

# What Price Analyses Show About Cross-Border Integration in Commodity Markets

Economists like to use prices whenever possible to identify a market (Stigler and Sherwin). This is due to the fact that "the market" is defined as the collective set of buyers and sellers that establish the price. Moreover, reliable price data are often readily available at the individual commodity and product level. By contrast, other market-based data—such as quantities produced and/or the value of trade—often do not exist or are difficult to obtain at desired levels of frequency.

Economists consider markets to be spatially integrated for a specific good if prices for the good in different localities move in tandem with each other over time. This is based upon the law of one price (LOP) (Dornbusch). The absolute version of this law states that prices will equalize across freely trading areas and that identical goods sell for the same common-currency price in different countries. In practice, applied economists base their analyses on the relative LOP, which allows for transaction costs that do not vary proportionally over time.

Market integration is typically viewed as a longrun phenomenon. It is present whenever a stable price relationship is established. This means that spatial prices can temporarily deviate from each other in the short run and still be consistent with the notion of an integrated market. The concept of spatial arbitrage is central to understanding why this is so. One way to view arbitrage is to visualize traders buying in a low-priced market, transferring the item to a high-priced market, and reselling the purchased good until price equalization occurs. Spatial arbitrage explains why prices for a uniform good in different localities tend towards equality and move in tandem with each other in integrated markets.

Applied economists typically view integration of spatial markets in terms of degree rather than with respect to strict adherence to the LOP (Fackler and Goodwin). At one extreme are completely segmented markets; at the other are perfectly integrated markets.

A simple correlation of U.S. and NAFTA-member prices (denominated in a common currency) provides a relatively straightforward way to depict national price co-movements. Using this indicator, perfect market integration (segmentation) of two area markets occurs if the price correlation equals 1 (0). Correlations that

fall between 0 and 1 suggest intermediate levels of market integration. Simple correlations of area prices are relatively easy to calculate and can be used to quickly gauge the extent of integration. For example, price correlations in a Canadian-U.S. meat study show that U.S. and Canadian pork product markets are, on average, more integrated (correlation of .86) than the national markets for beef products (correlation of .60) which, in turn, are more integrated than the markets for whole chicken (correlation of .26) (Jenkins and Vollrath). These results confirm expectations that U.S.-Canadian beef and pork operate more like a single market than poultry. Canada's supply-managed poultry policies insulate this sector from U.S. and world markets.

One problem with using price correlation as an indicator of market integration across countries is that it cannot account for many real-world complexities. It cannot reveal, for example, how exchange rate fluctuations affect the enlarged market. Analyzing market integration across national borders in countries with different currencies is considerably more complicated than focusing on spatial markets within a country. Shifts in currency values affect inter-country, but not intra-country, market integration--unless exchange rate pass-through (ERPT) is complete. Complete ERPT occurs when an exporter alters own-currency prices at which it sells goods in the foreign market commensurate with the shift in the bilateral exchange rate, resulting in no change in the foreign-currency prices of exported goods. If the U.S. dollar appreciates, for example, U.S. exporters would have to lower U.S.-dollar prices at which they sold their goods in overseas markets in order to maintain their competitiveness in these markets. Otherwise, the foreign-currency price of U.S. goods would rise due to dollar appreciation and U.S. exporters would lose market share.

To separate the components of U.S.-Canadian market integration, Vollrath and Hallahan used LOP models to isolate the influence of foreign-currency domestic prices on home-currency local prices from that of the exchange rate. ERPT elasticities, defined as the responsiveness of the home-country price to a change in the relative value of the U.S. dollar to the Canadian dollar, show that a change in the exchange rate has little or no bearing on contemporaneous U.S. and Canadian domestic prices for meat and livestock.<sup>2</sup>

This reveals that fluctuations in the bilateral exchange rate are a barrier to cross-border market integration. It means that shifts in the Canadian-U.S. exchange rate can fundamentally alter U.S. and Canadian competitiveness in each other's markets. The finding of incomplete ERPT is supported by widespread evidence in the applied literature that the transmission of exchange rate changes to product and factor prices is usually weak (Isard).

Shifts in government policies and/or programs influence integration. To determine the impact of the 1994 NAFTA legislation and termination of Canadian rail subsidies under the Western Grains Transportation Act (WGTA) in 1995, Mohanty and Langley examined integration of the U.S.-Canadian spring-wheat and feed-barley markets before and after these policy innovations. Their research revealed stable longrun price relationships between the United States and Canada in both spring wheat and feed barley, confirming that U.S.-Canadian markets for both grains have been, in fact, integrated for some time. Their findings also revealed that integration deepened over time, most notably following the elimination of freight subsidies in 1995. The longrun price transmission elasticity for wheat (barley) increased from 0.84 (0.67) in the pre-WGTA period to 0.99 (0.91) in the post-WGTA period, where the price transmission elasticity is defined as the responsiveness of the home-country price to a change in the partner-country price. In addition, their research showed that following a price shock, the speed of adjustment back to equilibrium increased in both grain markets post-NAFTA (post-WGTA reform). This finding provides additional evidence that the U.S.-Canadian markets for spring wheat and feed barley have become increasingly integrated. It is likely that the creation of NAFTA and reform of the WGTA contributed to the observed convergence of U.S. and Canadian grain prices.

---

<sup>2</sup> They also found that the U.S.-Canadian exchange rate exhibits a random walk while national commodity prices are stationary in levels. This finding alone identifies the exchange rate as an inhibiting factor constraining market integration.

Recently, a new perspective of market integration has emerged, one that relates to "market connectedness" (McNew). In this approach, market integration is measured by the degree to which supply and demand shocks are transmitted from one region to another. One advantage of this new perspective is that it focuses explicitly on the price adjustment process. For example, it can reveal the impact of delivery lags on contemporaneous prices. It can also show the path of adjustment and how long it takes for shocks to dissipate.

National markets may not be integrated with each other to the same degree. For example, empirical analyses of market connectedness show that meat markets in the United States and Canada are asymmetrically integrated. The high degree of responsiveness of Canadian pork and beef prices to shocks in corresponding U.S. product markets indicates that the Canadian market is highly dependent upon and integrated with the U.S. market (Jenkins and Vollrath). But the reverse does not hold. U.S. pork and beef prices are not very responsive to shocks occurring in the Canadian market. The accumulated, 8-week multiplier of a unit shock to U.S. pork (beef) prices is 4.27 (1.94). By contrast, Canadian-based impact multipliers do not exceed 1 in any U.S. meat market.

Price analyses convey useful information about market integration because of the central role of prices in defining the market for individual goods, and because price data reflect equilibria of supply and demand through time and space. But problems of aggregating unlike items constrain the ability of price analyses to expose information about market unification at the sector, industry, or even undifferentiated product level. Trade data and institutional analyses can be used to enhance our understanding of market integration at the aggregate level.