important in explaining the Canadian business cycle.

27. ***These remaining differences suggest that there could be gains from further steps to deepening economic linkages.*** The CUSFTA/NAFTA experience illustrated the significant benefits accruing to both countries from free trade, but important barriers remain. For example, differences in regulatory frameworks impede trade and investment flows; security concerns, which have become critically important during the past two years, slow cross-border flows of goods; and rules-of-origin requirements also restrict trade flows (McMahon, Curtis, and Adegoke, 2003). Recent research suggests that the removal of rules-of-origin requirements and the harmonization of MFN tariffs—which is under discussion among the NAFTA partners—could boost Canada's GDP by as much as 2-3 percent (Policy Research Initiative, 2003).[9]

28. ***The continued importance of country-specific and idiosyncratic factors in driving business cycles in Canada also confirms the benefits of exchange rate flexibility.*** Although there remain those in Canada who argue in favor of a Canada-U.S. monetary union, the significant differences in industrial structure and composition of trade between the two countries suggest that there could be important costs to Canada giving up its ability to insulate itself from country-specific and other shocks.

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[9] NAFTA partners have recently decided to establish study groups to analyze avenues for harmonization of MFN tariffs and rules of origin requirements, and to improve rules governing investment flows. In addition, recognizing the importance of secure and continuous access to each other's markets, Canada and the United States have recently placed an emphasis on border security. For example, a Smart Border Action Plan has been implemented, which includes a Free and Secure Trade (FAST) program to harmonize procedures for clearing cross-border shipments.

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