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**An Examination of the Market Structure of the
U.S. Produce Industry**

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by

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Abstract

Recent literature, largely from the U.S. Department of Agriculture, Economic Research Service, indicates that substantial changes have occurred in the produce industry in recent years. With the rise of retail mass merchandisers and increased concentration in the retail food industry, the procurement power of these large firms reportedly has also increased. With direct buying and contracting, market intermediaries such as brokers and wholesalers allegedly are being bypassed. As a result, these market intermediaries ostensibly are also consolidating becoming fewer and larger with increased emphasis on servicing the food service industry. However, the findings of this study indicate that there is no convincing evidence that the market structure of the U.S. produce industry has markedly changed since the early 1980s. While supermarket concentration has increased noticeably, the same cannot be said for produce market intermediaries such as brokers and wholesalers.

An Examination of the Market Structure of the U.S. Produce Industry

Marketing channels for fresh fruits and vegetables in the United States are distinctly different from those for other agricultural commodities. The primary marketing channel is composed of three major echelons: shipping-point markets, wholesale terminal markets, and retail markets. Shipping-point markets are located where the fruits and vegetables are grown. Firms in these markets include grower-packers or packer-shippers, brokers, wholesalers, and integrated wholesaler-retailers. Produce moves from the shipping points to export markets, wholesale terminal markets, and integrated wholesale-retail destinations. At terminal markets, wholesalers take possession of the fruits and vegetables, commonly repackage them under their own labels, and distribute to retail food stores and the food service sector which includes entities such as restaurants, hotels, and institutions. Examples of institutions are schools, hospitals, prisons, and the military. Merchant wholesalers and brokers/commission agents are the major players in terminal markets. The retail market includes food stores, restaurants, and direct fruit and vegetable markets (Calvin et al. 2001; Kaufman et al. 2000).

In recent years, the produce marketing channel has purportedly become increasingly vertically integrated. Vertical integration refers to control over upstream suppliers or downstream procurers. This control can occur through ownership or contracts. In the case of fruit and vegetable markets, the industry is becoming more backward or upstream coordinated. Large supermarket chains in many cases have bypassed brokers and wholesalers, dealing directly with grower-packers often under contract (Calvin et al. 2001; Handy et al. 2000; Kaufman et al. 2000; Patterson and Richards 2003; Sexton, Zhang, and Chalfant 2003).

The market relationships among produce shippers, wholesalers, and retailers apparently have undergone substantial changes in recent years. Such changes first came to light in 1999 when the Federal Trade Commission and the U.S. Senate held hearings to discuss the effects of recent retail changes and trade practices on different industries, one of which was the produce industry. The hearings reflected all sides as shippers complained that wholesalers and retailers had too much market power while retailers and wholesalers indicated that new practices, such as fees and services, are just the cost of doing business in the current market environment (Calvin et al. 2001).

Calvin et al. (2001) reported on the evolution of market channels from growers to retail buyers. The growth of mass merchandisers was linked to the decline in sales of produce to conventional retailers. Glaser, Thompson, and Handy (2001) studied the effects of retail consolidation along with changing customer preferences on shipper-wholesaler relations. Further, there has been some empirical work on market channel performance. Richards and Patterson (2003) studied the produce buying power exercised by larger retailers. They found that retailers are able to wield both buying and selling market power to some degree. Sexton, Zhang, and Chalfant (2003) studied the extent to which retailers are able to exercise oligopsony power in the procurement of fresh produce.

There has also been research conducted on the use of contracts to increase vertical integration. MacDonald and Korb (2006) looked at the different types of contracts used to organize the production and use of agricultural commodities. Marketing contracts are the major type of contract used in the fruit and vegetable industry. Over half of fruit production and almost one third of vegetable production are produced under this type of contract. The actual use of

contracts for produce did not increase between 1994 and 2003.

Regarding financial indicators, research has been carried out on how financial ratios change and how these changes reflect profitability and leverage. Chen and Zhao (2007) showed why more profitable firms have lower leverage ratios (more solvent) and how these ratios are affected by the choice of using internal or external funds for financing. The study concluded that the negative relationship between profitability and leverage ratios is a result of larger firms using internal instead of external funds.

With the rise of retail mass merchandisers and increased concentration in the retail food industry, the procurement power of these large firms reportedly has also increased. After 1996 many retailers merged, leading to an increased percentage of sales by the top eight retailers – from 1987 to 2002 the increase was from 27 to 45.6% (Calvin et al. 2001; U.S. Department of Commerce, Bureau of the Census of Retail Trade 2005). With direct buying and contracting, market intermediaries such as brokers and wholesalers reportedly are increasingly being bypassed. As a result, these market intermediaries ostensibly are also consolidating becoming fewer and larger with increased emphasis on servicing the food service industry.

If produce market intermediaries are adversely impacted by increasing oligopsony power of retail supermarkets, the evidence should manifest in financial time-series data representative of the impacted firms. Thus, a test of the adverse economic impact of oligopsony on upstream firms in the produce industry is possible through an analysis of the financial and census data representative of the impacted firms over the relevant time period. The overall purpose of this study is to determine whether produce wholesalers and brokers have been adversely impacted by the increase in mass merchandisers and retailers in the food industry.

The next section is devoted to an explanation of the financial ratios used in the analysis. Data, econometric analysis, and results are presented by financial standing of the firm. Next, census data are used to ascertain changes in market structure by type of wholesale firm over time. Lastly, conclusions are provided.

Financial Ratios

Ratios are one of the most important methods for analyzing the financial standing of a company. They provide managers and lenders ways to see relationships among items on financial statements. Two major sources of financial ratios are the Dun and Bradstreet Credit Services *Industry Norms and Key Business Ratios* (D&B) and Robert Morris Associates *Annual Statement Studies* (RMA). Robert Morris Associates is an organization of bank loan officers who obtain sample financial statements from over 375 industry groups subdivided by SIC code and more recently, NAICS code.

Key ratios for two categories, solvency and profitability, are used in the analysis. An exact match of ratios from the two major published sources – D&B and RMA – was not possible. The ratios employed were matched as closely as possible. The D&B solvency ratio used in the study is Total Liabilities to Net Worth. The RMA ratio is the same but called Debt to Net Worth. Two sets of profitability ratios are used in the study, return on assets (ROA) and return on net worth (RONW). The D&B measures are after taxes while the RMA measures are before taxes, table 1.

Analysis of Financial Ratios by Level of Financial Standing

In order to test the hypothesis that the profitability and solvency of produce

wholesale intermediaries (agents, brokers, and merchant wholesalers; SIC code 5148 and NAICS code 422480) have declined in the face of increased procurement power of mass merchandisers, time-series date for the selected financial ratios are used. Ratios were gathered for a 20-year span (1984-2003) which covers the period over which structural changes reportedly have occurred in the produce market channel. The D&B data are based on financial reports from within given industries and span the same period.

The categories employed are based on financial standing: upper, median, and lower quartiles. The median is the midpoint of all companies in the sample. The upper and lower breakdowns represent the midpoint of the upper and lower halves. The upper quartile encompasses strong ratio values, while the lower quartile encompasses weaker ratio values (Robert Morris Associates 1984-2003, Dun and Bradstreet 1984-2003).

Each ratio is tested to see if it weakens over the study period (1984-2003). The regressors include time (TIME) and percentage change in real GDP. ΔGDP is included to account for the possible influence of the business cycle. The base year for real GDP is 2000 (U.S. Department of Commerce, Bureau of Economic Analysis). Data description and simple statistics are provided in table 1. Ordinary Least Squares adjusting for first order autocorrelation was used for each ratio and each dataset separately, tables 2 and 3. The results of each test include parameter estimates, t values, R^2, and F values. No evidence of multicollinearity was found.

Results

The test results are mixed. Overall, there seems to be only modest support for the hypothesis that produce intermediaries in recent years have suffered financial stress because of increased procurement pressures from mass merchandisers. The analyses using the D&B data

are more supportive of the hypothesis than those using the RMA data, tables 2 and 3.

The trend model with D&B data shows some support for the hypothesis, table 2. The test is designed to see if the ratios conform to a trend over the study period. Congruous with the hypothesis, the coefficient for the TIME variable is positive and significant at the 0.01 level for the Total Liabilities to Net Worth ratio across all quartiles, a sign of increasing weakness.

The same pattern of increasing weakness is shown for ROA and RONW across all quartiles – negative TIME coefficients. However, the TIME coefficients for only the lower quartiles are significant at the 0.01 level for ROA and RONW. The only significant median quartile coefficient (ROA) is significant at the 0.05 level. The F-values are significant at the 0.01 level or better for all trend equations involving significant TIME coefficients, table 2.

Using RMA data, the TIME coefficients for the Debt to Net Worth ratio across all quartiles are not significant though the signs are as expected, table 3. The TIME coefficient for the ROA median quartile has the correct sign, negative, and is significant at the 0.05 level. The TIME coefficient for the upper quartile RONW is significant at the 0.10 level but has the wrong sign. The F-values for the two trend equations with significant TIME coefficients are significant at the 0.01 and 0.10 levels, respectively. All in all, the results for the test using RMA data are contradictory with no clear indication regarding the hypothesis, table 3.

The addition of ΔGDP to account for the business cycle seems to add little information. In the few equations where the ΔGDP coefficients are significant at least the signs are correct, tables 2 and 3.

In summary, the results using the two datasets (D&B and RMA) show mixed results regarding the financial strength of produce market intermediaries over the study period. For

additional insight an analysis of the census data is next.

Census Evidence

Using the census data, it is possible to shed light on the hypothesized decline in the

financial condition of produce market intermediaries by comparing the number of establishments

based on level of sales over the study period. The U.S. Census of Wholesale Trade

(Establishment and Firm Size) compiles economic data for different industries every five years.

The years used in this analysis are 1982, 1987, 1992, 1997, and 2002. Industries are classified

by SIC code (5148 represents fresh fruit and vegetable wholesale intermediaries) in 1982, 1987,

and 1992. For 1997 and 2002, the data are classified by NAICS code (424480). Census

categories of produce wholesalers include merchant wholesalers, who buy and take title to the

produce they sell, and agents, brokers, electronic marketers, commission merchants who collect

a commission or fee for arranging the sale of produce owned by others. It should be noted that

data reporting by level of sales for brokerage establishments/firms were discontinued after the

1997 census. Thus, the 2002 census contains data by level of sales for wholesale

establishments/firms only. The total number of wholesale and brokerage establishments and

corresponding sales continue to be reported (U.S. Department of Commerce, Bureau of the

Census, 1982 - 2002).

According to the hypothesis of this study, there should be a pattern of fewer and perhaps

larger wholesale firms over the study period. Increasing consolidation is supported by the works

of Calvin et al. (2001), Cook (2001), Handy et al. (2000), Kaufman et al. (2000), Richards and

Patterson (2003), and Sexton, Zhang, and Chalfant (2003).

The number of wholesale and brokerage establishments with lower sales (those under $5

million) declined 17.3% from 1982 to 1997, table 4. However, there was a large increase

(71.5%) in the number of establishments with sales of $5 million and over. Overall, the number

of establishments increased 8.1% from 1982 to 1997 and 5.5% with the period extended to 2002.

Apparently, the effects of inflation aside, smaller firms are growing and merging into larger

entities.

Inflation accounts for some of the movement from one sales class to another. This effect

is akin to that of income tax bracket creep from inflation. U.S. inflation was 85.3% from 1982 to

2002 (U.S. Department of Labor, Bureau of Labor Statistics 2007).

The results for merchant wholesaler establishments are similar to those for all

establishments, table 4. Although the number of smaller firms (those under $5 million)

decreased 13.6%, overall the number of establishments increased 14.8% from 1982 to

1997 and 13.2% with the period extended to 2002.

For agents brokers, electronic marketers, and commission merchants the data show a

different story, table 4. The number of establishments declined in every sales category except

the highest category, $25 million and over. For sales categories under $5 million the decline in

the number of establishments was 41.9% from 1982 to 1997. The decrease was about half that

for sales categories of $5 million and over. For all brokerage establishments the decline was

27.7% through 1997 and 35.2% through 2002.

The level of sales reflects the same pattern as the number of establishments, table 4.

For all firms real sales increased 30.3% from 1982 to 2002. This encompasses a large increase

in real wholesale sales, 44.1%, and a decrease in real brokerage sales of 14.4%.

Concentration ratios for wholesale and brokerage firms are presented in table 5 for the

study period. As can be seen, this is not a concentrated industry. The ratios are quite low

reflecting many firms without substantial market power. Though the concentrations are low,

brokerage firms are more concentrated than wholesale firms.

Concentration ratios for produce brokerage firms were discontinued after the 1997

census. However, from 1982 to 1997 the CR4 for produce brokerage firms actually declined

12.9% and the CR8 was unchanged for the same period. The CR20 and CR50 increased 10.7%

and 13.5%, respectively, for brokerage firms.

From 1982 to 1997, concentration increases for wholesale firms ranged from 12.2 to

16.7% with the highest increases for CR8 and CR20. However, adding the next census period,

2002, the changes were relatively substantial. From 1982 to 2002 the increases ranged from

29.7% to 53.8% with the highest increases for CR20 and CR50.

Conclusions

There is no convincing evidence that the market structure of the U.S. produce industry

has markedly changed over the study period. While supermarket concentration has increased

noticeably, the same cannot be said for produce market intermediaries such as brokers and

wholesalers. Increased vertical integration between retailers and packer-shippers via contracts

(marketing and production), obviating the need for market intermediaries, has not occurred.

There has not been an increase in produce contracting over the study period. Purported

increased monopsony power by retailers should have manifested in weakening financials for

market intermediaries over the study period. However, the financial analyses did not reveal clear

evidence to this end.

The census data allowed another view where the produce market intermediaries could be

largely delineated in two segments: brokerage versus wholesale firms. Both segments of this intermediary industry were not found to be concentrated, though the brokerage component was shown to be more concentrated than that of wholesalers. Overall, the number of establishments and real sales increased while market concentration increased mildly over the study period. However, when looking at brokerage firms specifically, the number of establishments and real sales declined.

It would appear that the wholesale component has been doing well servicing smaller retail food companies and the ever bourgeoning food service sector as the away-from-home market has continued to grow. Though the census data suggest that the produce brokerage business has experienced a mild decline in recent years, it is entirely plausible, because of produce market experience, that many of the produce wholesale firm entrants in recent years are former brokerage firms.

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Table 1. Description of Variables and Simple Statistics by Quartile of Financial Standing

Variable	Description	Min. Value	Max. Value	Mean	Std. Dev.
D&B[a]					
Total Liabilities to Net Worth	Total Liabilities/Net Worth (%)				
Quartile[b]					
Lower		216.70	346.20	257.88	8.84
Median		102.10	152.70	117.31	3.42
Upper		38.70	56.20	45.73	1.36
Return on Assets (ROA)	Net Profit after Taxes /Total Assets (%)				
Quartile[b]					
Lower		0.50	2.50	1.33	0.12
Median		3.10	6.10	5.17	0.21
Upper		9.00	15.20	13.11	0.37
Return on Net Worth (RONW)	Net Profit after Taxes/Net Worth (%)				
Quartile[b]					
Lower		1.70	5.50	3.71	0.27
Median		8.60	16.10	13.38	0.46
Upper		18.20	36.00	32.03	1.11
RMA[c]					
Debt to Net Worth	Total Liabilities/Net Worth				
Quartile[b]					
Lower		4.30	8.80	5.59	0.25
Median		1.90	2.70	2.20	0.05
Upper		0.90	1.20	1.09	0.02
Return on Assets (ROA)	Net Profit before Taxes/Total Assets (%)				
Quartile[b]					
Lower		0.20	2.00	1.03	0.13
Median		3.40	6.30	5.06	0.16
Upper		1.10	14.80	11.63	0.62
Return on New Worth (RONW)	Net Profit before Taxes/Net Worth (%)				
Quartile[b]					
Lower		1.30	8.60	4.70	0.41
Median		11.30	20.80	17.91	0.47
Upper		30.40	45.50	39.37	0.89
TIME	1984=1,1985=2,...,2003=20	1	20	10.50	1.33
ΔGDP	Percent change in GDP in 2000 dollars	-0.20	7.20	3.32	0.34

[a] Dun and Bradstreet.
[b] For each ratio, the lower quartile represents weak ratio values and the upper represents strong ratio values.
  Median represents the midpoint of ratio values.
[c] Robert Morris Associates.

Table 2. Ratio Model Coefficients for TIME and Percent Change in GDP by Quartile of Financial Standing
          with Dun and Bradstreet Data

Variable	Ratio								
	Total Liabilities to Net Worth			Return on Assets			Return on Net Worth		
	Quartile			Quartile			Quartile		
	Lower	Median	Upper	Lower	Median	Upper	Lower	Median	Upper
Intercept	208.5591	94.6275	33.4492	1.6742	4.7205	13.7974	3.9066	13.1125	32.9703
	(8.78)***	(13.79)***	(16.96)***	(6.29)***	(9.20)***	(9.81)***	(7.11)***	(8.08)***	(8.94)***
TIME	5.6864	2.4151	1.0375	-0.0650	-0.0720	-0.0999	-0.1356	-0.1308	-0.1705
	(3.79)***	(5.79)***	(8.82)***	(-4.06)***	(-2.27)**	(-1.16)	(-4.11)***	(-1.30)	(-0.78)
ΔGDP	-5.0729	-1.6887	0.0937	0.1346	0.4207	0.1529	0.4501	0.5846	0.3158
	(-1.08)	(-1.14)	(0.21)	(2.40)**	(3.96)***	(0.51)	(3.69)***	(1.74)	(0.38)
R^2	0.64	0.74	0.83	0.64	0.65	0.12	0.69	0.30	0.09
F-value	10.73***	18.38***	30.62***	11.00***	11.89***	0.91	14.43***	2.70	0.32

Note: n=20. The numbers in parentheses are t values and ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels,
respectively.

Table 3. Ratio Model Coefficients for TIME and Percent Change in GDP by Quartiles of Financial Standing with Robert Morris Associates Data

Variable	Ratio								
	Debt to Net Worth			Return on Assets			Return on Net Worth		
	Quartile			Quartile			Quartile		
	Lower	Median	Upper	Lower	Median	Upper	Lower	Median	Upper
Intercept	6.0228	2.1797	1.0088	0.4593	4.8854	8.1374	2.7287	17.5471	33.5741
	(6.92)***	(14.50)***	(15.62)***	(0.90)	(12.91)***	(4.51)***	(1.49)	(13.28)***	(10.41)***
TIME	0.0375	0.0091	0.0016	0.0101	-0.0487	0.1033	0.0593	-0.0711	0.3461
	(0.84)	(1.23)	(0.49)	(0.36)	(-2.66)**	(1.19)	(0.52)	(-1.13)	(2.04)*
ΔGDP	-0.2501	-0.0223	0.0181	0.1378	0.2060	0.7276	0.3826	0.3398	0.6438
	(-1.48)	(-0.73)	(1.40)	(1.50)	(2.63)**	(1.94)*	(1.45)	(1.22)	(1.06)
R^2	0.22	0.14	0.11	0.20	0.50	0.25	0.37	0.25	0.25
F-value	2.35	1.11	1.00	1.55	7.70***	2.03	0.79	1.45	2.76*

Note: n=20. The numbers in parentheses are t values and ***, **, and * denote significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 4. Number of Establishments by Level of Sales and Sales for all Establishments, 1982-2002

Census Year & Intermediary Type	Sales Level ($ thous.)											Sales ($bil)[b]
	<100	100-249	250-499	500-999	1,000-2,499	2,500-4,999	5,000-9,999	10,000-24,999	≥25,000	Total	All[a]	
1982												
Wholesale	220	354	473	635	999	728	503	308	78	4,298	4,769	19.2
Broker	60	26	42	75	150	162	133	93	41	782	895	5.9
Total	280	380	515	710	1,149	890	636	401	119	5,080	5,664	25.1
1987												
Wholesale	141	294	446	590	967	774	634	434	143	4,423	4,945	20.8
Broker	17	24	37	69	173	182	156	110	62	830	893	6.0
Total	158	318	483	659	1,140	958	790	544	205	5,253	5,838	26.8
1992												
Wholesale	113	208	361	553	986	816	734	563	246	4,580	5,293	22.7
Broker	9	23	20	47	105	109	127	106	64	610	710	4.8
Total	122	231	381	600	1,091	925	861	669	310	5,190	6,003	27.4
1997												
Wholesale	102	246	377	539	921	761	773	642	356	4,717	5,474	25.2
Broker	13	27	20	42	101	96	80	79	52	510	647	3.7
Total	115	273	397	581	1,022	857	853	721	408	5,227	6,121	28.8
2002												
Wholesale	115	255	356	514	880	750	679	652	443	4,644	5,397	27.6
Broker[c]											580	5.1
Total											5,977	32.7

[a] All – includes full and partial year establishments.
[b] Sales for all establishments by census year are in 1982-84 dollars.
[c] Number of establishments not available by level of sales.
Source: U.S. Bureau of the Census of Wholesale Trade.

Table 5. Sales and Concentration Ratios by Largest Firms, 1982-2002

Census Year & Intermediary Type	Level of Sales ($ mil.) And Concentration Ratios			
	CR4 (4 largest firms)	CR8 (8 largest firms)	CR20 (20 largest firms)	CR50 (50 largest firms)
1982				
Wholesaler	1,362.4 (7.4)	1,888.1 (10.2)	2,685.4 (14.5)	3,999.7 (21.6)
Broker	834.2 (14.7)	1,144.8 (20.2)	1,748.1 (30.8)	2,640.9 (46.6)
All	1,410.8 (5.8)	2,364.5 (9.8)	3,434.3 (14.2)	5,049.9 (20.9)
1987				
Wholesaler	2,100.1(8.9)	2,602.0 (11.0)	3,643.0 (15.4)	D (D)
Broker	1,070.2 (15.6)	1,472.8 (21.5)	2,196.3 (32.1)	3,282.4 (48.0)
All	2,566.4 (8.4)	3,206.0(10.5)	4,516.5 (14.8)	6,563.3 (21.6)
1992				
Wholesaler	2,549.6 (8.0)	3,809.9 (12.0)	5,389.8 (17.0)	7,808.7 (24.6)
Broker	1,069.3 (15.9)	D (D)	2,257.1 (33.5)	3,334.5 (49.6)
All	2,763.4 (7.2)	4,345.1 (11.3)	6,055.2 (15.7)	8,854.0 (23.0)
1997				
Wholesaler	3,868.3 (8.3)	5,502.9 (11.9)	7,827.6 (16.9)	11,241.9 (24.3)
Broker	760.1 (12.8)	1,199.3 (20.2)	2,018.0 (34.1)	3,133.1 (52.9)
2002[a]				
Wholesaler	4,768.0 (9.6)	6,857.7(13.8)	11,081.5 (22.3)	15,447.2 (31.1)

[a] Not available for produce brokers.
Note: Numbers in parentheses indicate market share or sales as percentage of industry sales.
Source: U.S. Bureau of the Census of Wholesale Trade.