

Exports, Imports, and the Appreciation of the Canadian Dollar

Richard Dion, Michel Laurence, and Yi Zheng, Research Department

- *Exports and imports adjusted significantly to the appreciation of the Canadian dollar in 2003 and 2004. Other factors, such as global and sector-specific shocks, competition from emerging economies, and constraints on the domestic supply of a few products also affected exports and imports over that period.*
- *Exports and imports of machinery and equipment and non-automotive consumer goods, as well as imports of non-energy raw materials, appear to have been the most affected by the currency appreciation.*
- *Econometric models suggest that, by the end of 2004, the drag on exports exerted by the appreciation would have offset more than half of the stimulus provided by the growth of U.S. demand since the end of 2002. As well, the appreciation would have accounted for about 60 per cent of the total increase in imports over the same period.*
- *Model simulations signal that the adjustment to the appreciation experienced over 2003 and 2004 should have started tapering off in the first half of 2005, thereby lending support to economic growth in the short term.*

Movements in the exchange rate affect the economy through multiple channels, but it is through international trade that their effect is felt most directly. Yet, isolating the specific contribution of exchange rate movements to the growth of exports and imports is a daunting task, not least because of the volatility in trade flows and the difficulty accounting for the many cyclical, structural, and sector-specific factors that affect them at any moment. In this article, we evaluate what this contribution might have been over 2003 and 2004, in the midst of one of the sharpest movements of the Canadian dollar in history.

We begin by identifying the main factors that might have masked the true impact of the currency appreciation on export and import volumes, including shifts in the composition of demand, sector-specific shocks, constraints on domestic supply, and competition from emerging-market economies.¹ We then use this preliminary analysis to interpret the evidence of exchange rate effects, first as signalled by the time path of the ratios of exports or imports to activity variables, and then as estimated by econometric models that control for business-cycle developments, exchange rate movements, and trends in international trade. Only these models can provide statistically valid estimates of the contribution of the Canadian-dollar appreciation to the recent developments in exports and imports. These estimates are specific to a particular model, however, and are subject to a considerable margin of error. As such, they are only meant to be taken as tentative, pending more information and better models.

1. In reality, some of these factors may not be entirely independent of exchange rate movements. For simplicity, however, they are treated as such in this article.

Recent Movements of the Canadian Dollar in Perspective

Following almost a decade of general depreciation against the currencies of Canada's major trading partners, the Canadian dollar appreciated abruptly during 2003 and 2004 (Chart 1). The dollar shot up by just over 17 per cent against a trade-weighted basket of currencies² during 2003 and by nearly 7 per cent during 2004, mostly in the latter half of the year. The appreciation was slightly more pronounced against the U.S. dollar. Only once in the past three decades has there been an appreciation of the Canadian dollar of similar magnitude. However, the previous rally unfolded over five years, from 1987 to 1991, and was therefore much less abrupt than the most recent surge.

Exports

As a result of a recession in the United States, exports of goods faltered in 2001, with a sharp reduction in shipments of machinery and equipment (M&E) and automotive products, which together account for roughly 40 per cent of total exports (Table 1). The slump in M&E exports dragged on to 2002, offsetting much of the rebound in most other components that accompanied an uneven recovery in the United States. As the Canadian dollar started to climb relative to other currencies in 2003, renewed weakness affected virtually all major export categories even as the U.S. upturn was gathering momentum. Among the hardest

Table 1

Annual Growth Rate in the Volume of Canadian Exports by Product

Per cent	Average of 1996–2000	2001	2002	2003	2004
Total exports ¹	9.3	-3.0	1.0	-2.1	5.0
Goods	9.5	-3.4	0.8	-1.8	5.4
Energy products (7.3)	4.0	2.0	3.9	-1.7	3.1
Other commodities ² (30.8)	5.7	-0.4	1.8	-2.9	6.7
Machinery and equipment (21.4)	16.5	-7.5	-5.8	-4.8	6.0
Of which:					
Telecom equipment	n/a	-39.6	-18.9	-6.4	13.3
Aircraft and parts	n/a	18.0	-11.4	-2.0	-2.8
Auto products (20.0)	9.5	-8.7	3.5	-2.1	6.9
Other consumer goods (3.5)	11.2	5.4	7.8	-2.3	0.5
Services	7.9	0.4	2.3	-4.0	2.5
Travel (3.3)	5.0	1.3	1.7	-10.4	12.1
Transportation (2.0)	4.9	-6.0	1.6	-9.6	8.7
Commercial (6.7)	10.7	2.0	3.5	1.4	-3.6

1. 2004 share of total exports shown in brackets

2. Includes agricultural and fish products, forestry products, and industrial goods and materials

hit were industrial goods and materials, M&E, and automotive products. The year 2004 saw a broad-based rebound, thanks to strong gains in the first two quarters. Several major categories of exports enjoyed growth rates close to, or even exceeding, the average annual growth in the late 1990s.

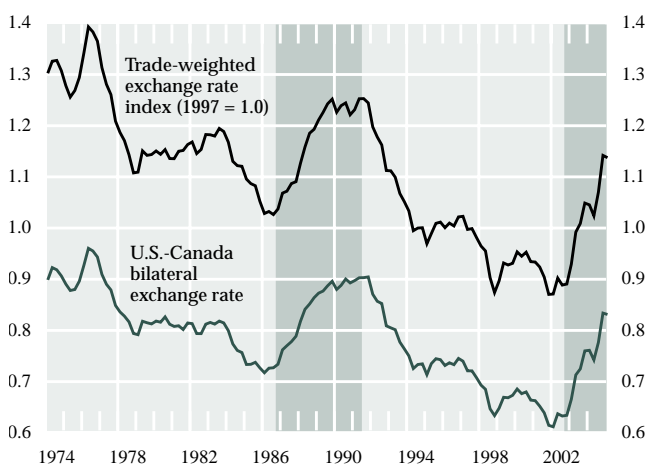
Sources of weakness

The geographic focus and product composition of Canada's exports contributed to strengthen rather than to weaken export growth in recent years, particularly in 2004.

Since 2001, Canadian export volumes have grown at a much slower pace than the volume of imports in advanced countries,³ with a marked widening of the gap in 2003 and 2004 (Table 2). Unfavourable composition effects played no role in this pattern, since the geographic focus and product composition of Canada's exports contributed to strengthen rather than

Chart 1

Canadian-Dollar Exchange Rates



2. The basket consists of the euro (6.0 per cent), yen (5.3 per cent), pound sterling (2.2 per cent), and U.S. dollar (86.5 per cent).

3. As defined by the International Monetary Fund, advanced countries consist of 29 countries capturing about 95 per cent of Canadian exports.

Table 2

Effects of Geographic Focus and Product Composition on the Growth in Volume of Canadian Exports

Per cent

	2001	2002	2003	2004
Geographic composition				
U.S. imports	-2.7	3.4	4.6	10.7
Actual imports of advanced countries ¹	-0.8	2.6	4.0	8.8
Weighted imports of advanced countries ²	-2.5	3.3	4.5	10.5
Composition effect ³	-1.7	0.7	0.5	1.7
Product composition				
Actual U.S. imports of selected products ⁴	-3.6	3.5	5.6	11.8
Weighted U.S. imports of selected products ⁵	-4.5	3.1	4.3	12.3
Composition effect ⁶	-0.9	-0.4	-1.3	0.5
Canadian exports	-3.0	1.0	-2.1	5.0

1 Actual growth of the combined imports of the United States, the euro area, Japan, the United Kingdom, and the newly industrialized Asian economies (International Monetary Fund)

2 Fixed-weighted growth of the combined imports of the advanced countries. The weights are based on their average share of Canadian exports in 2001 and 2002.

3 Difference between the weighted and the actual growth of imports of advanced countries

4 Actual growth of U.S. imports of oil, non-oil commodities, machinery and equipment, motor vehicles and parts, and non-auto consumer goods

5 Fixed-weighted growth of U.S. imports of selected components with the weights based on their average share of Canadian exports in 2001 and 2002

6 Difference between the weighted and the actual growth of U.S. imports

to weaken export growth in recent years, particularly in 2004. Indeed, total imports by the United States, Canada's largest market by far, grew comparatively quickly, and those imports shifted towards products that have a relatively large weight in Canadian exports, notably non-oil commodities. The appreciation of the Canadian dollar likely played a key role in the relative weakness of the Canadian exports, but several other factors may have also contributed to it.

Shocks and supply constraints

One consequence of product specialization is that it makes a country vulnerable to unfavourable shocks in particular sectors. Two such shocks, of global dimension, have had disproportionate effects on Canadian exports in recent years: the worldwide collapse of the telecommunications equipment industry in 2001, followed by a gradual recovery that only began in 2004; and the contraction of demand for aircrafts and parts in the aftermath of the 11 September terrorist attacks, with no steady recovery by the end of 2004 (Table 1). These shocks had considerably more impact on Canadian exports than on U.S. imports of M&E because of the much larger weights of telecommunications equipment and aircrafts and parts in Canadian exports than in U.S. imports of M&E.

For aircrafts and parts, the shock would have contributed to a marked decline in the ratio of Canadian exports to U.S. imports of M&E right into 2003 and 2004, adding to the effect of the Canadian-dollar appreciation on this ratio. For telecommunications equipment, the shock would have had a similar effect in 2003 but not in 2004. U.S. imports of telecommunications equipment started recovering in 2003, but the corresponding Canadian export resurgence only occurred in 2004.

Several other shocks have at times restrained exports. Poor harvests in 2001 and 2002 depressed wheat exports. The ban on imports of Canadian cattle and beef,⁴ following an incident of bovine spongiform encephalopathy (BSE) in late May 2003, temporarily depressed meat shipments abroad (the U.S. ban on beef was lifted in late September 2003) and cut total live animal exports by half. Largely as a result of the outbreak of severe acute respiratory syndrome (SARS) early in 2003, exports of travel services plunged in the first half of that year and recovered slowly afterwards (Table 1).⁵ Taken together, these shocks appeared to have worked in the same direction as the impact of the Canadian-dollar appreciation on total exports over a good part of 2003.

In the second half of 2004, capacity utilization rates in some industries of the resources extraction and manufacturing sectors reached peak levels that had not been seen since the 1990s or the end of the 1980s. The extent to which this generated constraints that may have contributed to the observed decline in exports during this period is difficult to ascertain.

Competition from emerging-market economies

The integration into the world trading system of China's large emerging economy adds a new dimension to competition. China has such low production costs relative to advanced economies like Canada that even a sizable rise in its currency or its costs would not prevent the country from making inroads in foreign export markets. When this advantage is brought to bear on a wide range of products, as is the case for China, the result is a rapid capture of market share in key export markets for advanced countries. As shown in Table 3, China has gained, and Canada, along with other areas (especially Japan and other Asian countries), has lost shares in U.S. import markets for several product categories since 2000, including M&E, non-

4. Beef refers to the meat from cattle and does not include live animals.

5. There was also a sharp decline in exports (and imports) in August 2003 at the time of the electricity blackout in Ontario. It was reversed in September but still depressed the quarterly total significantly.

Table 3

Share of the Value of U.S. Imports by Source for Selected Products

Per cent

	Canada	China	European Union	Japan	Mexico	Others	Total
Machinery and equipment¹ (M&E)							
2000	8.6	8.8	15.2	16.6	11.4	39.3	100.0
2002	6.6	14.1	16.5	13.3	12.8	36.7	100.0
2004	5.8	21.9	15.8	11.4	11.6	33.6	100.0
Consumer goods, other than motor vehicles and parts²							
2000	7.0	21.3	11.9	5.3	12.6	41.9	100.0
2002	6.3	25.3	11.6	4.2	12.3	40.3	100.0
2004	5.6	29.3	11.7	3.2	11.0	39.2	100.0
Semi-manufactured goods, excluding chemicals³							
2000	22.0	8.0	20.6	7.6	8.7	33.0	100.0
2002	22.5	11.1	19.7	6.4	10.0	30.3	100.0
2004	19.8	12.9	18.4	5.3	9.3	34.3	100.0
Total⁴							
2000	18.8	8.2	18.1	12.0	11.2	31.6	100.0
2002	18.1	10.8	19.4	10.4	11.6	29.7	100.0
2004	17.4	13.4	18.6	8.8	10.6	31.2	100.0

- 1 M&E is defined as North American Industry Classification System (NAICS) 333 (machinery, except electrical) and 334 (computer and electronic products)
 2 Consumer goods other than motor vehicles and parts are defined as NAICS 313 (textiles and fabrics), 314 (textile mill products), 315 (apparel and accessories), 335 (electrical equipment, appliances, and components), 337 (furniture and fixtures), and 339 (miscellaneous manufactured goods)
 3 Semi-manufactured goods, excluding chemicals, are defined as NAICS 327 (non-metallic mineral products), 331 (primary metal manufacturing), and 332 (fabricated metal products)
 4 Totals are the sum of the three product categories divided by the total U.S. imports for the three categories.
 Source: U.S. Census Bureau

automotive consumer goods, and semi-manufactured products other than chemicals.⁶ On the assumption that China's cumulative gains in 2003 and 2004 with respect to these three product categories would have affected the other countries in proportion to their market share for these same categories in 2002, the impact of China's penetration would have been to cut the volume of Canadian exports by about 0.5 per cent in 2003 and by 1.0 per cent in 2004. Though not a trivial amount, it nevertheless indicates that the effect of the

6. One mitigating factor stems from the possibility that the total size of the export market may have expanded in response to lower-cost products offered by countries like China.

Canadian-dollar appreciation on exports could still have been substantial.

Isolating the exchange rate effect

The changing product composition of U.S. imports and Canadian exports primarily reflects variations in the structure of aggregate demand and production in the United States as a result of cyclical and structural forces. By relating broad Canadian export groupings to specific components of U.S. aggregate demand or supply, it may be possible to isolate the effects of exchange rate variations.

The substantial rise in U.S.-dollar commodity prices in 2003 and 2004 has made it profitable for Canadian producers to export commodities in spite of the Canadian-dollar appreciation.

By that measure, only exports of M&E and non-automotive consumer goods seem to have been markedly affected by the recent appreciation of the Canadian dollar (Charts 2 to 6). In contrast, since the second half of 2002, exports of industrial materials have held up relative to U.S. industrial production, with much volatility. Because such materials are less differentiated than end products, they offer less scope for pricing to deviate from U.S.-dollar quotes on commodity exchanges or competitors' prices. Furthermore, the substantial rise in U.S.-dollar commodity prices in 2003 and 2004 has made it profitable for Canadian producers to export commodities in spite of the Canadian-dollar appreciation. Exports of motor vehicles have also remained aligned, on average, with U.S. sales of motor vehicle units. Little exchange rate effect on these exports is to be expected in the short term in view of the high integration of the North American automobile industry and the resulting geographic specialization of production. Canadian parts producers, on the other hand, would be expected to lose market share as contracts are re-tendered. Exports of motor vehicle parts did decline relative to U.S. motor vehicle production in 2003 and 2004, but part of this movement reflects an ongoing downward trend since 2001.

The evolution of broad export categories relative to U.S. activity variables provides useful, but purely

Chart 2

Ratio of Canadian Exports of Machinery and Equipment to U.S. Investment in Machinery and Equipment

2000 = 1.0



Chart 3

Ratio of Canadian Exports of Non-Auto Consumer Goods to U.S. Consumption, Excluding Autos

2000 = 1.0

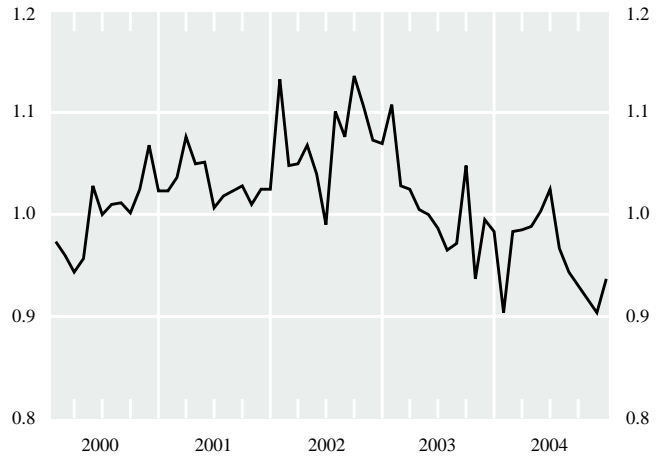


Chart 4

Ratio of Canadian Exports of Industrial Goods and Materials to U.S. Industrial Production

2000 = 1.0

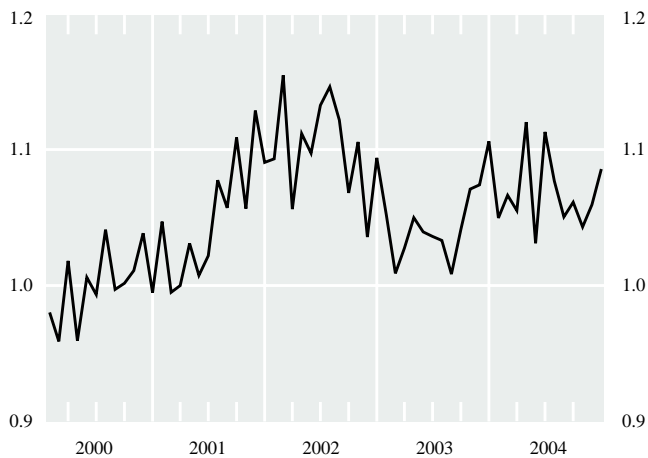


Chart 5

Ratio of Canadian Exports of Motor Vehicles to U.S. Auto Sales

2000 = 1.0

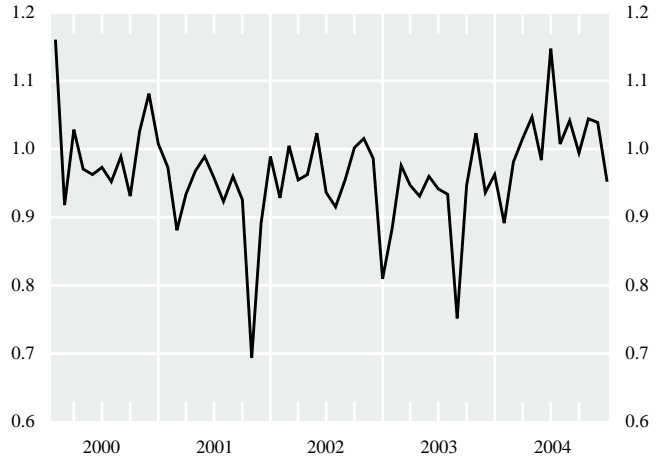


Chart 6

Ratio of Canadian Exports of Motor Vehicle Parts to U.S. Auto Production

2000 = 1.0

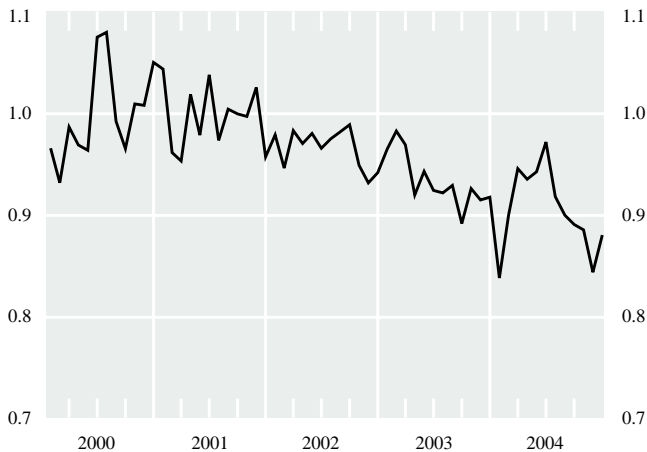
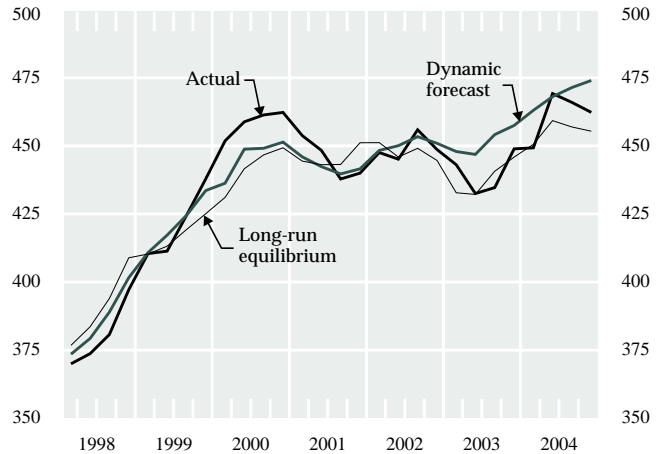


Chart 7

Exports: Actual, Dynamic Forecast, and Equilibrium Values

Billions of chained 1997 dollars, seasonally adjusted annual rates*



* A number expressed in chained 1997 dollars is a measure of real value adjusted for price changes in adjacent periods, using 1997 as a base period.

circumstantial, evidence on the underlying adjustment to the exchange rate appreciation. An estimated regression model of exports may provide a firmer basis for conclusions by more rigorously controlling for developments in foreign business cycles, real exchange rate movements, and trends in international trade over a period long enough to permit valid statistical inference of the relationship between exports and exchange rates. No matter how rich the specifications of such a model may be, however, it will make significant prediction errors over history for several reasons, including sectoral shocks that have disproportionate effects on exports, mismeasurement of the relevant activity or exchange rate variables in the model, or undetected shifts (caused by structural changes) in the true relationship between exports and one or more of the explanatory variables.

Box 1 describes the essential features of an estimated aggregate export model for Canada, including the resulting elasticities of export volumes with respect to U.S. demand components that are intensive in imports from Canada and to a real exchange rate, defined as the bilateral Canada-U.S. exchange rate adjusted by the ratio of the Canadian overall export price to the U.S. gross domestic product (GDP) deflator. Chart 7 presents the profiles of actual and forecast exports, along with their estimated long-term equilibrium values, using the model described in Box 1. Exports would have been about 2 per cent above long-term equilib-

rium by the end of 2004, consistent with a gradual adjustment to the appreciation.

The first wave of the Canadian-dollar appreciation, which spanned 2003, had its peak effect on export growth around the end of that year. The second wave, in the latter part of 2004, led to considerable additional restraint on exports.

A decomposition of the model predictions reveals that the first wave of the Canadian-dollar appreciation, which spanned 2003, had its peak effect on export growth around the end of that year (Table 4). The second wave, in the latter part of 2004, led to considerable additional restraint on exports. The model interprets the spike in export growth in the second quarter of 2004, between the two waves of appreciation, as having arisen largely from shocks unrelated to U.S. demand or to exchange rate developments. Indeed, the decline in exports over the following two quarters would have stemmed more from a reversal of these shocks than from the additional drag associated with the

Box 1

An Estimated Model of Exports

The model¹ used in this article relates Canadian export volumes to components of U.S. demand, a real exchange rate variable, and a measure of global trade openness, within an error-correction framework. Estimation of the model over the period 1973Q1 to 2004Q4 yields the following results (*t*-ratios are shown in brackets):

$$\begin{aligned} \Delta x_t = & 1.08 \cdot \Delta c_t^{us} + 0.29 \cdot \Delta i_t^{us} + 0.12 \cdot \Delta x_t^{us} \\ & (3.17) \quad (3.24) \quad (1.30) \\ & + 1.67 \cdot (\Delta inv_t^{us}/y_t^{us} - 1) - 0.13 \cdot \Delta(p_t^x \cdot pfx_t/p_t^{yus}) \\ & (3.77) \quad (1.42) \\ & - 0.08 \cdot d82q4_t - 0.31 \cdot (x_{t-1} - x_t^{eq}), \\ & (-3.78) \quad (-4.72) \end{aligned}$$

where percentage changes in exports (x_t) in quarter t are predicted by changes in U.S. consumption (c_t^{us}), in U.S. investment in fixed capital (i_t^{us}), and in U.S. exports (x_t^{us}); by the change in inventory investment relative to GDP ($\Delta inv_t^{us}/y_t^{us} - 1$); by relative prices as measured by the ratio of the Canadian export-price deflator expressed in U.S. dollars to the U.S. GDP deflator ($p_t^x \cdot pfx_t/p_t^{yus}$)²; and by a dummy variable for 1982Q4 ($d82q4_t$)³. Further influencing the forecast is the “correction” for the most recent divergence of exports from their equilibrium level ($x_{t-1} - x_t^{eq}$), governed by a speed-

1. This model was developed by Jean-Phillipe Cayen, an economist in the Research Department of the Bank of Canada.

2. The movements in the relative price variable are primarily driven by those in the nominal exchange rate vis-à-vis the U.S. dollar, but can also be affected by changes in commodity prices and other factors that influence the growth rates of the export price and the U.S. GDP deflator.

3. This variable has no theoretical justification. It is included only because it helps to keep the model stable over time in the face of an exceptionally large drop in exports in 1982Q4.

of-adjustment parameter of 0.31. The equilibrium level is determined by a long-run, cointegration relation linking the level of exports to those of relative export prices, the U.S. demand components, and global openness to trade, captured by the ratio of exports to GDP in countries that are members of the Organisation for Economic Co-operation and Development (OECD) ($open_t$)⁴:

$$\begin{aligned} x_t^{eq} = & 7.38 - 0.56 \cdot (p_t^x \cdot pfx_t/p_t^{yus}) + 0.11 \cdot open_t \\ & (4.60) \quad (-6.48) \quad (0.49) \\ & + 0.42 \cdot c_t^{us} + 0.29 \cdot i_t^{us} + 0.35 \cdot x_t^{us} \\ & (3.30) \quad (3.51) \quad (4.76) \end{aligned}$$

The resulting long-run elasticities of exports with respect to real exchange rate and U.S. activity are consistent with theoretical priors. The model was tested for structural parameter breaks and found to be stable.

Table B1

Key Elasticity Estimates for Total Canadian Exports

	Short run (on impact)	Long run
Relative price of exports	-0.13	-0.56
U.S. consumption	1.08	0.42
U.S. investment	0.29	0.29
U.S. exports	0.12	0.35

4. A crude dummy variable to capture the effect of the Free Trade Agreement was also tested but turned out to be statistically insignificant. However, this could simply indicate that the profound impact of the trade agreement emerged only over time and could hardly be captured by a simple dummy variable. The variable $open_t$ is kept in the equation, even if it is not significant, because it helps to maintain the stability of the equation over time.

Table 4

Contributions of Various Factors to Quarterly Growth in Total Exports

Per cent

	2003				2004			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Total exports	-1.25	-2.42	0.50	3.22	0.08	4.34	-0.70	-0.79
U.S. demand	-0.10	0.54	2.38	1.55	1.93	1.60	1.52	1.76
Relative prices	-0.60	-0.79	-0.74	-0.84	-0.81	-0.60	-0.93	-1.32
Trade openness	0.03	0.02	-0.02	0.03	0.08	0.09	0.12	0.09
Residual	-0.58	-2.18	-1.11	2.48	-1.12	3.26	-1.41	-1.33

second wave of appreciation. By the end of 2004, the drag exerted by the appreciation would have offset about 60 per cent of the stimulus provided by the growth of U.S. demand since the end of 2002.

The predominantly negative prediction errors from the model, as reflected in the residual component of Table 4, indicate that, through much of 2003 and 2004, exports were depressed by factors not taken into account by the model, including some that were discussed before, such as Canadian vulnerability to the downturn in telecommunications and aircrafts, the various ad hoc shocks that hit exports in 2003 and before, and the loss of market share to emerging-market economies. The negative errors also raise the possibility that exports

may have responded more swiftly than in the past to movements in the exchange rate, perhaps as a result of the unusual abruptness of the recent appreciation of the Canadian dollar. Such a front-loading of the exchange rate effect should give rise to systematically positive errors later on. The ongoing appreciation of the dollar, however, makes it particularly difficult at present to come to any conclusion with respect to this hypothesis.

Based on the impulse-response function, the past appreciation of the Canadian dollar would continue to cut into export growth during 2005, even with a stable real exchange rate from the first quarter onwards (Chart 8). Net of their import content, exports would be cumulatively reduced by the equivalent of about 0.5 per cent of GDP during the year. As this drag would diminish rapidly, the expansion of exports would tend to accelerate, thereby lending support to economic growth in the short term.

Imports

Following a period of strong growth from 1996 to 2000, sharp declines were registered in 2001 for key import categories, such as M&E, automotive products, and industrial goods and materials (Table 5). Services imports also fell in that year, mostly because of weakness in the travel and transportation categories. Automotive products recovered the following year, barely offsetting continued declines in M&E and some other categories. By 2003, imports had taken a decided turn to the upside, with M&E and services contribut-

Chart 8
Effect of the Exchange Rate on Exports: Historical Path and as Forecast by the Error-Correction Model

Per cent contribution to growth

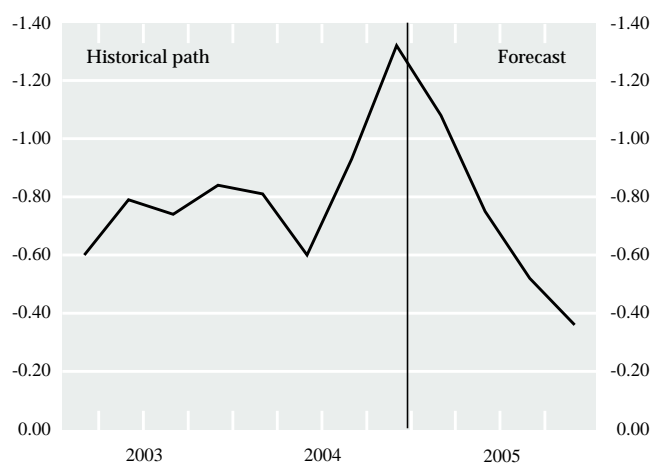


Table 5
Annual Growth Rate in the Volume of Canadian Imports, by Product

	Average of 1996–2000	2001	2002	2003	2004
Total imports ¹	8.8	-5.1	1.5	4.1	8.1
Goods	9.8	-5.7	1.7	3.6	8.3
Energy products (3.2)	7.0	3.2	-9.5	9.5	8.7
Other commodities ² (21.8)	8.5	-2.4	3.0	1.0	7.9
Machinery and equipment (28.0)	13.3	-10.6	-5.3	4.2	12.5
Auto products (18.1)	9.3	-8.7	11.0	2.1	4.3
Other consumer goods (11.0)	9.2	2.4	8.0	8.8	8.1
Services	3.4	-2.0	0.6	6.4	7.3
Travel (4.1)	0.1	-5.5	-3.3	9.1	14.0
Transportation (3.2)	3.3	-5.9	1.7	6.3	12.3
Commercial (7.4)	5.7	1.4	2.4	5.4	2.5

1 2004 share of total imports shown in brackets

2 Includes agricultural and fish products, forestry products, and industrial goods and materials

ing the most. The gains were sustained and even amplified in 2004, not least because of an acceleration in imports of industrial goods and materials and further momentum from M&E. While growth of goods imports in 2003 and 2004 remained below the average rate seen in the late 1990s, the same cannot be said of services. Of particular note are travel and transportation services imports, which bounced back from the effects of earlier negative shocks to surge over the 2003–2004 period at a rate not seen since the previous episode of Canadian-dollar appreciation (1987–1991).

While goods from the United States still account for more than half of all Canadian imports, their share has declined steadily in recent years (Table 6). Also losing ground has been Japan's share, which fell behind that of China in 2002. The growth in goods imports from China has since accelerated, resulting in a full 3 percentage point lead in import share over Japan in 2004. Other countries, including the European Union, also made modest gains during the 2003–2004 period.

Table 6
Share of the Value of Canadian Imports of Goods, by Source

	Average of 1996–2000	2001	2002	2003	2004
United States	67.0	63.6	62.6	60.7	58.8
European Union	10.1	11.5	11.4	11.9	11.8
China	2.6	3.7	4.6	5.5	6.8
Japan	4.6	4.3	4.4	4.1	3.8
Others	15.7	16.9	16.9	17.8	18.8

Sources of strength

Import volumes grew at a much faster pace than did total demand for Canadian goods and services in 2003 and 2004 (Chart 9), an indication that the appreciation of the Canadian dollar may have induced a shift towards cheaper foreign sources of supply. Factors other than the exchange rate that could also have led to a rise in the overall import intensity include a shift in demand towards particularly import-intensive components, shocks or constraints on domestic supply, and competition from emerging-market economies.

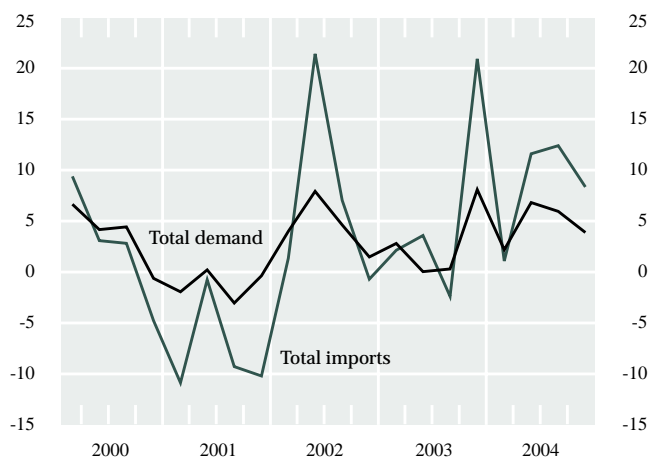
Composition of total demand

Imports of goods and services accommodate final domestic demand, exports, and inventory investment. They include end-products as well as the intermediate goods and services in domestic production. Import intensity varies considerably across the various demand categories, depending on the tradability of the relevant goods and services, the specialization and vertical integration of Canadian production, and the degree of product differentiation within the same classes of goods and services. Investment in M&E and personal expenditures on motor vehicles, other durable goods, and semi-durable goods have relatively high import propensities compared with expenditures on services by the personal and government sectors (Table 7). A comparison of growth in total demand with growth in weighted components, using import propensities⁷ as

Chart 9

Growth Rate of Imports vs. Total Demand

Quarter-over-quarter annualized per cent



7. We are grateful to Jian-guo Cao at Finance Canada for providing us with the estimates of import propensities for 2000 used in this article.

Table 7

Annual Growth and Import Propensity of the Components of Final Demand

Per cent

	Import propensity ¹ (%)	Annual growth			
		2001	2002	2003	2004
Components of final demand					
Personal expenditures on:					
- food, beverages, and tobacco	31.9	1.3	1.0	1.5	1.8
- electricity, natural gas, and other fuels	20.3	-4.0	2.7	2.6	-0.9
- other non-durable goods	24.5	2.8	5.3	3.5	4.6
- semi-durable goods	40.5	4.0	4.1	3.4	5.5
- motor vehicles, repairs, and parts	55.6	1.7	9.0	-0.6	-0.8
- other durable goods	47.2	7.8	7.8	6.3	8.9
- services other than rent	17.8	1.7	2.5	3.8	3.7
- paid and imputed rent	8.7	2.8	3.4	3.5	3.8
Investment in:					
- residential structures	21.0	10.6	14.3	6.2	8.3
- non-residential structures	23.9	5.4	-7.3	5.7	0.8
- machinery and equipment	71.7	-3.0	-3.3	6.4	9.8
Government expenditures on goods and services					
Government gross fixed-capital formation	36.9	11.5	8.4	4.5	4.9
Exports of goods and services	34.3	-3.0	1.0	-2.1	5.0
Investment in inventories (year-over-year difference)					
Total demand	29.3	-15,762	4,146	9,306	469
Weighted total demand ²		-1.1	2.4	2.5	5.0
Actual imports		-5.1	1.5	4.1	8.1

1 Estimated for 2000 (Finance Canada)

2 Fixed-weighted growth of all final demand components with the weights based on their import propensity

weights, indicates that the composition of demand made little difference in 2003 but stimulated imports moderately in 2004. Contributing to the latter were relatively strong advances in investment in M&E, personal expenditures on non-automotive durable and semi-durable goods, and exports of goods and services, all components with higher-than-average import propensities. The fact that, over the 2003–2004 period, actual imports accelerated relative to the pace suggested by the growth of weighted total demand points to an intensifying effect of the Canadian-dollar appreciation. This effect may even be greater than implied by the rise of imports relative to weighted total demand, inasmuch as the shift in demand towards import-intensive components was itself prompted by the lower import prices resulting from the appreciation of the Canadian dollar.

Shocks/constraints on domestic supply

Particular sectoral developments or shocks appear to have affected imports less than exports over recent years. Nevertheless, imports did experience shocks that at times masked, and at other times enhanced, the impact of the Canadian-dollar appreciation. The uncertainties created by SARS and the war in Iraq, for instance, delayed travel spending abroad by Canadians in the second quarter of 2003. There was also a sharp decline in merchandise imports in August 2003, at the time of the electricity blackout in Ontario. The decline was reversed in September but nonetheless depressed the quarterly total markedly. These shocks had the effect of somewhat masking the impact of the currency appreciation. On the other hand, demand may have outstripped domestic supply in particular sectors, leading to the need for additional imports to make up for the shortfall and thereby amplifying the exchange rate effect. In this vein, the rise in imports to high levels relative to exports of energy in 2004 likely stemmed more from excess demand for energy in Canada than from the appreciation of the Canadian dollar. A trend decline in the productivity of the Western Sedimentary Basin oil fields, temporary production problems at extraction sites, and a vigorous rise in personal consumption of gasoline would have contributed to this excess demand. Likewise, continued depletion of mineral reserves in Canada and a faster rate of mine closings than openings over most of the decade up to 2004 likely contributed to a substantial rise in imports of metal ores relative to primary metals exports in 2003 and 2004.

Competition from China

Because of its substantial cost advantage, China has made considerable inroads in recent years, not only in the markets for Canadian exports, but also in the Canadian market itself, where its import share has risen particularly rapidly with respect to M&E and non-automotive consumer goods, partly at the expense of the United States, Japan, and Taiwan. Chinese exports to Canada of computer and peripheral equipment, clothing, toys and sporting goods, audio-video equipment, footwear, and communications equipment are particularly important. Measuring the displacement of domestic production by these exports is problematic, if only because their fine product composition may not match that of Canadian supply. Nevertheless, it is significant that, for most of the above products, especially computers and peripheral equipment, marked increases in the Chinese share of total supply in Canada

Table 8

China's Share of Canadian Total Demand or Supply and Imports of Selected Products

Per cent

	2001	2002	2003	2004
As a share of total demand or supply ¹				
Selected machinery and equipment (M&E)	3.0	4.9	7.8	11.1
Computer and peripheral equipment manufacturing	4.6	7.2	12.8	19.7
Communications equipment manufacturing	2.2	4.4	6.1	6.3
Industrial machinery manufacturing	0.7	0.9	1.2	1.6
Selected consumer goods	18.0	20.8	23.1	26.5
Cut-and-sew clothing manufacturing	11.3	14.3	15.2	18.1
Footwear manufacturing	39.7	41.6	45.0	46.9
Audio-video equipment manufacturing	15.2	18.0	21.8	26.3
Sporting and athletic goods manufacturing				
Doll, toy, and game manufacturing	27.1	29.2	32.4	36.6
As a share of imports from all countries				
Selected M&E	5.1	7.9	12.2	17.6
Selected consumer goods	29.4	32.7	36.2	39.2

¹ Total demand or supply is approximated by the sum of apparent domestic demand or supply plus exports, or, alternatively, by the sum of shipments and imports.

in 2003 and 2004 were accompanied by declining shares of Canadian shipments (Table 8).

Because of its substantial cost advantage, China has made considerable inroads in recent years, not only in the markets for Canadian exports, but also in the Canadian market itself.

Isolating the Influence of the Exchange Rate

Ratios of imports to Canadian activity variables suggest an increasing stimulus exerted by the Canadian-dollar appreciation on non-energy raw materials, M&E, and non-automotive consumer goods in 2003 and 2004 (Charts 10 to 14).

An estimated regression model also indicates that exchange rate effects were important. Box 2 describes the essential features of such a model, including the resulting elasticities with respect to demand components and a real exchange rate, defined as the ratio of the Canadian overall import price to the Canadian GDP deflator. Chart 15 shows actual and forecast imports, along with their estimated long-run equilibrium values.

Chart 10

Ratio of Canadian Imports of Non-Energy Raw Materials to Canadian Industrial Production

2000 = 1.0

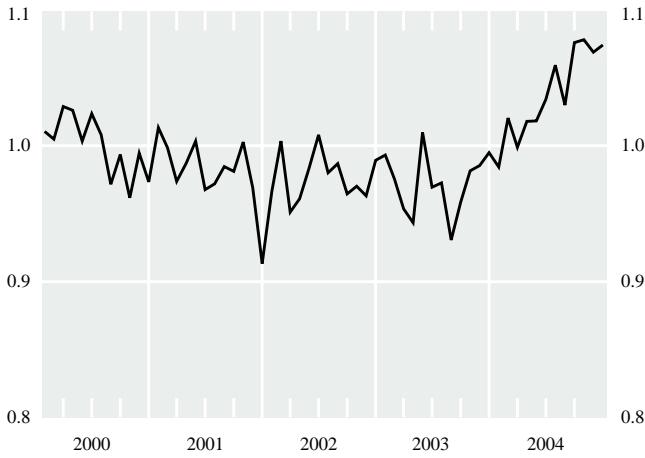


Chart 11

Ratio of Canadian Imports of Machinery and Equipment to Canadian Investment in and Exports of Machinery and Equipment

2000 = 1.0



Chart 12

Ratio of Canadian Imports of Non-Auto Consumer Goods to Canadian Consumption, Excluding Autos

2000 = 1.0

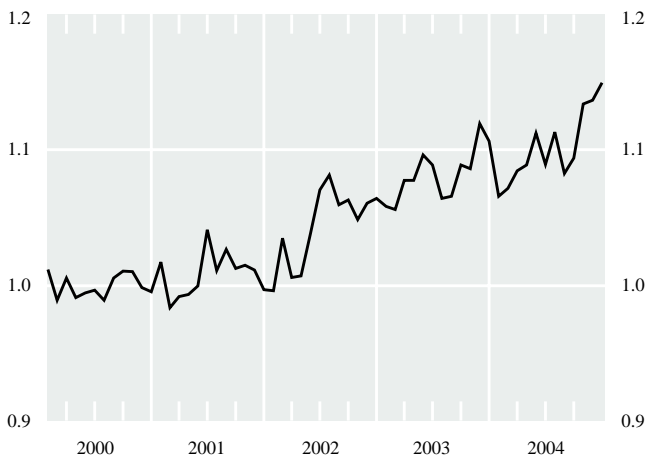


Chart 13

Ratio of Canadian Imports of Motor Vehicles to Canadian Consumption of Motor Vehicles

2000 = 1.0

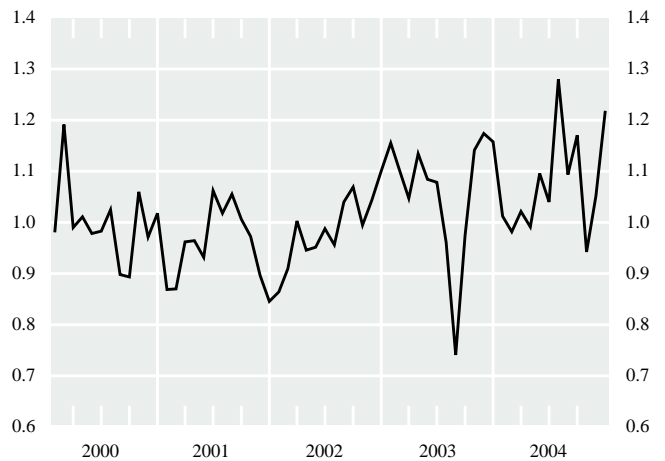
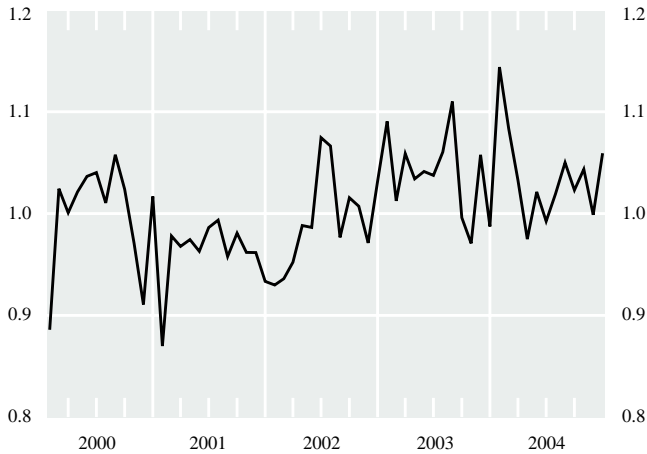


Chart 14

Ratio of Canadian Imports of Motor Vehicle Parts to Canadian Exports of Motor Vehicles

2000 = 1.0



Imports would have been about 7 per cent below long-term equilibrium by the end of 2004, consistent with a more gradual adjustment to the appreciation than exports.

A decomposition of the model predictions indicates that the appreciation of the Canadian dollar would have boosted import growth by about 1 percentage point per quarter in 2003 and 2004 and accounted for about 60 per cent of the total advance in imports over these two years (Table 9). The rate of response of imports to the real exchange rate changes shows a profile similar to that of the response of exports, with a first peak at the end of 2003 and another one a year later as the second wave of the appreciation started to be felt. From the fourth quarter of 2003 onwards, however,

Table 9

Contributions of Various Factors to Quarterly Growth in Total Imports

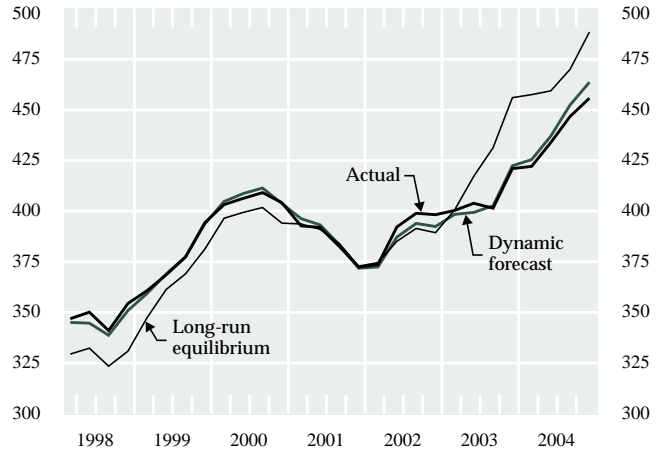
Per cent

	2003				2004			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Total imports	0.53	0.88	-0.60	4.75	0.27	2.74	2.92	2.00
Demand	0.84	-1.07	-0.26	3.43	-0.20	2.34	2.48	1.06
Relative prices	0.67	1.31	1.06	1.37	0.92	0.35	0.98	1.39
Residual	-0.98	0.63	-1.40	-0.05	-0.45	0.05	-0.54	-0.45

Chart 15

Imports: Actual, Dynamic Forecast, and Equilibrium Values

Billions of chained 1997 dollars, seasonally adjusted annual rates*



* See the footnote to Chart 7 for a definition of chained 1997 dollars.

the strength of total demand in Canada would have explained most of the vigorous expansion of imports. The relatively modest size of the residual component in Table 9 suggests that shocks that are unrelated to demand components or the exchange rate, including gains in China's share in the Canadian market, would have played a comparatively minor role in the evolution of imports.

From the fourth quarter of 2003 onwards, the strength of total demand in Canada would have explained most of the vigorous expansion of imports.

Based on the impulse-response function, the past appreciation of the Canadian dollar would continue to stimulate import growth during 2005, even with a stable real exchange rate from the first quarter onwards (Chart 16). Imports would be cumulatively raised by the equivalent of about 1.0 per cent of GDP during 2005. As this stimulus would diminish steadily, their expan-

Box 2

An Estimated Model of Imports

The model¹ relates Canadian import volumes to components of total Canadian demand and a real exchange rate variable, within an error-correction framework.² Estimation of the model over the period 1973Q1 to 2004Q4 yields the following results (*t*-ratios in brackets):

$$\Delta m_t = 0.59 \cdot \Delta c_t + 0.37 \cdot \Delta i_t + 0.61 \cdot \Delta x_t + 1.58 \cdot (\Delta inv_t / y_{t-1})$$

(3.23) (7.53) (12.06) (8.16)

$$y_{t-1} - 0.18 \cdot \Delta(p^m_t / p^y_t) - 0.10 \cdot (m_{t-1} - m^{eq}_{t-1}),$$

(-2.22) (3.54)

where percentage changes in imports (m_t) in quarter t are predicted by changes in domestic consumption (c_t), in investment in fixed capital (i_t), and in exports (x_t); by the change in inventory investment relative to Canadian GDP ($\Delta inv_t / y_{t-1}$); and by relative prices as measured by the ratio of the Canadian import-price deflator to the Canadian GDP deflator (p^m_t / p^y_t).³ There is also a “correction” for the most recent divergence of imports from their

1. This model was developed by Jean-Phillipe Cayen, an economist in the Research Department.
2. A measure of global trade openness was tested but found statistically insignificant.
3. The movements in the relative price variable are primarily driven by those in the nominal exchange rate vis-à-vis the U.S. dollar, which feed into the import prices estimated by Statistics Canada. They can also be affected by changes in U.S. price indexes, commodity prices and other factors that influence Canadian import prices and the GDP deflator.

equilibrium level ($m_{t-1} - m^{eq}_{t-1}$), governed by a speed-of-adjustment parameter of 0.10. The equilibrium level is determined by the long-run cointegration relation:

$$m^{eq}_t = 4.24 - 0.90 \cdot (p^m_t / p^y_t) + 0.11 \cdot c_t + 0.29 \cdot i_t + 0.61 \cdot x_t,$$

(1.40) (-4.36) (0.27) (1.49) (4.51)

The magnitude of the short-run relative price elasticity is similar to that in the export model, but the size of the long-run elasticity is markedly larger, and the speed of adjustment much slower. Again, the sum of the long-run elasticities to final demand components is very close to unity.

The parameter estimates were found to be stable over time. Statistical tests reveal that the contemporaneous variations in the demand components, including the changes in inventory investment relative to GDP, were exogenous to those in imports.

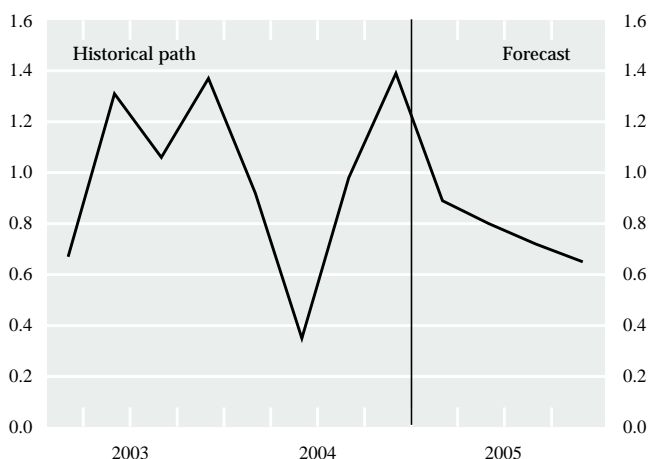
Table B2
Key Elasticity Estimates for Total Canadian Imports

	Short run (on impact)	Long run
Relative price of imports	0.18	0.90
Domestic consumption	0.59	0.11
Domestic investment	0.37	0.29
Domestic exports	0.61	0.61

Chart 16

Effect of the Exchange Rate on Imports: Historical Path and as Forecast by the Error-Correction Model

Per cent contribution to growth



sion would slow down, thereby supporting economic growth in the short term.

Conclusion

Trying to isolate the specific contribution of exchange rate movements to the evolution of exports and imports is fraught with risks because it is difficult to properly account for the many other factors—cyclical, structural, and sector-specific—that affect trade flows at any point in time. Evidence examined in this article indicates that both exports and imports have adjusted significantly to the Canadian-dollar appreciation in 2003 and 2004. Model simulations suggest that this adjustment should have started tapering off in the first half of 2005, thereby lending support to economic growth in the short term.

