

Aggregate Measures of Income and Output in Canada and the United States: Implications for Productivity and Living Standards

Chris Ross¹

University of Toronto

Alexander Murray

Centre for the Study of Living Standards

ABSTRACT

The objectives of this article are to clarify definitions and to produce estimates of the eight aggregate measures of income and product (gross domestic product, gross domestic income, gross national product, gross national income, net domestic product, net domestic income, net national product and net national income) for Canada and the United States over the 1980-2008 period. The article also discusses the implications of the eight measures for productivity and living standards analysis. It concludes that GDP and NDP are the most appropriate measures of output for productivity analysis, while NNI is the most appropriate measure of income for the analysis of living standards because it captures the impact on real income of terms of trade changes, net income received from abroad, and the sustainability of the capital stock.

THERE ARE EIGHT measures of aggregate income (or output) in national accounting. These aggregates are based on three dimensions of analysis: gross versus net, domestic versus national, and product versus income. The eight combinations of these concepts constitute the eight measures of aggregate income: gross domestic product (GDP), net domestic product (NDP), gross national product (GNP), net national product (NNP), gross domestic

income (GDI), net domestic income (NDI), gross national income (GNI) and net national income (NNI).

The purpose of this article is to produce estimates of the eight income aggregates for Canada and the United States over the 1980-2008 period and to discuss the implications of the measures for the analysis of productivity and living standards.² The trends in the eight measures since 1980 have not been identical, and the dif-

1 Chris Ross is a graduate student in the Department of Economics at the University of Toronto. Alexander Murray is an economist at the Centre for the Study of Living Standards. The authors would like to thank Ryan Macdonald of Statistics Canada, Lisa Mataloni and Steve Landefeld of the Bureau of Economic Analysis, and Andrew Sharpe of the Centre for the Study of Living Standards. Email: christopher.ross@csls.ca; alex.murray@csls.ca.

2 The analysis ends in 2008 for two reasons. First, the 2009 estimates currently available for both Canada and the United States are preliminary and may change substantially when they are finalized. Second, and more important, 2008 represented an output peak (as did 1980, 1989, and 2000, the years we use to divide the 1980-2008 period into sub-periods). The inclusion of the recession year of 2009 would therefore reduce the cyclical neutrality of the growth rates we examine.

ferences between the measures provide important information about the Canadian and US economies. In addition, different measures may have different implications for the analysis of productivity and living standards. It is therefore important to consider which measures are most appropriate for such analysis.

The article is divided into six sections. The first defines the eight aggregates and explains how they relate to one another. The second addresses data availability and describes the methods used to estimate the aggregates. The third section analyzes within-country trends in the eight measures over the 1980-2008 period. Comparisons between gross and net measures, domestic and national measures, and product and income measures reveal important insights about the composition of the capital structure, the impact of net income flows from abroad, and the importance of terms of trade changes for real income. The fourth section compares the performance of the Canadian economy to that of the United States by comparing like aggregates on absolute and per-capita bases. The fifth section synthesizes the key empirical findings and discusses their implications for the analysis of productivity and living standards. The final section concludes.

National Accounts Definitions

National accounts data are collected on an internationally comparable basis as national statistical offices collect data consistent with accepted definitions. Currently, the international standard is outlined in a United Nations (1993) document, *The System of National Accounts 1993*.³ Statistics Canada (1989) offers a user's guide that outlines data availability and the methods and concepts underlying Canada's

national accounts. The agency also publishes updates to its methodology on a regular basis (e.g. Statistics Canada, 2009). The United States also follows the UN conventions. Bureau of Economic Analysis (2009) outlines how the Bureau of Economic Analysis (BEA) defines and estimates the aggregate measures in the United States national accounts. These resources are essential for understanding national accounting methodology, definitions and concepts.

Income and Product Accounts – Nominal Estimates

There are eight aggregates of income and output: gross domestic product (GDP), gross domestic income (GDI), gross national product (GNP), gross national income (GNI), net domestic product (NDP), net domestic income (NDI), net national product and net national income (NNP). Since one person's output is another person's income, each aggregate output measure should by definition be equal to its corresponding income measure when they are measured in current prices (Figure 1). In practice, corresponding nominal output and income measures may differ because they are based on different data sources. Gross measures differ from net measures in that the latter is equal to the gross measure less consumption of fixed capital. Domestic measures differ from national measures in that the latter measure sums the domestic measure with net income from non-residents. As an example, if a Canadian firm owns a factory in Belize and the factory earns \$10 in profit which it pays in dividends to Canadian investors, Canadian GNP increases by \$10, but GDP is unaffected.

The most widely watched measure is GDP, which is the value of all goods and services produced inside the country and sold to final users

3 The system of national accounts advocated by the United Nations in 1993 remains the official outline to which countries should conform. The 2008 update is largely consistent with the 1993 system. Luige (2008) clarifies that "recommendations do not change the fundamental framework, so countries are encouraged to continue development in line with 1993 SNA."

Figure 1
Relationship Between Nominal Income
and Product Accounts

GDP	=	GDI	
GNP	=	GNI	
NDP	=	NDI	
NNP	=	NNI	
GNP-GDP	=	}	Net income from non-residents
GNI-GDI	=		
NNP-NDP	=		
NNI-NDI	=		
GDP-NDP	=	}	Consumption of fixed capital
GDI-NDI	=		
GNP-NNP	=		
GNI-NNI	=		

in a year. This can be valued by summing personal consumption expenditures, fixed investment, change in inventories, net exports of goods and services as well as government consumption. The corresponding income measure is GDI, which sums income payments incurred in the production of goods and services. GDI is the sum of compensation of employees, taxes on production and imports, and net operating surplus less subsidies. GDP and GDI, expressed in current dollars, are by definition equal. GNP is equal to GDP less net income payments to the rest of the world, and GNI relates to GDI in the same way. NDP is equivalent to GDP less the consumption of fixed capital and NDI relates to GDI in the same fashion. NNP is the same as GNP less the consumption of fixed capital (cap-

ital consumption allowance, or CCA) and NNI relates to GNI in the same manner.

Income and Product Accounts – Real or Chained Estimates

The eight measures of income and output also exist in real, or chained, estimates.⁴ While each product measure has a corresponding income measure that is exactly equal in nominal terms, this is not true for chained estimates except in the base year. Chained estimates of product measures reflect output volumes, while chained income measures are meant to reflect volumes of consumption possibilities, or purchasing power. Macdonald (2007a) notes that “economic theory and statistical practice dictate that nominal gross domestic product (GDP) and nominal gross domestic income (GDI) are equal, the difference between real GDP and real GDI will be determined by their respective deflators.”

United Nations (1993) stresses that the choice of deflator can have a substantial impact on the perceived trend in the observed indicator. Unfortunately, there is disagreement among major statistical agencies, as well as economists in general, as to which deflator is most appropriate for use in calculating real GDI. United Nations (2008) argues that “as there may often be no obvious, or uncontroversial choice of numeraire there has always been some reluctance to show real incomes in national accounts” but adds “it can be argued that compilers of statistics are under an obligation to present at least some measures of real income.” The Bank of Canada (2009) and Kohli (2006) both suggest the use of the final

4 A chain index is rebased on a period to period basis (annually in the case of output), and is then accumulated multiplicatively from a reference period value. In other words, a chain volume index calculates the volume index in each pair of consecutive years, always treating the earlier year as the base period (while the base period is changing every year, the reference period - which is the year in which the volume and nominal index are identical - is fixed and arbitrary). Growth rates for a chain index are thus unaffected by changes in the reference period. A Fisher volume index is a measure of change in volume from period to period which is calculated as the geometric mean of a Paasche volume index and a Laspeyres volume index. In other words, it is the mean of two distinct measures of change in volume: one calculated as if prices were constant in the first of two consecutive periods (Laspeyres volume) and the other calculated as if prices were constant in the second of the two consecutive periods (Paasche volume). A chain Fisher index is thus the geometric mean of a chain Laspeyres index and a chain Paasche index.

domestic demand deflator, which is the methodology that was adopted by Statistics Canada until quite recently. Currently, Statistics Canada uses the final domestic expenditure (FDE) deflator, as this is the broadest aggregate available; this measure differs from the final domestic demand deflator only due to the inclusion of inventories in the final domestic expenditure deflator.⁵ The Bureau of Economic Analysis (BEA) in the United States uses an import price deflator for calculating “command based” GNP,⁶ as does the Australian Bureau of Statistics. Eurostat uses the mean of import and export price indexes. All of these methods are valid and there is a case to be made for them, though the differences in methodology used by Statistics Canada and the BEA mean that the trends reflected in official data are not completely consistent when comparing across countries for GDI.

Estimation Methodology and Data Availability

Current Price Measurements

The U.S. BEA makes data on income and output measures easily accessible. Current-price estimates for the United States were almost all accessible from NIPA Table 1.7.5 and available on a consistent basis (market prices).⁷ Net national income (NNI) is not included in the table, but all the data needed to calculate this measure are available. The difference between “gross” and “net” measures is simply that gross measures include the consumption of fixed capital.⁸ This identity has been used to compute the U.S. NNI estimates discussed in this article.

Table 1

Availability of Official Aggregate Income and Product Estimates for Canada and the United States

	United States		Canada	
	NOMINAL	CHAINED	NOMINAL	CHAINED
GDP	Yes	Yes	Yes	Yes
GDI	Yes	Yes ^b	Yes	No ^e
GNP	Yes	Yes	Yes	No ^f
GNI	Yes	Yes ^b	Yes ^c	Yes ^g
NDP	Yes	Yes	No ^a	No ^a
NDI	Yes	Yes ^b	Yes ^{a,d}	No ^e
NNP	Yes	Yes	No ^a	No ^a
NNI	No ^a	No ^b	Yes ^{a,d}	No ^e

- Values are calculated by the authors by subtracting capital consumption allowances from the gross measures.
- For this report, we calculate estimates of these measures by deflating the nominal income measures by the gross domestic purchase price deflator. We do not use the existing official estimates because they are based on the GDP deflator (or, in the case of the BEA's ‘command-based GNP’ measure, an import price deflator). This is inconsistent with the Canadian methodology for estimating aggregate income measures.
- Official data are available back to 1982. For earlier years, we construct estimates by subtracting net foreign income flows from nominal GDI.
- We do not use the official estimates because they are expressed in basic prices rather than market prices.
- We calculate estimates by deflating the nominal product measure by the final domestic expenditure deflator.
- We calculate estimates by deflating the nominal product measures by the GDP deflator.
- Official data are available back to 1982. For earlier years, we construct estimates by deflating the nominal measure using the final domestic expenditure deflator.

GDP and GDI are in principle equal when expressed in current dollars, even though the former is based on expenditure and the latter is based on income data. (Statistics Canada refers to both measures as GDP, but adds the labels “expenditure-based” and “income-based” to dis-

5 The FDE price deflator has increased at an average annual rate of 2.71 per cent per year compared with the FDD price index growth rate of 2.79 per cent over the 1981 to 2008 period.

6 The BEA's measure of ‘command-based GNP’ is conceptually analogous to Statistics Canada's ‘real GNI’ except in the use of the import price deflator. Reinsdorf (2009), a BEA researcher, recommends that the BEA switch to the gross domestic purchases deflator. As we explain below, this is precisely the approach we take in estimating real aggregate income measures for the United States.

7 All NIPA tables are available through <http://www.bea.gov/national/nipaweb/SelectTable.asp>.

8 Consumption of fixed capital, in the context of the NIPA Table 1.7.5, was larger than capital consumption allowance in the table because that capital consumption referenced only capital consumed by businesses; generally speaking, capital consumption allowance is used to refer to the entire consumption of fixed capital by all economic agents.

tinguish between them.) As a practical matter, however, the income- and expenditure-based estimation approaches lead to slightly different estimates because of measurement error and the fact that different data sources are used.

The United States and Canada differ in how they address this issue. In the United States, the BEA publishes the two different numbers with the understanding that the discrepancy is the result of measurement error. The discrepancy between nominal GDP and GDI in the United States amounted to \$101 billion (or about 0.7 per cent of GDP) in 2008.

In contrast, Statistics Canada publishes one number called GDP, and that number is the average of the expenditure- and income-based estimates. They also publish a "statistical discrepancy," which is the difference between the officially published GDP and the underlying expenditure- and income-based estimates. In 2008, for example, Canadian nominal GDP was \$1,601.49 billion according to the income-based approach and \$1,598.67 billion according to the expenditure-based approach. Statistics Canada published \$1,600.08 billion as the official estimate and reported \$1.41 billion and -\$1.41 billion as the statistical discrepancies for the income- and expenditure-based approaches, respectively.⁹

While it is possible to use the statistical discrepancies to construct estimates of GDP and GDI for Canada that would be consistent with the U.S. approach, we have chosen to use Statistics Canada's official estimates of nominal GDP as our estimates of both GDP and GDI. For similar reasons, GNP is equal to GNI, NDP is equal to NDI, and NNP is equal to NNI (all in nominal terms).

Net measures of national output and income are not generally published by Statistics Canada. The exception to this is NNI,

which is published. Unfortunately, these data are published at basic prices, and the values in our table are in market prices; this number could be changed to reflect market prices through the addition of taxes less subsidies. An alternative method that could be used to estimate NNI, which would differ only negligibly, is to subtract capital consumption allowances from the gross measure. This would be an equally valid method of calculating the net measure, and this is actually the methodology that we chose to use to calculate all four of the net measures for Canada, thus ensuring that all net measures were calculated on a perfectly consistent basis. Currently, Statistics Canada does not publish data for NDP, NDI or NNP in either basic or market prices.

Real or Chained Estimates

Data in chained 2005 dollars for the product measures (GDP, GNP, NDP, and NNP) in the United States were all accessible from NIPA Table 1.7.6. Of the four, only GDP is officially published in real terms by Statistics Canada. Real income measures are published by the BEA, but they are inconsistent with the Canadian definition. The inconsistency lies in the price deflators used. In order to produce real income measures reflective of the *purchasing power* associated with production, Statistics Canada uses the final domestic expenditure price deflator, which accounts for changes in the prices of final goods and services purchased by domestic economic agents. The BEA, in contrast, publishes real income measures that simply deflate nominal income measures by the relevant *product* deflator. For example, real GDI is the result of deflating nominal GDI (that is, nominal GDP estimated by the income approach) with the GDP deflator implied by the expenditure approach.

⁹ These calculations are based on the 2008 income- and expenditure-based GDP estimates from Statistics Canada CANSIM Tables 380-0016 and 380-0017.

The GDP deflator and the final domestic expenditure deflator do not capture the same price changes, so the official Canadian and US real income estimates are not comparable.

In order to make the data comparable, real income measures for the United States have been calculated by deflating nominal product measures using the gross domestic purchases deflator, a deflator similar to Canada's final domestic expenditure deflator.¹⁰

Data for Canada are less readily available. Statistics Canada publishes chain-dollar estimates of only two of the eight measures, GDP and GNI. We estimate the three remaining income aggregates (GDI, NDI and NNI) by deflating the nominal measures by the final domestic expenditure price deflator, consistent with the methodology of Statistics Canada in producing GDI and GNI volume indexes.¹¹ Until recently, Statistics Canada used the final domestic demand price deflator rather than the final domestic expenditures price deflator in order to estimate real income measures; the deflators are very similar in terms of growth rate and differ only in terms of the treatment of inventories.¹²

We estimate the net product measures (NDP and NNP) by a two-step process. First, we construct chained estimates of the of capital consumption allowance (CCA) in Canada. A price deflator for investment is estimated by calculating price deflators for government and private investment and multiplying these

deflators by their respective shares of total investment. The nominal CCA series is deflated by the investment index to produce estimates of real CCA.¹³ In the second step, we generate the real NDP and NNP estimates by subtracting real CCA from the real gross product measures (GDP and GNP). Chained data are not additive, strictly speaking, so the above methodology does not give an exact estimate of net measures.¹⁴ Nonetheless, the above methodology provides a good approximation of the proper value; testing this methodology on U.S. data, for which official gross and net data are available, shows that the estimates were never even a half of a per cent different from the official data for the entire 1980-2008 period. Chained GNP data were calculated by deflating nominal GNP with the GDP price deflator.

Summary

In this article, we analyze the eight income (or output) aggregates for Canada and the United States, expressed in both real and current dollars. This amounts to 32 time series altogether. Whenever possible and appropriate, we have used official estimates from Statistics Canada and the Bureau of Economic Analysis. For Canada, we use official estimates of nominal GDP, GDI, GNP, and GNI; and real GDP and GNI. For the United States, we use official estimates of nominal GDP, GDI, GNP, GNI, NDP, NDI, and NNP; and real

10 Gross domestic purchases deflator is found in NIPA Table 1.4.4, line 4.

11 The earliest year for which the final domestic expenditure deflator is available through CANSIM is 1982. Ryan Macdonald of Statistics Canada provided us with a final domestic expenditure deflator series beginning in 1961. It is the series used in Macdonald (2007b), with data revisions and additional years added by summing the quarterly data found in CANSIM series v44182032.

12 The final domestic expenditure deflator includes prices for private consumption, gross fixed capital formation, government consumption and inventories, whereas the final domestic demand deflator includes only private consumption, gross fixed capital formation and government consumption prices.

13 Strictly speaking, the investment deflator is not applicable to CCA because the old capital being depreciated and the new capital being invested in are likely to have different compositions. Nevertheless, our approach provides a good approximation.

14 The Bureau of Economic Analysis (2009) offers a very insightful summary of the properties of chained measures as well as an overview of national accounting practices.

Table 2

Levels of Product and Income Measures in Canada and the United States, \$Billions, 2008

	United States		Canada	
	Chained 2005\$	Current dollars	Chained 2002\$	Current dollars
GDP	13,312	14,441	1,321	1,600
GDI	13,157	14,340	1,423	1,600
Difference	156	101	-101	0
GNP	13,443	14,583	1,308	1,584
GNI	13,286	14,482	1,409	1,584
Difference	157	101	-100	0
NDP	11,597	12,594	1,141	1,393
NDI	11,474	12,493	1,238	1,393
Difference	123	101	-97	0
NNP	11,728	12,736	1,128	1,377
NNI	11,603	12,635	1,224	1,377
Differences	124	101	-96	0

Source: Appendix Table 6.

Table 3

Growth Rates of Product and Income Measures in Canada and the United States, Per Cent per Year, 1980-2008

	United States		Canada	
	Chained 2005\$	Current dollars	Chained 2002\$	Current dollars
GDP	2.99	6.05	2.71	5.98
GDI	2.99	6.09	2.89	5.98
Difference	-0.01	-0.04	-0.18	0.00
GNP	2.98	6.04	2.77	6.05
GNI	2.99	6.08	2.95	6.05
Difference	-0.01	-0.03	-0.18	0.00
NDP	2.80	6.03	2.55	5.93
NDI	2.98	6.07	2.84	5.93
Difference	-0.17	-0.04	-0.29	0.00
NNP	2.79	6.02	2.62	6.01
NNI	2.97	6.06	2.91	6.01
Differences	-0.17	-0.04	-0.29	0.00

Source: Appendix Table 6.

GDP, GNP, NDP and NNP. Thus, 17 of the 32 time series are drawn directly from official sources: six of 16 for Canada, and 11 of 16 for the United States.

We produce estimates of the remaining aggregates using methods consistent with the UN guidelines, as described above.

Within Country Analysis

Product versus Income

Product and income measures provide insight into different aspects of the economy. Product measures (GDP, GNP, NDP, NNP) provide the volume of output while income measures (GDI, GNI, NDI, NNI) represents the total income for the participants in the economy, thus the amount available for consumption. By definition, the current dollar value for a given income and product measure is identical, so any difference, such as is seen in the U.S. data, arises from the fact that they are based on different data sources.

As discussed earlier, however, real measures of product and income differ as a result of different deflators. In Canada the real value for product measures is lower than that of income measures, due to a higher deflator (Table 2).¹⁵ In the United States, the opposite is true. When measured in chained dollars, the product and income measures are equal to one another in the base year of the deflators (2005 for the United States and 2002 for Canada). Differences between them in 2008 reflect only the relative growth rates of the underlying deflators since the base year. If the deflator for income measures grows faster than the deflator for product measures after the base year, then the income measures will be lower than the product measures in 2008. The reverse is also true. As we discuss below, differences between the growth rates of the two price deflators reflect changing terms of trade.

The growth rates for real product measures (GDP, GNP, NDP and NNP) reflect changes in the volume of output produced by the economy. In contrast, the consumption possibility set for a country is determined by volumes of production as well as the changes in the prices of produced goods and services relative to prices of consumed goods and services. Real income mea-

15 All the complete time series used in this article are contained in a set of appendix tables, which are available online at http://www.csls.ca/ipm/19/appendix_ross_murray.pdf.

asures (GDI, GNI, NDI and NNI) represent the consumption possibility set for a country. Given these definitions, one may correctly infer that the difference between GDP and GDI is due to changing trade gains or losses caused by changes in the real exchange rate (price ratio of traded to non-traded goods) and changing terms of trade (ratio of export prices to import prices). Macdonald (2007a) notes that the growth in output volume is generally a more important determinant of prosperity in the long run than relative price changes are, because changes in terms of trade are generally transitory. Nonetheless, the impact of changes in terms of trade can be quite large in the short term.

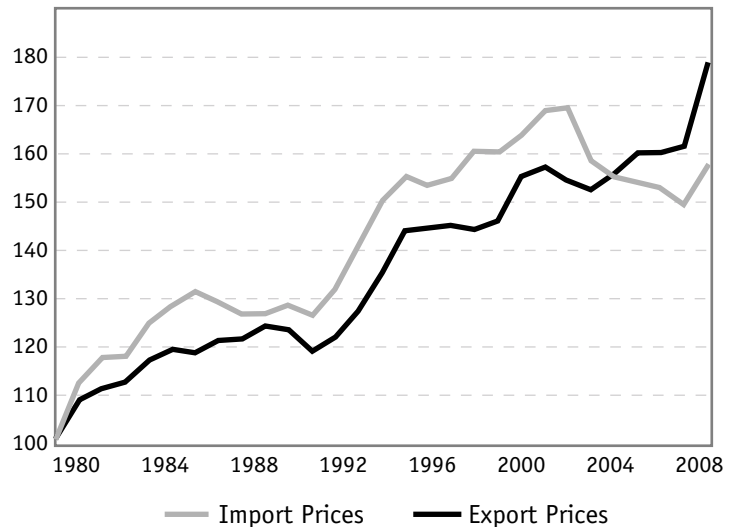
There was virtually no difference in the annual growth rates for GDP and GDI in the United States over the 1980-2008 period; growth was 2.99 per cent per year for both measures (Table 3). This is as we would expect if the effects of terms of trade shocks on aggregate income tend not to persist over long time periods. In Canada, the annual growth rates of the income aggregates exceeded those of the corresponding product aggregates by about 0.20 to 0.30 percentage points over the 1980-2008 period. As we show below, this is entirely attributable to a significant terms of trade improvement since 2000.

Over the 2000 to 2008 period, real GDI in the United States grew at an average annual rate of 1.98 per cent compared to GDP growth of 2.15 per cent (Appendix Table 6). This implies a large decline in terms of trade for the United States (Chart 1). Such an observation follows from the large increase in energy prices from 2003-2008 and the fact that the United States is a large energy net importer. The sensitivity of U.S. terms of trade to energy prices is so significant that Reinsdorf (2008) suggests a need for terms of trade measure excluding petroleum products!

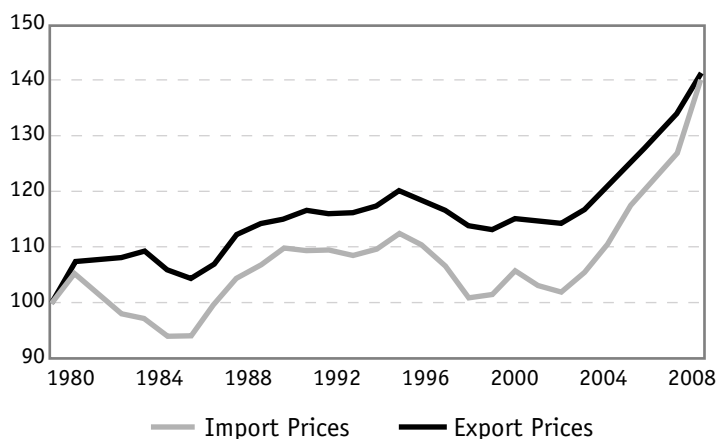
While the United States was handicapped by unfavourable price changes, Canada was the

Chart 1

Export and Import Price Indexes in the United States and Canada, 1980-2008, 1980=100
Canada



United States



beneficiary of a large boost in economic fortunes for the same reasons (Chart 1). Over the 2000-2008 period, Canada experienced average annual real GDI growth of 3.03 per cent, 0.72 percentage points higher than the real GDP growth rate of 2.31 per cent per year. The gap in growth rates between net product and net income measures was 0.80 percentage points per year (Table 3).

These numbers largely reflect the increase in natural resource prices, especially energy. Can-

Chart 2

Gap between Real GDI and GDP Growth in Canada and the United States
(percentage points)

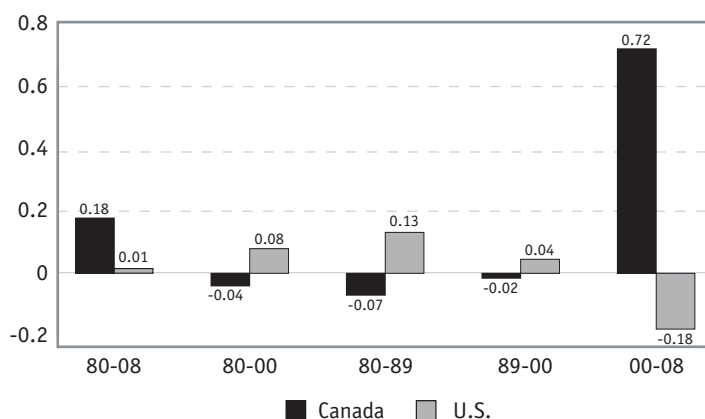


Table 4

Levels of National and Domestic Measures in Canada and the United States, \$Billions, 2008

	United States		Canada	
	Chained 2005\$	Current dollars	Chained 2002\$	Current dollars
GNP	13,443	14,583	1,308	1,584
GDP	13,312	14,441	1,321	1,600
Difference	130	142	-13	-16
GNI	13,286	14,482	1,409	1,584
GDI	13,157	14,340	1,423	1,600
Difference	129	142	-14	-16
NNP	11,728	12,736	1,128	1,377
NDP	11,597	12,594	1,141	1,393
Difference	130	142	-13	-16
NNI	11,603	12,635	1,224	1,377
NDI	11,474	12,493	1,238	1,393
Difference	129	142	-14	-16

Source: Appendix Table 6.

ada, being a net exporter of such commodities, and the United States, a net importer, experienced opposite changes in terms of trade. While the short term implications of this development are clearly favourable for Canada, the long-term prospect is not unambiguously positive. If the terms of trade improvement turns out to be transitory, as Macdonald (2007a) suspects such changes generally are, Canadians could experi-

ence losses in consumption possibilities equivalent to the recent gains not tied directly to output volumes.

Over the 1980-2000 period, the annual GDI-GDP growth gap in the United States was 0.08 percentage points. The gap was larger in the 1980s than in the 1990s and, as discussed above, it became negative after 2000 (Chart 2). The United States experienced the short-term price fluctuations that one would expect over the 1980-2008 period, such that the GDI-GDP gap for the entire period was essentially zero.

In Canada, the GDI-GDP growth gap was -0.04 percentage points over the 1980-2000 period. While the 0.18 percentage-point gap for the 1980-2008 period may seem to suggest that GDI has outperformed GDP in Canada for a long time, it is clear from Chart 2 that the positive long-term gap is entirely attributable to the large post-2000 gap. It is reasonable to suppose that this development will yet prove to be transitory.

National versus Domestic Measures

National measures (GNP, GNI, NNP and NNI) reflect all production or income arising from labour from residents of the country or capital owned by residents of the country. Domestic measures (GDP, GDI, NDP and NDI) relate to production and factor income within the borders of the country, regardless of where the proprietor of the capital lives. The difference between the two measures is net income receipts from non-residents.

In 2008, the national measures were at lower levels than the domestic measures in Canada and at higher levels than the domestic measures in the United States (Table 4). Thus, in Canada, the net income from non-residents was negative; that is, income from capital owned in Canada by non-Canadians was higher than income earned from capital outside of Canada by Canadians. In contrast, the income received by Americans

from capital outside of the United States was higher than the income earned by non-Americans within American borders.

Comparing the growth rates of domestic and national measures allows for the analysis of how these factors change over time and reveals information about the importance of net income receipts for the welfare of those living in the United States or Canada.

National measures of aggregate income have increased faster than domestic measures over the 1980 to 2008 period in Canada, but not in the United States (Table 5 and Chart 3). Canada witnessed GNP growth that was 0.06 percentage points per year higher than GDP growth over the period (Chart 3). Counter to what one might expect in this age of increasingly integrated markets and international investments, payments from Canada to non-residents have fallen as a proportion of GDP (Chart 4). In 1980, the gross outflow amounted to 5.16 per cent of GDP, and reached as high as 6.63 per cent in 1982. Since 1998, there has been a downward trend in payments to non-residents as a proportion of GDP; these payments amounted to only 4.41 per cent of GDP in 2008.

During the 1980 to 2008 period, not only did the outflow as a proportion of GDP decrease in Canada, but gross income received from non-residents increased. In 1980, investment income from non-residents amounted to 2.44 per cent of GDP, and fell to 1.95 per cent in 1992 before falling further to reach a low of 1.72 per cent in 2002. In the years following 2002, income receipts from the rest of the world increased dramatically, peaking at 3.71 per cent in 2006 and leveling off to 3.43 per cent in 2008.

Given that the proportion of Canada's GDP paid to non-residents has decreased and income receipts from the rest of the world increased, net income from non-residents increased. Net income payments to non-residents amounted to 2.72 per cent of GDP in 1980, and increased fur-

Chart 3

Gap between Real GNP and GDP Growth in Canada and the United States
(percentage points)

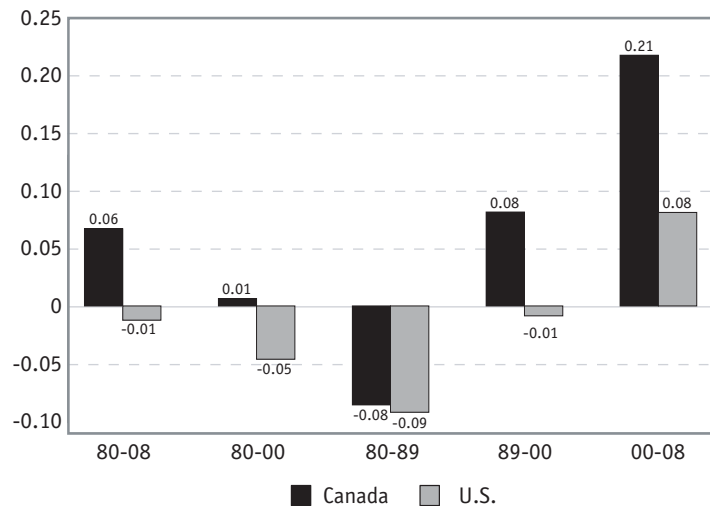


Table 5

Growth Rates of National and Domestic Measures in Canada and the United States, Per Cent per Year, 1980-2008

	United States		Canada	
	Chained 2005\$	Current dollars	Chained 2002\$	Current dollars
GNP	2.98	6.04	2.77	6.05
GDP	2.99	6.05	2.71	5.98
Difference	-0.01	-0.01	0.06	0.07
GNI	2.99	6.08	2.95	6.05
GDI	2.99	6.09	2.89	5.98
Difference	-0.01	-0.01	0.07	0.07
NNP	2.79	6.02	2.62	6.01
NDP	2.80	6.03	2.55	5.93
Difference	-0.01	-0.01	0.07	0.08
NNI	2.97	6.06	2.91	6.01
NDI	2.98	6.07	2.84	5.93
Difference	-0.01	-0.01	0.07	0.08

Source: Appendix Table 6.

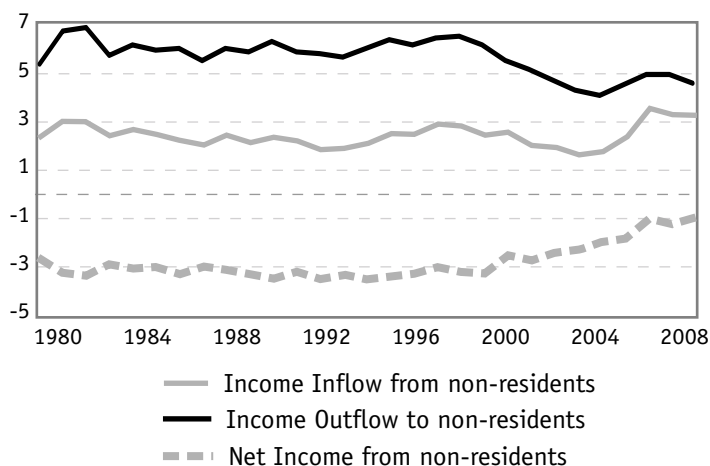
ther to reach 3.63 per cent in 1992. Since 1992, this trend has reversed. Net income received from non-residents as a proportion of GDP has been increasing, reaching a high of 0.98 per cent of GDP in 2008. Cross (2004) argues that this trend is the result of lower interest rates domes-

Chart 4

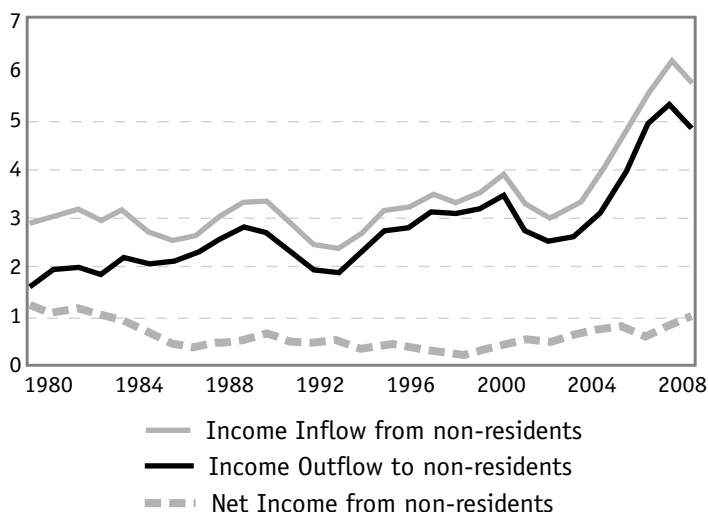
Inflow, Outflow and Net Income Received
from Non-residents as a Proportion of GDP,
Canada and the United States, 1980-2008

(per cent)

Canada



United States



tically, falling foreign debt and increased foreign direct investment on the part of residents of Canada.

Unlike Canada, the United States experienced slightly faster growth in domestic measures of aggregate income than national measures over the 1980-2008 period (Chart 4). The rate of GNP growth was 0.01 percentage points lower than GDP growth in the

United States over the period. Gross income payments to non-residents were equivalent to only 1.61 per cent of GDP in 1980. With increasing economic integration and reduced barriers to and capital flows, foreign capital became a more important component of investment; gross outflows of investment income almost tripled over the period, going from 1.61 per cent in 1981 to a peak of 5.30 per cent in 2007 before reaching 4.66 per cent in 2008. Contrasting the growth of gross outflows in Canada and the United States over the 1980-2008 period yields the observation that gross outflows as a share of GDP have increased by 3.01 percentage points in the United States, but fallen by 0.75 percentage points in Canada. Looking over the entire period for which data are available for both countries (the 1961 to 2008 period), 2006 is the first year on record for which gross payments to non-residents were larger in the United States than in Canada as a proportion of GDP, a situation that repeated itself in 2007 as well as 2008.

Gross income received from non-residents amounted to 2.84 per cent of GDP in the United States in 1980, and it fluctuated around that value for the next twenty-two years. In 2002, gross income inflows amounted to 2.95 per cent of GDP, not much different from the 1980 value. After 2002, however, gross income receipts experienced strong growth. They peaked at 6.12 per cent of U.S. GDP in 2007, before falling to 5.60 per cent in 2008.

Net income from non-residents in the United States declined from 1.23 per cent of U.S. GDP in 1980 to 0.98 per cent in 2008. The proportion declined between 1982 and 1987, reaching 0.37 per cent of GDP in 1987. The proportion ranged from 0.20 per cent to 0.59 per cent over the 1987 to 2002 period, but has since increased.

Gross versus Net Measures

Gross measures (GDP, GDI, GNP and GNI) reflect all production or income and do not subtract the depreciation of fixed capital. Net measures (NDP, NDI, NNP and NNI) subtract capital consumption from the corresponding gross measures. A comparison of gross and net measures allows for an analysis of changing capital composition. Changes in capital composition have changed the rate at which capital depreciates, due to the rapid growth of investment in short-lived ICT capital in recent years (Sharpe and Arsenault, 2009).

Since net measures of national income or output are equal to gross measures minus the consumption of fixed capital, the gross measure is always greater in magnitude than the net measure. By definition, the difference is always identical in all current dollar measures and for real measurements, the difference is identical for national and domestic accounting, although it can differ between product and income measures because of the use of different deflators.

Over the entire period of 1980 to 2008, both Canada and the United States experienced faster growth in gross than in net measures (Table 7). Real GDP grew 2.99 per cent per year over the period in the United States, while real NDP grew 2.80 per cent per year. In Canada over the same period, real GDP grew 2.71 per cent per year and real NDP grew 2.55 per cent per year. The implication is that both countries experienced a change in the composition of capital in favour of fast depreciating assets, as one would expect given the increased importance taken by information and communications technology over the period. The increases in capital consumption allowances as a share of real GDP (illustrated in Chart 5) were responsible for the fact that annual NDP growth lagged GDP growth by 0.18 percentage points in the United

Table 6

Levels of Gross and Net Measures in Canada and the United States, \$Billion, 2008

	United States		Canada	
	Chained 2005\$	Current dollars	Chained 2002\$	Current dollars
GDP	13,312	14,441	1,321	1,600
NDP	11,597	12,594	1,141	1,393
Difference	1,715	1,847	180	208
GDI	13,157	14,340	1,423	1,600
NDI	11,474	12,493	1,238	1,393
Difference	1,683	1,847	185	208
GNP	13,443	14,583	1,308	1,584
NNP	11,728	12,736	1,128	1,377
Difference	1,715	1,847	180	208
GNI	13,286	14,482	1,409	1,584
NNI	11,603	12,635	1,224	1,377
Difference	1,683	1,847	185	208

Source: Appendix Table 6.

Table 7

Growth Rates of Gross and Net Measures in Canada and the United States, Per Cent per Year, 1980-2008

	United States		Canada	
	Chained 2005\$	Current dollars	Chained 2002\$	Current dollars
GDP	2.99	6.05	2.71	5.98
NDP	2.80	6.03	2.55	5.93
Difference	0.18	0.02	0.16	0.05
GDI	2.99	6.09	2.89	5.98
NDI	2.98	6.07	2.84	5.93
Difference	0.02	0.01	0.05	0.05
GNP	2.98	6.04	2.77	6.05
NNP	2.79	6.02	2.62	6.01
Difference	0.18	0.02	0.15	0.04
GNI	2.99	6.08	2.95	6.05
NNI	2.97	6.06	2.91	6.01
Difference	0.02	0.02	0.04	0.04

Source: Appendix Table 6.

States and by 0.16 percentage points in Canada over the 1980-2008 period.

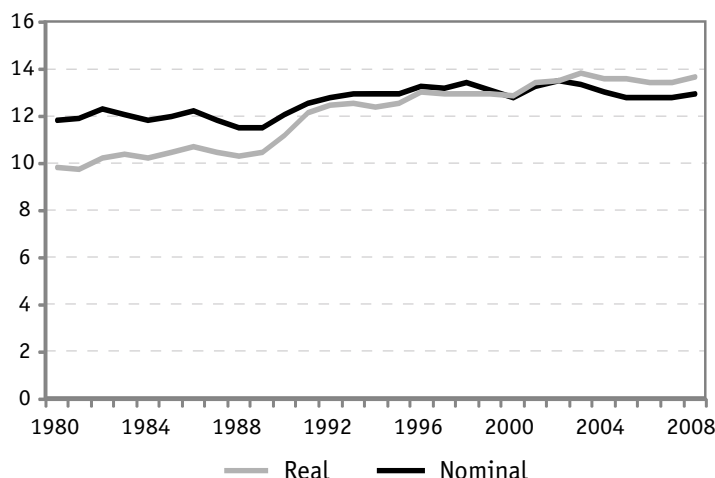
Between 1980 and 2000, rising capital consumption amounted to 0.17 percentage points of real GDP growth in the United States and 0.18 percentage points of real GDP growth in Canada (Chart 6). Most of this increase in the importance of CCA in both countries occurred in the 1990s, when ICT investment

Chart 5

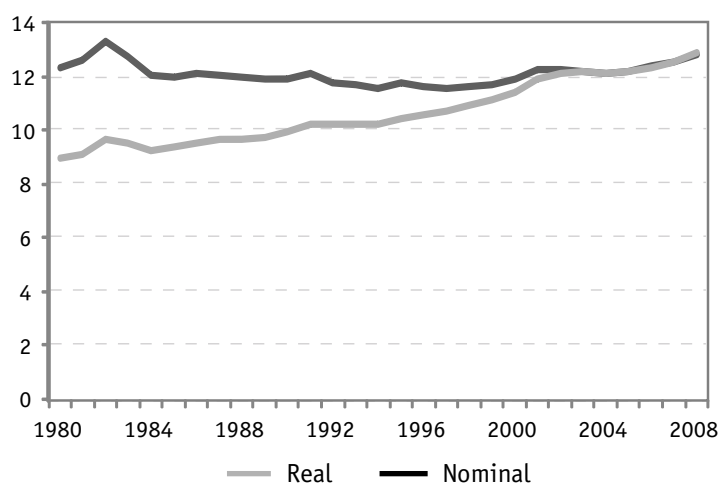
Capital Consumption Allowance as a Proportion of GDP in Canada and the United States, 1980-2008

(per cent)

Canada



United States



significantly increased. Throughout the 1990s, CCA accounted for 0.26 percentage points of annual GDP growth Canada and 0.20 percentage points of annual GDP growth in the United States.

In the 2000-2008 period, the growth gap between GDP and NDP declined to 0.11 percentage points in Canada (Chart 6). In the United States, in contrast, the gap increased to 0.23 percentage points.

Table 8

Growth of Real Income and Product Measures in the United States and Canada, 1980-2008

	United States	Canada	U.S. - Canada Gap
GDP	2.99	2.71	0.28
GDI	2.99	2.89	0.11
GNP	2.98	2.77	0.20
GNI	2.99	2.95	0.04
NDP	2.80	2.55	0.26
NDI	2.98	2.84	0.14
NNP	2.79	2.62	0.17
NNI	2.97	2.91	0.05

Source: Appendix Table 6.

Canada-United States Cross-Country Analysis Aggregate Basis

Over the 1980 to 2008 period, the United States saw higher growth than Canada for every measure (Table 8 and Chart 7). The gap in growth rates was smallest for income measures, which had the four lowest gaps. This is the result of the improved terms of trade that the Canadian economy benefitted from. National measures had lower gaps than domestic measures, reflecting the greater improvement in net income earned from non-residents experienced in Canada relative to the United States. Product measures increasing faster in the United States than in Canada indicate that output volumes increased faster.

The growth rate in the 1980-2000 period was higher than the 1980-2008 average in the United States for every measure and in Canada for product measures. The percentage point gap between the U.S. and Canadian growth rates was greater in the 1980-2000 period than in the full 1980-2008 period (Table 9). As in the 1980-2008 period, the gaps for the national measures were smaller than for the domestic measures between 1980 and 2000. However, there is a significant dif-

Table 9
Growth of Real Income and Product Measures in the United States and Canada, 1980-2000

Measure	United States	Canada	U.S.-Canada Gap
GDP	3.32	2.87	0.46
GDI	3.40	2.83	0.58
GNP	3.28	2.87	0.40
GNI	3.36	2.83	0.53
NDP	3.15	2.69	0.46
NDI	3.43	2.77	0.66
NNP	3.10	2.69	0.41
NNI	3.38	2.78	0.60

Source: Appendix Table 6.

ference in the comparison between income and product measures. In the period from 1980-2000, the U.S.-Canada gap between the growth rates was larger for income measures than for product measures. This demonstrates that Canada's terms of trade advantage discussed earlier did not occur before 2000. In the 1980-2000 period, the growth rate for gross income measures was lower than that for the gross product measures in Canada and higher than that for the gross product measures in the United States, so the United States had increasing terms of trade and Canada had decreasing.

In recent years, however, there has been a catch-up effect; Canada experienced higher growth than the United States for all eight measures of income and product over the 2000-2008 period (Table 10 and Chart 7). Product measures had the smallest absolute gaps between Canada and the United States, reflecting similar growth in actual output volumes while income measures saw a larger gap due to trading gains for Canada and trading losses for the United States. The growth rate gap was larger for national measures than domestic measures, reflecting increasing net income received from non-residents in Canada. The gap in net measures was higher than

Chart 6
Gap between Real GDP and NDP Growth in Canada and the United States (percentage points per year)

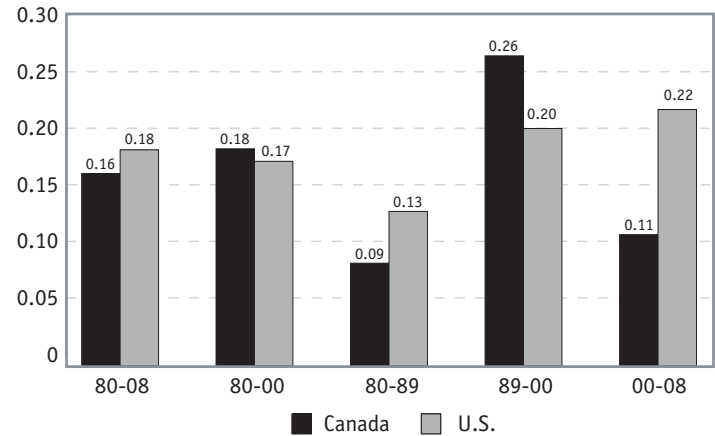


Table 10
Growth of Real Income and Product Measures in the United States and Canada, 2000-2008

Measure	United States	Canada	U.S.-Canada Gap
GDP	2.15	2.31	-0.16
GDI	1.98	3.03	-1.06
GNP	2.23	2.52	-0.29
GNI	2.05	3.25	-1.19
NDP	1.94	2.20	-0.27
NDI	1.85	3.00	-1.16
NNP	2.03	2.45	-0.42
NNI	1.94	3.25	-1.31

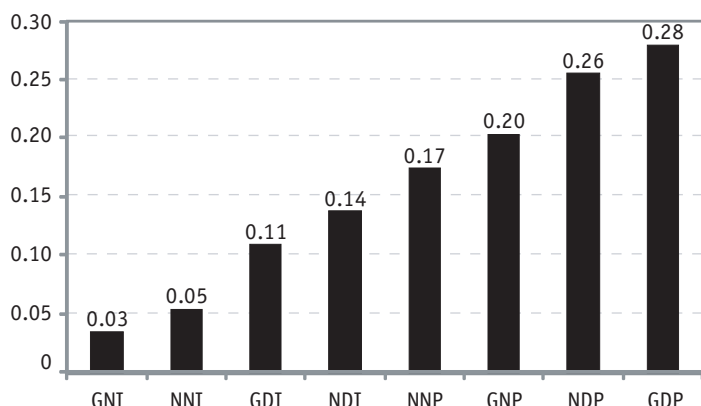
Source: Appendix Table 6.

the gap in gross measures due to the quicker pace of capital consumption growth in the United States as compared to Canada over the period. Overall, Canada outperformed the United States in the most recent period while the opposite was true for the 1980-2000 period.

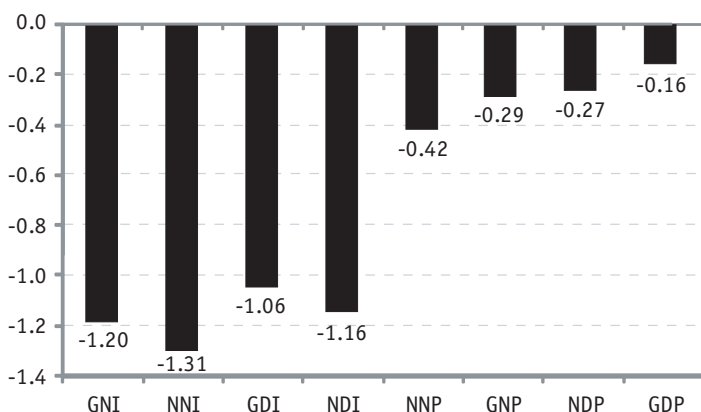
It is not unprecedented for Canada to outperform the United States in product and income measures. While Canada performed poorly compared to the United States for the 1980-2000 period, Canada exhibited a superior per-

Chart 7

Canada-U.S. Real Income Growth Gap, 1980-2008
(percentage points)
1980-2008



2000-2008



Source: Appendix Table 6.

formance over the 1961-2008 period.¹⁶ Over this period, Canada experienced an average real GDP growth rate of 3.48 per cent while the United States experienced growth of 3.30 per cent. Similarly, real income measures indicate higher growth for Canada at 3.66 per cent average annual growth compared to 3.23 per cent growth in the United States.

¹⁶ This analysis is limited to gross measures. While the net measures are estimated with a very reliable and sound methodology for the 1980 to 2008 period, looking at earlier years yields conclusions that we cannot be as confident in. This follows for two reasons: data for the United States are official, but subject to the observation by Spant (2003) concerning the difficulty in estimating capital depreciation. The second reason, which applies to Canadian net product measures, is that CSLS estimates these data by subtracting chained CCA from the chained gross measures; the summation or subtraction of chained indexes becomes less accurate as you get farther away from the base year.

Table 11

Growth of Per-capita Real Income and Product Measures in the United States and Canada, Per Cent per Year, 1980-2008

Measure	United States	Canada	U.S.-Canada Gap
GDP	1.92	1.59	0.33
GDI	1.93	1.76	0.16
GNP	1.91	1.65	0.26
GNI	1.92	1.83	0.09
NDP	1.74	1.43	0.31
NDI	1.91	1.72	0.19
NNP	1.73	1.50	0.23
NNI	1.90	1.79	0.11

Source: Appendix Table 10.

Per Capita Basis

Using per-capita measures allows us to control for differences between Canada and the United States in terms of the size and growth rates of their populations. As it turns out, this does not affect our conclusions regarding the growth rates of the eight aggregate measures. Population growth was virtually identical in the two countries over the 1980-2008 period: 1.05 per cent per year in the United States and 1.10 per cent per year in Canada (Appendix Table 9). (The population growth rates were also very similar within the 1980-2000 and 2000-2008 sub-periods.) Thus, the relative growth rates of the eight aggregates measures in Canada and the United States are essentially the same whether the aggregates are expressed in absolute or per-capita terms. Note that the growth rate gaps presented in Table 11 differ from those in Table 8 by only 0.05 percentage points -- the difference between the population growth rates in Canada and the United States over the 1980-2008 period.

The use of per-capita measures is essential, however, for the purpose of level comparisons between Canada and the United States. In per-capita terms and adjusted for purchasing power parity (Appendix Table 13), the U.S. values are higher than the Canadian values for each of the eight measures (Table 12). The gaps, measured in 2002 U.S. dollars at PPP, range from \$4,131 for NDI to \$8,621 for GNP. The differences between the gaps illustrate many of the issues discussed earlier. The terms of trade advantage that Canada has means that the gap is much smaller for income measures than for product measures. The disadvantage in terms of income from non-residents means that the gap between Canada and the US is higher for national than domestic measures.

The U.S.-Canada gap is greater for gross than for net measures. This is partly a size effect. GDP is about 15 per cent larger than NDP in both the United States and Canada, but the same *proportional* GDP-NDP differential corresponds to different *absolute* GDP-NDP differentials in the two countries because NDP is larger in the United States than in Canada. Thus, the U.S.-Canada GDP gap exceeds the NDP gap.

Note that by the same reasoning, the U.S.-Canada gaps should be about equal for gross and net measures when the gaps are measured in proportional terms rather than in absolute dollar terms. Indeed, the data in Table 13 show that this is the case. As a proportion of the U.S. values, the Canadian gross aggregates are roughly the same as the net ones (Chart 8). (In fact, they are slightly larger.)

It is possible to find the level of depreciation per capita by subtracting the net measures from the gross measures. This gives values for the United States of \$5,241 and \$5,047 (in 2002 U.S. dollars) for product and income measures and for Canada the values are \$4,411 and \$4,512 (in 2002 U.S. dollars at

Chart 8

The Canada-U.S. Per-capita Income Gap, Canada as a Proportion of the United States, 2008
(per cent)

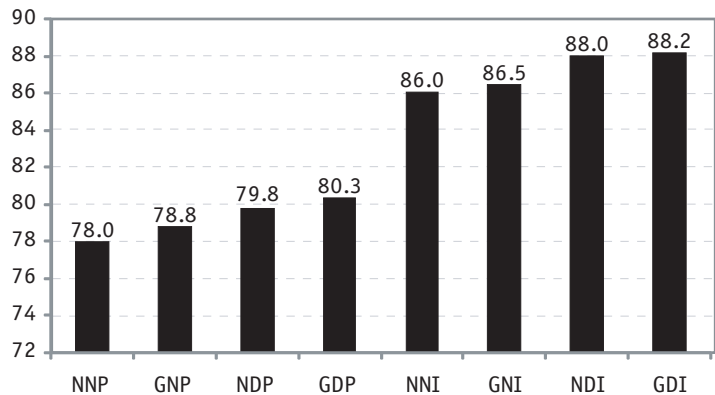


Table 12

Real Per-capita Income and Product Measures in the United States and Canada, 2002 \$U.S. at PPP, 2008

Measure	United States	Canada	U.S.-Canada Gap
GDP	40,228	32,317	7,912
GDI	39,458	34,793	4,665
GNP	40,620	31,999	8,621
GNI	39,846	34,451	5,394
NDP	34,987	27,905	7,082
NDI	34,411	30,280	4,131
NNP	35,379	27,588	7,791
NNI	34,799	29,939	4,860

Source: Appendix Table 16.

PPP). Thus the United States does have a slightly higher value of depreciation per capita by both measures.

Table 13 and Chart 8 also illustrate the importance of terms of trade for the living standards of Canadians relative to Americans in recent years. As a proportion of the U.S. level in 2008, Canada's GDI was 7.9 percentage points greater than its GDP (88.2 per cent versus 80.3 per cent). In terms of NNI, which captures terms of trade, net income from abroad, and the sustainability of the capital

Table 13

Real Per-capita Income and Product Measures in the United States and Canada, Canadian Measures as a Proportion of American Measures, per cent, 1990, 2000, and 2008

Measure	1980	2000	2008
GDP	88.0	79.8	80.3
GDI	92.2	81.6	88.2
GNP	84.6	77.4	78.8
GNI	88.6	79.2	86.5
NDP	86.8	78.5	79.8
NDI	92.8	80.8	88.0
NNP	83.0	75.9	78.0
NNI	88.7	78.1	86.0

Source: Appendix Table 17.

stock, Canada's aggregate income was 86.0 per cent of the U.S. level in 2008.

Synthesis of the Findings

This article has presented estimates of the levels and growth of eight measures of aggregate income for Canada and the United States for the 1980-2008 period. This section highlights the key empirical findings. It also discusses which of the aggregate income measures is most appropriate for analysis of productivity and living standard trends.

Empirical Findings

By definition, the absolute level of a net income measure is less than that of a gross measure because of depreciation or capital consumption allowances (CCA). The relative growth rates of the two measures reflect trends in the share of CCA in total income. A rising share means that net measures grow at a slower rate than gross measures. As this share was indeed rising during the 1980-2008 period in both Canada and the United States because of the shift to assets with shorter service lives, net measures of income advanced at a slightly slower pace than gross measures (0.02 to 0.20 percentage points per year).

The size of domestic measures of aggregate income relative to national measures depends on whether net income flows from non-residents are positive or negative. If the former, then national measures of income exceed domestic measures; if the latter, then domestic measures exceed national measures. In Canada, domestic measures of aggregate income levels have traditionally exceeded national measures because of a negative balance on net income from non-residents. The opposite has been the case in the United States.

The relative growth rates of the domestic and national income measures depend on the growth trend in net income flows from non-residents and the importance of these flows in aggregate income. In the United States, net income from non-residents is a relatively small share of aggregate income. The growth rates of US domestic and national income measures were virtually identical over the 1980-2008 period as the share of net income flows from non-residents in income was stable. In Canada, by contrast, growth of national measures exceeded that of domestic measures of aggregate income by 0.06-0.08 percentage points per year as the negative balance on net income from non-residents, as a share of total income, fell in magnitude.

In theory, current price estimates of product and income measures are by definition identical (in practice, this is not the case in the United States because of the methodology used to construct these estimates). In contrast, constant price estimates of income and product differ because of differences in the deflators used to calculate these estimates. Such deflators are of course not needed for current price estimates. Differences between estimates of real income and real product depend on the relative level of the two deflators used to construct the estimates (the GDP deflator for product estimates and the final domestic expenditure deflator for income estimates). In the United States in 2008, product

estimates exceeded income estimates because the level of the domestic demand deflator (relative to the base year) exceeded that of the GDP deflator. The opposite was the case in Canada, with real income estimates exceeding real product estimates.

The growth rates of real income and product estimates also reflect the relative growth rates of the GDP and final domestic expenditure deflators, which in turn represent changes in the terms of trade. In the United States, there was little difference in the growth rates of the GDP and final domestic demand deflators over the 1980-2008 period, and hence little difference in product and income measures of aggregate income growth. This was not the case in Canada, where GDP deflator growth exceeded final domestic demand growth, as a result of positive terms of trade effects. Growth in measures of aggregate income exceeded that of aggregate product by around 0.2 percentage points per year. This effect was uniquely due to developments in the 2000-2008 period.

In terms of the growth of aggregate income or output, our findings are the same whether we consider the income measures in absolute or per-capita terms. This is because population growth was virtually identical in Canada and the United States over the 1980-2008 period. In terms of the per-capita levels of the aggregates, we find that Canada's aggregate income measures are greater as a proportion of their U.S. levels than the corresponding output measures.

Implications for Analysis of Productivity and Living Standards

Gross Domestic Product (GDP) is by far the most widely used of the eight possible measures of aggregate income, but it is not necessarily the

Figure 2

Most Appropriate Output or Income Measure for Analysis of Productivity and Living Standards

	Productivity Analysis	Living Standards Analysis
Gross versus Net	Either	Net
Domestic versus National	Domestic	National
Product versus Income	Product	Income
Overall	GDP or NDP	NNI

most appropriate measure for all purposes. Figure 2 provides the author's perspective on the most appropriate income measure for the analysis of productivity and living standards, broken down by the three specific areas: gross versus net; domestic versus national; and product versus income.

From a theoretical perspective, a case can be made that either gross or net measures are appropriate for productivity analysis.¹⁷ The strength of a gross measure is that it captures all the value produced by the economy, which corresponds to the physical quantity of output. The strength of the net measure is that it adjusts for the output needed to maintain the capital stock.¹⁸ Concerning domestic versus national measures, a domestic measure is more appropriate than a national measure because the output measure for productivity calculations should reflect only production within the country. National measures include net income from non-residents, which reflects production that occurs outside of the country. Finally, regarding real product versus income measures, a product measure is much more appropriate than an income measure for productivity analysis as the latter incorporates terms of trade effects, which are not directly linked to physical or quantity-

17 Spant (2003) argues that net measures are more important from a welfare perspective, as these measures account for the changing capital depreciation rates; gross measures are poor indicators of economic growth, productivity and differences in growth rates across countries.

18 Baker and Rosnick (2007:43) make the case for a net productivity measure.

based input-output relationships. Consequently, the most appropriate aggregate income measure for productivity analysis is GDP or NDP.

In terms of living standards analysis, a net measure of aggregate income is more appropriate than a gross measure as it reflects sustainability considerations. A national measure is more appropriate than a domestic measure because net income from non-residents augments the command over resources, and hence the living standards, of the population. Finally, an income measure is more appropriate than a product measure because the former incorporates terms of trade effects, which can again increase or decrease command over resources and hence living standards. Consequently, the most appropriate aggregate income measure for living standards analysis is Net National Income (NNI).

The NNI statistic is little used in discussion of trends in living standards. It is noteworthy that Canada's performance in recent years, both in absolute terms and in comparison to that of the United States, has been better when measured by NNI than when measured by GDP, the much more common indicator. In 2008, Canada was at 86.0 per cent of the US level in terms of NNI, but only 80.3 per cent in terms of GDP (Table 12). Over the 2000-2008 period, Canada's per capita NNI growth of 2.20 per cent per year was 0.93 percentage points higher than Canadian GDP growth of 1.27 per cent per year (Table 15). The Canada-US gap in NNI growth rates for the 2000-2008 period was 1.23 percentage points in Canada's favour, versus just 0.09 percentage points for GDP growth.

Conclusion

There are eight aggregate measures of income and product and each yield somewhat different information. Gross and net measures differ in that net measures subtract capital consumption allowances from the corresponding gross mea-

asures. National and domestic measures differ in that national measures reflect all production or income dependent on labour from residents of the country or capital owned by residents of the country, whereas domestic measures include all production within the national borders. Real product and income measures differ in that product measures are concerned with output volumes and real income measures may increase due to changes in volume or prices; real income measures are concerned with the volume of consumption attainable rather than the volume produced. Real income and product measures differ because different deflators are used to attain the volume of production and the volume of consumption attainable. Given that all eight aggregates convey important information, it is important to understand each one.

Over the 1980 to 2008 period, the United States experienced higher growth than Canada in all aggregate income and product measures. Canada did, however, outperform the United States in all eight aggregates for the 2000 to 2008 period. While Canada continues to lag the United States in terms of levels, the most recent period indicates Canada is catching up. Canada has been fortunate to see trading gains such that GDI growth outpaced GDP growth while the United States experienced almost identical growth rates for both measures over the 1980 to 2008 period.

Canada's growth advantage since 2000 has been most pronounced in terms of NNI, the measure most relevant for living standards; it has been smallest in terms of GDP and NDP, the measures most relevant for productivity analysis. It is likely that most readers were unaware of this, since NNI is almost never discussed. Because NNI captures terms of trade effects, net income received from abroad, and the sustainability of the capital stock, it is a key measure of an economy's aggregate command over consumption opportunities. A recommendation arising from

this report is that Statistics Canada and other statistical agencies should publish data on all eight income aggregates, so that analysts will be able to easily choose the most appropriate measure for their purposes.

References

- Arsenault, Jean-Francois and Andrew Sharpe (2008) "An Analysis of the Causes of Weak Labour Productivity Growth in Canada since 2000," *International Productivity Monitor*, Number 16, Spring, pp. 14-39.
- Baker, Dean, and David Rosnick (2007) "Productivity and Sustainable Consumption in OECD Countries, 1980-2005," *International Productivity Monitor*, Number 15, Fall, pp. 41-54.
- Bank of Canada (2009) "Monetary Policy Report," January. Available <http://www.bankofcanada.ca/en/monr/pdf/2009/update220109.pdf>
- Bureau of Economic Analysis (2009) *Concepts and Methods of U.S. National Income and Product Accounts*. Available at: <http://www.bea.gov/national/pdf/NIPAhandbookch1-4.pdf>.
- Cross, P. (2004) "National versus Domestic Output: A Measure of Economic Maturity," *Canadian Economic Observer*, Catalogue no. 11-010-XIB, December. Available <http://www.statcan.gc.ca/pub/11-010-x/11-010-x2004012-eng.pdf>
- Kohli, U. (2006) "Real GDP, Real GDI, and Trading Gains: Canada, 1982-2005," *International Productivity Monitor*, Number 13, Fall, pp. 46-56.
- Hulten, Charles R. (1992) "Accounting for the Wealth of Nations: The Net versus Gross Output Controversy and its Ramifications," *Scandinavian Journal of Economics* 94, Supplement, pp. 9-24.
- Landefeld, Steven, Brent R. Moulton, and Cindy M. Vojtech (2003) "Chained Dollar Indexes: Issues, Tips on Their Use and Upcoming Changes," *Survey of Current Business*, Volume 83, No. 11, pp. 8-16.
- Luige, Tiina (2008) "2008 SNE" Presentation 3 at the United Nations Economic Commission for Europe, Baku Conference, September.
- Macdonald, Ryan (2007a) "Real GDP and Purchasing Power of Provincial Output," *Economic Analysis Research Paper Series* Cat. 11F0027MIE No. 046. Ottawa: Statistics Canada.
- Macdonald (2007b) "Canadian and U.S. Real income Growth Pre and Post 2000: A Reversal of Fortunes," *Economic Analysis Research Paper Series* Cat. 11F0027MIE No. 048. Ottawa: Statistics Canada.
- Reinsdorf, Marshall (2008) "Measuring the Effects of Terms of Trade in National Accounts," presentation at World Congress, Session 4D, Rosslyn, VA. Delivered May 14. <http://www.indexmeasures.com/dc2008/presentations/WorldCongressVersionoCommand-basis-GNP.ppt>.
- Reinsdorf, Marshall (2009) "Terms of Trade Effects: Theory and Measurement," Bureau of Economic Analysis Working Paper 2009-01 (revised). http://www.bea.gov/papers/pdf/measuring_the_effects_of_terms_of_trade_reinsdorf.pdf.
- Spant, Roland (2003) "Why Net Domestic Product Should Replace Gross Domestic Product as a Measure of Economic Growth". *International Productivity Monitor*, Number 7, Fall, pp. 39-45.
- Sharpe, Andrew, and Jean-Francois Arsenault (2009) "New Estimates of Multifactor Productivity Growth for the Canadian Provinces," *International Productivity Monitor* Number 18, Spring, pp. 25-37.
- Statistics Canada (1989). *A User Guide to the Canadian System of National Accounts*. 13-589E Available at: <http://www.statcan.gc.ca/nea-cen/pub/guide/4221065-eng.pdf>
- Statistics Canada (2009) *Latest Developments in the Canadian Economic Accounts*. 13-605-XIE Available: <http://www.statcan.gc.ca/pub/13-605-x/2003001/chrono/4066065-eng.htm>
- United Nations (1993) *The System of National Accounts 1993*. Available at: <http://unstats.un.org/unsd/sna1993/toctop.asp>.
- United Nations (2008) *System of National Accounts 2008: Pre-edited version of Volume 1*. Available <http://unstats.un.org/unsd/sna1993/drafting-phase/WC-SNAvolume1.pdf>.