Biases in calculating dumping Margins: The case of cyclical products

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Biases in Calculating Dumping Margins: The Case of Cyclical Products*

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Abstract: A dumping investigation involves comparing export prices with a "normal value" loosely defined as the price in the exporter's domestic market observed in the course of normal trade. However, domestic sales with prices below production costs are excluded from the computation of a normal value; thus increasing the probability products with cyclical prices will get caught with positive dumping margins although there are no intentions to dump. The objective of the paper is to illustrate how price cycles impact the magnitude of estimated dumping margins. The empirical analysis focuses on Canadian hog exports to the U.S. and U.S. potato exports to Canada. The period and amplitude of each price cycles are estimated. The analysis starts with the assumption that export and domestic prices are equal so no true dumping occurs. Margins are then calculated based on rules that exclude below cost sales. The resulting average dumping margins for Canadian hogs and U.S. potato exports are respectively 11.5 and 5.9 percent. Biases in dumping margins depend on the nature of the cycle, the period of investigations, and the estimate of the cost of production.

Keywords: Anti-dumping; frequency estimation, price cycles; hog/pork trade disputes; potato antidumping case

JEL Classification: Q17, F13, C22

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1. Introduction

Antidumping measures/remedies are among the most controversial practices in international trade. At the same time as dumping investigations increase, the anti-dumping trade remedy rules are increasingly and extensively criticized in the literature (see for example Staiger, 2005, Irwin, 2005 and Prusa, 2005). Anti-dumping duties are retaliatory tariffs placed on imported goods that are deemed to have been "dumped" on the domestic market by foreign firms. Dumping is also said to occur when export prices fail to cover a statutory measure of production costs. Agricultural products have characteristics that make them vulnerable to antidumping actions. Seasonality uncertainty in production, the perishable nature of the product, substantial price volatility, and a lack of control over the timing of sales make agricultural exports susceptible to positive dumping margin determinations without any evidence of the exercise of anti-competitive behaviour.

Under the WTO Antidumping Agreement, national trade remedy agencies must establish a positive dumping margin (*i.e.*, a difference between the "normal value" and the export value of a product and that the domestic import competing industry is materially injured in order to impose an antidumping duty. Although there are significant problems with injury determinations, the focus of the paper is about the problems in determining dumping margins. A number of researchers have established statistical biases in the administrative determination of dumping margins (*e.g.*, Lima-Campos, 2005; Lindsey and Ikenson, 2002; Niels 2000, Francois, Palmeter and Anspacher, 1991).[1] Dumping margins can be inflated due to certain averaging techniques (comparing specific export prices to weighted average foreign values, inflating normal values by

[1] Another strand of the literature has focused on the administrative biases emerging during dumping investigations using a political-economy framework (Hansen and Prusa, 1996; Hansen and Prusa, 1997).

ignoring below cost sales in the exporting country). Other biases are introduced through asymmetric adjustments between the export price and the exporter's home market price; arbitrary calculations of constructed costs which inflate the normal value; and treating negative dumping margins as zero values when determining an overall average margin. The problem is that these biases can result in spurious accusations of dumping.

The controversy over dumping does not just concern the distortionary impact of the remedy but also the motivation to dump. Willig (2000) describes five categories of dumping: market expansion dumping, cyclical dumping, state trading dumping, strategic and predatory dumping. Cyclical (or sporadic) dumping was viewed by Viner (1923) as the most frequent type of dumping. Cyclical dumping involves exporting at low prices when there is substantial excess production capacity due to a downturn in demand or an increase in supply. Agricultural markets exhibit cyclical behaviour (Gilbert, 2006) and may be particularly prone to accusations of dumping. The combination of cyclical behaviour and biases in determining dumping margins can lead to a situation where even though net home market and export prices are the same, the trader can nonetheless be found guilty of dumping. Hartigan (2000) examined the theoretical impacts of cyclical behaviour in agricultural markets on dumping investigations but did not provide empirical evidence. There is also a considerable literature that explains how below cost sales are consistent with profit-maximizing behaviour of exporting firms that face uncertainty and/or adjustment costs (Ethier, 1982; Bernhardt, 1984; and Hillman and Katz, 1986). Other studies examined anti-dumping measures and their impacts on trade flows from an empirical standpoint (Hartigan, Kamma, and Perry, 1989; Prusa, 2001).

The objective of the paper is to illustrate how the length of a cycle in a market impacts the probability of finding a positive determination of dumping and how the amplitude of the

cycle influences the size of a potential dumping margin. We argue that excluding prices that are below average costs and the use of constructed value tests in antidumping cases increases the potential that agricultural commodities with cyclical prices will get caught with positive dumping margins although there are no intentions to dump, or even price discriminate in the first place. The empirical analysis focuses on two North American dumping investigations: 1) Canadian hog exports to the U.S.; and 2) U.S. potato exports to Canada.

The remainder of the paper is structured as follows. The next section describes the conceptual biases in determining dumping margins. The third section of the paper builds an empirical model of cyclical price behaviour for Canadian hogs and U.S. fresh potatoes. The fourth section of the paper simulates the implications of cyclical prices on margin determination as a result of less-than-cost price exclusion, constructed value tests, and zeroing of negative dumping margins. The final section concludes and discusses some policy implications related to the findings.

2. Conceptual biases in determining dumping margins.

The WTO Anti-dumping Agreement states that dumping occurs when the export price is less than the "comparable price (normal value) in the ordinary course of trade, for the like product" in the exporter's domestic market. Based on this notion, the dumping margin should be measured by the difference between the export price and the exporter's domestic price of the product. Despite the simplicity of this basic notion, the application of this "test" is far from simple. Depending on the circumstances, "normal values" can take several forms; it can be the price of the same or a similar product in the exporter's home market; the price of a similar good in a third country market; or it can be a constructed value that accounts for the cost of producing the good plus overhead expenses and a profit margin.

The WTO Anti-dumping Agreement allows the importer's trade-remedy body to make a myriad of complicated price and cost adjustments. Export prices and the comparable reference price are subjected to a number of (not necessarily symmetric) adjustments to establish the price that would be charged at the factory gate.[2] These arbitrary adjustments that go into determining the normal value make margin determination an extremely complicated, highly discretionary, sometimes arbitrary accounting exercise.

Home market prices are excluded from normal value calculations when there are insufficient sales in the "Ordinary Course of Trade". Insufficient sales could occur when the product in question is not sold in the exporter's home market or if the product is sufficiently differentiated that it is not comparable.[3] However, the most common reason for exclusion is because home market sales were made below the full cost of production. Article 2.2.1 of the WTO Anti-dumping Agreement states that:

> *" Sales of the like product in the domestic market of the exporting country or sales to a third country at prices below per unit (fixed and variable) costs of production plus administrative, selling and general costs may be treated as not being in the ordinary course of trade (…) and may be disregarded in determining normal value only if the authorities determine that such sales are made within an extended period of time in substantial quantities and are at prices which do not provide for the recovery of all costs within a reasonable period of time. If prices which are below per unit costs at the time of sale are above weighted average per unit costs for the period of investigation, such prices shall be considered to provide for recovery of costs within a reasonable period of time. "*

An extended period of time would normally be one year but not be less than six months. The substantial quantity provision means that sales may be excluded from the margin calculation if 20 % or more of the exporter's total home country sales are below fully allocated cost.

[2] See Lindsey and Ikenson (2002) for a discussion of the biases incurring in adjusting export prices and home market prices to the ex factory gate level.

[3] Under U.S. trade law, the difference in variable costs for the differentiated products can not exceed 20% of the total cost of manufacturing.

The exclusion of sales at less than full cost is perhaps the most critical issue in the computation of dumping margins. The cost of production provision does not even concern sales into the importing country but it is directed to sales in the exporter's home market. This is the opposite of the common notion that, with dumping, the exporter sits in a protected high priced market (sanctuary market) and dumps its surplus onto world markets to avoid a loss at home. The exporter may be making large profits on its export sales and still be deemed to have sold below costs.

The way the cost test is applied creates a further problem in that individual prices are compared to average annual costs. A firm could make every sale at prices above transaction-specific costs but still have prices that are below average annual costs because both cost and prices vary over time (Lindsey and Ikenson, 2002). A reasonable time period in which to make the cost comparison that excludes domestic prices from the normal price should not be arbitrary and should depend on the nature of the industry in the exporting country. This is a particular problem for those commodities with long price cycles because prices could be below average costs for extended periods (i.e., during the bottom of the cycle).

The practice of cost exclusion has two consequences. First, if sales below full cost are excluded, the weighted average of the domestic price will increase escalating the probability of dumping. All exports are compared to only the highest valued home market sales skewing the calculation in favour of dumping. Second, eliminating sales may result in insufficient domestic sales to make the price comparison and thereby make a constructed value test inevitable.

When the remaining home market or third country sales are too few to provide an adequate basis of comparison to export sales an alternative method to determine normal value is used. Constructed value is a cost based approximation for the home market selling price which is

determined by calculating the unit cost of production and then adding margins for profit and selling and administrative expenses. Article 2.2.2 of the Anti-dumping Agreement establishes the procedures that should apply to the determination of constructed values and requires that the costs and profits be based on actual data for the exporter under investigation.[4]

Establishing costs of production for agricultural production is problematic because of issues such as imputed values for family labour and the cost of land. By accounting for these imputed costs as direct expenses (which are typically thought of as part of the producer's residual claim to production), the investigating authority should reduce profits accordingly. Certainly the most controversial aspect of constructed value is the establishment of the margin for profit. Article 2.2 allows the investigating authority to use only above-cost sales to determine the margins for profits and selling expenses, which significantly inflates the dumping margin. So the complaint is that the resulting constructed normal values are arbitrary and the calculation is open to discretionary manipulation.

Another averaging problem arises because differences in sales volumes generate different weighted average prices in the home and export markets. Price can be identical in both markets, but if a relatively larger volume is sold in the export market when prices are low, then a positive dumping margin will result. Likewise, if the volume of sales increases by relatively more in the home market when prices are higher, the weighted average normal value will increase by more and as a result a positive dumping margin will result (Lindsey and Ikenson, 2002).

Because it is often not possible to collect data for all firms within an industry, investigating authorities typically only set firm-specific margins for the largest producers and apply an *all-others rate* for the remaining agents. This rate is typically the weighted average of

[4] If this data is not available the investigating authority may use the *best available information* which in some cases may involve information provided by the petitioner.

margins determined for the individual firms chosen for the investigation. This practice also creates a bias in setting the dumping margin for the remaining firms. Moreover, if a firm under investigation fails to provide information that the investigating authority considers satisfactory, the authority will rely on the *best available information* from secondary sources such as that provided by the petitioners. This practice is once again likely to yield a biased margin.

The Anti-dumping Agreement provides that the dumping margin will normally be established by comparing a weighted average of the normal value with a weighted average of all comparable export prices or by a comparison of the prices on a transaction to transaction basis. The final step in the dumping calculation involves averaging the margins. One final source of bias is that negative margins are not included in the calculation of the average margin. This practice, which is known as zeroing, inflates the size of the margin.

3. An Empirical Illustration of Cyclical Prices

The cyclical nature of agricultural prices may increase the bias in margin determination because of the technical problems discussed above and because of the large variation of prices relative to average costs within the investigation period. This variation in prices will increase the probability of below cost sales and increase the average normal value because lower priced domestic sales are excluded from the calculation. Excluding below cost sales increases the potential that constructed costs will be used to determine the normal value and this increases the probability of large positive dumping margins. Finally, the application of zeroing could further inflate the size of the dumping margin.

Two products are chosen for illustrative purposes. Both have been involved in anti-dumping investigations and have faced positive dumping margin determinations. Canada has imposed anti-dumping duties on imports of U.S. whole potatoes since 1984 and continues to do

so. In March of 2005, the U.S. determined a non *de minimis* dumping margin against imports of live Canadian swine (all hogs except breeding stock) but a final duty was not applied because of failure to find material injury. Both of these products involve production lags and uncertainties in production that may generate cyclical behaviour in prices. The North American hog industry has historically been characterized as having cyclical variations in hog inventories, pork production, and hog and pork prices (Holt and Lee, 2006; Miller and Hayenga, 2001; Holt and Chavas, 1991). Potato production may also involve seasonal variations in prices associated with peak harvest periods and limited storage, as well as longer cyclical behaviour.

The hog case involves a long line of trade remedy disputes between the U.S. National Pork Producers Council (NPPC) and the Canadian hog industry. While most of the previous disputes involved countervailing duty investigations, the latest dispute started with petition that included allegations of dumping. The U.S. Department of Commerce found in both their preliminary and final determinations that sales from Canadian firms were made below fair (normal) value. The methods used included the exclusion of sales below the cost of production to determine normal values with home market prices, the use of constructed values for normal values in the case of some firms, the use of *best information available* for one firm and the use of *facts otherwise available* for firms that are not individually investigated (ITA 2005) Despite the positive determination of dumping, the U.S. International Trade Commission did not find that Canadian live hog imports caused material injury and as a result, the case was dismissed.

Canada has imposed antidumping duties on imports of fresh potatoes from Washington, Oregon, and Idaho since 1984 which allegedly enter British Columbia are prices below normal value. In 1986, the Canadian Department of National Revenue (Customs and Excise) issued a final determination with a 34.2% dumping margin. Since then, there have been four expiry

reviews which have maintained the antidumping duty because it is argued that expiry of the order is likely to result in the resumption of dumping. The U.S. potato industry has argued that the continuation orders were ill-founded because the investigating authority (most recently the Canadian Border Services Agency, CBSA) established normal values that are artificially high compared to the true cost of production due to CBSA using outdated data and not accounting for improved yields. In 2005 the Canadian International Trade Tribunal ruled that certain classes of potatoes (red, yellow and exotic) were no longer to be covered by the order. Duties remain for russet potatoes in certain package sizes.

Canadian hog prices are represented by Manitoba hog prices, which were collected from the red meat market information website of Agriculture and Agri-food Canada (AAFC) and represent the monthly average of the index-100 live price in $/kg. Figures 1 and 2 respectively present the pattern of average monthly hog prices in Manitoba from January 1988 to December 2005 and the first difference between monthly hog prices. Potato prices were collected from the Potatoes Annual Summary and Agricultural Prices administered by the National Agricultural Statistics Service. They are in $US per cwt and correspond to the average table stock potato price in the U.S. Figures 3 and 4 respectively present the pattern of U.S. average monthly prices of potatoes, in levels and first differences, for a period between January 1985 to December 2003.

In order to investigate the stochastic properties of the price data, the unit root bootstrap procedure of Parker, Paparoditis and Politis (2006) is used to determine if the data are stationary. The details of the test are given in the technical appendix. Their procedure was shown to have more power than asymptotic values normally used for the general class of unit root tests (such as the Augmented Dickey-Fuller test). Table 1 reports the *p*-value of the null hypothesis that both

price variables possess a unit root (without a drift) using 2000 repetitions for the bootstrap procedure.

Price cycles can be approximated with a spectral analysis using a finite Fourier transform. The idea is to decompose the data series into a sum of sine and cosine functions. Price series for Canadian hogs and U.S. potatoes are first differenced to deal with unit roots and the series are also de-trended. The adjusted price series for each product, denoted y_t, is regressed on a series of sinusoidal terms:

$$y_t = \beta_{1j} \sum_{j=1}^{J} \cos\left(2\pi\omega_j t\right) + \sum_{j=1}^{J} \beta_{2j} \sin\left(2\pi\omega_j t\right) + u_t \qquad (1)$$

where *t* denotes time, coefficients ω_j are angular frequencies, coefficients β_{1j} and β_{2j} measure the amplitude and the initial phase of cycle *j* and u_t is a stationary error term with mean zero. The period of cycle *j* is defined as $p_j = 2\pi/\omega_j$ and *J* is the number of frequencies. If the number of frequencies is known *a priori*, equation (1) can be estimated with ordinary least squares; however it must generally be estimated simultaneously to the amplitude coefficients. To this end, the selection criterion of Kavalieris and Hannan (1994) along with the sequential least squares procedure of Walker (1971) and Hannan (1973) is used to estimate the coefficients in (1). The technical appendix details the estimation algorithm.

The estimation results are presented in Table 2. Walker (1971) shows that the asymptotic distribution of the OLS estimates of the β_{ij} coefficients is normal with variance: $2\sigma_e^2\left(1-\sum_h \rho_h\right)^{-2}\left(\beta_{ij}^2+4\beta_{kj}^2\right)^{-1}\left(\beta_{1j}^2+\beta_{2j}^2\right)^{-1}/T$; where the ρ coefficients measure the autocorrelation in the residuals of (1). The variance of frequency *j* is

$24\sigma_e^2\left(1-\sum_h \rho_h\right)^{-2}\left(\beta_{1j}^2+\beta_{2j}^2\right)^{-1}\Big/T^3$; and these formulas are used to establish the standard errors reported in Table 2.

The estimates of the coefficients in (1) include information about the amplitude of the cycles (coefficients $\hat{\beta}_{1j}$ and $\hat{\beta}_{2j}$) and the period of each cycle $\hat{p}_j = 2\pi/\hat{\omega}_j$. The amplitude coefficients for the hog price series associated with the longest period are significantly different than zero. However, the β_{21} and β_{31} coefficients are not large relative to their standard error and are not significantly different than zero. The standard errors for the periods are very small. The empirical results identify three cycles for the hog price with periods 2 months, 12 months and 43 months. The empirical procedure in the potato case identified two cycles with periods of 12 and 38 months. The standard errors of the amplitude coefficients in the potato case are relatively large except for the β_{12} and β_{22} coefficients. Given the estimated period and amplitudes of the cyclical equations for hogs and potatoes, the next section illustrates the potential biases in determining dumping margins. Figures 5 and 6 respectively present actual prices and the fitted price cycles (assuming the first observation in the sample is known) for Canadian hogs and U.S. potatoes.

4. Empirical Bias in Dumping Margins: Hogs and Potatoes

The presence of a cycle causes several complications in determining unbiased dumping margins. The number of home market sales that are excluded from the normal value because they are below the average cost of production will be affected by how costs are established over time and the length of the cycle. For a cost exclusion test, individual prices are compared to average annual costs (ITA, 1997, Chapter 8, p. 73). But if unit costs fluctuate over the period of investigation, a firm that makes every sale at prices above transaction specific costs will have

some sales below average costs and the average of the remaining prices will be inflated. The more variation in costs and prices in the period of investigation, the more this problem will manifest itself. The longer the cycle, and the more that costs vary over time, the more important it is that individual unit reference costs are allowed to vary when applying the exclusion test.

Conceptually extending the period in which home market sales are compared to the average unit cost will add more observations above costs to off-set those observations that are below costs and excluded. Furthermore, cutting off the bottom of the cycle increases the average home market price and the normal value. But extending the period of investigation also increases the probability that the cost of production will change over time.

Once the normal value is established, it must be compared to export prices. The problem is that a cyclical price series, with the bottoms of the cycle cut off, is compared to a cyclical export price series where the bottom of the cycle is not adjusted to eliminate observations. Two types of comparisons can be made: a transaction to transaction comparison or a comparison of weighted average prices for each series.[5] With a transaction specific comparison, when the home and export price series follow roughly similar cycles, the below cost truncation of home market prices creates a different series from the non-truncated export price series and the resulting dumping margins will fluctuate quite wildly over time. A weighted average price comparison will average or smooth out some the large price differences between home and export prices. However, the below cost truncation increases normal value average while the export weighted average price reflects the movements of the cycle and inflates the resulting dumping margin.

[5] Prior the Uruguay Round Antidumping Agreement, the practice of the U.S. Department of Commerce was to compare weighted average normal values to transaction specific export prices. This practice has been discontinued (except in exceptional circumstances) for antidumping investigations, but the practice is still used for administrative reviews.

To assess the determinants of the magnitude of the overstatement of the dumping margins, a stylized simulation of the margin setting procedure is used to compare true margins to the administratively set margin. We assume that the export price is identical to the home market price during the period of investigation so the true dumping margin is zero.[6] Any administratively calculated margin will represent an overestimate of the true margin. Although the simulation is stylized the information is similar to that used in the specific cases under consideration. The cycle is adjusted to start at the price which occurred at the start of the investigation. However, actual prices over the period of investigation are not used, but rather the predicted prices using the estimates of the period and amplitude coefficients in the price cycle defined in (1).

These problems are illustrated with empirical estimates of the price cycles for Canadian hog and U.S. potato prices. Consider the hog case first. Cost of production estimates of individual hog producers affected by the dumping investigation are not available, so data from the *Ontario Farrow to Finish Swine Enterprise Budget* (OMAFRA 2006) were used as a proxy for average costs.[7] The average cost of production in 2003 was $(Cdn)1.68 per kg. The average Manitoba hog price in December 2002 was $(Cdn)1.28 per kg. All subsequent prices are projections using the hog price cycle parameters in table 2 assuming export and domestic prices are identical.[8]

[6] This approach has been used in previous studies (e.g., Francois *et al*, 1991; Palmeter, 1991).

[7] These costs were used in the National Pork Producer's Council's antidumping petition. The Department of Commerce used costs surveyed from a sample of actual producers. There is good reason to expect that the OMFRA costs were higher than those used in the investigation. These costs were $1.62 /kg in 2004 and $1.50 in 2005.

[8] Larue and Tanguay (1999) demonstrate that the U.S. and Canadian hog prices are closely connected and follow a stable long-run relationship (or in statistical terms, prices are cointegrated).

Figure 7 presents a series of hypothetical dumping investigations, each of which starts in a different consecutive month and computes an average dumping margin for either a six or twelve month period of investigation. For example the first 6-month investigation applies to observations from January to June while the next investigation starts in February with observations through to July. This particular graphical construct includes consecutive staggered start periods and is intended to illustrate the effect of the cycle on the size of the margin while keeping the horizon short enough to use a single cost estimate. Because the true margin is zero, the resulting margins will represent the potential bias in antidumping investigations. Typical investigations last a year, but a six month investigation period is also considered to determine the influence of the length of the investigation period on the bias in the margin. The six month average margin calculation compares monthly prices to costs. Those prices below costs are dropped and then an average home price is computed using the remaining prices.[9] This adjusted average home price is compared to a six month average of the export price. If there are not sufficient home market sales, the six month average export price is compared to the annual average cost of production. The twelve month investigation proceeds along the same lines.

Consider the first 6-month investigation period that starts in January 2003. None of the 6 simulated domestic prices climb above the average cost of production and thus there are no domestic sales that are considered to be in the ordinary course of trade. Hence, the dumping investigation must use a constructed value test. The average export price (per kg) over this 6-month period is $(Cdn)1.54 and thus the constructed value test yields a dumping margin of $(1.68-1.54)/1.54 = 8.9\%$ which is illustrated by the first dark coloured vertical bar in figure 7.

[9] The WTO Antidumping Agreement specifies that at least 20% of the sales have to be below costs before observations can be dropped. Because this analysis does not involve explicit volumes we are assuming that sufficient below cost sales occur.

The effect of changing the length of the investigation period is illustrated with the light coloured vertical bar which measures the dumping margin for a 12-month period. The 12-month margin is simulated with a similar process to that described above. The average dumping margin for the 12 month investigation period is illustrated by the first light coloured vertical bar in figure 7 and equals 7.8%. Once again, the dumping margin was estimated based on a constructed value test as no prices in the simulated series rise above the average cost of production over the 12-month period. The symbol $CV_{6,12}$ in figure 7 denotes that a constructed value test was used for the 6-month and 12-month investigation periods.

The simulation results are affected by the starting point of the investigation period. For example, for an investigation starting in March 2003 the initial price is higher, $(Cdn)1.41 per kg, and as result the dumping margins are lower. The March 2003 margins for the 6-month and 12-month investigation periods are respectively 5.3% and 8.4%. In this instance, the dumping margin in the 6-month period was computed using a constructed value test while the 12-month investigation used the average of the (truncated) domestic price series. There is a wide variation in estimated dumping margins in Figure 7. The lowest dumping margin is for the 6-month investigation period beginning in March (5.3%) while the estimated dumping margin with the investigation beginning in May 2003 attains its maximum value at 22.4%. Interestingly, no simulations in figure 7 generate dumping margins under 2%, that would be classified as *de minimis*. Dumping is found to occur in all periods although both the domestic and export price series are constructed such that no actual dumping occurs.

In the simulated hog case, the length of the investigation period affects the bias in the dumping margin according to the position of the cycle. When prices are rising, the 6-month margin exceeds the average margin computed over the 12 different investigations in figure 7; but

when prices begin to decline, the 12-month investigation results in a higher estimated dumping margin.[10] This result is however sensitive to the position of unit total costs which are held constant during the investigation.

In the two years subsequent to 2003, OMAFRA reports a declining cost of production from $(Cdn)1.68/kg to $(Cdn)1.62/kg to $(Cdn)1.50/kg. The impact of changing the production cost estimate is illustrated in figure 8. The same simulation exercise, described above, is carried out using a 6-month investigation period and a 10% reduction in the estimate of the average cost of production. By lowering the cost of production from $(Cdn)1.68 to $(Cdn)1.51 the average dumping margin declines from 11.5% to 6.0%. So lowering the average cost of production by 10% almost halves the bias in the dumping margin. Furthermore, the constructed value test is only used three times when the average cost of production is $(Cdn)1.51 per kg compared to nine times with a $(Cdn)1.68 cost estimate. For those three months where a constructed value test is used, the estimated dumping margin is noticeably higher than those other months where a pure price comparison is used. With a lower cost of production more sales are considered to be in the *ordinary course of trade*, and it results in higher average domestic prices and lower dumping margins.

If cost comparisons are to be used to adjust normal values, it is important to frequently adjust the cost estimate. In the period between 1995 and 2005, Ontario costs per hog had a coefficient of variation of around 8%.[11] In terms of the cost components the coefficients of variation were 11% (feed), 20% (depreciation) 24% (interest) and 14% (other inputs). With feed costs contributing roughly 60% of the total cost of production it is likely that cyclical variation in

[10] This result cannot be seen in Figure 7; but would readily appear in a more detailed graph of the price cycle with dumping margins superimposed.

[11] The variation in cost estimates were obtained through personal communication with Ken McEwen Ridgetown College, University of Guelph.

feed prices will contribute to significant variation of the cost of production over a yearly period. Therefore significant bias in the dumping margin can be reduced by using more frequent cost estimates.

Not adjusting for changing costs is a major problem in the perplexing case of the Canadian anti-dumping duty on imports of whole U.S. potatoes. Four expiry reviews have been conducted in this case. The normal values used in these reviews have not been adjusted since 1995 (CBSA, 2005). The argument for not changing the normal value has been that U.S. potato exporters have not cooperated to the investigations and therefore the CBSA used a ministerial specification pursuant to section 29 of the Special Import Measures Act to determine a constructed value for the normal value:

> "*The normal values are based on the total costs and expenses associated with growing and harvesting potatoes, using published cost data plus an amount for profit and an estimated amount for packing charges which includes costs and expenses related to packing and selling the goods*" (CBSA 2005).

We start the potato simulation in 2001 which corresponds to the first year of the latest expiry review. Over the course of 2001, the price of potatoes increased rapidly so the CCBA did not find dumping in the second half of the year. Our simulations use a 2001 estimate of the cost to grow, store and pack russet potatoes in the state of Washington for the period October 2000 to June 2001, as reported in Schotzko and Sund (2002).[12] Figure 9 presents the simulations carried out with an assumed average cost of production of $(US)6.80 per cwt. In this highly stylized investigation, dumping is found to occur in the first six months of the year. The average dumping margin under the six-month investigation period is 5.7% while the 12-month period yields an average dumping of 8.9%. In all cases, the dumping margin is higher under a 12-month investigation than under a 6 month. However, a constructed value test is used in March and April

[12] Unfortunately, this cost estimate cannot be directly compared with the constructed cost estimated by the CBSA.

under the 6-month investigation period while the 12-month simulation yields only a single constructed value test (for the investigation that starts in March).

The cyclical nature of potato prices raises the same concerns with the averaging procedures that were identified in the discussion of the hog case. In this instance, the problem with using the same unit cost measure is more pronounced because the same cost measure has been used in over a ten year period for a case that has been open for 22 years. The problem is the use of the *best information available* provisions. Although Article 12.7 the WTO Antidumping Agreement tightened up the rules for applying best information available provision, relying on 10 year old cost data seems unreasonable.

5. Concluding remarks

Because of methodological distortions in the rules defining dumping, uncovering sales made at lower than normal value all too frequently have little or nothing to do with price discrimination or selling below costs (to the extent that this comparison makes any sense at all). Given that it is unlikely that meaningful reforms can be made in the near future, are there minor revisions to administrative practices that can be made which will limit the bias in determining dumping margins? Products that display cyclical price behaviour present special problems. Intuition suggests that the period of investigation should roughly equal the period of a simple cycle with a single frequency. However, cycles often have multiple components frequency and it is not a simple matter of matching investigation periods to frequencies. The estimated results from this study suggest the cyclical behaviour involves periodic functions with a combination of periods and peaks and valleys with different amplitudes. This of course complicates the effort to match the investigation with a precise cycle, not to mention the difficulties of writing rules in a

framework that is not flexible and does not accommodate special cases. Every price cycle is a special case.

We showed one special case where shorter averaging techniques, with below cost exclusions, reduced the bias for rising prices, but not for declining prices. One problem that emerges is the average cost level that is used. When average cost is high enough, positive dumping margins always result, while lower average costs would result in less frequent positive margins. The problem is that costs also vary over time and cyclical costs may produce cyclical prices. Probably the most practical reform that can be made to administrative practice is to estimate costs over short time periods and make frequent comparisons with these prices.

There are aspects to averaging export and home market prices that bias the dumping margin and which were left out of the analysis. The averages used are weighted averages that depend on the volumes of sales in the home and export markets. With fluctuations in prices if the relative change in volumes is not the same in both markets changing weights can cause average home and export prices to diverge and create artificial dumping margins. This was a major concern of Canadian hog producers in the 2003 antidumping case. Export volumes increased concurrently with declining prices and this created proportionately more low valued export prices in the averages used to calculate the dumping margins.

Although the investigating authority may not receive cooperation from the exporter, the use of the *best available information* provision is open to abuse. Frequently the best available information is in the allegations of the petitioner and this will certainly bias the dumping margin. For a cyclical agricultural product, it is irresponsible to assume that costs will remain constant over a prolonged period time. Technological improvements are common and, in some instances, it is likely that costs are as cyclical as final prices.

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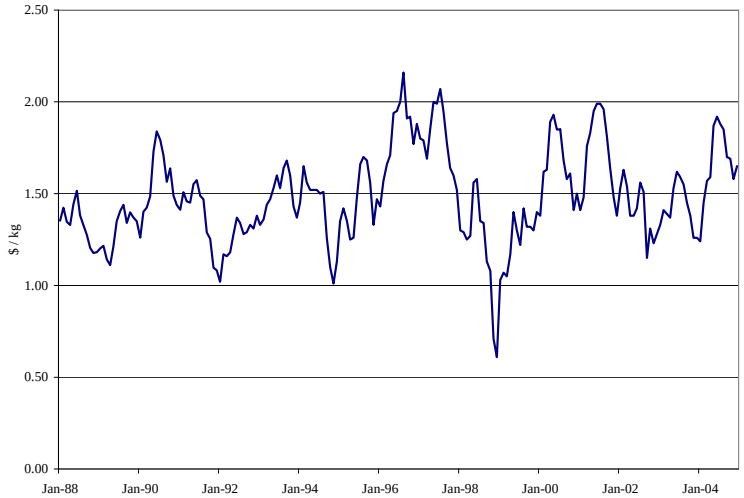

Figure 1. Manitoba average monthly hog prices from January 1988 to December 2005.

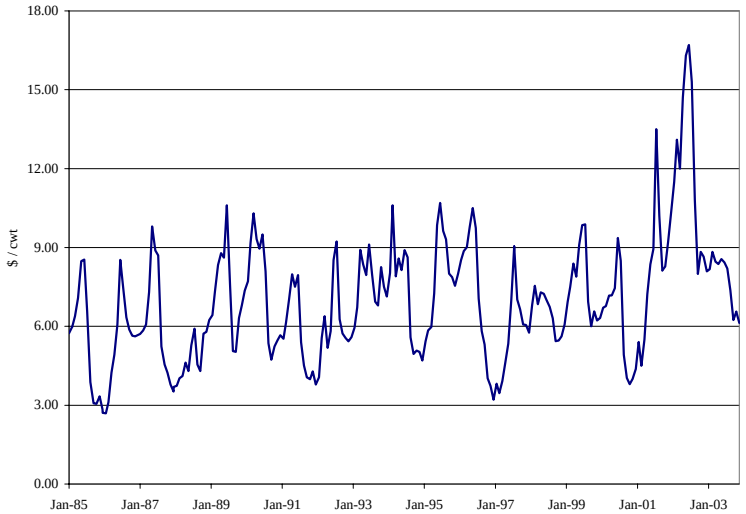

Figure 2. U.S. average monthly table stock potato prices from January 1985 to December 2003.

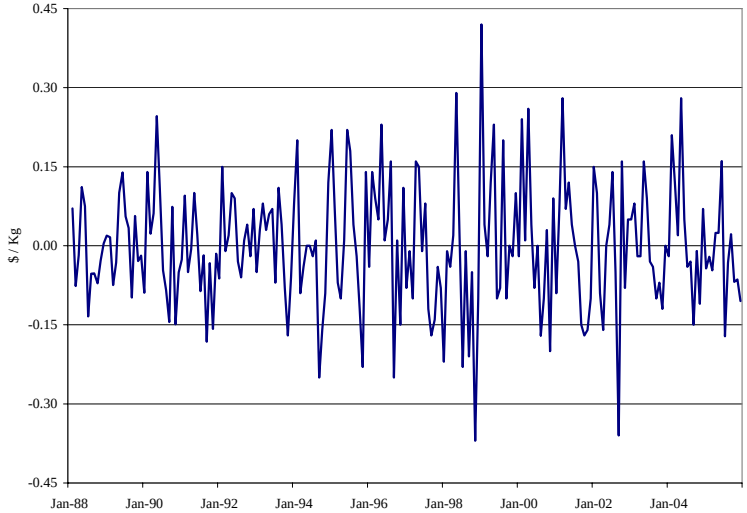

Figure 3. First difference of the Manitoba hog price from January 1988 to December 2005.

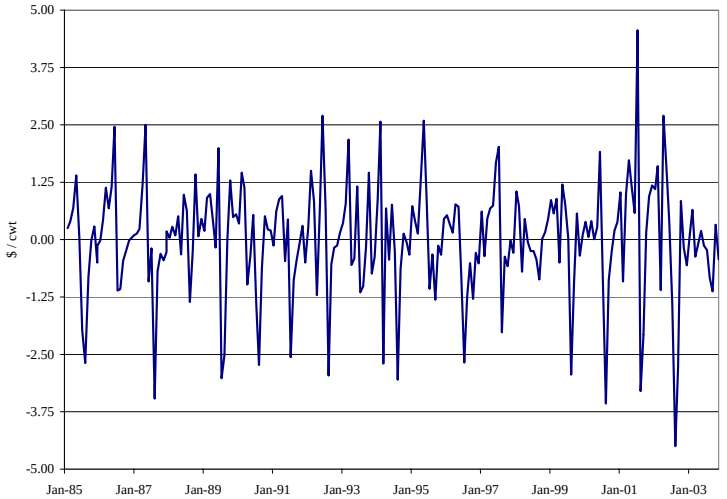

Figure 4. First difference in the U.S. potato price from January 1985 to December 2003.

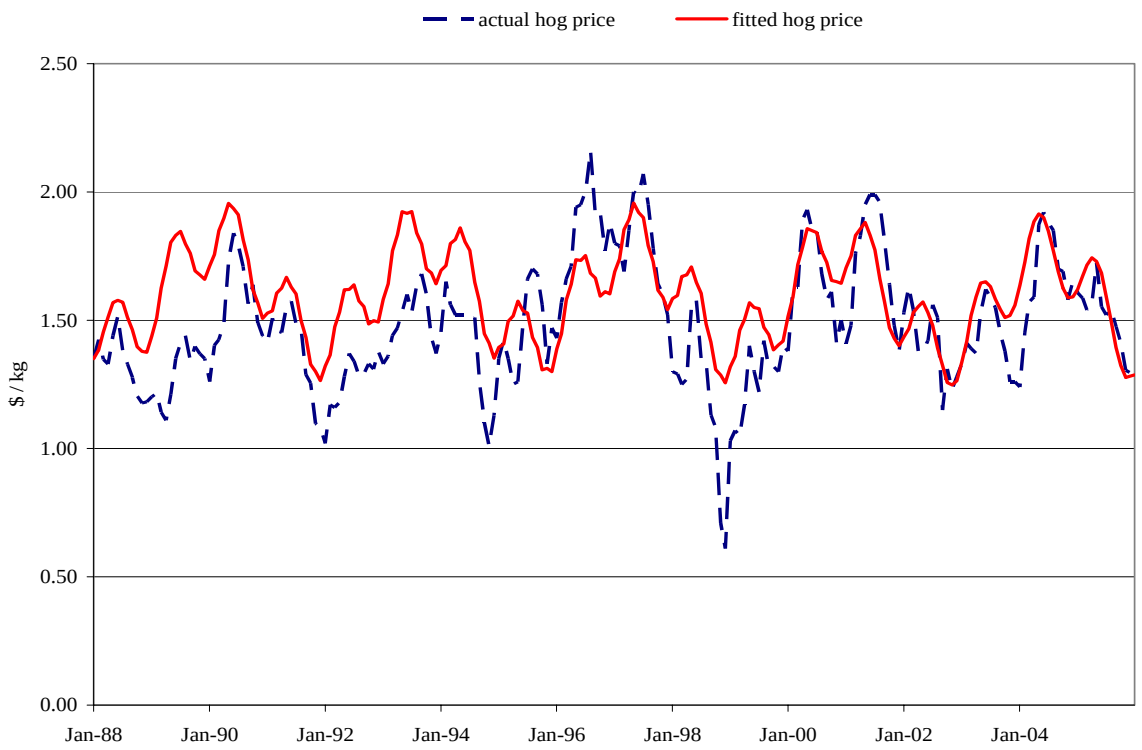

Figure 5. Predicted cycles in the Canadian hog price

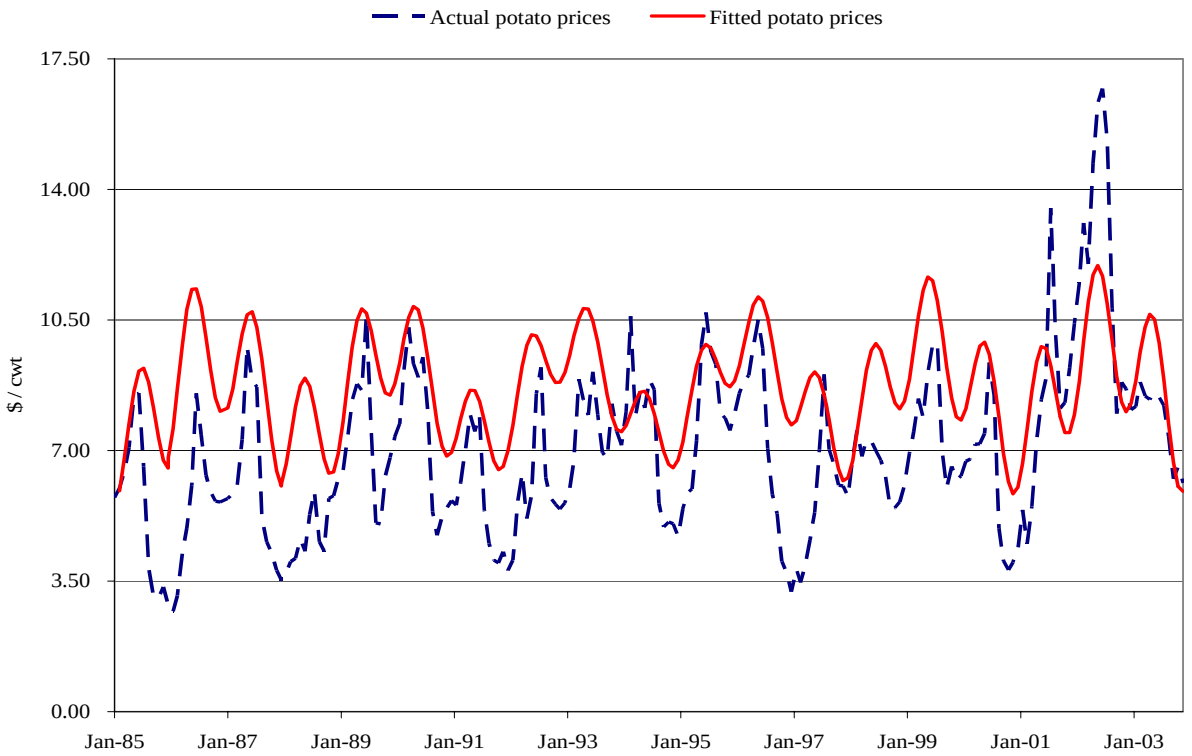

Figure 6. Predicted cycles in the U.S. potato price.

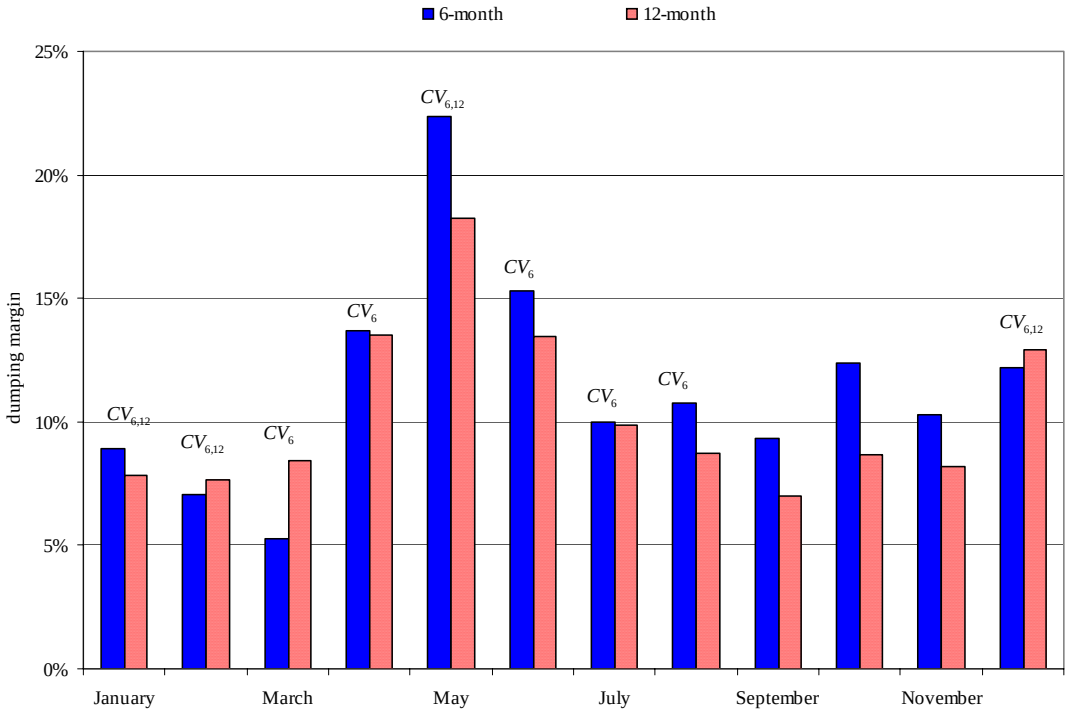

Figure 7. Estimated dumping margins in the hog case based on a 6-month and a 12-month investigation period.

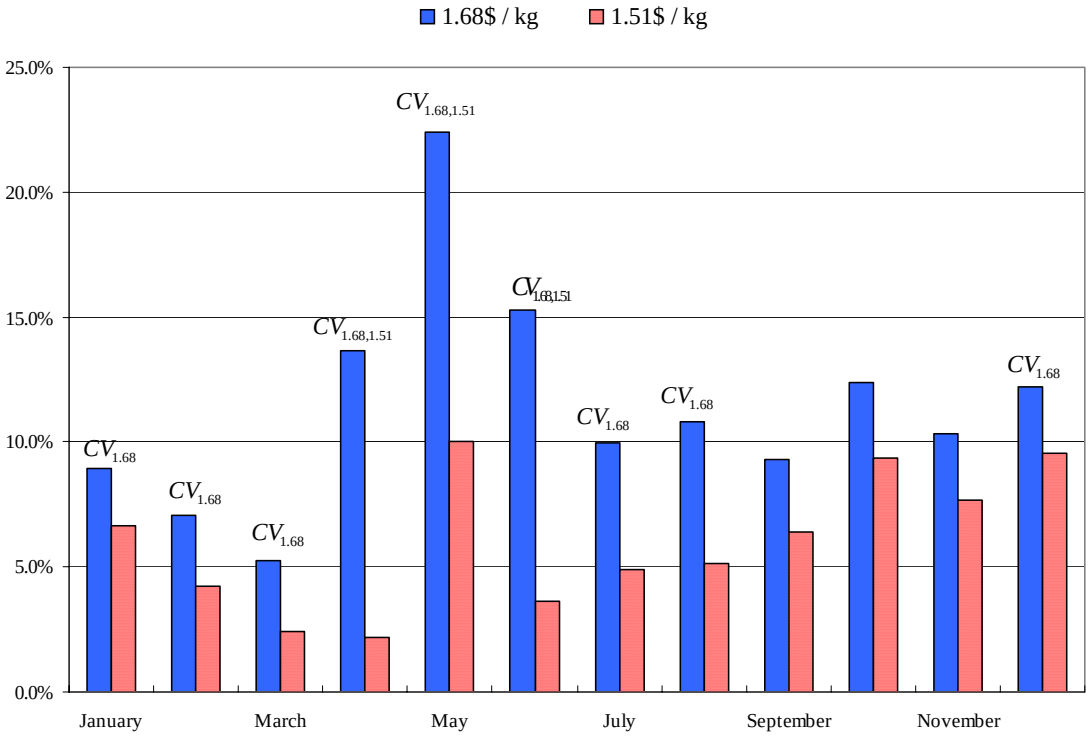

Figure 8. Estimated dumping margins in the hog case based on a 6-month investigation period and different estimates of the average cost of production

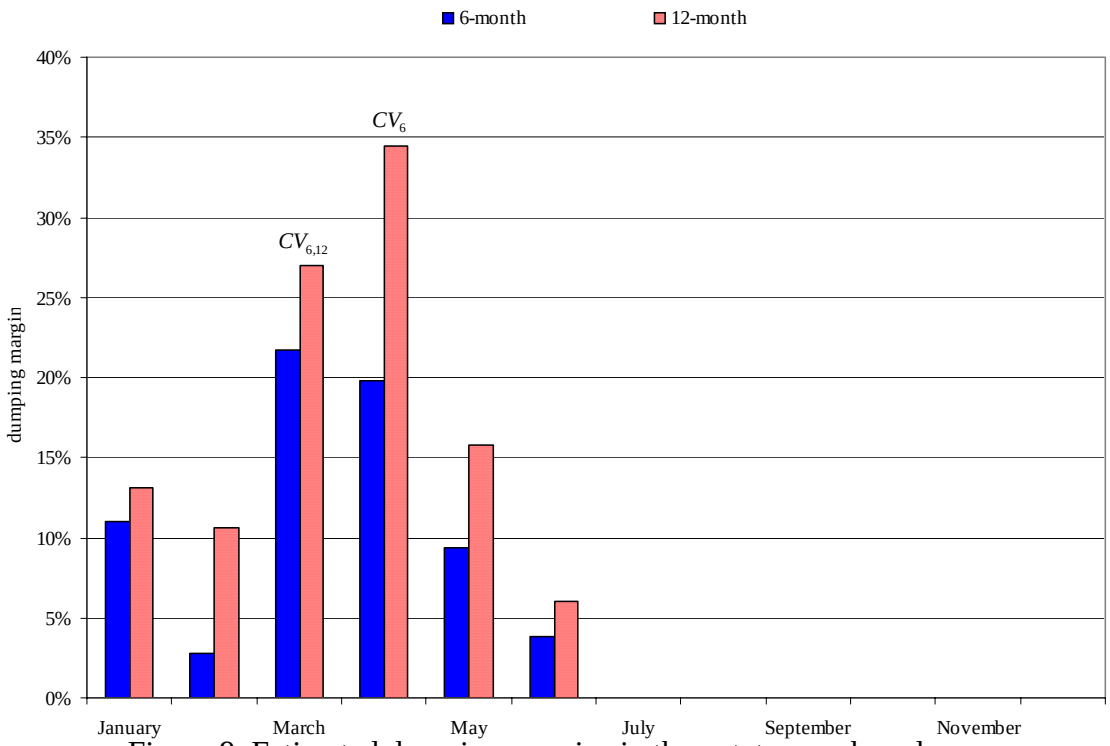

Figure 9. Estimated dumping margins in the potato case based on a 6-month and a 12-month investigation period.

Table 1. Unit root bootstrap results

Variable	*p-value* for the null hypothesis of a unit root
Hogs	0.561
Potatoes	0.808

Table 2. OLS estimates of the Fourrier transform

Coefficient	Hogs	Potatoes
β_{11}	-0.021 (0.009)	-0.104 (0.131)
β_{12}	0.020 (0.009)	0.191 (0.094)
β_{21}	-0.017 (0.011)	-0.024 (0.144)
β_{22}	0.074 (0.006)	0.750 (0.072)
β_{31}	-0.007 (0.011)	-
β_{32}	0.030 (0.006)	-
ω_1	0.146 (0.003)	0.166 (0.006)
ω_2	0.526 (0.001)	0.526 (0.007)
ω_3	3.127 (0.003)	-

Technical appendix

A. Unit root testing procedure

Parker, Paparoditis and Politis (2006)'s procedure is used to investigate if the data is integrated of order one. They propose a residual-based stationary bootstrap procedure that has overwhelmingly better power in small samples than the usual asymptotic tests which tend to under-reject the null hypothesis (Maddala and Kim, 1998). Although, there are more than 190 observations in each series, the bootstrap procedure has the advantage of converging to the true finite sample distribution faster than the asymptotic distribution. Consider a time series X_t and define the (centered) residuals $\hat{v}_t = X_t - \hat{\rho} X_{t-1}$; where $\hat{\rho}$ is the OLS estimate of ρ. The idea is to sample blocks from the empirical distribution of the residuals whose length (denoted *l*) is randomly selected using a geometric distribution with parameter *p* $\left\{\hat{v}_t^*, \ldots, \hat{v}_{t+l}^*\right\}$. A bootstrap sample is formed by setting the first observation of the bootstrap sample to its sample value and computing $X_t^* = X_{t-1}^* + \hat{v}_t^*$. Using the bootstrap sample, the OLS estimate $\hat{\rho}^*$ is computed.

This procedure is repeated *B* times and the empirical rejection probabilities can be computed. It is possible to show that the sample series is always stationary and replicates the time dependence of the data while generating a series that mimics the distribution of the statistic under the null hypothesis of a unit root. Note that a drift variable can be included in the unit root test if theory warrants its inclusion. In practice, there is no theoretical basis to select the parameter of the geometric distribution. Some experimentations with the data confirmed that different values of *p* did not change the qualitative nature of the results.

B. OLS algorithm to estimate the Fourrier transform

Kavalieris and Hannan (1994) along with the sequential least squares procedure of Walker (1971) and Hannan (1973) is used to estimate equation (1). The algorithm can be summarized as follows:

1. Let $\hat{\sigma}_0^2(h)$ be the least squares estimate of the prediction variance obtained from an AR(*h*) model applied for $\hat{u}_{t,0} = y_t$ and compute the Kavalieris and Hannan (1994) Criterion (KHC): $KHC(h, J=0) = \log\left(\hat{\sigma}_0^2(h)\right) + (5J+h)\log(T)/T$. An autoregressive process is used to "whiten" the residuals and the order of this process is selected using the Akaike Information Criterion (AIC).
2. Consider the case in which $J=1$. The model in (1) is estimated by OLS by letting the potential first frequency vary from $2\pi/T$ to π such that $\omega_1 = 2\pi k/T$, $k = 1,\ldots,0.5T$. For each *k*, the best autoregressive process of order *h* for the residuals is determined according to the AIC.
3. Starting from $k=1$, if $KHC(h,1) < KHC(h,0)$, the first frequency is set to $\hat{\omega}_1 = 2\pi/T$ and the procedure moves to step 4. Alternatively, if $KHC(h,1) > KHC(h,0)$, the OLS procedure is repeated for $k=2$ and so on. Let the value of *k* for which $KHC(h,1) < KHC(h,0)$ be denoted by $\hat{k}_1$. If $k = 0.5T$ and still $KHC(h,1) > KHC(h,0)$, the price series is best explained as random walk; i.e. $\Delta y_t = u_t$ and the estimation procedure stops.

4. Setting ω_1 equal to step 3's estimate, the sequential OLS procedure is applied setting $\omega_2 = \hat{\omega}_1 + 2\pi k/T$ for $k = \hat{k}_1 + 1, ..., 0.5T$. The procedure stops when for all possible values of *k*, $KHC(h, J+1) > KHC(h, 0)$.

Some conditions must be imposed through the grid search procedure to prevent two frequencies to be too close to each other and thus converge in probability to the same value. Hence, the restriction of Walker (1971) is used such that the Euclidian distance between two frequencies cannot be greater than the inverse of the square of the sample length; *i.e.* $\min|\omega_h - \omega_i| = T^{-0.5}$.