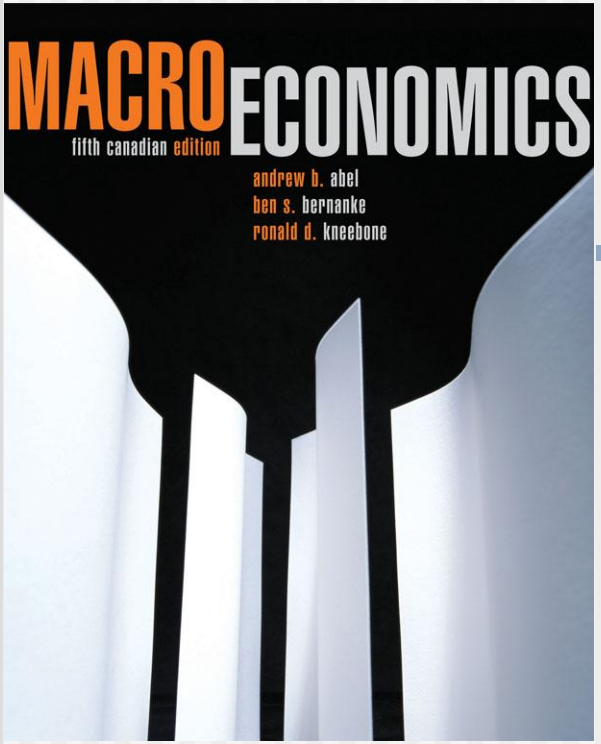


Chapter 2

The Measurement and Structure of the Canadian Economy

National Income Accounting

- The national income accounts is an accounting framework used in measuring current economic activity. There are three approaches, each of which gives a different perspective on the economy:
  - The product approach measures the amount of output produced, *excluding* output used up in intermediate stages of production.
  - The income approach measures the incomes received by the producers of output.
  - The expenditure approach measures the amount of spending by the ultimate purchasers of output.

National Income Accounting Numerical Example

AppleInc Transactions	
Wages paid to AppleInc employees	15000
Taxes paid to government	5000
Revenues received from the sale of	35000
Apples sold to public	10000
Apples sold to JuiceInc	25000
JuiceInc Transactions	
Wages paid to JuiceInc employees	10000
Taxes paid to government	2000
Apples purchased from AppleInc	25000
Revenues received from the sales	40000

The Three Approaches Are Equivalent

- The market value of a good (product) and the spending on a good (expenditure) are always the same. Your spending reflects what it is worth.
  - What about inventories? The same holds as inventories are assumed to be purchased by firms.
- The seller's receipts (*i.e.,* expenditure) are equal to the total income generated by the economic activity (income).
  - Expenditure is the amount spent by *ultimate* users of output, which here are households.
- Total income is equal to wages, taxes and profits, the latter being determined as a residual.

The Three Approaches Are Equivalent (continued)

- Fundamental identity of national income accounting:

$$total\ \ production = total\ \ income = total\ \ expenditure$$

What happens if we change the numbers?

- The basic relationships will still hold; that is, it will add up and three approaches will each give the same answer.
- For the income approach, the key is to focus on profits, which will adjust.
  - Profits (after taxes) = total revenues – costs of inputs – wages – taxes.
- The product and expenditure approach are straightforward.

The Product Approach to Measuring GDP

- A nation's gross domestic product (GDP) is the market value of final goods and services newly produced within a nation during a fixed period of time (*location, location, location*). Some of these factors will be owned by foreigners.
- This is the broadest and most well-known measure and what is typically reported in the press.
- Using market values allows adding the production of different goods and services according to their importance.

The Product Approach to Measuring GDP (continued)

- Problems with the market values:
  - Some goods are not sold in markets, e.g., household and volunteer services.
  - The underground economy – illegal activities and legal activities hidden from the government. Part of this can be measured.
  - Lack of market values to use when calculating the government contribution to the GDP. Here service costs are used.

The Product Approach to Measuring GDP (continued)

- GDP includes only goods and services newly produced within the current period. It is a sum of value added – value of an output less value of what is used up in production.
- Intermediate goods are those **used up** in the production of other goods in the same time period.
  - The distinction between intermediate and final goods can be subtle when they are capital goods.

The Product Approach to Measuring GDP (continued)

- GDP includes only final goods – not intermediate goods, the end products.
- New capital goods and inventory investment are final goods in this framework. They are produced during the period and not used up. Inventories are assumed to be bought by firms.
- What happens to inventories in the next period when the goods are sold? Do we double count?
  - Turns out no; inventories are run down.

GDP versus GNP

- Gross national product (GNP) is the market value of final goods newly produced by domestic factors of production (capital, labour) during the current period, regardless of their location. Here ownership is important as apposed to location.
- Some of these factors will be located abroad but owned by Canadians.

GDP versus GNP (continued)

- Canadian-owned capital and labour used abroad produce output and income. They are included in Canadian GNP, not GDP.
- Foreign owned capital and labour used in Canada produce output and income are included in Canadian GDP, not GNP.

GDP versus GNP (continued)

- Net factor payments from abroad (*NFP*) is:
  - income paid to domestic factors of production by the rest of the world;
  - minus income paid to foreign factors of production by the domestic economy.

$$GDP + NFP = GNP$$

GDP versus GNP (continued)

- In 2006 Canadian *GDP* was $1446.4 billion and Canadian *GNP* was $1435.7 billion.
- The somewhat less than 1% difference arises because of the scale of foreign investments in Canada.

The Expenditure Approach to Measuring GDP

$$Y = C + I + G + NX$$

Y = *GDP* or total income

C = consumption

I = investment

G = government purchases of goods and services

NX = net exports of goods and services (exports minus imports)

TABLE 2.1

Expenditure Approach to Measuring GDP in Canada, 2006

	Billions of dollars	Percent of GDP
Personal consumption expenditures	**803.5**	**55.6**
durable goods	105.7	7.3
semi-durable goods	66.8	4.6
nondurable goods	195.6	13.5
services	435.4	30.1
Business fixed investment	**277.9**	**19.2**
residential construction	98.4	6.8
nonresidential construction	85.7	5.9
machinery and equipment	93.8	6.5
Business inventory investment	**7.8**	**0.5**
Government investment	**40.3**	**2.8**
fixed capital	40.3	2.8
inventories	0.0	0.0
Government purchases of goods and services*	**279.8**	**19.3**
Net exports	**37.0**	**2.6**
exports	524.7	36.3
imports	487.7	33.7
Statistical discrepancy†	**–0.1**	**0.0**
Total (equals GDP)	**1446.3**	**100.0**

Source: Adapted from Statistics Canada CANSIM II Table 380-0017.

* Government *purchases of* goods and services are also referred to as government *expenditure on* goods and services.

† See Table 2.2 for a definition of the statistical discrepancy.

The Expenditure Approach (continued)

- *GDP*:
  - total production or total income or total expenditure.
- Consumption is spending by domestic households on both domestic and foreign goods and services (55.6% of GDP):
  - consumer durable goods (7.3%);
  - semi-durable goods (4.6%);
  - nondurable goods (13.5%);
  - services (30.1%).

The Expenditure Approach (continued)

- Investment which also includes domestic and foreign goods (22.5% of GDP):
  - fixed investment (19.2%):
    - residential construction (6.8%),
    - nonresidential investment (5.9%),
    - machinery and equipment (6.5%);
  - inventory investment (0.5%);
  - government investment plus their holdings of inventories (2.8%).

The Expenditure Approach (continued)

- Government purchases of goods and services (19.3% of GDP):
  - government purchases, other than capital goods;
  - transfers are not included as they do not represent a purchase of a new good or service.
- Net exports of goods and services (2.6% of GDP):
  - exports (36.3%) minus imports (33.7%).

The Income Approach to Measuring GDP

- This approach is the final way to measure GDP. We start with *Net National Income at factor cost,* which consists of:
  - Labour income (51.0%);
  - Corporate profits (14.7%);
  - Interest and investment income (4.4%); and
  - Unincorporated business income (6.0%).

The Income Approach to Measuring GDP (continued)

- Labour income (51.0%):
  - wages, salaries, employee benefits;
  - employer contributions to the EI and the CPP;
  - These data are before taxes.
- Corporate profits (14.7%)
  - typically we show the uses of profits which consist of:
    - taxes levied on corporations;
    - dividends to shareholders;
    - retained earnings (corporate saving).

The Income Approach to Measuring GDP (continued)

- Interest and investment income (4.4%):
  - interest earned by individuals from business and foreign sources;
  - minus interest paid by individuals.
  - by convention, interest on government debt is excluded because it is not used to produce new goods and services.
- Unincorporated business income (6.0%):
  - income of self-employed, which includes both labour and capital income.

The Income Approach to Measuring GDP (continued)

- We still don't have GDP. To get there we need to account for two other items:
  - Indirect taxes less subsidies (11.2%):
    - provincial sales taxed (PST);
    - goods and services tax (GST);
    - minus subsidies.
  - We add this in since they are income of the government. Note that NNI is constructed with before-tax prices while GDP use after-tax prices.
  - Capital consumption allowances or depreciation – the value of capital that wears out during the measured period (12.8%).

TABLE 2.2

Income Approach to Measuring GDP in Canada, 2006

	Billions of dollars	Percent of GDP
Labour income	737.4	51.0
Corporate profits*	212.7	14.7
Interest and investment income†	63.5	4.4
Unincorporated business income**	86.3	6.0
Total (equals Net National Income) at factor cost	1099.9	76.0
Plus Indirect taxes less subsidies	161.6	11.2
Total (equals Net Domestic Product) at market prices	1261.5	87.2
Plus Capital consumption allowances	184.8	12.8
Plus Statistical discrepancy††	0.1	0.0
Equals Gross Domestic Product (GDP)	1446.4	100.0
Plus Net factor payments	–10.7	–0.7
Equals Gross National Product (GNP)	1435.7	99.3

Source: Adapted from Statistics Canada CANSIM II Tables 380-0015 and 380-0016.

* Includes government enterprise profits.

† Includes inventory valuation adjustment.

** Includes net farm income.

†† Statistical discrepancy reflects the difference between Statistics Canada's estimates of GDP from the expenditure approach and its estimates from the income approach. The discrepancy is an adjustment that is made so that the two estimates coincide.

Private Sector and Government Sector Income

- Now we will look at income.
- Private disposable income (PDI) is the amount of income the private sector has available to spend after paying taxes and receiving government transfers.
- The definition of the private sector is very inclusive (households and corporations – the *corporate veil*).

Income (continued)

- Private-sector disposable income is:
  - income earned at home (Y) and abroad (NFP);
  - plus transfers from the government (TR);
  - plus interest on government debt (INT);
  - less taxes (T).

$$PDI = Y + NFP + TR + INT - T$$

Income (continued)

In the real world the government also has income:

$$\text{Net Government Income} = T - TR - INT$$

TR = transfers received from the government

INT = interest payments on the government's debt goes back in because it is income for the private sector

T = taxes

Note: if we add the two sources if income we get Y + NFP or GNP.

Saving and Wealth

- Wealth is the difference between assets and liabilities.
- National wealth is the wealth of an entire nation and a measure of well being.
- Saving is current income minus spending on *current needs* and is an important determinant of wealth.

Note that understanding saving will be important for this course.

Private saving

$S_{pvt} = (Y + NFP - T + TR + INT) - C$

- Here total consumption is subtracted from private disposable income because private consumption represents spending on current needs.
- Note we did not subtract private investment – investing is not done to satisfy *current needs* but rather future needs.
- The best way to think of this is that if you are not spending your income you are saving it.
- The private saving rate is defined as:

  S_{pvt}/PDI

The Government Budget Surplus and Budget Deficit

- The government budget surplus is a positive difference between government revenue (T) and government expenditure ($G+TR+INT$) – this is government saving (S_{govt}).
- The government budget deficit is a negative difference between T and ($G+TR+INT$) – government dissaving ($-S_{govt}$).

Total National Saving

- If we add the two sectors' saving we get national saving (S):

$$S = S_{pvt} + S_{govt}$$
$$= (Y + NFP - T + TR + INT - C)$$
$$+ (T - TR - INT - G)$$
$$= Y + NFP - C - G.$$

The Uses of Private Saving

- We start with national saving – what a country as a whole saves and we substitute in the expenditure definition of total income:

$$S = (C + I + G + NX) + NFP - C - G$$
$$= I + (NX + NFP)$$
$$= I + CA$$

  - *CA* is the current account balance – payments received from abroad for exports minus payments made to foreigners for imports, *NFP* included.

The Uses of Saving Identity

$$S - S_{govt} = I + CA - S_{govt}$$

$$S_{pvt} = I + (-S_{govt}) + CA$$

Private saving is used in three ways:

- to fund investment (I);
- to fund the government budget deficit ($-S_{govt}$);
- or to purchase assets from foreigners or lend abroad – the current account balance (CA).

This is the ***uses-of-saving identity***.

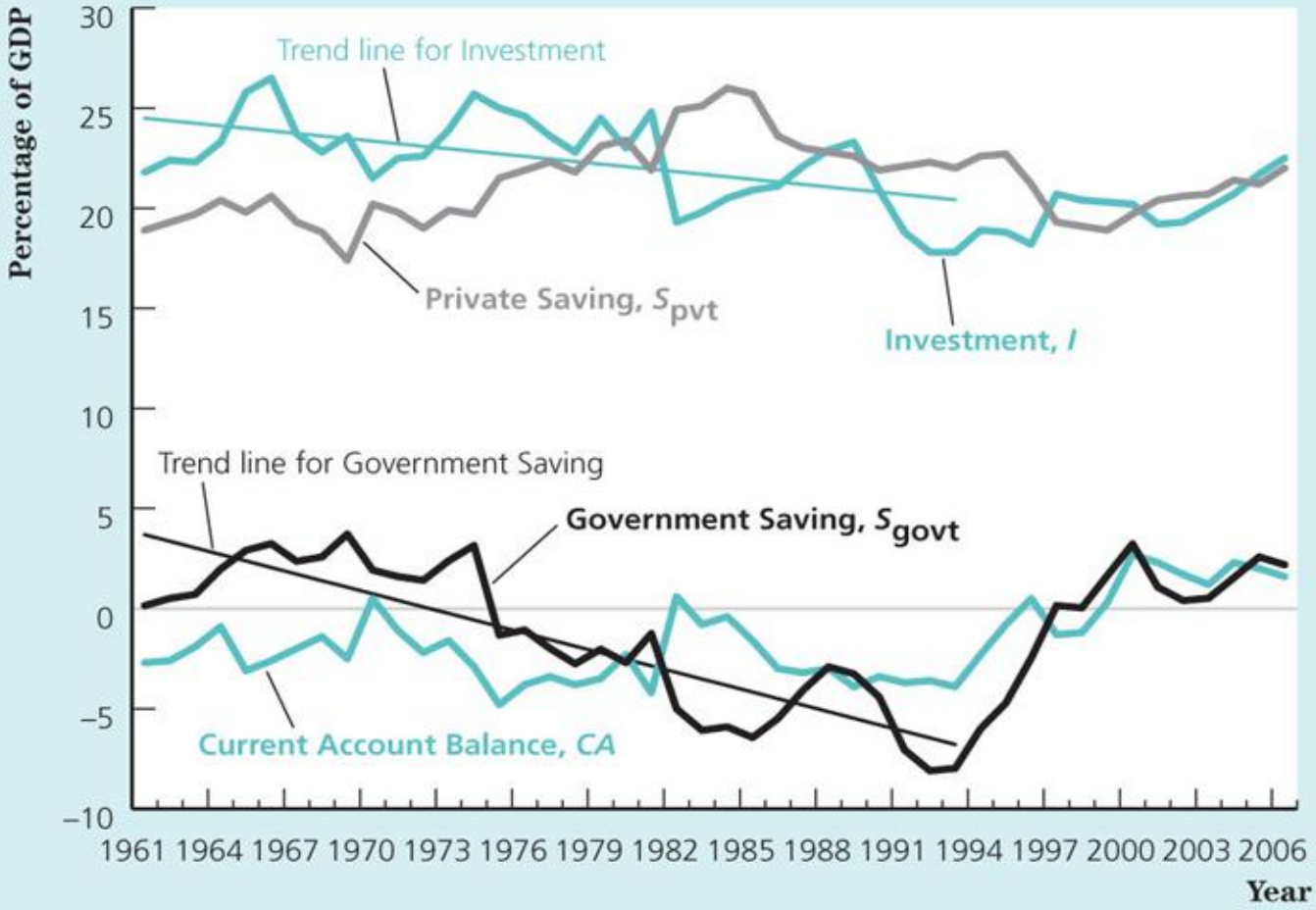
Uses of Saving

FIGURE 2.1

THE USES-OF-SAVING IDENTITY IN CANADA, 1961–2006

The figure illustrates the uses-of-saving identity—which states that private saving equals the sum of investment, the government budget deficit, and the current account balance—for Canada over the period 1961–2006. Each variable is measured as a percentage of GDP, and government saving is the combined saving of the federal, provincial, and municipal governments.

Sources: Statistics Canada, CANSIM II series v113713, v498342, v498343, v498095, v498100, v498086, and v498315.



Relating Saving and Wealth

- Saving is a flow variable – a variable that is measured per unit of time.
- Wealth is a stock variable – a variable that is measured at a point in time. It is as well the past accumulation of saving. These saving in turn have been used to accumulate assets or pay down liabilities (debts).

Relating Saving and Wealth (continued)

- National wealth is:
  - country's domestic physical assets;
  - country's net foreign assets – country's foreign assets minus its foreign liabilities.
- National wealth can change through changes in value of national saving ($I + CA$) or changes in the value of the stock of wealth.

Real GDP

- Nominal GDP (or current-dollar GDP) is the dollar value of an economy's final output at current market prices.
- Real GDP (or constant-dollar GDP) is the physical volume of an economy's final output using the prices of a base year.
- Real GDP is a measure that allows us to make better comparisons over time – what has changed, prices or quantities?

An illustration

TABLE 2.3

Production and Price Data

	Year 1	Year 2	Percentage change from Year 1 to Year 2
Product (Quantity)			
Computers	5	10	+100%
Bicycles	200	250	+25%
Price			
Computers	$1200/computer	$600/computer	–50%
Bicycles	$200/bicycle	$240/bicycle	+20%
Value			
Computers	$6 000	$6 000	0
Bicycles	$40 000	$60 000	+50%
Total	$46 000	$66 000	+43.5%

TABLE 2.4

Calculation of Real Output with Alternative Base Years

Calculation of real output with base year = Year 1

	Current quantities		Base-year prices		
Year 1					
Computers	5	×	$1200	=	$6 000
Bicycles	200	×	$200	=	$40 000
				Total =	**$46 000**
Year 2					
Computers	10	×	$1200	=	$12 000
Bicycles	250	×	$200	=	$50 000
				Total =	**$62 000**

Percentage growth of real GDP = ($62 000 – $46 000)/$46 000 = **34.8%**

Calculation of real output with base year = Year 2

	Current quantities		Base-year prices		
Year 1					
Computers	5	×	$600	=	$3 000
Bicycles	200	×	$240	=	$48 000
				Total =	**$51 000**
Year 2					
Computers	10	×	$600	=	$6 000
Bicycles	250	×	$240	=	$60 000
				Total =	**$66 000**

Percentage growth of real GDP = ($66 000 – $51 000)/$51 000 = **29.4%**

GDP Deflator

- A price index is a measure of the average level of prices for some specified set of goods and services.
- The GDP deflator is a price index that measures the overall level of prices of goods and services included in GDP.

GDP Deflator (continued)

$$GDP\ Deflator = \frac{Nominal\ GDP}{Real\ GDP}$$

- The measurement of real *GDP* and the GDP deflator depends on a choice of a base year.
- In our example the deflator in year 2 is 1.065 – prices have risen by 6½ per cent.

The Consumer Price Index

- The consumer price index (*CPI*) measures the price of consumer goods. The CPI is calculated for a fixed consumer "basket". Tells how much prices have risen.
- The basket should be occasionally updated or chain-weighted indexes should be used.
- The measure may be biased because of:
  - Quality adjustments
  - Substitution effects
  - Introduction of new goods
- Reasons why this is important:
  - Understates improvement in incomes
  - Certain expenditures/wage/pensions are indexed
  - The Bank of Canada has an inflation target

CPI and Inflation

The rate of price change is the percentage rate of increase in a price index (the CPI, for example) per a period of time.

$$\pi_{t+1} = \frac{(P_{t+1} - P_t)}{P_t} = \frac{\Delta P_{t+1}}{P_t}$$

π_{t+1} is the rate of inflation between t and $t+1$

P_t is the price level in period t

P_{t+1} is the price level in period t+1

ΔP_{t+1} is change in the price level between t and $t+1$

Inflation is an ongoing increase in the price level

Inflation rate

FIGURE 2.2
THE INFLATION RATE IN CANADA, 1945–2006

Here, inflation is measured as the annual percentage change in the GDP deflator. Inflation fell after the Korean War, then rose during the 1960s and 1970s, before falling sharply in the 1980s and again in the 1990s. Since 1989, the Bank of Canada has imposed targets designed to keep inflation between 1% and 3% per year.

Source: 1945–1960: *Historical Canadian Macroeconomic Dataset 1871–1994*, compiled by R. Marvin McInnis, Queen's University, 2001. 1960–2006: Adapted from Statistics Canada CANSIM II series v1997756.

Real versus Nominal Interest Rates

- An interest rate is a rate of return promised by a borrower to a lender.
- We talk about "the" interest rate. Although there are numerous definitions, they all tend to move up and down together.

Real versus Nominal Interest Rates

- The real interest rate is the rate at which the real value of an asset increases over time.
- The nominal interest rate (i) is the rate at which the nominal value of an asset increases over time.

$$\textbf{\textit{real interest rate}} = i - \pi$$

i = nominal interest rate

π = inflation rate

Expected Real Interest Rate

- The expected real interest rate (*r*) is the rate at which the real value of an asset is expected to increase over time.

$$r = i - \pi^e$$

π^e = an expected inflation rate

- Defining expected inflation is difficult. We can use surveys, last period's rate or other approaches

Nominal and Real Interest Rates

FIGURE 2.3
NOMINAL AND REAL INTEREST RATES IN CANADA, 1951–2006

The nominal interest rate shown is the interest rate on three- to five-year Government of Canada bonds. The real interest rate is measured as the nominal interest rate minus the average inflation rate (using the GDP deflator) over the current and subsequent two years. The real interest rate was unusually low (actually negative) in the mid-1970s. In the early 1980s, both nominal and real interest rates were very high. Since that time both nominal and real rates have fallen.

Source: The implicit price deflator for GDP is the same as that in Figure 2.2. The average interest rate on three- to five-year federal government bonds is adapted from Statistics Canada CANSIM II series v122485.