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by Ilan Kolet and Ryan Macdonald

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May 2010

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by

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## **Acknowledgements**

The authors would like to thank their colleagues at the Bank of Canada and Statistics Canada: John Baldwin, Carlos de Resende, Olivier Gervais, Sharon Kozicki, Danielle Lecavalier, Robert Lafrance, Robert Lavigne, Eric Santor, Larry Schembri, and seminar participants for helpful feedback. Amberly Jane Coates provided excellent research assistance.

## Abstract

The prices of commodities produced in Canada have important implications for the performance of the Canadian economy and the conduct of monetary policy. The authors explain an important change to the methodology used to construct the Bank of Canada commodity price index (BCPI). Since its inception, the BCPI has been a fixed-weight index of commodity prices, with weights that were updated roughly once a decade. Such indexes are subject to bias, because output shares change over time. In this paper, the authors use the chain Fisher index method to update the production weights on an annual basis, and expand the BCPI to include a broader set of commodities. They find that the new index, called the Fisher BCPI, is more comprehensive, flexible, and accurate than the fixed-weight index.

*JEL classification: E3, C1*

*Bank classification: Inflation and prices; Econometric and statistical methods*

## Résumé

L'évolution des prix des matières premières produites au Canada revêt une grande importance pour la tenue de l'économie canadienne et la conduite de la politique monétaire. Les auteurs décrivent un changement majeur qui a été apporté à la méthodologie qui sert à construire l'indice des prix des produits de base (IPPB) de la Banque du Canada. Depuis sa création, l'IPPB est fondé sur des pondérations fixes, qui ont été rajustées environ une fois tous les dix ans. De tels indices comportent un biais, car la composition de la production n'est pas stable dans le temps. Dans leur étude, les auteurs ont recours à une formule d'indice en chaîne de Fisher pour actualiser annuellement les pondérations relatives à la production. De plus, ils élargissent l'IPPB pour y intégrer une gamme plus vaste de produits de base. Ils notent que le nouvel indice, appelé « IPPB Fisher », est plus complet, flexible et exact que le précédent à pondérations fixes.

*Classification JEL : E3, C1*

*Classification de la Banque : Inflation et prix; Méthodes économétriques et statistiques*

# 1 Introduction

The prices of commodities produced in Canada have important implications for the performance of the Canadian economy. Given Canada's substantial comparative advantage in natural resource production, changes in commodity prices reflect important relative price changes that significantly affect the allocation of resources and production in the Canadian economy. Commodity price movements also affect Canada's terms of trade, as well as domestic demand (Macdonald 2008, 2010). In addition, the Can\$/US\$ exchange rate depends importantly on commodity prices (Amano and van Norden 1993; Bailliu and King 2005; Issa, Lafrance, and Murray 2008; Maier and DePratto 2008; Cayen et al. 2010).<sup>1</sup>

The interpretation of commodity market developments is critical for the conduct of monetary policy, and, as such, requires an accurate measure of overall commodity price movements. The fixed-weight Bank of Canada commodity price index (FWBCPI) incorporates 23 commodities, whose weights are updated infrequently.<sup>2</sup> The BCPI was last updated in 2003 using production weights based on the years 1988 to 1999 (Hirsch 2003).<sup>3,4</sup> Significant changes in the value of commodity production in Canada, especially since 2002, raise the concern that the FWBCPI may not adequately reflect the movements in overall commodity prices due to a potential bias introduced by the use of outdated output weights (Rossiter 2005).

In this paper, we explain an important change to the methodology used to construct the Bank of Canada's commodity price index. We adopt a Fisher ideal chain index that uses weights that are updated every year. Thus, biases from changes in production values that are due to price movements are minimized. In addition, the structure of the index is expanded to improve commodity coverage and thereby increase regional representation. The Bank's new commodity price index is called the Fisher BCPI. It is a more comprehensive, flexible, and accurate means of measuring changes in global prices for commodities produced in Canada.

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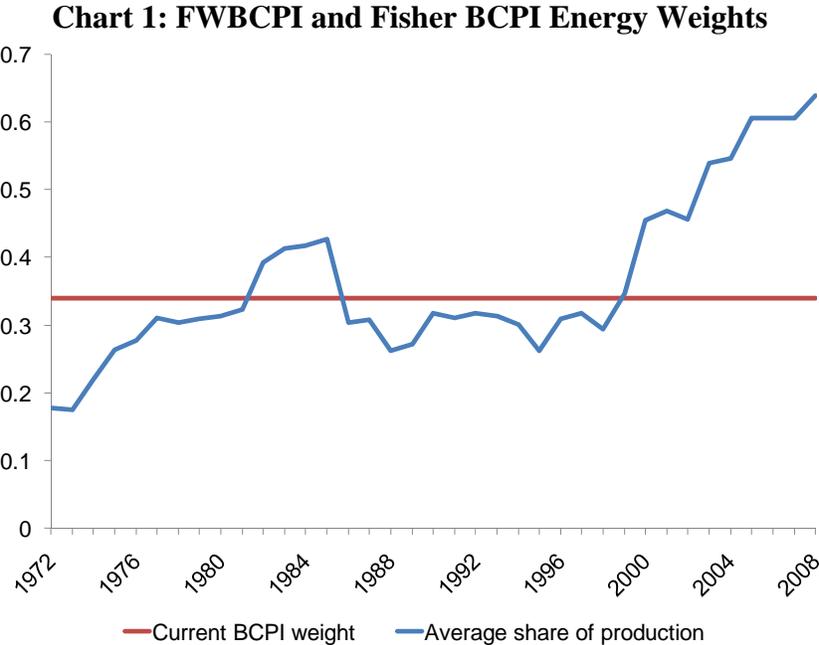
<sup>1</sup> Commodity prices and currency fluctuations, in turn, influence manufacturing prices (Baldwin and Yan 2006; Baldwin and Macdonald 2009) and inflation in Canada (Cheung 2009).

<sup>2</sup> The Bank of Canada commodity price index was created in 1975, and updated in 1988, 1994, and 2003.

<sup>3</sup> Unless stated otherwise, nominal or current-dollar values are used throughout.

<sup>4</sup> When the FWBCPI was reweighted in 2003, the revised index was linked to the 1994 fixed-weight index, in order to preserve the historical information in the previous index and eliminate any level disconnect at the point of transition to the 2003 weights.

Energy commodity production is of growing importance for Canada (Chart 1). During periods of low energy prices – for example, between the late 1980s and the late 1990s – energy commodities made up about one-third of the commodity price index. However, during the oil shocks of the 1970s, and during the most recent period of rising energy prices, the share of production accounted for by energy commodities rose dramatically. By 2008, approximately two-thirds of the value of production included in the index was related to energy.



Movements in the Fisher BCPI are broadly similar to those in the FWBCPI, despite changes in aggregation techniques and commodity coverage. This similarity is unexpected, given the large growth in production weights over time, but stems from the fact that commodity price movements are correlated, and that the year-to-year volatility in commodity prices dominates the gradual annual change in weights.

An important advantage of the Fisher BCPI is its ability to easily update the weights on an annual basis. In addition, its consistency with the Canadian system of national accounts makes the construction of a volume measure for Canadian commodity production relatively straightforward. This index will, therefore, be used in the Bank of Canada’s quarterly projection model, ToTEM (Murchison and Rennison 2006).

The remainder of this paper is organized as follows. Section 2 examines the commodities in the Fisher BCPI. Section 3 discusses the choice of index and describes the Fisher index formula. Section 4 examines the Fisher BCPI relative to the FWBCPI. Section 5 discusses contributions to growth by commodity and introduces subindexes for similar groups of commodities, such as energy or forestry products. Section 6 offers some conclusions.

## **2 Commodities in the Fisher BCPI**

### **2.1 Commodities covered**

The FWBCPI was intended to summarize the U.S.-dollar price movements of 23 commodities produced in Canada. This information was used to analyze the movement of economic variables of interest, including GDP, industrial producer prices, inflation, the terms of trade, and the exchange rate. When the index was last updated in 2003, several commodities were dropped from the index, since they represented a small fraction of production over the 1988 to 1999 period.<sup>5</sup> The FWBCPI is thus less than ideal for making comparisons with previous commodity price cycles, since the commodities included in the index represent the representative mix of outputs only for the period from 1988 to 1999.

The Fisher BCPI expands the number of commodities included in the index, to ensure that it represents the majority of tradable commodities produced in Canada (Table 1). While it is preferable to use as many commodities as possible, data constraints on the availability of production values limit the scope of the index. Commodities such as zinc and pulp are included, while non-metallic minerals such as sand and gravel are not.

Some commodities that have a small weight in the index, such as corn, are included in an effort to measure the effect of commodity price movements on particular regions, rather than on the

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<sup>5</sup> At the time of the previous update, sulphur and cod were removed from the FWBCPI.

country as a whole.<sup>6</sup> The FWBCPI includes at least one commodity that represents an important share of output for most provinces and territories.<sup>7</sup>

**Table 1: Expanded BCPI Commodities**

<b>Standard commodities (FWBCPI)</b>	<b>Expanded commodities (Fisher BCPI)</b>
<b>Energy</b> Coal, oil, natural gas	
<b>Metals and minerals</b> Gold, silver, nickel, copper, aluminum, zinc, potash	Lead, iron
<b>Forestry</b> Pulp, lumber, newsprint	
<b>Agriculture</b> Cattle, hogs, wheat, barley, canola, corn	Potatoes
<b>Fisheries</b> Salmon, lobster, shrimp, crab	Ocean fish, shellfish <sup>a</sup>

a. In the Fisher BCPI, fisheries products are grouped into two categories: ocean fish (haddock, halibut, salmon, flounder, cod, pollock, sablefish, rockfish, and other ocean fish), and shellfish (shrimp, crabs, lobsters, clams, and other shellfish).

## 2.2 Index weights and input-output tables

To calculate a commodity price index, prices and production weights are needed. To facilitate calculation of the index weights, Statistics Canada’s databases are employed as the primary source of production values. Specifically, Statistics Canada has in place a data collection system that compiles data from multiple sources, including surveys, other federal departments, and tax records, to produce its input-output tables. The input-output tables contain information on the outputs of Canadian industries for 477 commodities.

While it would be ideal to produce an index that covers all of the traded primary commodities produced in Canada, the input-output system does not produce data that are sufficiently disaggregated to permit such a calculation. Because Statistics Canada is legally prohibited from releasing information that compromises the confidentiality of Canadian firms and individuals,

<sup>6</sup> For instance, the Fisher BCPI includes potato production, which is important for Prince Edward Island (Macdonald 2007).

<sup>7</sup> Although Canada produces 25 per cent of the world’s uranium, detailed and timely price and production data are not available.

the input-output data are often aggregated over two or more commodities or are suppressed to preserve confidentiality.<sup>8</sup>

To address these measurement issues, the input-output tables are supplemented with data from other sources. For instance, information on mineral prices and production volumes is used to generate value indexes that are employed to interpolate the value of production in years when input-output data are suppressed. Information on agricultural products is taken from other Statistics Canada data series available on CANSIM.<sup>9</sup> Data for fisheries are obtained from the Department of Fisheries and Oceans Canada, while additional data for mineral production are taken from the *Canadian Minerals Yearbook* (both of these sources are used by the input-output system to calculate commodity production). Although the data from other federal agencies are not perfectly consistent with the input-output system, they are nonetheless useful for constructing the index weights.<sup>10</sup>

### 2.3 Prices

Price data are available from a number of sources. To standardize the tracking of commodity price movements, U.S.-dollar spot market prices are used when available. For certain commodities, such as crude oil and natural gas, we use the front month NYMEX futures contract price.<sup>11</sup> Other prices are obtained from a variety of sources, including the *Wall Street Journal*, the U.S. Department of Agriculture, and the U.S. Bureau of Labor Statistics (BLS). For fisheries prices, a more readily available measure of prices is the BLS. Indexes of primary ocean fish and shellfish prices are employed to produce an index of fish prices that is more historically representative than the mix of fish in the FWBCPI. Appendix A provides a detailed description of the price data.

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<sup>8</sup> Preliminary discussions also considered the possibility of creating an export weight commodity price index. While this would have been an interesting option, the Canadian export data are not sufficiently disaggregated, nor is a complete set of data maintained by Statistics Canada. Note, however, that the results of calculating an approximate export weight index (using the aggregate commodity categories) did not differ widely from those employing the production-based approach.

<sup>9</sup> CANSIM is Statistics Canada's main socioeconomic database.

<sup>10</sup> The input-output estimates of commodity production and use are part of a balanced system used for measuring GDP. Data from all sources are subject to adjustment when multiple data sources offer differing results. As a result, data for commodity outputs in the input-output tables may not always match source data.

<sup>11</sup> In the United States, the price of the front month light sweet crude oil futures contract, traded on the NYMEX commodity exchange, is widely reported as a proxy for the spot price of crude oil.

### 3 Choice of Index

The Fisher BCPI improves on the FWBCPI by expanding the commodity coverage, and by employing a chain weight index formula to adjust for changes in the value of production over time.

#### 3.1 Choosing an index methodology

There are several types of chain indexes that could be used. Among them are Laspeyres, Paasche, Fisher, and Törnqvist indexes. The Fisher (1922) index was selected for the new BCPI because no other index passes more tests for desirable index properties (Diewert 1992). First, the Fisher (ideal) index is simply a geometric mean of the fixed-weight Paasche and Laspeyres indexes, thus minimizing the bias associated with the Laspeyres and Paasche formulas. Second, the Fisher index is easy to interpret, since the user can examine its Laspeyres and Paasche components to gain an understanding of movements in the index. Finally, a distinct advantage of the Fisher ideal formula is that one can extract a Fisher ideal quantity index.<sup>12</sup> Furthermore, the Fisher calculation is also used by Statistics Canada, and so using this methodology for the commodity price index makes it consistent with published national accounts data.

##### 3.1.1 The Fisher index

For  $j = 1, \dots, N$  commodities, where price ( $p$ ) and quantity ( $q$ ) estimates can be obtained, the Fisher implicit price index between periods  $t$  and  $t - 1$  is defined as:

$$BCPI_{\frac{t}{t-1}} = (LP_{\frac{t}{t-1}} \times PP_{\frac{t}{t-1}})^{\frac{1}{2}}, \quad (1)$$

where  $LP$  is the Laspeyres price index and  $PP$  is the Paasche price index, which are defined, respectively, as:

$$LP_{\frac{t}{t-1}} \equiv \sum \frac{p_t q_{t-1}}{p_{t-1} q_{t-1}}, \quad (2)$$

and

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<sup>12</sup> According to Triplett (1992), “the product of a Fisher Ideal price index between two periods and a Fisher Ideal quantity index between the same two periods is equal to the total change in value (change in current-dollar expenditures) between those periods.”

$$PP \frac{t}{t-1} \equiv \sum \frac{p_t q_t}{p_{t-1} q_t}. \quad (3)$$

The Fisher index is advantageous in calculating the contribution of individual commodities to overall commodity price index growth. The Fisher ideal index can thus be decomposed into contribution-to-growth components for each commodity (see, for example, Chevalier 2003; Reinsdorf, Diewert, and Ehemann 2002). Using the contribution-to-growth factors, the influence of a single commodity, or group of commodities, can be examined. The Fisher contribution-to-growth formula is:

$$Ctg\% \frac{t}{t-1} = 100 \times \frac{(\sum C_{i,t} / \sum C_{i,t-1}) \times (C_{i,t} (q_{i,t-1} / q_{i,t}) - C_{i,t-1}) + BCPI \frac{t}{t-1} \times (C_{i,t} - C_{i,t-1} (q_{i,t} / q_{i,t-1}))}{\sum C_{i,t} + BCPI \frac{t}{t-1} \times \sum C_{i,t-1} (q_{i,t} / q_{i,t-1})},$$

where  $C_i$  and  $q_i$  correspond to nominal values and volumes for individual commodities.

The FWBCPI included stand-alone indexes for energy and non-energy commodities, because their behaviour was sufficiently different and, consequently, they had different effects on macroeconomic variables of interest. In addition, energy and non-energy commodities are often delineated in the mainstream financial media. To provide continuity with the FWBCPI, and to provide commodity price indexes that are sensitive to particular commodity markets, stand-alone commodity price indexes are calculated for each of the major commodity group areas: energy, agriculture, metals and minerals, forestry, and fisheries.

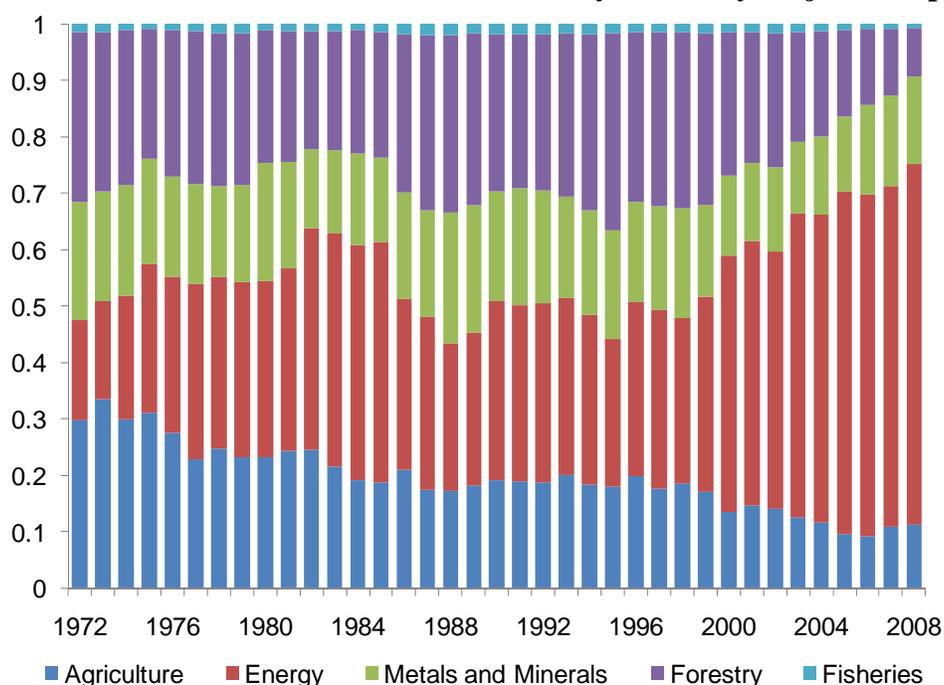
## 4 The Fisher BCPI Compared to the FWBCPI

### 4.1 Aggregate BCPI

We calculate an updated aggregate BCPI that consists of 24 commodities from 1972 to 2008 using the Fisher chain weight methodology. The Fisher BCPI better captures ongoing shifts in the structure of commodity production in Canada towards energy products (Chart 2 and Table 2). Between 1978 and 2008, the share of energy production in the index rose from 30 per cent to 64 per cent. This increase occurred at the expense of most other commodity groups. From 1978 to 2008, agriculture's share in production declined from 25 per cent to 11 per cent, and forestry's

share declined from 27 per cent to 9 per cent. The share of metals and minerals remained roughly constant over the sample.

**Chart 2: Fisher BCPI - Nominal Commodity Shares by Major Group**



**Table 2: Production Weights in the Fisher BCPI**

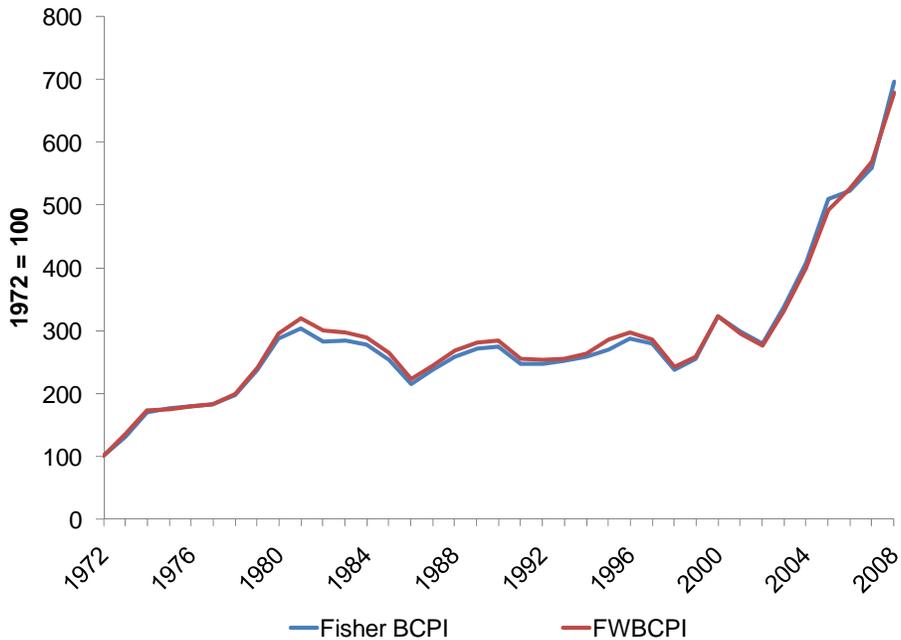
	FWBCPI weights (%)	Fisher BCPI - nominal commodity shares by major group (%)			
		1978	1988	1998	2008
<b>Energy</b>	34	30	26	29	64
Crude oil	21	18	15	15	40
Natural gas	11	10	9	12	22
<b>Non-energy</b>	66	70	74	71	36
Agriculture	16	25	17	19	11
Metals and minerals	16	16	23	19	16
Forestry	33	27	31	31	9
Fisheries	1	2	2	2	1

Although the weights of specific commodities in the index have changed over time, the level and year-to-year movements of the Fisher BCPI are very similar to those of the FWBCPI. Despite differences in any one year, over the entire 1972 to 2008 period, the FWBCPI and Fisher BCPI

averaged 6.4 per cent growth per annum with standard deviations of 12.5 and 12.4 per cent, respectively. To better understand these similarities, three important stylized facts are worth noting.

First, the correlation of commodity prices is high, which pushes the two indexes in the same direction irrespective of the weight changes (Chart 3).<sup>13</sup> Energy prices, due to their rising importance and large price swings, dominate and influence all other price movements.<sup>14</sup> In addition, similar price movements across commodities may arise because commodity demand cycles are synchronized. We find that most commodity price movements follow those of crude oil prices, especially after 2000.

**Chart 3: Annual Fisher BCPI vs. Annual FWBCPI**

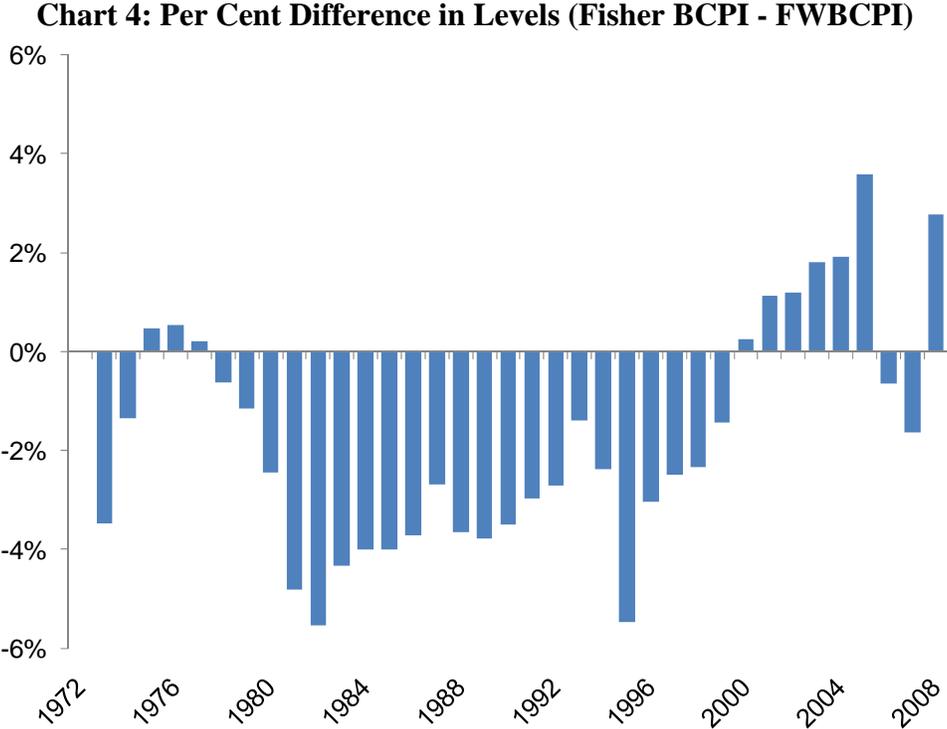


Second, by coincidence, there are offsetting movements in commodity production weights and energy prices over the sample. In particular, energy prices, which are the most volatile, are strong and overweighted by the FWBCPI in the first part of the sample, and are strong and underweighted by the FWBCPI in the last part of the sample (Chart 4). Consequently, over the

<sup>13</sup> Although commodity prices are volatile, weights change by small amounts from year to year.

<sup>14</sup> This may also be due to the fact that energy is an important input in the production of other non-energy commodities.

entire sample, the average of the Fisher weights is almost identical to the old fixed weights, thus mitigating large differences between the levels of the two indexes. The FWBCPI and the Fisher BCPI begin and end together. Therefore, if the sample were to be expanded by 20 years, the profiles of the two indexes would likely be different.

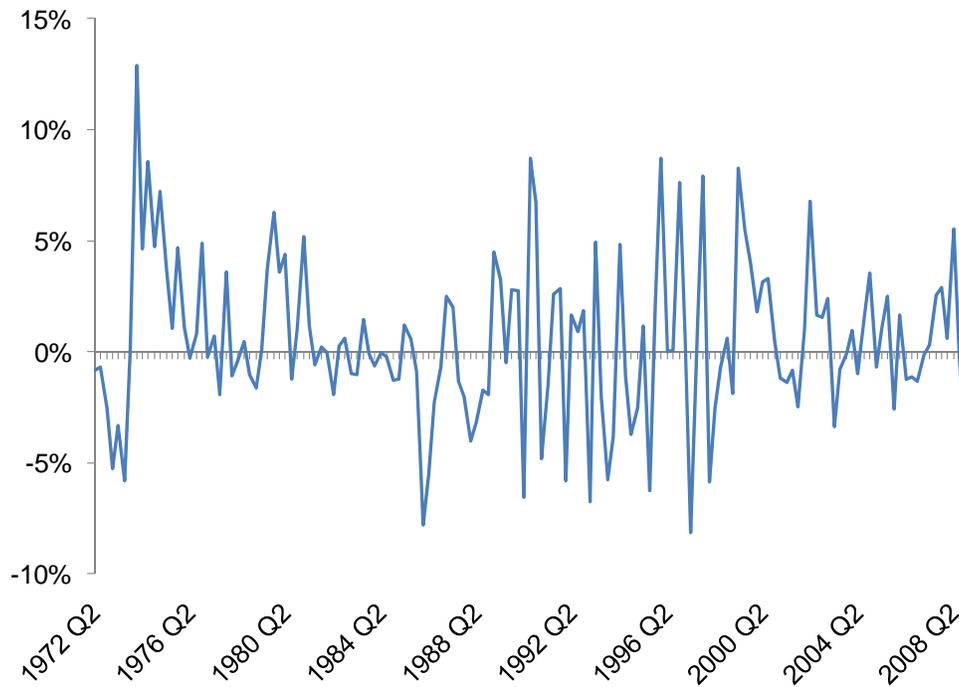


Third, the annual frequency masks significant quarterly differences between indexes (Chart 5). The weights are fixed within a year, and so large price swings create differences when we examine quarter-over-quarter growth rates. For example, in 2008Q2, the FWBCPI indicates that commodity prices rose by about 18 per cent (quarter-over-quarter), whereas the Fisher BCPI indicates that they increased by roughly 23 per cent (quarter-over-quarter). This discrepancy is due to the 12 per cent increase in non-energy commodity prices observed in 2008Q2 – a substantial difference from the 3 per cent increase that the FWBCPI computes for non-energy commodity prices.

Although the FWBCPI and the Fisher BCPI appear to be very similar, the new Fisher index is advantageous for several reasons. Specifically:

- (i) the Fisher BCPI provides a more accurate historical representation of commodity production in Canada,
- (ii) the Fisher BCPI is flexible enough to allow for new commodities to enter the basket going forward,
- (iii) it is easier to calculate the contribution of individual commodities to overall commodity price index growth in the Fisher BCPI, and
- (iv) the Fisher index calculation places the commodity price index on the same methodological footing as the Canadian system of national accounts produced by Statistics Canada.

**Chart 5: Difference between Quarter-over-Quarter Growth Rates (Fisher BCPI – FWBCPI)**



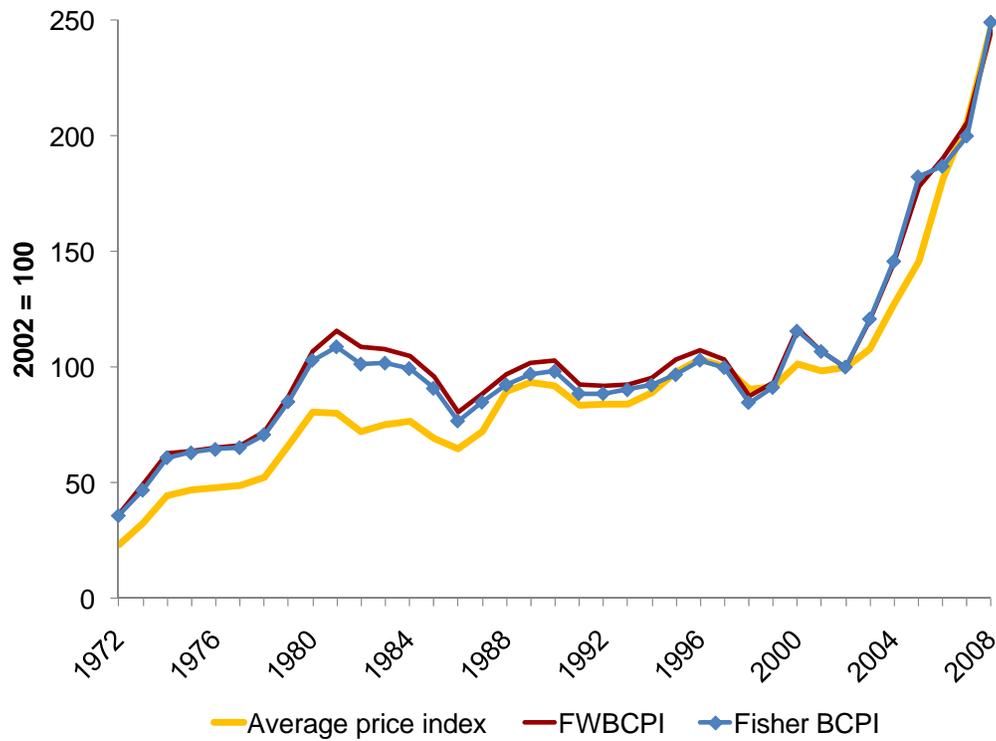
## 4.2 Lack of sensitivity to index choice

One way to demonstrate the dominance of year-to-year price fluctuations over the variation in weights in determining movements in the commodity price index is to use a simple price index in

which all prices are given equal weights. This simple average price index closely tracks the FWBCPI and the Fisher BCPI (Chart 6).

Another way to illustrate the dominance of price movements over the gradual change in weights is to compare the Fisher BCPI and the FWBCPI with other types of price indexes. Table 3 shows that, regardless of whether a Laspeyres, Paasche, Fisher, or Törnqvist index is employed, the estimate of overall commodity price growth is nearly identical.<sup>15</sup>

**Chart 6: Fisher BCPI vs. Index Based on Average of Commodity Price Movements**



<sup>15</sup> The Törnqvist index is a multiplicative index that uses the average share of a commodity in production between  $t$  and  $t-s$  to aggregate individual price ratios between  $t$  and  $t-s$  into an overall index. For computational purposes, we have calculated the preliminary version of the quarterly BCPI using a Törnqvist index calculation. Dumagan (2002) shows mathematically that the Törnqvist index provides a close numerical approximation to the Fisher ideal index.

**Table 3: BCPI Growth by Index Type (1990–2008)**

	<b>Laspeyres</b>	<b>Paasche</b>	<b>Törnqvist</b>	<b>Fisher</b>	<b>FWBCPI</b>
1990	1.4%	0.9%	1.1%	1.2%	0.9%
1991	-9.5%	-9.9%	-9.7%	-9.7%	-10.2%
1992	0.3%	-0.4%	-0.1%	-0.1%	-0.3%
1993	2.2%	1.6%	1.9%	1.9%	0.5%
1994	2.4%	2.0%	2.2%	2.2%	3.3%
1995	5.1%	4.6%	4.9%	4.8%	8.3%
1996	6.9%	6.1%	6.4%	6.5%	3.8%
1997	-3.2%	-3.1%	-3.1%	-3.1%	-3.7%
1998	-14.9%	-15.3%	-15.2%	-15.1%	-15.3%
1999	7.8%	7.6%	7.7%	7.7%	6.7%
2000	28.1%	25.3%	26.8%	26.7%	24.7%
2001	-7.6%	-7.7%	-7.6%	-7.6%	-8.4%
2002	-6.4%	-6.2%	-6.3%	-6.3%	-6.4%
2003	20.9%	20.7%	20.9%	20.8%	20.1%
2004	20.9%	20.4%	20.6%	20.6%	20.5%
2005	25.7%	24.5%	25.1%	25.1%	23.1%
2006	4.2%	0.9%	2.6%	2.5%	6.9%
2007	7.1%	6.9%	7.0%	7.0%	8.1%
2008	25.4%	23.8%	24.8%	24.6%	19.3%
Average	6.7%	5.8%	6.2%	6.2%	6.2%
Absolute average	10.8%	10.0%	10.4%	10.4%	10.5%
Std. dev.	12.7	12.2	12.5	12.5	12.4
<b>Correlation with Fisher</b>					
Growth rates	99.9%	99.9%	100.0%	100.0%	98.8%
Level index	99.9%	99.9%	100.0%	100.0%	98.9%

## 5 Fisher BCPI Contributions to Growth and Subindexes for Major Commodity Groups

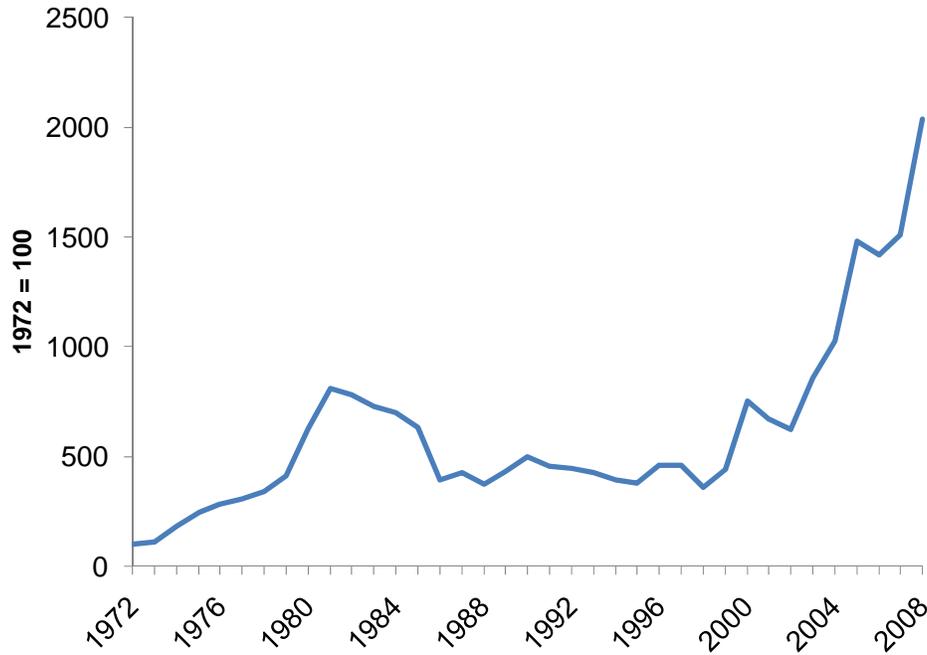
The FWBCPI included several subaggregate categories such as energy, food, and industrial materials. These aggregations were based on previous index updates, and have been modified in the Fisher BCPI, which groups commodities according to their type: energy, agriculture, metals and minerals, forestry, and fisheries. Each commodity subindex is calculated using the Fisher methodology, and, as such, it is possible to calculate the contribution to growth by individual commodity.

### 5.1 Energy

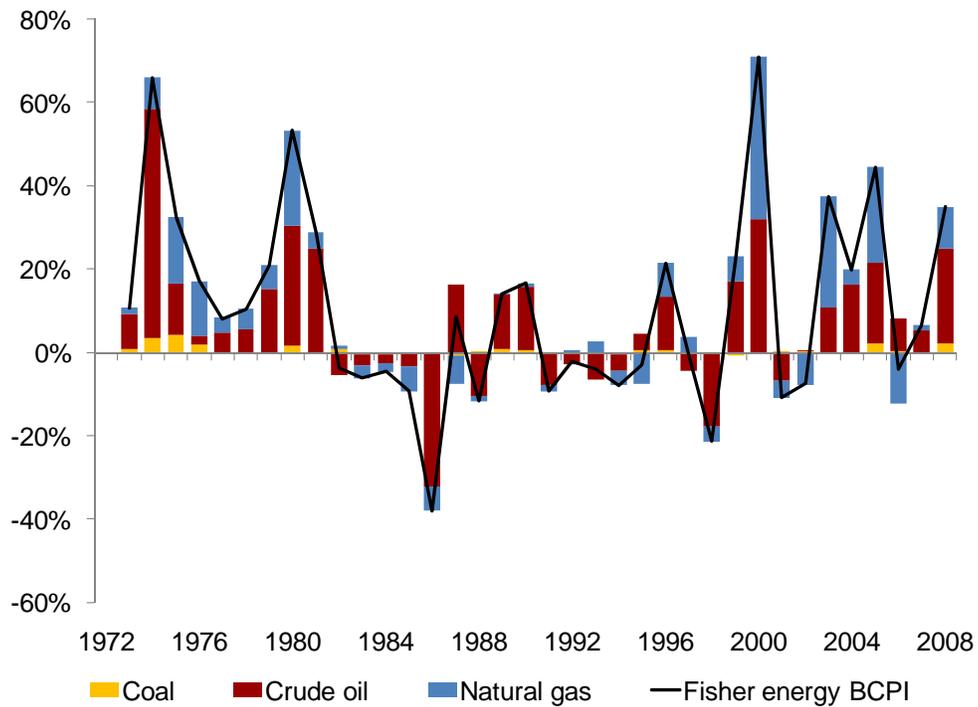
Energy prices are volatile and subject to rapid changes (Chart 7). In fact, in most periods, oil prices are the dominant source of growth in energy prices – only in a few years do prices for

natural gas match or exceed the contribution of oil prices, and those years are all grouped in the 1970s and after 2000 (Chart 8).

**Chart 7: Energy BCPI**



**Chart 8: Contribution to Energy BCPI by Commodity**



Natural gas production has increased in importance for Canada; its production weight has risen from roughly 11 per cent to 22 per cent of the total BCPI. However, most of the increase occurred between 2000 and 2008, a period where we would expect a larger bias in the FWBCPI relative to the Fisher BCPI. The absence of this large bias is, in part, the result of the high degree of correlation (over 80 per cent) between movements in oil prices and natural gas prices over this period.<sup>16</sup>

## **5.2 Non-energy commodities**

### ***5.2.1 Metals and minerals***

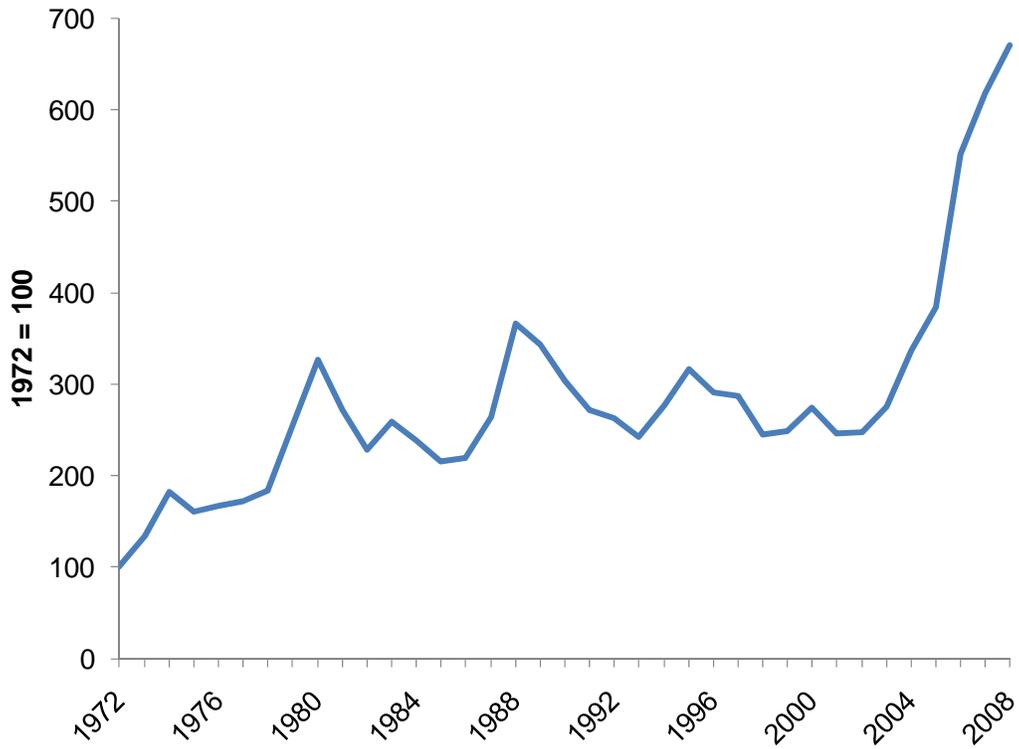
Metals and minerals prices exhibited some upward movement through the 1970s and 1980s, with noticeable peaks in 1980 and 1988 (Chart 9). In the run-up to each peak, prices increased across a range of metals and minerals, likely reflecting strong global demand. The 1990s ushered in a decade of stagnant price growth. By the late 1990s, however, prices began rising and then increased steeply towards 2008, in part reflecting an acceleration in demand from important emerging-market economies (Cheung and Morin 2007).<sup>17</sup> Throughout the 1972 to 2008 period, price movements for metals and minerals were not dominated by a particular commodity (Chart 10). In most years, commodity prices in this group tended to move synchronously, largely reflecting the global business cycle.

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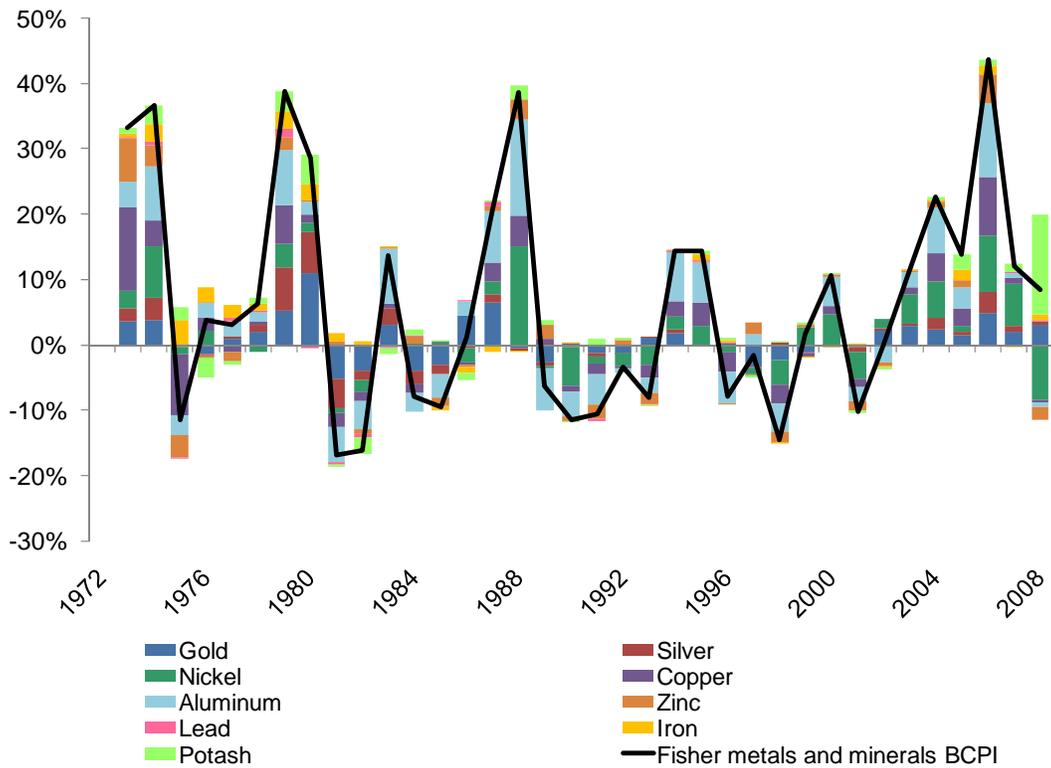
<sup>16</sup> Should the correlation between oil prices and natural gas prices decline – for example, as a result of a large increase in the supply of shale gas – these changes would be captured as part of the regular annual update of the Fisher index.

<sup>17</sup> The International Monetary Fund estimates that annual increases in global consumption of major commodity groups between 2001 and 2007 were larger than during the 1980s and 1990s, and that a combination of strong income growth, globalization, and rapid population growth has contributed to the rapid growth in demand.

**Chart 9: Metals and Minerals BCPI**



**Chart 10: Contribution to Metals and Minerals BCPI by Commodity**



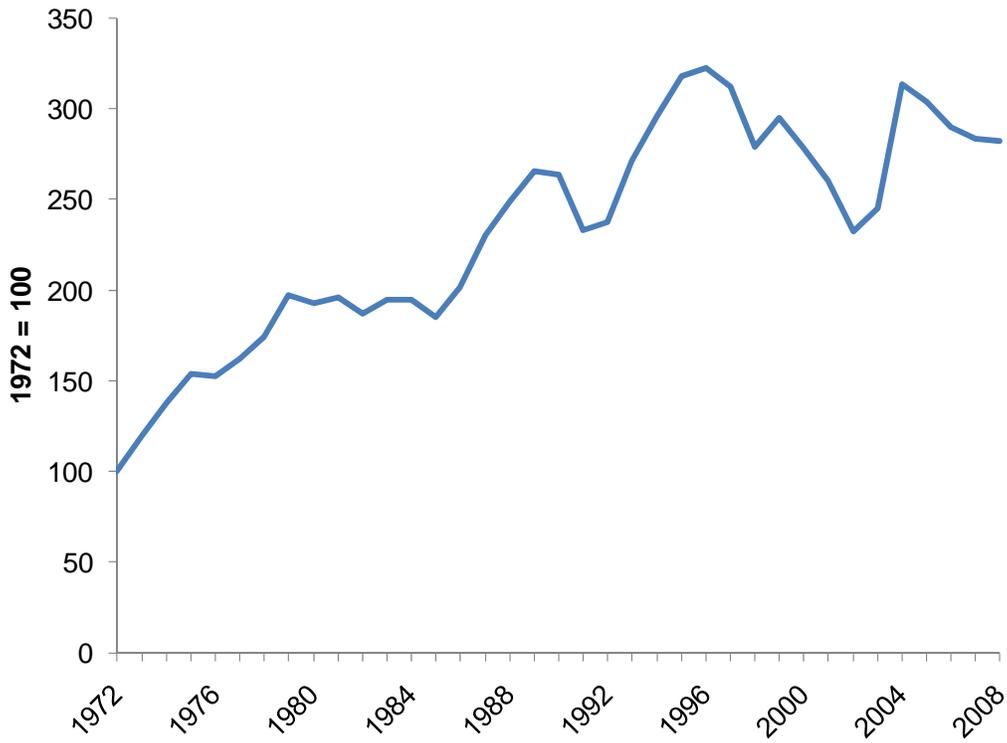
### *5.2.2 Forestry*

Forestry prices increased by over 200 per cent between 1972 and 1996 (Chart 11). While the progression was not smooth, with price growth experiencing weakness from the late 1970s to the early 1980s and during the 1991 recession, the general trend was upward. After 1996, forestry prices declined for seven years before rebounding in 2003–04. The increase in forest product prices in the early 2000s was largely due to the increased demand for lumber during the North American housing market boom. The rebound in prices, however, was temporary, since forest product prices have fallen, in part due to the large decline in housing activity in North America.

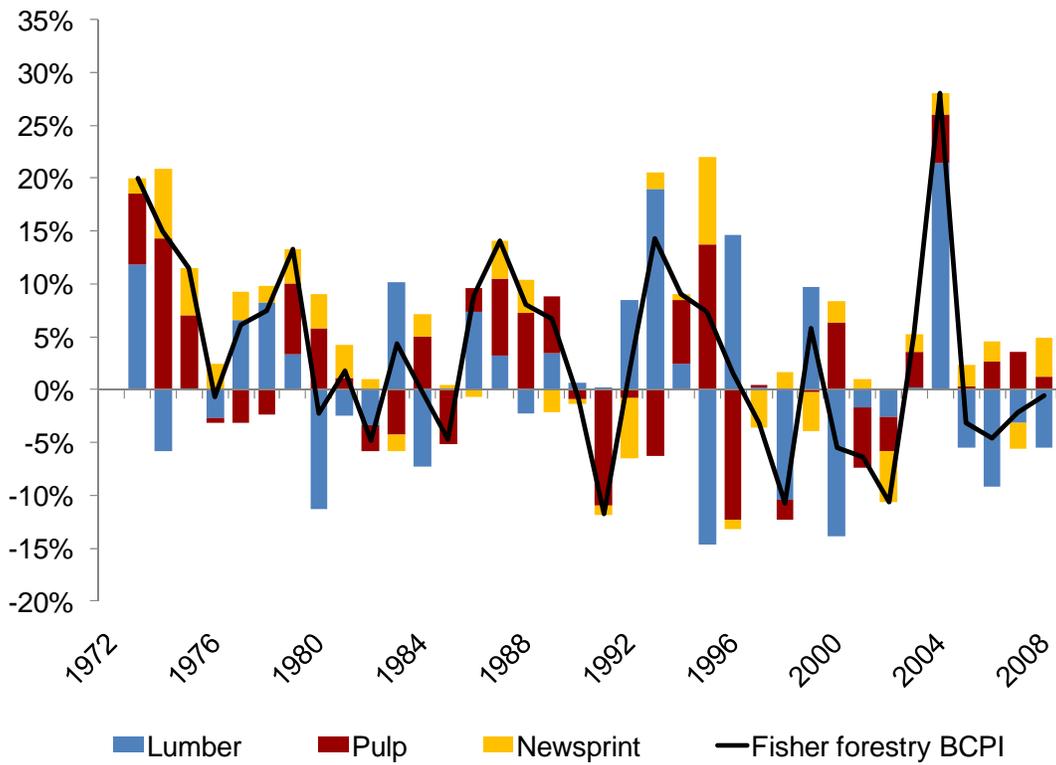
The recent declines in newsprint and pulp prices are due to structural shifts in demand and supply. Survey evidence suggests that an increasing proportion of newspaper readers have moved to online news sources. These structural changes have led to large declines in the demand for newsprint in North America, and, when coupled with the increase in pulp production from emerging markets, they have led to a decline in prices (Chart 12). Pulp prices have fallen by nearly 30 per cent from their peak, while newsprint prices have declined by about 14 per cent from their 2008 peak. Between 2000 and 2009, North American newsprint demand declined by nearly 60 per cent, while pulp demand (as measured by shipments) declined by about 20 per cent.

Forestry price movements depend importantly on how lumber and pulp prices evolve (Chart 12). Paper prices affect growth at the margin, but tend not to be the determining influence in the overall growth of the index. Surprisingly, in many years, lumber and pulp prices move in opposite directions, reducing changes in the overall index. Since lumber constitutes a large share of British Columbia's forestry production, and pulp and paper production are proportionately more important in Quebec and Ontario, the forestry index also has an important regional aspect.

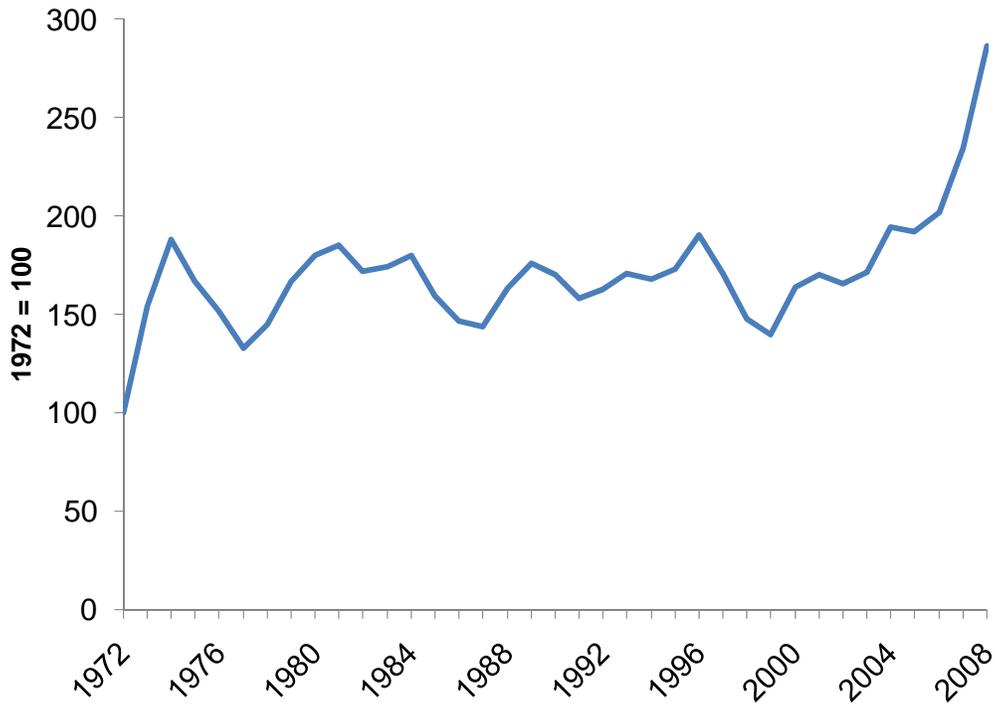
**Chart 11: Forestry BCPI**



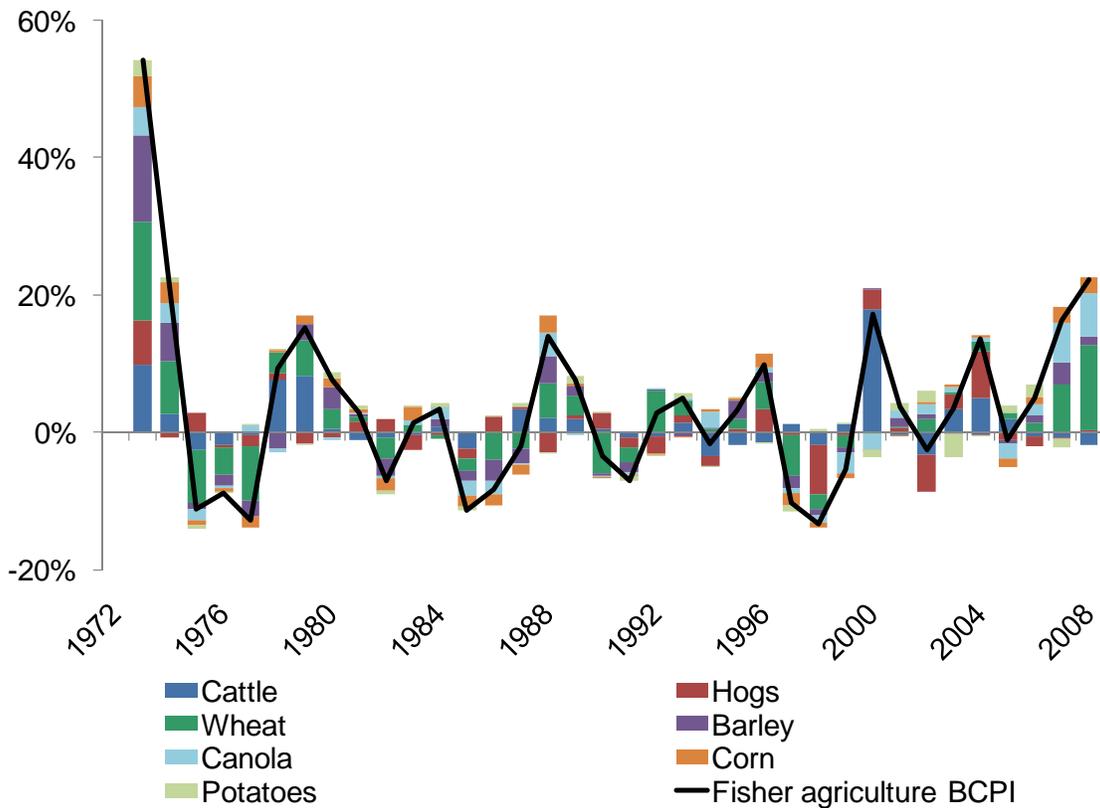
**Chart 12: Contribution to Forestry BCPI by Commodity**



**Chart 13: Agriculture BCPI**



**Chart 14: Contribution to Agriculture BCPI by Commodity**



### 5.2.3 Agriculture

Agricultural commodities show little upward movement between the early 1970s and the early 2000s (Chart 13). But, beginning in the mid-2000s and continuing through to 2008, agricultural commodity prices increased sharply, again reflecting the increase in demand from emerging-market economies for a broad range of agricultural products (Chart 14). In fact, the period from 1998 to 2008 marks the longest improvement in agricultural prices over the history of the index.

### 5.2.4 Fisheries

Over the past 30 years, Canadian fish production has moved away from ocean fish to shellfish as cod and salmon stocks collapsed in the 1990s (Chart 15). As a result, an index that covers predominantly shellfish will capture the influence of price changes after the late 1990s, but it will not be historically accurate for making comparisons with earlier periods.<sup>18</sup> The need to obtain price data that could be easily updated for the required range of ocean fish and shellfish over the 1972 to 2008 period led to the use of the Bureau of Labor Statistics (BLS) price indexes as a measure of fish price movements.<sup>19</sup> The new fish index shows that prices have increased steadily over time (Chart 16). Despite substantial shifts in the composition of production, the trend price growth in the index remained roughly constant over the entire 1972 to 2008 period. However, there were years in which price growth was weak. From 1999 to 2004, fish prices progressed minimally, with movements in shellfish and ocean fish markets often making offsetting contributions to price growth (Chart 17). The contribution-to-growth calculations also illustrate that the majority of the price growth in fisheries markets since the early 1990s has been due to price fluctuations for shellfish.<sup>20</sup>

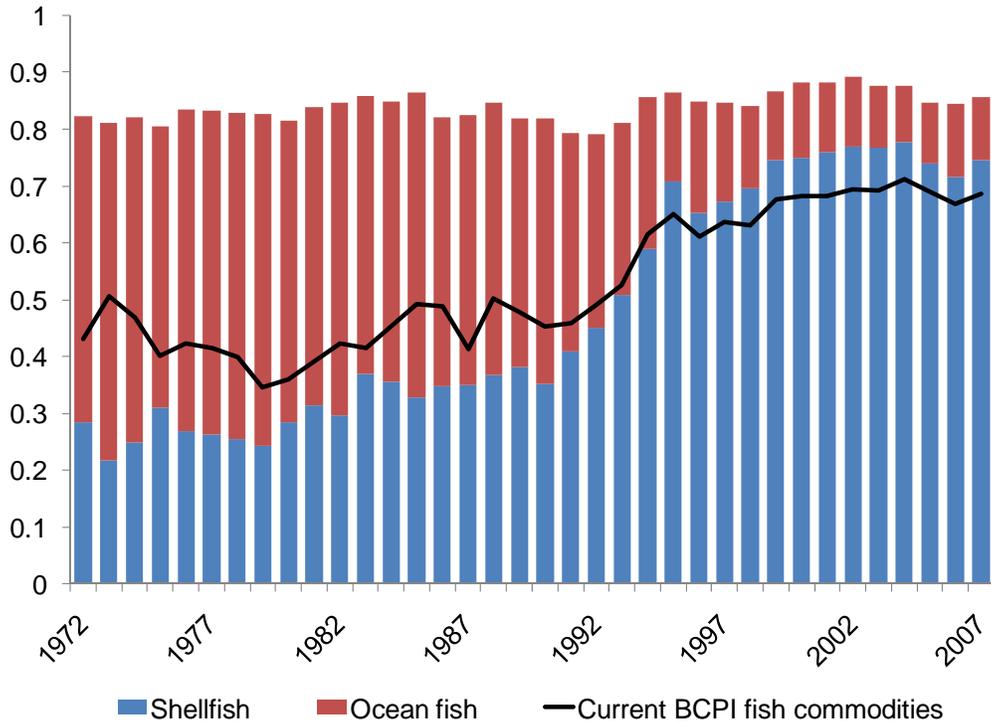
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<sup>18</sup> Because some fish were no longer being caught in sufficient amounts (for example, cod), they were omitted from the index in previous updates. Consequently, the fish commodities covered by the FWBCPI in the 1970s and 1980s comprise less than half of the value of the commercial fish caught in those decades, and thus do not accurately reflect production shares over time.

<sup>19</sup> The BLS indexes for ocean fish and shellfish are aggregated together using the value of Canadian landings to form the index weights. The key assumption is that the U.S. prices are a good proxy for Canadian prices. The index for ocean fish is available from 1972 to the present at a monthly frequency, while the shellfish index has been produced since 1991. Prior to 1991, the fish index includes data only for ocean fish. This is not an ideal solution, since the weights applied to individual fisheries will not be as appropriate as possible. Nevertheless, the approach followed in the new index provides a historically consistent method of gauging average price changes for commercial fish landings in Canada.

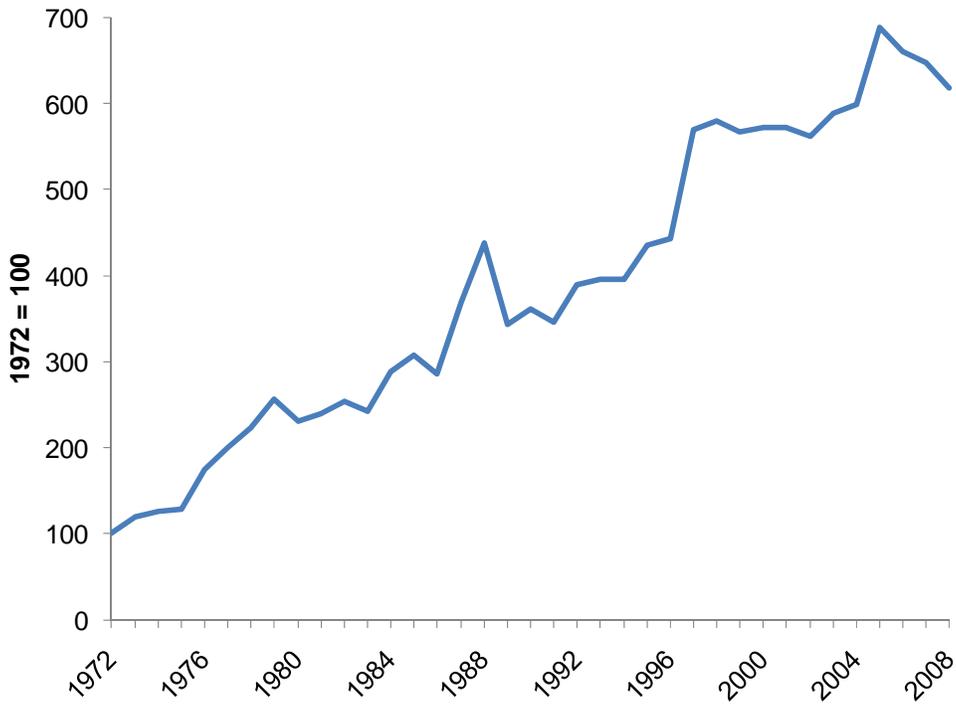
<sup>20</sup> Some shellfish may also be considered luxury goods, which have suffered large declines during the most recent recession. For example, Canadian lobster prices are currently near 20-year lows, according to news reports.

**Chart 15: Share of Commercial Fish Landings**

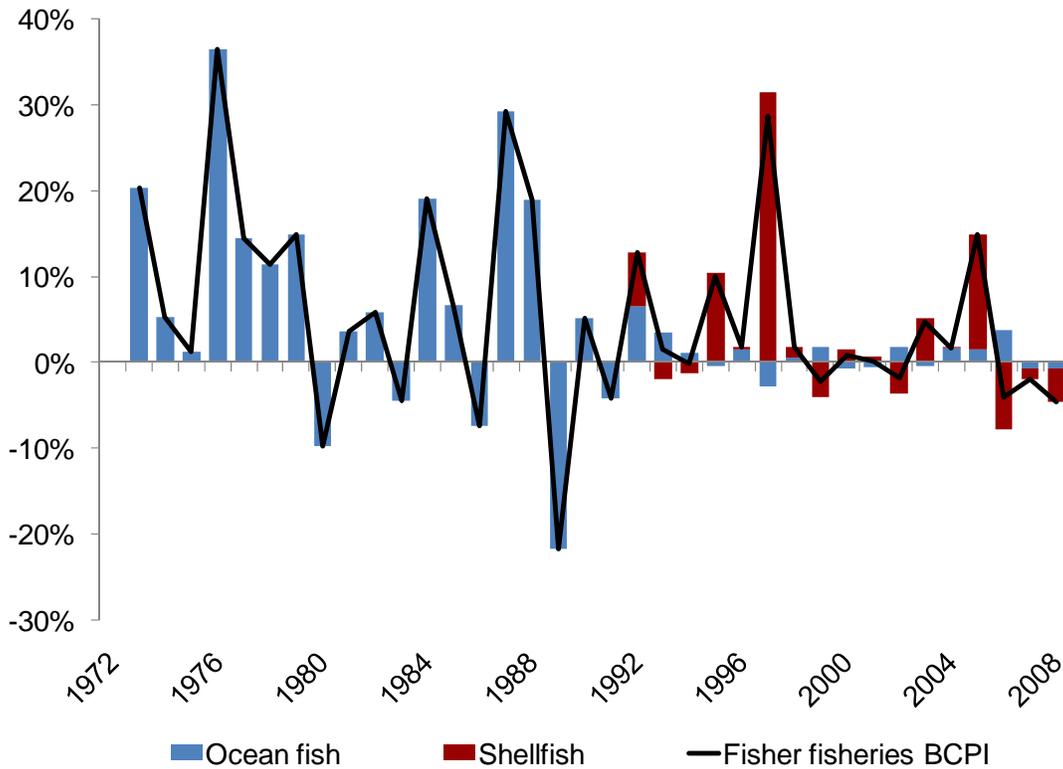


Source: Authors' calculations based on data from Department of Fisheries and Oceans Canada

**Chart 16: Fisheries BCPI**



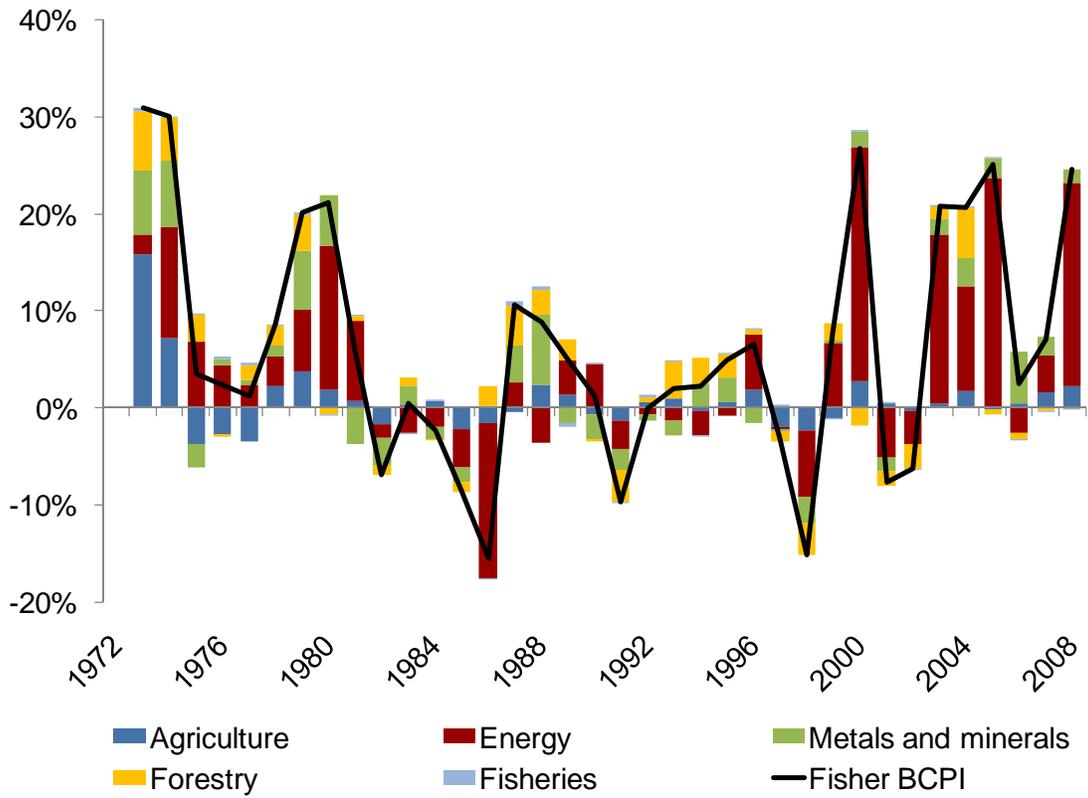
**Chart 17: Contribution to Fisheries BCPI by Commodity**



### 5.3 Aggregate BCPI

The most important commodity group for the Fisher BCPI movements over the 1972 to 2008 period is energy (Chart 18). Energy prices are subject to large price fluctuations in particular years that dominate the overall dynamics of the index. This is especially true in the years after 2000, when energy price changes accounted for a majority of the growth in the overall price index (Table 4). For example, about 85 per cent of the increase in the Fisher BCPI in 2008 was driven by the 20.8 per cent increase in the energy component. The next most important contributors to the growth in the Fisher BCPI are metals and minerals, and forestry. The only year when the dynamics of overall commodity price growth was not dominated by energy, metals and minerals, or forestry was 1973, when agriculture price growth was responsible for over half of the growth in the Fisher BCPI.

**Chart 18: Contributions to Growth for Fisher BCPI**



**Table 4: Fisher BCPI Growth by Major Commodity Groups, 2000–08 (per cent)**

Contributions to Growth (year-to-year)						
	Fisher BCPI	Energy	Metals and minerals	Forestry	Agriculture	Fisheries
<b>2000</b>	26.7	24.1	1.7	-1.8	2.7	0.0
<b>2001</b>	-7.6	-5.1	-1.5	-1.6	0.5	0.0
<b>2002</b>	-6.3	-3.4	0.0	-2.6	-0.4	0.0
<b>2003</b>	20.8	17.4	1.6	1.2	0.5	0.1
<b>2004</b>	20.6	10.8	3.0	5.2	1.7	0.0
<b>2005</b>	25.1	23.7	2.0	-0.6	-0.1	0.2
<b>2006</b>	2.5	-2.6	5.3	-0.7	0.5	0.0
<b>2007</b>	7.0	3.8	1.9	-0.3	1.6	0.0
<b>2008</b>	24.6	20.8	1.4	-0.1	2.3	0.0

The contribution-to-growth calculations illustrate that energy price fluctuations are a dominant source of overall commodity price index fluctuations. However, they also indicate a correlation between commodity groups, which helps explain the relative insensitivity of index behaviour across methodologies. The contributions from energy, metals and minerals, and forestry tend to be correlated. Of the 36 years from 1972 to 2008, energy, metals and minerals, and forestry moved in the same direction nearly half of the time.

## **6 Conclusion**

Commodity prices have important implications for the performance of the Canadian economy and the conduct of monetary policy. Consequently, accurately measuring the price developments across a wide range of commodities is important for the interpretation of price changes on the value of the Canadian dollar, the terms of trade, and the overall state of the Canadian economy. Since 2003, the Bank of Canada has used an aggregate (fixed-weight) commodity price index (FWBCPI) that is subject to bias, since the structure of nominal commodities output shares changes over time.

The index has been recalculated using a Fisher chain index formula. The Fisher chain index uses weights that are updated every year, so that biases from changes in production values due to price movements are minimized. At the same time, the commodity composition of the new index has been expanded to improve commodity coverage and increase regional representation. The Fisher BCPI is more comprehensive, flexible, and accurate than the fixed-weight commodity price index.

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## Appendix A: Commodity Price Data

Commodity	Price source
<b>Energy</b>	
Coal	(US\$/tonne) long-term contract price for Canadian exports of metallurgical coal
Oil	(US\$/barrel) West Texas Intermediate Crude Oil at Cushing, Oklahoma
Natural gas	(US\$/MBtu) New York Mercantile Exchange (NYMEX)
<b>Metals and Minerals</b>	
Gold	(US\$/oz.) Handy and Harman base price, N.Y.
Silver	(US\$/oz.) Handy and Harman base price, N.Y.
Nickel	(US\$/lb.) LME cash settlement
Copper	(US\$/lb.) LME cash settlement
Aluminum	(US\$/lb.) LME cash settlement
Zinc	(US\$/lb.) LME cash settlement
Potash	(US\$/tonne) standard potassium chloride, spot price, f.o.b. Vancouver
Lead	U.S. Bureau of Labor Statistics – Producer Price Statistics
Iron	U.S. Bureau of Labor Statistics – Producer Price Statistics
<b>Forestry</b>	
Pulp	(US\$/tonne) bleached northern softwood kraft, transactions price, delivery U.S.A.
Lumber	(US\$/thousand board feet) spruce-pine-fir, 2"x4", Crow's
Newsprint	(US\$/tonne) transactions price to large buyers, delivery eastern U.S.A.
<b>Agriculture</b>	
Potatoes	U.S. Bureau of Labor Statistics – Producer Price Statistics
Cattle	(US\$/100 lb.) U.S. Department of Agriculture
Hogs	(US\$/100 lb.) U.S. Department of Agriculture
Wheat	(US\$/bushel) U.S. #1 spring wheat, 14% protein
Barley	(US\$/bushel) #1 CW at Thunder Bay
Canola	(US\$/bushel) #1 Canada in store Vancouver
Corn	(US\$/bushel) U.S. corn #2, hard
<b>Fisheries</b>	
Salmon (o)	<p style="text-align: center;">Fish prices are now divided into ocean fish (o) and shellfish (s).            These prices are obtained directly from the U.S. Bureau of Labor Statistics.            Ocean fish data are located in BLS catalogue 022301.            Shellfish data are located in BLS catalogue 022305.  <a href="http://www.bls.gov/opub/hom/pdf/homch14.pdf">http://www.bls.gov/opub/hom/pdf/homch14.pdf</a></p>
Lobster (s)	
Shrimp (s)	
Crab (s)	
Cod (o)	
Halibut (o)	
Herring (o)	
Tuna (o)	
Clams/Quahaug (s)	
Scallops (s)	