Market Integration: Case Studies of Structural Change

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The grain/oilseed industry is undergoing considerable structural change through mergers and new value-added businesses, which raises price-related questions. We analyze the level of price integration prior to and following a merger between two grain firms and the start-up of a producer-owned ethanol facility. This research utilizes error correction vector autoregression analysis to compute market integration structural change effects. We find evidence that market integration initially increases with the merger, but deteriorates with time following the merger. We find no significant localized change in the level of price integration for the case of a new value-added business.

Key Words: consolidation, structural change, price integration

The grain/oilseed industry is undergoing considerable structural change, including consolidation and new processing facilities to add value beyond commodity grade. Such rapid structural changes present difficulties in precisely modeling and forecasting price relationships. Furthermore, past research may no longer be relevant in post-structural change environments. Two lines of thought exist regarding structural change. First, industry consolidation may provide market power to acquiring firms (Goodwin 1992a, and Parcell, Mintert, and Plain 2004), and the economic impact of applying market power (e.g., collusion) may be significant (Connor 1997). Firms with market power are perceived to affect price levels, manipulating prices relative to other locations and reducing market efficiency. Second, consolidation and/or the development of new businesses may improve market efficiency through reduced transaction costs and increased competition, respectively (Goodwin and Schroeder 1991). For the current analysis, we do not directly address the issue of price-level changes. We focus on market price integration, in which deviations from historical levels might signal a change in pricing behavior. In light of the above described trade-offs (reduced transaction cost, but potentially asymmetric information), we postulate no *a priori* expectation regarding the impact of a merger on the level of price integration. Similarly, no *a priori* expectation is held for the impact of a new business. Increased competition generally favors market efficiency. However, the introduction of a new business may weaken existing price linkages if the surrounding firms already approximate perfect competition (Faminow and Benson 1990).

Selecting two structural change events in northeast Missouri as case studies, we provide an incisive glimpse at the larger impact of structural change in the grain/oilseed industry. We investigate the impact of structural change on spatial price relationships, i.e., market integration effects, prior to and following the 1998 merger of Archer Daniels Midland (ADM) and the Quincy Soybean Company, and the opening of a producer-owned ethanol plant in Macon, Missouri, in 2000. While these are local events, they are representative of the two most likely structural change events to occur in the grain/oilseed industry today.

ADM and the Quincy Soybean Company operated competing elevators in northeast Missouri. After they merged in January 1998, ADM owned many of the elevators in the region. The acquisi-

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tion included Quincy Soybean Company's 22 elevators and two terminals on the Mississippi River at Quincy, Illinois, and Helena, Arkansas, and made ADM the clear leader in U.S. soybean trade, with 33 percent of the crush capacity and 30 percent of the vegetable oil refining volume (Smith 1998).

The Northeast Missouri Grain Processors (NEMO) cooperative created a value-added market for its producer-owners when it began purchasing corn for its ethanol plant on May 1, 2000. This facility produced nearly 15 million gallons of ethanol, using over 5 million bushels of corn annually. This structural change provided a new source of corn demand in northeast Missouri. The NEMO producer-owners are located primarily within a 70-mile radius of the ethanol plant, and over 70 percent of the corn is sourced in state.

Structural changes such as these raise questions regarding to what extent, if any, the entrance and exit of competitors, i.e., the number of buyers in a given region, and the structure and ownership characteristics of these firms impact pricing patterns and linkages. This research determines if the degree of price integration in the grain/oilseed industry changed in correspondence to the two identified structural change events. Our analysis differs from previous analyses by the scope of the study. We investigate two localized structural changes, whereas previous research has focused on regional or national structural changes.

Literature Review

Numerous producers (sellers) and relatively fewer buyers dispersed over geographic regions are general characteristics of agricultural markets (Faminow and Benson 1990). Given the structure of agricultural markets, the process of price discovery is often influenced by the spatial and intertemporal aspects of the markets. Market competition and efficiency varies with these spatial and intertemporal influences. Thus, the study of the interdependence of markets, as measured by price relationships, is important.

Faminow and Benson (1990) noted that studies of spatial price relationships for agricultural commodities have been widely used to indicate market performance, without consideration of intraregional transportation costs. In an analysis of short- and long-run integration among Canadian hog markets, the authors found possible market inefficiencies, which they attributed to substantial institutional change in the industry.[1]

Bedrossian and Moschos (1988) identified a negative industry profitability effect on the relationship between concentration and speed of price adjustment, since lower industry profit margins incite higher speed of price adjustments. The opposing positive leadership effect, associated with higher relative profitability of industry leaders, was shown to be the exception by quarterly price analysis of 20 Greek manufacturing industries, suggesting that both concentration and the length of the production period had negative effects on the speed of price adjustments.

Goodwin (1992a) noted that standard forecasting models that ignore structural change might produce biased and misleading forecasts. The author's vector autoregression (VAR) models and impulse response functions confirmed the existence of a gradual structural change in U.S. cattle markets from 1974 through the early 1980s, and indicated greater exogeneity and faster adjustment of prices since the structural change.

Goodwin and Schroeder (1991) found that increased cointegration in several regional fed cattle markets paralleled significant structural changes to the livestock industry in the 1980s.[2] The authors suggested that increased market concentration may have decreased trade and information costs or, alternatively, that packers may have coordinated price behavior across regions.

Schroeder (1997) evaluated fed cattle spatial price relationships. Using error correction VAR models, he estimated the level of price causality between market locations. Furthermore, he regressed market factors on the error correction (speed-of-adjustment) coefficient generated from separate market integration equations. He found an increase in the speed-of-adjustment term to be associated with plants in close proximity to each other, and a decrease in the speed-of-adjustment term for larger plants and plants having fewer cash transactions.

Goodwin and Piggott (2001) utilized VAR models to test for the significance of "neutral bands"

[1] Markets perform efficiently when they are integrated (i.e., when the price in the importing market equals the price in the exporting market plus the transportation and other transfer costs associated with trade).

[2] When a long-term equilibrium exists between price series, they are cointegrated. Highly cointegrated markets imply strong spatial price linkages.

in accounting for transaction costs in an analysis of price linkages among four corn and soybean markets in North Carolina (p. 302). The significance of transaction costs on spatial price linkages was confirmed, as threshold models consistently suggested faster adjustments in response to deviations from equilibrium than when threshold behavior is ignored. Overall, the results were consistent with long-run market integration.

Thompson, Sul, and Bohl (2002) tested for the Law of One Price (LOP) in French, German, and British wheat markets, and considered the effects of European Union policy reform when assessing short-run price adjustment dynamics. Employing various augmented Dickey-Fuller (ADF) and error correction methods, the authors rendered their results "strong evidence for LOP in the long run" (p. 1051).

Theoretical Model

We adopt a model used extensively in the spatial literature in which commodity producers are assumed to be evenly and continuously distributed over some arbitrary space (Mulligan and Fik 1989, Faminow and Benson 1990, and Schrimper 2001). Faminow and Benson (1990) provide detailed derivations of oligopolistic competition among spatially dispersed firms, which may be adapted to cases of oligopsonistic competition. Following Faminow and Benson (1990), an inverse demand function for the commodity at each buying point (i.e., elevator) is given by

$$(1) \qquad \overline{P} = a - (b/v)q^{v},$$

where $\overline{P}$ is the delivered price, q is the quantity demanded, a and b are positive constants, and v is a constant parameter, $v > -1$.[3] The price received by producers consists of the commodity's value, p, at some location, minus transportation costs, u. Thus, the price producers receive by delivering to a particular elevator is specified as

$$(2) \qquad \overline{P} = p - u.$$

Combining (1) and (2) and solving for q yields

$$(3) \qquad q = \left[\frac{v}{b}(a - p + u)\right]^{1/v}.$$

The costs of transporting a commodity to geographically separated $i = 1, \ldots, n$ elevators are not necessarily identical.

The effect of transportation costs on prices received may be diagramed using producer price surfaces, as outlined by Schrimper (2001). Figure 1 depicts the two-firm case (i.e., $i = x, y$), where price is measured vertically and distance horizontally. The heights of the bars emanating out of the horizontal axis reflect differences in the value, or the marginal cost to the seller, of the commodity at locations X and Y. Hence, P_y (the price offered by elevator y) is greater than P_x (the price offered by elevator x) in this depiction. This price difference may be due to location, convenience yield, or operational cost differences. The slopes of the linear lines, called price surfaces, represent how the value of the commodity diminishes with distance due to transportation costs (steeper slopes implying higher transportation costs).[4] Elevators compete only at the periphery of their market areas, represented in Figure 1 by the point on the horizontal axis corresponding to the dashed line.[5] The boundary between the two elevators' market areas exists at the intersection of the elevators'

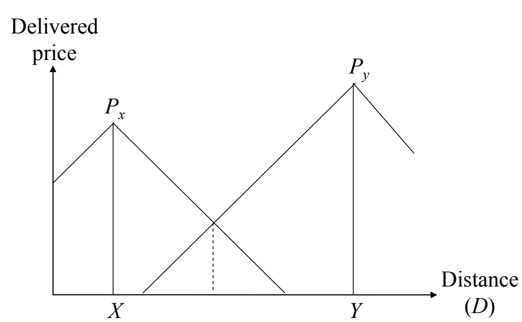

Figure 1. Duopsonistic Spatial Competition Under FOB Pricing

[3] As a constant marginal cost is assumed, v must be greater than -1, since v less than -1 implies an upward-sloping marginal revenue.

[4] Price surfaces can be made more complicated by considering that the relationship between transportation costs and distance may be nonlinear (due to multiple modes of transportation), but the purpose of our exposition is simple illustration.

[5] The market periphery area is not constant due to local supply and demand factors. For example, during certain times of the year it is not uncommon for a north-central Missouri large hog producer, Premium Standard Farms, to source corn from north-central Iowa.

price surfaces where delivered prices are equal, and producers are indifferent between delivering to one elevator or the other. The price set by elevator *i* is impacted by transportation costs and demand conditions faced by elevators $j, \ldots, n \neq i$, so that if P_i decreases, then the other firms respond by decreasing their respective prices. Thus, elevators *x* and *y* are (by the definition of geographic market integration used here) in the same market, as illustrated by the interdependence of relative prices. Faminow and Benson (1990) submit that neither prices net of transportation costs between locations nor the magnitude of a price response by one elevator to a change in the price offered by another need to be identical. Indeed, arbitrage guarantees only that prices at different locations will not differ by more than transportation costs.

The theoretical example of oligopsonistic competition among relatively few buyers for the production of numerous sellers is illustrated by adding a firm at location *Z* (Figure 2). P_z may be interpreted as the corn price offered by a start-up corn ethanol plant that values the commodity somewhat more than its neighboring elevator (point *X*), but somewhat less than, say, a river terminal (point *Y*). Placing the ethanol plant between the two pre-existing elevators creates new market boundaries represented by the dashed lines. Faminow and Benson (1990) suggest that as the number of intermediate buying sites between existing buyers increases, price linkages between the original locations weaken.[6] Furthermore, a distance-decay effect causes price responses to be weaker among more distantly located and indirectly linked competitors (Mulligan and Fik 1989).[7]

Suppose that one firm owns elevators at locations *V* and *Z*, while another firm owns elevators at locations *W* and *Y*, and still another firm owns elevators at locations *U* and *X*. Corresponding to the six locations, Figure 3 illustrates five market boundaries by dashed lines. Now suppose that a merger occurs such that locations *V*, *W*, *Y*, and *Z* fall under the control of a single firm. The effect of a merger on price linkages is not evident from this type of diagram, since the number of market boundaries decreases only if some locations are shut down. Price linkages between locations *V*, *W*, *Y*, and *Z* may become stronger if information is better communicated within one firm than across multiple firms. Though, in general, short-run price rigidities are prolonged in sectors with high industrial concentration and longer production processes, the effect of increasing concentration on the speed of price adjustments may be positive in a concentrated industry dominated by a relatively more profitable price-leader or a collusive group of firms (Bedrossian and Moschos 1988).

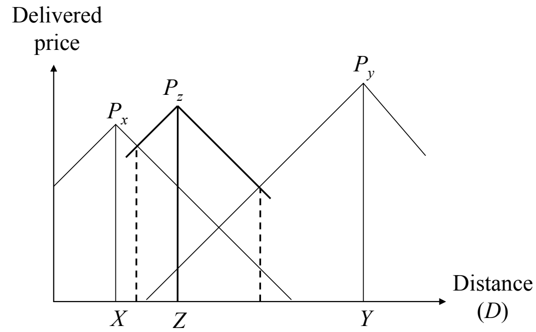

Figure 2. Oligopsonistic Spatial Competition Under FOB Pricing, a New Business Entity

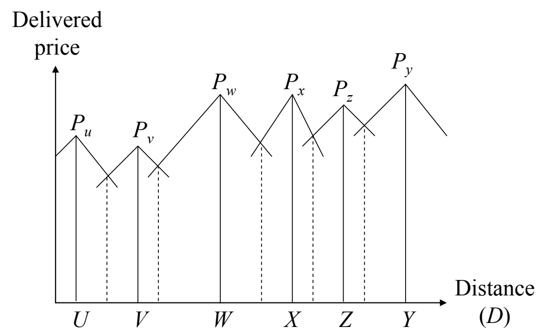

Figure 3. Oligopsonistic Spatial Competition Under FOB Pricing, a Merger

Empirical Model

An extensive literature has employed time-series procedures appropriate for analyses of market

[6] According to price surface theory, markets that are indirectly linked (e.g., *X* and *Y* in Figure 2) by an intermediate market (e.g., *Z*) may be less integrated than directly linked markets (e.g., *X* and *Y* in Figure 1).

[7] Distance decay—the deterioration of interlocational price relationships with increasing geographic space—is due to the greater costs and risks associated with trading between more distant markets. Generally, the greater the distance (hence, the greater the associated costs and risks of trade) between two markets, the less likely the markets are to be cointegrated.

integration. The decay of spatial relationships over space suggests that more distant markets, which are linked indirectly by the markets between them, may be used as benchmarks in assessing the implications of a structural change event (Goodwin and Schroeder 1991).

Our analysis utilized daily corn and soybean price data spanning January 1996 through January 2003, from Macon and Hannibal elevators, two northeast Missouri markets, and from St. Louis and Kansas City elevators, two primary markets outside of the region, to assess if the observed structural changes affect price integration. Price data were obtained from DTN (DTN 2001). Pre- and post-structural change event summary statistics are reported in Table 1. While average prices decreased in each market, the absolute value of price differences grew in the soybean market and shrank in the corn market following the respective structural changes. Sticky prices are assumed for this study, meaning that we did not adjust for transportation costs.

Prior to the market integration analysis, Dickey-Fuller (DF) tests of stationarity were performed on both the soybean and corn price series. In all cases, the null hypothesis of nonstationarity could not be rejected at a 10 percent confidence level, as the absolute values of the DF test statistics were between zero and the DF absolute critical value of 2.57. Thus, the price series were deemed nonstationary. Nonstationarity was corrected for by first-differencing the data. DF tests verified that the time series were integrated of order 1, denoted I(1), meaning that differencing the nonstationary time series once yielded stationary, or I(0), time series.

The Law of One Price (LOP) holds when prices at paired locations are cointegrated, i.e., when a long-run equilibrium relationship exists between prices at paired locations (Goodwin 1992b). Cointegration necessitates that each of the time series be integrated of the same order (Gujarati 1995). Given that each time series was found to be I(1), the Johansen method (Enders 1995) was employed prior to and following the structural change events to investigate the LOP between Kansas City, Macon, Hannibal, and St. Louis, Missouri, corn and soybean prices.

Error correction VAR models, incorporating a structural change dummy interacted with the speed-of-adjustment coefficient and a time trend dummy interacted with the speed-of-adjustment coefficient, were estimated to determine whether price responsiveness among locations differs before and after the identified structural change events. Initially a macroeconomic forecasting method (Sims 1980), VAR modeling has since found microeconomic applications (e.g., Goodwin 1992a and Goodwin and Piggott 2001). Highly integrated markets should respond to shocks in each other by quickly returning to a long-run equilibrium (Enders 1995). The error correction VAR model is specified as

$$\text{(4)}\quad \begin{aligned}\Delta P_{it} &= \alpha_0 + \alpha_1\hat{e}_{t-1} + \alpha_2\hat{e}_{t-1}\times \textit{structural shift}_t \\ &+\alpha_3\hat{e}_{t-1}\times \textit{trend after structural shift}_t \\ &+\sum_{k=1}\alpha_{11}(k)\Delta P_{it-k} + \sum_{k=1}\alpha_{12}(k)\Delta P_{jt-k} + \boldsymbol{\lambda}_{\mathbf{it}},\end{aligned}$$

where t refers to time (t = 1, 2, . . ., T), which for this study is days; i and j refer to elevator location ($i \neq j$); k is the number of lag lengths; and $\boldsymbol{\lambda}_{it}$ is an n x 1 vector of normally distributed random errors. The first three terms following the intercept term on the right-hand side of equation (4) are the speed-of-adjustment measure, an interaction term between the speed-of-adjustment measure and structural binary variable (*structural shift*$_t$ = 1 following the structural shift, 0 o.w.), and an interaction term between the speed-of-adjustment measure and time trend variable (*trend after structural shift*$_t$ = 1, 2, 3 . . . T following the structural change event, 0 o.w.). The next two terms are lagged price variables following from the standard VAR model. A speed-of-adjustment coefficient close to one in absolute value indicates fast adjustment to deviations from equilibrium, and a value close to zero indicates a slow to no adjustment. We expect the absolute value of the speed-of-adjustment coefficient to be larger for market pairs that include terminal markets (i.e., Kansas City and St. Louis).

Results

All statistical analyses were conducted using *EViews* 4 (*EViews Users Reference Manual* 2001). As previously indicated, the time-series data used for this study exhibited nonstationarity,

Table 1. Summary Statistics for Corn and Soybean Prices and Differentials Before and After Structural Change Events

	January 1, 1996, to December 31, 1997				January 1, 1998, to January 30, 2003			
Elevator consolidation (soybean prices in $/bushel)	Average	Standard deviation	Maximum	Minimum	Average	Standard deviation	Maximum	Minimum
Kansas City	$7.56	$0.58	$8.93	$6.10	$5.09	$0.66	$6.93	$4.11
Hannibal	$7.53	$0.58	$8.90	$6.21	$5.03	$0.65	$6.88	$3.97
Macon	$7.41	$0.57	$8.75	$6.02	$4.86	$0.68	$6.70	$3.83
St. Louis	$7.67	$0.55	$8.99	$6.29	$5.17	$0.66	$7.01	$4.08
Hannibal – Kansas City	$-0.03	$0.10	$0.26	$-0.52	$-0.06	$0.09	$0.27	$-0.45
Hannibal – St. Louis	$-0.13	$0.08	$0.14	$-0.59	$-0.14	$0.07	$0.30	$-0.57
Hannibal – Macon	$0.12	$0.09	$0.33	$-0.91	$0.16	$0.07	$0.41	$-0.80

	January 1, 1996, to April 28, 2000				May 1, 2000, to January 30, 2003			
Ethanol plant operation (corn prices in $/bushel)	Average	Standard deviation	Maximum	Minimum	Average	Standard deviation	Maximum	Minimum
Kansas City	$2.68	$0.87	$5.51	$1.70	$2.06	$0.27	$2.83	$1.53
Hannibal	$2.64	$0.83	$5.26	$1.60	$2.01	$0.25	$2.72	$1.45
Macon	$2.48	$0.86	$5.20	$1.45	$1.89	$0.28	$2.55	$1.30
St. Louis	$2.76	$0.82	$5.32	$1.73	$2.13	$0.26	$2.88	$1.56
Macon – Kansas City	$-0.19	$0.09	0.25	$-0.69	$-0.16	$0.09	$0.17	$-0.40
Macon – St. Louis	$-0.28	$0.11	0.58	$-0.49	$-0.23	$0.11	$0.17	$-0.44
Macon – Hannibal	$-0.15	$0.09	0.66	$-0.38	$-0.12	$0.11	$0.27	$-0.34

Note: Number of observations is 545 (1,130) prior to and 1,304 (719) after the merger (new value-added business) structural change.

which was corrected for by first-differencing the data. Pre- and post-structural change Johansen unrestricted cointegration rank test statistics (Enders 1995) are reported in Table 2. Trace statistics, calculated from characteristic roots (i.e., eigenvalues), reject the null hypothesis of no cointegrating vector at the one percent level in each case. Hence, all paired corn and soybean markets are deemed cointegrated. Thus, between each set of locations a long-run price relationship exists before and after the respective structural change events. The presence of a cointegrating relationship between each paired price series justifies the error correction VAR model, as opposed to the standard VAR model (Enders 1995). The lag length of the VAR model was determined by minimizing the Akaike Information Criteria (Greene 2003).

To conserve space, only speed-of-adjustment coefficients are presented in Table 3. (Full results of the VAR analysis are available from the authors upon request.) Although the flow of commodities is likely unidirectional, results are reported for both directions of price integration. The speed-of-adjustment coefficient over all observations is statistically significant at the 5 percent level (column one of Table 3). As expected, the speed-of-adjustment coefficient is generally greater for relationships where one market is a terminal market. The distance decay impact does not seem to be as pronounced for firms pricing homogeneous goods (e.g., corn and soybeans) as for firms pricing product-differentiated goods (i.e., more substitutable goods have greater information flows). The absolute value of the speed-of-adjustment coefficient is, in general, smaller than that found for other industries (e.g., Schroeder [1997] finds the speed-of-adjustment coefficient to vary between 0.15 and 0.45 for beef-packing firms). However, in most cases full return to equilibrium occurs within one week, which is similar to the findings by Goodwin and Piggott (2001) for North Carolina corn and soybean markets.

The second column of Table 3 is the immediate change in the size of the speed-of-adjustment coefficient following the structural change event. The fourth column of Table 3 is the trend of the speed-of-adjustment coefficient following the structural change event. Columns three and five indicate the composite impact immediately following the structural change and at the end of the study period, respectively. In addition to statistical significance, one should consider the economic significance of changes in coefficient values, as the implications of changes in the absolute level of price integration are not well understood. Beyond statistical significance, we deem speed-of-adjustment coefficients greater than 0.10 in absolute value and changes of 20 percent or more in coefficient values between columns one and three, one and five, or three and five to be economically significant. Consider the Hannibal → Kansas City model in the elevator consolidation case. The absolute value of the speed-of-adjustment coefficient -0.2096 (column one) indicates that nearly 21 percent of the price adjustment in Hannibal is realized in Kansas City within one day. Immediately after the merger (column three), 27 percent of the price adjustment occurs within one day, which is a 31 percent increase. By the end of the study period, 14 percent of the price adjustment occurs within one day, which is much slower than that reported in column one or column three.

The immediate post-merger impact (column two) is an economically significant increase in the level of across-location price integration in four of the five scenarios meeting our criteria. Following the immediate impact, economically significant erosion in the level of integration persists through the end of the study period. While Bedrossian and Moschos (1988) found the short-run speed-of-adjustment to be negatively related to increased industry concentration, we find that a longer time period is required before realizing a decrease in price integration from a merger in the grain/oilseed industry.

An initial reduction in transaction costs, due to intra-firm information exchange, may explain the merger's immediate positive impact on market integration, but why would the intra-firm level of market integration erode over time? Perhaps the exercise of market power is learned over time.[8] Quincy Soybean may have been small enough for its acquisition by ADM to not alarm government antitrust agencies, unlike mergers concerning the acquisition of more prominent firms, in which firms were required to sell off assets to ensure

[8] Alternative explanations seem improbable, as technological advancements decrease barriers to information transmission, and there is no reason to suspect market infrastructure to decrease in such a developed market.

Table 2. Summary of Johansen Unrestricted Cointegration Rank Test Statistics of Reported Elevator Prices (constant, no trend)

	January 1, 1996, to December 31, 1997		January 1, 1998, to January 30, 2003	
Elevator consolidation (soybean markets)	Eigenvalue	Trace statistic	Eigenvalue	Trace statistic
Hannibal ↔ Kansas City	0.063**	36.919	0.045**	62.490
Hannibal ↔ St. Louis	0.055**	31.987	0.039**	52.923
Hannibal ↔ Macon	0.042**	25.834	0.053**	73.288
	January 1, 1996, to April 28, 2000		May 1, 2000, to January 30, 2003	
Ethanol plant operation (corn markets)	Eigenvalue	Trace statistic	Eigenvalue	Trace statistic
Macon ↔ Kansas City	0.052**	62.062	0.103**	77.651
Macon ↔ St. Louis	0.044**	51.917	0.065**	48.541
Macon ↔ Hannibal	0.064**	76.738	0.090**	68.180

Note: ** denotes rejection of the null hypothesis of no cointegrating vector at the one percent level. Lag-length is set to 22. Number of observations is 545 (1,130) prior to and 1,304 (719) after the merger (new value-added business) structural change. The trace test statistic one percent critical value is 6.65.

Table 3. Speed-of-Adjustment Coefficients from Vector Autoregression Estimator Specified in Equation 4

Elevator consolidation	Speed-of-adjustment coefficient (entire time period) (A)	Size of speed-of-adjustment after structural change (B)	Immediate impact = (A + B)	Speed-of-adjustment trend after structural change (C)	Long-term impact = (A + B + C × obs after structural change)
Hannibal → Kansas City	-0.2096**	-0.0647	-0.2743	0.0001	-0.1439
	(-5.4262)	(-1.0823)		(1.7444)	
Kansas City → Hannibal	0.3381**	-0.0210	0.3171	-0.0001**	0.1867
	(8.9088)	(-0.3580)		(-2.0717)	
Hannibal → St. Louis	-0.1377**	-0.1528**	-0.2905	6.18E-05**	-0.2099
	(-3.4075)	(-2.2876)		(0.8448)	
St. Louis → Hannibal	0.2464**	0.0639	0.3103	-0.0001	0.1799
	(6.1505)	(0.9643)		(-1.6409)	
Hannibal → Macon	0.2096**	-0.0546	0.1550	2.92E-05	0.1931
	(5.8338)	(-0.9306)		(0.3999)	
Macon → Hannibal	-0.2240**	-0.2700**	-0.4940	0.0004**	0.0276
	(-6.0262)	(-4.4452)		(5.5576)	
Ethanol plant operation					
Macon → Kansas City	-0.2069**	0.0962**	-0.1107	-0.0001	-0.1826
	(-12.6039)	(2.9420)		(-1.4632)	
Kansas City → Macon	0.1273**	-0.1139**	0.0134	0.0002**	0.1572
	(8.4937)	(-3.8171)		(2.4302)	
Macon → St. Louis	-0.0996**	0.0012	-0.0984	8.55E-06	-0.0923
	(-9.6932)	(0.0478)		(0.1285)	
St. Louis → Macon	0.0300**	-0.0090	0.0210	8.88E-05	0.0848
	(3.1008)	(-0.3921)		(1.4162)	
Macon → Hannibal	-0.1433**	0.0276	-0.1157	5.77E-05	-0.0742
	(-10.7505)	(1.0754)		(0.9782)	
Hannibal → Macon	0.0446**	-0.0217	0.0229	4.15E-05	0.0527
	(3.4169)	(-0.8638)		(0.7181)	

Note: Standard errors are in parentheses. ** denotes statistical significance at 5 percent level. Lag-length is set to 22 in vector autoregression estimator. Number of observations is 1,849.

competitiveness.[9] While the abuse of market power is cause for concern, no negative connotation is attached to market power in and of itself, as the downward slope of a demand curve reflects its existence (Frank and Bernanke 2001). Certain advantages (e.g., scale, scope, etc.) are also associated with consolidation. Thus, previously competing facilities may not compete for the same market share post-merger, as the acquiring firm may capitalize on these advantages by reallocating facilities to other commodities or for other purposes. Such activity reflects rational behavior by the acquiring firm and, at the same time, may provide opportunity for a new entrant.

For the case of the new value-added business, the immediate impact of the three relationships fitting our criteria of economic significance is a decrease in the level of price integration. Of these, one can easily argue that only the Kansas City → Macon relationship makes economic sense, due to the flow of grain and Kansas City's importance as a terminal market. One may postulate that a segregated market initially arose around the ethanol plant, as the plant changed seasonal demand, i.e., convenience yield. However, the absolute value of the speed-of-adjustment coefficient increases by the end of the period of study, as the trend effect generally offsets the initial impact. Thus, there may have been a learning period in spatially dispersed markets following the structural change. In general, we conclude no significant change in the level of local price integration prior to and following the value-added business start-up.

Conclusion

The purpose of this research was to analyze how the degree of price integration within soybean and corn markets responds to the presence of structural change in the respective markets. The 1998 merger of ADM and Quincy Soybean and the 2000 opening of the NEMO ethanol plant in northeast Missouri were the particular cases studied. Given the degree of substitutability between corn and soybeans in livestock rations and their use in crop rotations, the possibility of contamination in a study such as ours is indeed a legitimate initial concern. We would expect the potential for such contamination to be indicated by changes in the acres planted to each crop, as rational farmers would attempt to react to changing market conditions. Upon examination of the acres planted to each crop in the appropriately selected northeast Missouri counties corresponding to this study, we find minimal changes over the analyzed time period. The percentage of acres planted to corn prior to and following the ethanol plant structural change increased from 29.80 percent to 29.90 percent in the 7-county area (3-year average). Soybean planted acres went from 66.02 percent prior to the merger to 65.18 percent after. We suggest that these small changes are likely due to government programs and genetics. Hence, we believe the potential for contamination in this study to be low.

After correcting for nonstationarity, tests of cointegration and VAR analysis were employed to investigate whether changes in market integration corresponded to the two observed structural change events. We find evidence that the impact of localized structural change, in the form of a new value-added business, is less than that previously reported for industry-wide structural change. Whereas for the case of a grain/oilseed merger, we find that the level of price integration erodes over time.

Our results yield two important findings. First, it appears that a new business does not significantly impact spatial price linkages over a larger geographic area, particularly for a substantially sized new business. Second, while there is initially a significant gain in price integration due to the merger, long-term effects suggest a loss of price integration. While others (e.g., Bedrossian and Moschos 1988, Dixon 1983, and Scherer 1980) have found a reduction in the size of the speed-of-adjustment coefficient due to mergers, we find that the speed-of-adjustment size erodes over time. Other studies have not analyzed this specific issue.

The merger case suggests caution for future price analyses performed over periods that comprise structural change events. In particular, researchers should pay close attention to the time lag of the impact following a merger. Model re-specification may be necessary for the situation

[9] In the 1998 merger of Cargill, Inc., and Continental Grains, the Antitrust Division of the U.S. Department of Justice required the firms to divest ten elevators in seven states (MacDonald 1999).

where a significant merger has occurred, but model re-specification is less likely needed for the case of a new business venture entering the market. The limitation of this study is that it deals only with price integration among markets and, hence, does not provide insight into changes in price levels that may or may not have occurred. Future research could investigate the seasonality of price integration, and to what extent the level of price integration differs between homogeneous and heterogeneous goods.

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