The Persistence of Profitability in the Food and Agribusiness Sector

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Introduction

The food production, processing, wholesale distribution, and retailing system is an important component of the U.S. economy accounting for 12.8% of U.S. GDP in 2000. Harris et al. recently noted that the level of vertical coordination has intensified in certain U.S. agricultural sectors, with producers actively participating in contracting and integration (e.g., U.S. Premium Beef, Dakota Growers Pasta, South Dakota Soybean Processors, etc.).[1] This has led public universities in many states to become involved in business development and value added research.[2] Many of the business plans and feasibility studies of these value added businesses are based on the assumption that the existing industry structure is somehow conducive to a new entrant such as a producer-owned business (e.g., above-average profits are being made by existing firms) or that the producer-owned business can meet an unmet consumer demand (i.e., leaner beef products, fewer split dry beans in salads, etc.) by using unique inputs made by these producers.[3] Furthermore, some existing large cooperatives (e.g., Farmland Industries, Tri Valley, CHS Cooperatives, Land O'Lakes) restructured their business portfolios to diversify and attain more profits through diversification.

The ability of some firms to persistently earn higher returns has been widely studied (ex., Mueller). Industrial economists have long treated the industry or market as the unit of analysis to explain the source of persistent profitability. Interindustry empirical work has suggested the importance of the structure of the industry in determining member firm profitability. According to the industry structure view (henceforth referred to as INDUSTRY view), some industries have structural characteristics that deter entry, encourage product differentiation, or limit competition

among rival members (e.g., Caves and Porter; Waring; Schmalensee). These industry characteristics may include economies of scale, excess capacity, capital-intensity, advertising intensity, degree of vertical integration, and degree of product differentiation within the industry. From this INDUSTRY view, firm profitability of firms within an industry can and do vary; however, the industry commonality can increase the average profitability.

An opposing view suggests that performance differs across firms as the result of differences in efficiency due to unique resources and capabilities that are long-lived and difficult to imitate (Conner). Dierickx and Cool make a distinction between resource stocks and flows, where strategic stocks, those necessary for sustainable competitive advantage, are developed internally and are nontradeable, nonimitable and nonsubstitutable. Proponents of the firm specific resource (henceforth referred to as FIRM view) view industry structure as unimportant, relative to a firm's resources, because firm specific resources, whether individual or collective, contribute to differences in inter-firm profitability.

The objective of this study is to analyze firm profitability in the food and agribusiness sector and determine whether industry structure or firm-specific components of firm profits are more persistent within this sector. In this study we evaluate the persistence of incremental industry, business-specific (firm), and corporate-parent effects on firm profitability in the food and agribusiness sector.

The results from this research have important implications for a producer interested in investing in a value added business. If industry effects are more persistent then it is important for producers considering investments in this industry to have an

understanding of industry competition and the source and extent of its profits. A potential entrant also needs to understand how a new entry would impact the current industry structure. If business-specific effects are more persistent, then knowledge and understanding of potential rival firms' competitive advantage are important to producers interested in investing in a value added business. An investor may want to determine whether the potential business has unique resources or capabilities that would be difficult for others to imitate. In reality, both are important for any business. However, the degree of importance is valuable information.

Background Information

Prior empirical studies that analyzed the source of firm profitability have focused primarily on the manufacturing sector and are inconsistent in their view of the source and persistence of firm profits. Literature that supports the INDUSTRY view includes Caves and Porter, Schmalensee; Waring; and McGahan and Porter. In contrast, there is literature that supports the FIRM view, including work by Rumelt; Dierickx and Cool; Mahoney and Pandian; and Brush, Bromiley, and Hendrickx. These studies, supporting both INDUSTRY and FIRM views, have focused on aggregate industry data rather than individual sector data. With the exception of McGahan and Porter, these studies used cross sectional data for a small time period Our study is unique in that it focuses on firms in one subsector, Kinsey's "food economy," which we further subdivide into four unique sectors, processing, wholesale, retail, and restaurant; and we use cross sectional data over a longer period of time (1980 to 2001).

We use the framework of McGahan and Porter to determine the persistence of profits in the food and agribusiness sector. Similar to that study, we use Standard and

Poors Computstat Business-Segment reports, except we only include business-units that report results under the food and agribusiness SIC codes as described in Appendix A. Persistence is defined as the percentage of a firm's economic rent in a previous period that systematically remains in the current period. A business-segment is defined as the portion of a company's operations reported under a single four-digit SIC code. For example, one firm may have operations in different industries.[4] Rather than use the aggregated data for all industries, we use the specific segment data for each industry. Thus, industries and corporations are sets of business-segments and have one or more business segments. In addition to estimating average persistence rates across all food and agribusiness segments, we estimate average persistence rates by four major food and agribusiness industry sectors chosen because they comprise the principal components of the food economy.

Theoretical Background and Framework

Our analysis of profitability in the food and agribusiness sector is based on estimating industry, business-specific, and corporate effects on firm profitability between 1980 and 2001. Then, by separating these effects into fixed and incremental components, we distinguish sources of firm profitability associated with circumstances preceding the period under study (fixed effects) from those that arose during the period under study (incremental effects). We cannot determine whether prior industry structure or business-specific efficiencies contribute to the fixed components of firm profitability. However, we determine the bounds of the incremental effects generated during the period under study that arose due to industry or business-specific characteristics. Incremental effects that are lasting during the period under study may become a source of later fixed effects.

Therefore, persistence provides direct insight as to the sustainability in the incremental components of profitability and the potential impact on future fixed effects.

The INDUSTRY and FIRM proponents have different views about the relative rates of persistence in industry and business-specific effects. According to the INDUSTRY proponents, industry structural characteristics such as economies of scale, capital intensity, and degree of vertical integration are relatively stable compared to the performance of individual firms. Since the industry structure is viewed as comparatively stable, incremental industry effects should last longer and be more persistent than incremental business-specific effects.

In contrast, the FIRM proponents suggest that business-specific resources and capabilities that are long-lived and difficult to imitate contribute to firm profitability. Examples of resources that accumulate over time and are difficult to emulate include reputation for quality, research and development capability, and customer loyalty. Resources that are unique to a business include human capital with firm-specific skills and knowledge that accumulates through on the job learning and training. Therefore, efficient high-achieving firms are able to maintain at least a portion of their competitive advantage over a period of time since the source of their advantage is exclusive and/or hard to emulate. Hence, business-specific effects should last longer and be more persistent than industry effects.

Both the INDUSTRY and FIRM views are applied to corporate effects that are relevant for firms that participate in more than one industry. Extending the logic of the INDUSTRY view, participation in more than one industry may generate opportunities for corporations that participate in multiple industries. According to the INDUSTRY view

these corporate effects are imitable by other diversified firms suggesting greater persistence in incremental industry effects than in incremental corporate effects. In contrast, extending corporate effects to the FIRM view suggests that diversification, if successful, reflects firm efficiencies due to a unique combination of resources that are difficult to emulate. Hence, the FIRM view implies greater persistence in incremental corporate effects than in incremental industry effects.

In order to distinguish the various components of firm profitability, as in McGahan and Porter, we model the profits of a business segment of a firm in each year as:

$$(1) \qquad \Pi_{i,k,t} = m + \sum_t g_t d_t + \sum_{i,t} a_{i,t} d_{i,t} + \sum_{k,t} b_{k,t} d_{k,t} + f_{i,k,t},$$

where $\Pi_{i,k,t}$ is the ratio of operating income to assets of the business segment in industry i for corporation k at time t; m is the average profit over all business segments in all years; g_t is the increment to profit shared by all business segments in year t; d_t is a binary variable equal to 1 if the observation applies to year t, 0 otherwise; $a_{i,t}$ and $b_{k,t}$ are industry and corporate effects respectively; $d_{i,t}$, is a binary variable equal to one if the variable applies to industry i at time t, 0 otherwise; $d_{k,t}$ is a binary variable equal to one if the variable applies to corporation k at time t, 0 otherwise; and $f_{i,k,t}$ is the residual that represents the increment to profit that is specific to the segment. If a corporation has only one segment, we assume there is no corporate effect.

Issues in Estimation

We estimate the coefficients in equation (1), by partitioning profitability into means by year, industry, and corporate effects. We partition the data using two different

approaches, which are distinct by the order in which means are obtained. To obtain the first set of estimates ("the first approach"), we first estimate m as the average profitability of all business-segment observations. Second, we obtain estimates of the year effects, g_t, from the averages of the residual profitability of business-segments at time *t* after subtracting m. Industry effects, $a_{i,t}$, are the averages of the profitability of business-segments at time *t* after subtracting both m and g_t. Corporate effects, $b_{k,t}$, are obtained from the averages of the profitability of segments at time *t* after subtracting m, g_t, and $a_{i,t}$. Segment effects, $f_{i,k,t}$, are the residual after subtracting all of the previously estimated effects, m, g_t, $a_{i,t}$, and $b_{k,t}$. Hence, the order in which means are obtained using the first approach is year, industry, corporate, and business-segment.

A second approach involves the partitioning of profit by estimating the means in a different order: year, corporate, business-segment, and industry, with the residual added to the business-segment effect. The estimates for the mean, m, and the year effects, g_t are estimated similar to the first set of estimates. The corporate effects, $b_{k,t}$, are the averages of the business-segment profitability after subtracting the mean and year effects. The stable segment effects are the averages over all years for a segment after subtracting the mean, year effects, and corporate effects. Yearly industry effects are the average of the business segment profitability after subtracting the mean, year, corporate and stable segment effect. Finally, the residual profits are added to the stable segment effects to obtain the overall segment effect.

Econometric Model and Estimation Procedures

By partitioning the profits using two distinct approaches, the estimates represent bounds on industry, corporate, and business segment effects. The effects that are introduced first in the estimation tend to capture the increment that is jointly determined. The first approach is more consistent with the INDUSTRY literature, and the second approach is more consistent with the FIRM literature. Using both sets of estimates, profits above or below the average for each business segment are given by

$$(2) \qquad r_{i,k,t} = \sum_t g_t d_t + \sum_{i,t} a_{i,t} d_{i,t} + \sum_{k,t} b_{k,t} d_{k,t} + f_{i,k,t},$$

where, $r_{i,k,t} = \Pi_{i,k,t} - m$, and all other variables are as previously specified in equation (1). Specification of profits above or below the average, $r_{i,k,t}$, as in equation (2) produce estimates of g_t, $a_{i,t}$, $b_{k,t}$, and $f_{i,k,t}$. This specification provides us with profit above or below the average for each observation that is attributable to the year, the industry-year, the corporation-year (if the business segment is part of a diversified corporation), and the specific business segment-year.

We characterize each of the effects in equation (2) as consisting of a fixed component and an incremental component. Using the same method as McGahan and Porter, we examine the first-order regressive process in the incremental components of the year, industry, business-segment, and corporate effect and denote the estimated autoregressive rates as the persistence of the incremental effects. This results in the following first-order autoregressive model which is estimated using OLS:

$$(3) \qquad r_{i,k,t} - r_{i,k,\underline{t}} = r_{i,k}(r_{i,k,t-1} - r_{i,k,\underline{t-1}}) + y_{i,k,t},$$

$$(4) \qquad g_{i,k,t} - g_{i,k,\underline{t}} = r_{YRi,k}(g_{i,k,t-1} - g_{i,k,\underline{t-1}}) + l_{i,k,t},$$

$$(5) \qquad a_{i,k,t} - a_{i,k,\underline{t}} = r_{INi,k}(a_{i,k,t-1} - a_{i,k,\underline{t-1}}) + u_{i,k,t},$$

(6) $b_{i,k,t} - b_{i,k,\underline{t}} = r_{CP,i,k}(b_{i,k,t-1} - b_{i,k,\underline{t-1}}) + x_{i,k,t}$, and

(7) $f_{i,k,t} - f_{i,k,\underline{t}} = r_{BS,i,k}(f_{i,k,t-1} - f_{i,k,\underline{t-1}}) + k_{i,k,t}$,

where $r_{i,k,\underline{t}} = (1/T)\sum_{t=1}^{T} r_{i,k,t}$ and $r_{i,k,\underline{t-1}} = (1/T)\sum_{t=0}^{T-1} r_{i,k,t}$. The variables g, a, b and f with an underline subscript can be interpreted similarly. The last term in each equation represents the residuals, which are assumed to be normally distributed with a zero mean. The parameters (persistence rates) to be estimated are $r_{i,k}$, $r_{YR,i,k}$, $r_{IN,i,k}$, $r_{CP,i,k}$, and $r_{BS,i,k}$, where the subscript YR, IN, CP, and BS denote, respectively, Year, Industry, Corporate, and Business Segment for the respective estimated persistence rates. Further explanation and complete derivation of the estimated model is shown in Appendix B.

Firm Efficiency and Industry Hypothesis

The formal hypothesis under the INDUSTRY and FIRM is related to the persistence of the incremental components of industry, corporate, and business segment effects. Proponents of the FIRM (INDUSTRY) suggest that there is greater (less) persistence in incremental segmental effects than in incremental industry effects, $r_{BS,i,k} > r_{IN,i,k}$. Also consistent with the FIRM (INDUSTRY) is that persistence in incremental corporate effects is greater (less) than persistence in incremental industry effects, $r_{CP,i,k} > r_{IN,i,k}$. We also hypothesize that industry, corporate, and segment persistence rates vary across the four food and agribusiness sectors previously described. Differences in market structure and firm-characteristics across sectors play a role in differences in persistence rates across sectors.

Data

Data for this study are obtained from the Standard and Poors Compustat Business-Segment Reports for business segments in the food and agribusiness sector for the 1980 to 2001 time period. This initial data set contains 9,844 observations in 86 different industries, of which 324 observations are excluded because they are the only corporation within its SIC classification. In order to calculate lagged effects, we eliminate the first observation on each business segment, leaving a total of 7,900 observations.

We consider only those segments with at least six years of data in estimating rates of persistence.[5] If we have less than six years of data on a business segment and that business segment is procyclical, we could have data between a trough and a peak in the business cycle. Thus, we exclude business segments with five years of data or less to avoid analyzing business segments that only have data between a low and a high, based on overall GDP growth and food share of U.S. GDP growth between 1980 and 2001 (U.S. Department of Commerce).

In the screened sample, the average business segment has $763.3 million in assets and a mean ratio of operating income to assets of 9.11% with a standard deviation of 16.12%. Average sizes and returns of business segments by major industry sectors and year are reported in table 1. Business segments are classified as high (low) performers if their profitability in a particular year is above (below) the median. Comparing assets and return by sector, the processing sector has the highest mean return of 11.4% and second highest assets of $1,060 million. In contrast, the restaurant sector has the lowest mean return of 5.8% and lowest assets of $312.9 million. Figure 1 presents average return on assets for each of the four sectors over the 1981 to 2001 time period. In general, there has been a downward trend in return on assets over this time period.

The data included in the estimation of persistence rates consist of 5,854 observations (74% of the screened data set), which consist of 524 different business segments. These business segments cover 57 industries, 465 corporations, of which 107 are diversified. The mean return on assets for the business segments included in the estimation of persistence rates is 10.39%.

Estimation

We use OLS to estimate persistence rates as specified in equations (3) through (7) for each business segment. However this results in biased estimates because the errors in yearly observations may not be independent. To correct for this bias, we add back the estimated amount of bias using Nickell's formula (e.g., Nickell's equation 17) to obtain unbiased estimates. Additionally, due to our interest in the four food and agribusiness industry sectors, we calculate average effects by the four major industry sectors previously described. Since rates of persistence are estimated for each business segment in our data set, we calculate an average across all business segments and across each of the four sectors in the food and agribusiness industries.

Estimated Effects

The estimated effects for all the business segments within the food and agribusiness industry and by the four major sectors are reported in table 2 (first approach) and table 3 (second approach). These two sets of estimates represent upper and lower bounds on industry, corporate, and segment effects. Table 2 reports effects that are estimated in an order that is most consistent with the INDUSTRY view, and table 3 shows effects that are estimated in an order that is most consistent with the FIRM view. The estimated effects

are obtained from the partitioning of equation (1) by the order described in the titles of the tables.

The averages are obtained by classifying segments as either low performers or high performers. Segments are classified as high (low) performers if their total profitability in a particular year is above (below) the mean, m. We pool the negative of effects for low performers with the effects of high performers to focus on deviations from the mean, regardless of their direction. The average absolute deviation from the mean for the total food and agribusiness industry is 9.04%. The average absolute deviation from the mean for the processing, wholesale, retail and restaurant sectors are 10.82%, 6.00%, 4.79%, and 9.19%, respectively. The estimates of g_t and $r_{i,k,t}$ are identical in tables 2 and 3 since the different order of introduction affect only the partitioning by industry, corporate and segment effects.

In tables 2 and 3, total segment effects of 6.10% and 7.14%, respectively, are larger than year, industry, and corporate effects combined. The average estimates of the fixed and incremental components of the effects for all business segments (all sectors) and by sector are shown in tables 2 and 3. The average fixed and incremental component for each effect sum to the mean listed in the table. The size of the fixed components is related to the length of the time series on a segment. The length of the average series influences the division of effects into fixed and incremental components and estimates of persistence rates. In our estimation of effects we have an average of 11.2 years per business segment, which causes the fixed components to include activity that would be estimated as incremental if our series were longer. For all business segments the average fixed component of the deviation of return from the mean is 9.98% and the average

incremental component is -0.94%. Incremental components are negative because the best fit in the regression for persistence rates results in imputed estimates of fixed components that are large on average. In table 3, the difference in the order of introduction in estimating the effects contributes to larger corporate and segment effects and smaller industry effects on average compared to the effects in table 2.

Results

Persistence rates, which are relevant for distinguishing between implications of the INDUSTRY and FIRM views, are reported in tables 4 (first approach) and 5 (second approach) under the two methods of estimation. We report results for the OLS estimates and the unbiased estimates. Note that the OLS estimates are lower than the unbiased estimates, since the bias added back to the OLS estimate is always negative when the estimate is greater than zero (Nickell). The OLS estimates are also more efficient then the unbiased estimates.

The estimated persistence rates in tables 4 and 5 are used to calculate t statistics for hypotheses tests between the industry, corporate, and segment effects. Note that the year effects are the same in both tables because they are introduced first under both approaches. Likewise the sum of the effects is the same because the order of introducing affects only the partitioning by type of effect. To formally compare persistence rates, we estimate a t-statistic for the distribution of differences between the pair of estimates for each business segment at the 0.10 significance level and report them in table 6. These tests are performed between industry and corporate persistence rates and industry and segment persistence rates.

Comparison of Persistence Rates within Sector and Over Time

The persistence rate for the incremental industry effect is estimated to be 22.33% to 38.08% on average for all business segments in total using the first approach (table 4). The incremental component of the corporate effect persists at an average rate of 5.64% to 10.02%, and the incremental component of the segment effect is estimated to persist at a rate of 19.66% to 35.07%. Incremental industry effects are more persistent than incremental corporate effects, $r_{IN,i,k} > r_{CP,i,k}$ for all business segments and for all four sectors (table 6). Industry effects also are more persistent than segment effects, $r_{IN,i,k} \leq r_{BS,i,k}$, for all business segments and for the processing and retail sectors (table 6). However, the reverse is true for the wholesale and restaurant sectors where we reject the null hypothesis for the restaurant sector and fail to reject the null hypothesis for the wholesale sector.

We use the second approach to conduct the same analysis as in the preceding paragraph by estimating persistence rates and calculating t-statistics. The estimated effects are reported in table 5 and the results of the hypothesis tests are reported in table 6. The persistence rate for the incremental industry effect is estimated to be 9.77% to 23.22% on average for all business segments in total. The incremental component of the corporate effect persists at a rate of 6.86% to 11.41%. The incremental component of the segment effect is estimated to persist at a rate of 19.03% to 34.39%. As in the first approach, incremental industry effects are more persistent than corporate effects for all sectors and for each of the four individual sectors. In contrast to the first approach, we find that segment effects are more persistent than industry effects for all sectors (t statistic

of -5.52). Furthermore, we reject the null hypothesis for the processing, wholesale and restaurant sectors at the 0.10 level.

In addition to comparing persistence rates within each sector, we compare the persistence rates across sectors to determine if there are differences across sectors. We construct a t-statistic (assuming unequal variance) comparing the means of the estimates across sectors at the 0.10 significance level (table 7). In total there are 36 comparisons made, with six comparisons made for the persistence rates of industry, corporate, and segment incremental effects under each method of estimation. For example, using the first approach the OLS industry persistence rates for the retail and restaurant sector are 57.11%, and 14.95%, respectively (table 4). The null hypothesis that we test is $r^{Retail}_{IN,i,k} \leq r^{Restaurant}_{IN,i,k}$, with a t-statistic of 13.7528. We reject the null hypothesis at the 0.10 significance level and conclude $r^{Retail}_{IN,i,k} > r^{Restaurant}_{IN,i,k}$.

Discussion

Incremental industry effects are more persistent than incremental corporate effects for total business segments and within each of the four sectors. Greater persistence in industry effects (INDUSTRY view) as compared to corporate effects suggests that the structure of the industry is more important than being a member of a diversified corporation as suggested by the FIRM view. This result is consistent with McGahan and Porter.

A second finding of note is that retail supermarket industry persistence rates are greater than retail corporate or segment persistence rates. This suggests that retail industry characteristics that contribute to profits last longer and are more persistent than

firm-specific effects. Industry persistence rates in the retail sector are greater and more long-lasting than similar persistence rates for processing, wholesale, and restaurant sectors. The retail sector has the largest industry persistence rates with ranges of 57.11% to 79.53% under the first approach and 41.11% to 58.74% under the second approach. Greater persistence in retail (as compared to processing and wholesale) industry persistence rates is consistent with structural characteristics of the retail industry that contribute to persistence in firm profitability as explained by INDUSTRY view proponents. Retail industry characteristics that support the industry view include large average firm size (see table 1), which may contribute to barriers of entry. Additionally, consolidation in the retail industry during the time period under study may be attributable to economies of scale, which could contribute to persistence in industry effects (Harris et al.). These results are consistent with Waring who found that capital intensity and economies of scale are significant factors in industry persistence rates.

Segment persistence rates for the retail and restaurant sector are greater than similar persistence rates for the wholesale and processing sectors. Firms within these two sectors have characteristics similar to the FIRM view. The retail and restaurant sector are "closer" to the consumer than both the wholesale and processing sectors, which may provide them greater ability to differentiate themselves as perceived by consumers.

Industry effects in the processing sector are more persistent over time than industry effects for the restaurant sector. In addition, corporate persistence rates for processing and wholesale are greater than similar rates for the restaurant sector. This suggests that industry characteristics of the processing sector and the characteristics of firms within that sector that contribute to profitability are more stable and long-lasting

than those of the restaurant sector. Greater asset capitalization in the processing sector as compared to the restaurant sector may be attributable to larger processing industry persistence rates. Lower persistence in restaurant industry effects is, in part, due to little diversification of business segments within this sector. Only 15% of the business segments within the restaurant sector were members of a diversified corporation as compared to 41%, 40% and 25% for the processing, wholesale and retail sectors, respectively. Firms within the restaurant sector have a low percentage of diversified firms since firms with multiple restaurants only report results in one SIC classification and therefore are not considered to be members of a corporate parent.

Segment persistence rates for the wholesale and restaurant sectors are greater than their respective industry persistence rates for the wholesale and restaurant sectors. This is a FIRM view result which suggests that firms in the wholesale and restaurant sectors have specific characteristics that contribute to persistent profitability that are longer-lasting than industry effects. Both the wholesale and restaurant sectors require less capitalization due to their lower average asset size, which may reduce barriers to entry (see table 1). Lower capitalization allows for greater entry and exit within these two industries which may cause less stability in industry effects as compared to segment effects.

Implications

The results have implications for proposed and existing value added ventures. Industry effects are greatest across all business segments and the processing sector. It is important, therefore, that producers understand the nature of competition in the industry

in which vertical integration is being considered. This knowledge must include information on industry profitability, how competitive advantage is created, the barriers to entry that exist in the industry, the bargaining power of buyers and suppliers, and the role of substitute products. For example, an alliance of beef producers interested in investing in a beef processing operation requires knowledge of the beef processing industry, how entry of a new firm within this industry would affect industry profits, and how the new operation would fit in the altered structure of the beef processing industry. Furthermore, the steering board of directors in these value added businesses need a solid understanding of the industry. Some, but not all, of this information is often presented in a business prospectus. Producers can also obtain such knowledge through hiring a manager that has intimate knowledge and a great deal of experience in this industry.

The retail supermarket sector has had relatively stable profits due to both industry and firm effects over time. This would suggest that the retail industry structure is conducive to stable profits and that firms within the industry are able to differentiate themselves, which also contributes to permanence of profits. Another way in which food retailers are differentiating themselves is through their own private brand name products, which may be perceived as better values, superior in quality to national brands, and unique to a particular store. Using their own brand name allows retailers to build customer loyalty and maintain a unique identity (Kinsey). Incumbent firms within the retail sector must differentiate themselves from rival firms in order to develop a unique competitive advantage.

Our results suggest that industry structure does not contribute to stable profits in the wholesale and restaurant sector. However, potential firms within the wholesale and

restaurant sectors would require less capital on average and there is more entry and exit in these sectors. New firms would need to analyze the market to determine what type of unique resources or offerings they have compared to existing rivals. For example, a group of North Dakota farmers is investing in a restaurant called "Agraria" that is to be located in Washington DC (Kolpak). Clearly a focused strategy is needed to ensure its success.

Industry effects are more persistent than corporate effects. In the past five years, several major food and agribusiness firms have restructured their portfolio of businesses in order to diversify the stream of earnings from their businesses (e.g., CHS Cooperatives, ConAgra, Farmland Industries, Koch Agriculture, Land O'Lakes, Tri Valley). Thus far, the results have not been all that successful with several large bankruptcies in recent years. Kinsey suggests that many food economy firms are becoming more integral and vertical rather than horizontal and modular due to changes in industry. Greater corporate effects are associated with businesses in industries characterized by horizontal and modular activities.

These implications are also of interest to land grant universities. Agribusiness economics research and extension programs exist at many land grant universities to educate producers and management about producer-owned businesses. Training and education programs aimed at producer-owned businesses should include information on how to analyze an industry, understand the competition within an industry, and assess the unique resources of firms within an industry that allow them to earn persistent profits.

Finally, persistence of profitability in certain firms has long been noted by economists. Further research is needed on identifying characteristics of those firms that contribute to their persistent profits.

Footnotes

[1]The Arthur Capper Cooperative Center in the Department of Agricultural Economics at Kansas State University has published over a dozen case studies documenting vertical integration by producers into durum milling and pasta manufacturing, tortilla manufacturing, high fructose corn syrup, sugar, par-baked grain products, pinto beans, soybean crushing, beef packing, and other industries. The U.S. Department of Agriculture has estimated that producers have invested over $2 billion in value added businesses in the past ten years.

[2]In recent years, at least seven major public universities (i.e., Iowa State, Kansas State, Missouri, Nebraska, North Dakota State, Oklahoma State, and Oregon State) have invested in "value added centers" that have sought to better coordinate the "post-harvest" research on meat and grain-based foods. These centers also include business development specialists with doctorates in agricultural economics whose charge is to determine how to market these products.

[3]The Agricultural Marketing Resource Center (whose library is housed at Iowa State University) and the Quenten Burdick Center (North Dakota State University) have many of these feasibility studies and business plans on file.

[4]For example, Nestle's corporate data is reported in SIC 2000 Food and Kindred Products. Its business segment data are reported in SIC 2023 Dry, Condensed and Evaporated Milk Products (called Milk Products by Nestle); SIC 2038 Frozen Specialties (called Prepared Dishes and Cooking Aids); SIC 2066 Chocolate and Cocoa Products (called Chocolate and Confectionary); and SIC 2095 Roasted Coffee (called Beverages).

[5] The following industries were eliminated due to the exclusion of business segments with less than 6 years of data: 2040, 2044, 2045, 2050, 2065, 2076, 2080, 2091, 2097, 5142, 5145, 5154, and 5461. This method of exclusion is similar to McGahan and Porter.

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Appendix A

SIC 20 Food and Kindred Products

Industry Group 201: Meat Products
- 2011 Meat Packing Plants
- 2013 Sausages And Other Prepared Meat Products
- 2015 Poultry Slaughtering And Processing

Industry Group 202: Dairy Products
- 2021 Creamery Butter
- 2022 Natural, Processed, And Imitation Cheese
- 2023 Dry, Condensed, And Evaporated Dairy Products
- 2024 Ice Cream And Frozen Desserts
- 2026 Fluid Milk

Industry Group 203: Canned, Frozen, And Preserved Fruits, Vegetables,
- 2032 Canned Specialties
- 2033 Canned Fruits, Vegetables, Preserves, Jams, And Jellies
- 2034 Dried And Dehydrated Fruits, Vegetables, And Soup Mixes
- 2035 Pickled Fruits And Vegetables, Vegetable Sauces And Seasonings, And
- 2037 Frozen Fruits, Fruit Juices, And Vegetables
- 2038 Frozen Specialties, Not Elsewhere Classified

Industry Group 204: Grain Mill Products
- 2041 Flour And Other Grain Mill Products
- 2043 Cereal Breakfast Foods
- 2044 Rice Milling
- 2045 Prepared Flour Mixes And Doughs
- 2046 Wet Corn Milling
- 2047 Dog And Cat Food
- 2048 Prepared Feeds And Feed Ingredients For Animals And Fowls, Except

Industry Group 205: Bakery Products
- 2051 Bread And Other Bakery Products, Except Cookies And Crackers
- 2052 Cookies And Crackers
- 2053 Frozen Bakery Products, Except Bread

Industry Group 206: Sugar And Confectionery Products
- 2061 Cane Sugar, Except Refining
- 2062 Cane Sugar Refining
- 2063 Beet Sugar
- 2064 Candy And Other Confectionery Products
- 2066 Chocolate And Cocoa Products
- 2067 Chewing Gum
- 2068 Salted And Roasted Nuts And Seeds

Industry Group 207: Fats And Oils
- 2074 Cottonseed Oil Mills
- 2075 Soybean Oil Mills
- 2076 Vegetable Oil Mills, Except Corn, Cottonseed, And Soybean
- 2077 Animal And Marine Fats And Oils

2079 Shortening, Vegetable Oils, Margarine, And Other Edible Fats And Oils,
Industry Group 208: Beverages
2082 Malt Beverages
2083 Malt
2084 Wines, Brandy, And Brandy Spirits
2085 Distilled And Blended Liquors
2086 Bottled And Canned Soft Drinks And Carbonated Waters
2087 Flavoring Extracts And Flavoring Syrups, Not Elsewhere Classified
Industry Group 209: Miscellaneous Food Preparations And Kindred
2091 Canned And Cured Fish And Seafoods
2092 Prepared Fresh Or Frozen Fish And Seafoods
2095 Roasted Coffee
2096 Potato Chips, Corn Chips, And Similar Snacks
2097 Manufactured Ice
2098 Macaroni, Spaghetti, Vermicelli, And Noodles
2099 Food Preparations, Not Elsewhere Classified

SIC 51 Wholesale Trade- Nondurable Goods

Industry Group 514: Groceries And Related Products
5141 Groceries, General Line
5142 Packaged Frozen Foods
5143 Dairy Products, Except Dried Or Canned
5144 Poultry And Poultry Products
5145 Confectionery
5146 Fish And Seafoods
5147 Meats And Meat Products
5148 Fresh Fruits And Vegetables
5149 Groceries And Related Products, Not Elsewhere Classified
Industry Group 515: Farm-product Raw Materials
5153 Grain And Field Beans
5154 Livestock
5159 Farm-product Raw Materials, Not Elsewhere Classified

SIC 54 Food Stores

Industry Group 541: Grocery Stores
5411 Grocery Stores
Industry Group 542: Meat And Fish (seafood) Markets, Including
5421 Meat And Fish (seafood) Markets, Including Freezer Provisioners
Industry Group 543: Fruit And Vegetable Markets
5431 Fruit And Vegetable Markets
Industry Group 544: Candy, Nut, And Confectionery Stores
5441 Candy, Nut, And Confectionery Stores
Industry Group 545: Dairy Products Stores
5451 Dairy Products Stores

Industry Group 546: Retail Bakeries
5461 Retail Bakeries
Industry Group 549: Miscellaneous Food Stores
5499 Miscellaneous Food Stores

SIC 58 Eating and Drinking Places

Industry Group 581: Eating And Drinking Places
5812 Eating Places

Appendix B

Following previous studies (Waring; McGahan and Porter), we characterize the above or below average profit, $r_{i,k,t}$, and each of the effects in equation (2) as consisting of a fixed component and an incremental component:

(A.1) $r_{i,k,t} = f^{r}_{i,k} + g^{r}_{i,k,t}$,

(A.2) $g_{i,k,t} = f^{g}_{i,k} + g^{g}_{i,k,t}$,

(A.3) $a_{i,k,t} = f^{a}_{i,k} + g^{a}_{i,k,t}$,

(A.4) $b_{i,k,t} = f^{b}_{i,k} + g^{b}_{i,k,t}$,

(A.5) $f_{i,k,t} = f^{f}_{i,k} + g^{f}_{i,k,t}$,

where $f^{f}_{i,k}$ is the fixed component of the segment effect, and $g^{f}_{i,k}$ is the incremental component of the segment effect. (Other variables can be interpreted similarly). The fixed component represents the average amount by which the effect differs from zero over the entire period that the segment is included in the data set. The incremental component is the amount of the effect in year *t* that only arises in that particular year. Both the fixed and incremental components of any of the effects may differ across business segments.

We examine the first-order regressive process in the incremental components of the year, industry, business-segment, and corporate effect and denote the estimated autoregressive rates as the persistence of the incremental effects. This specification in the incremental components of the effects can be shown by the following equations:

(A.6) $g^{r}_{i,k,t} = r_{i,k} g^{r}_{i,k,t-1} + e^{r}_{i,k,t}$,

(A.7) $g^{g}_{i,k,t} = r_{YR,i,k} g^{g}_{i,k,t-1} + e^{g}_{i,k,t}$,

(A.8) $g^{a}_{i,k,t} = r_{IN,i,k} g^{a}_{i,k,t-1} + e^{a}_{i,k,t}$,

(A.9) $g^{b}_{i,k,t} = r_{CP,i,k} g^{b}_{i,k,t-1} + e^{b}_{i,k,t}$,

(A.10) $g^{f}_{i,k,t} = r_{BS,i,k} g^{f}_{i,k,t-1} + e^{f}_{i,k,t}$,

where $r_{i,k}$, $r_{YR,i,k}$, $r_{IN,i,k}$, $r_{CP,i,k}$, and $r_{BS,i,k}$ are the persistence rates and the terms $e^{r}_{i,k,t}$, $e^{g}_{i,k,t}$, $e^{a}_{i,k,t}$, $e^{b}_{i,k,t}$, and $e^{f}_{i,k,t}$ are random shocks that are normally distributed with zero mean. In each equation, persistence is the proportion of the incremental component at time *t*-1 that systematically remains at time *t*. No restrictions are placed on the fixed or incremental components, so either component can be negative. This general specification allows for the persistence of an incremental component to carry over more than one year.

Further derivation of the model requires substitution of lagged values in equations (A.1) through (A.5) into equations (A.6) through (A.10), and then substitution of the resulting expressions into equations (A.1) through (A.5) to obtain the following equations:

(A.11) $r_{i,k,t} = h_{i,k} + r_{i,k} r_{i,k,t-1} + y_{i,k,t}$,

(A.12) $g_{i,k,t} = h^{g}_{i,k} + r_{YR,i,k} g_{i,k,t-1} + l_{i,k,t}$,

(A.13) $a_{i,k,t} = h^{a}_{i,k} + r_{IN,i,k} a_{i,k,t-1} + u_{i,k,t}$,

(A.14) $b_{i,k,t} = h^{b}_{i,k} + r_{CP,i,k} b_{i,k,t-1} + x_{i,k,t}$,

(A.15) $f_{i,k,t} = h^{f}_{i,k} + r_{BS,i,k} f_{i,k,t-1} + k_{i,k,t}$,

where the intercept term is a function of the fixed component and the rate of persistence. For example, the intercept term in equation (A.15) is $(1-r_{BS,i,k})\,f^{f}_{i,k}$. Similar interpretations of the constant terms in equations (A.11) through (A.14) can be made.

Further derivation of the model requires subtracting the time means of equations (A.11) through (A.15) from themselves. This results in the following first-order autoregressive model which is identical to equations (3) – (7) and can be estimated using OLS:

(A.16) $r_{i,k,t} - r_{i,k,\underline{t}} = r_{i,k}(r_{i,k,t-1} - r_{i,k,\underline{t-1}}) + y_{i,k,t}$,

(A.17) $g_{i,k,t} - g_{i,k,\underline{t}} = r_{YR,i,k}(g_{i,k,t-1} - g_{i,k,\underline{t-1}}) + l_{i,k,t}$,

(A.18) $a_{i,k,t} - a_{i,k,\underline{t}} = r_{IN,i,k}(a_{i,k,t-1} - a_{i,k,\underline{t-1}}) + u_{i,k,t}$,

(A.19) $b_{i,k,t} - b_{i,k,\underline{t}} = r_{CP,i,k}(b_{i,k,t-1} - b_{i,k,\underline{t-1}}) + x_{i,k,t}$,

(A.20) $f_{i,k,t} - f_{i,k,\underline{t}} = r_{BS,i,k}(f_{i,k,t-1} - f_{i,k,\underline{t-1}}) + k_{i,k,t}$,

where $r_{i,k,\underline{t}} = (1/T)\sum_{t=1}^{T} r_{i,k,t}$, $r_{i,k,\underline{t-1}} = (1/T)\sum_{t=0}^{T-1} r_{i,k,t}$ (The variables g, a, b and f with an underline subscript can be interpreted similarly), and the last term in each equation are the residuals which are assumed to be normally distributed with zero mean. The parameters (persistence rates) to be estimated are $r_{i,k}$, $r_{YR,i,k}$, $r_{IN,i,k}$, $r_{CP,i,k}$, and $r_{BS,i,k}$. Thus, the fixed and incremental components in equations (A.1) through (A.5) can be derived from persistent rates that are estimated in equations (A.16) through (A.20).

Table 1. Business Segment Assets and Profitability by Industry Sector and Year

	All Business Segments			High Performers[b]			Low Performers[c]		
	N	Avg. Assets ($mil)	Avg. Profit (%)[a]	N	Avg. Assets ($mil)	Avg. Profit (%)[a]	N	Avg. Assets ($mil)	Avg. Profit (%)[a]
Sectors									
All	7900	763.3	9.11%	3950	960.08	19.1%	3950	566.6	-0.9%
Processing	3746	1,060.0	11.4%	2154	1,149.3	21.1%	1592	939.1	-1.6%
Wholesale	910	355.6	8.2%	382	414.0	17.1%	528	313.3	1.8%
Retail	962	1,062.5	8.8%	437	1,400.1	14.9%	525	781.4	3.7%
Restaurant	2282	312.9	5.8%	977	559.6	17.6%	1305	128.2	-2.9%
Year									
1981	483	224.3	12.7%	308	252.4	19.7%	175	174.7	0.5%
1982	449	244.5	11.6%	266	275.5	19.3%	183	199.3	0.3%
1983	449	298.8	12.4%	264	374.3	20.6%	185	191.0	0.7%
1984	465	307.2	11.1%	262	382.0	20.6%	203	210.6	-1.1%
1985	437	346.5	9.8%	231	435.6	20.5%	206	246.5	-2.2%
1986	416	482.6	8.6%	202	559.6	20.0%	214	409.9	-2.2%
1987	407	857.1	8.2%	200	1,359.4	20.4%	207	371.8	-3.6%
1988	401	653.5	7.9%	190	803.7	19.5%	211	518.2	-2.5%
1989	388	785.8	8.6%	186	890.2	18.6%	202	689.7	-0.7%
1990	386	834.5	9.0%	183	928.5	19.0%	203	749.7	-0.1%
1991	395	855.6	8.3%	206	882.8	17.9%	189	825.9	-2.1%
1992	404	950.4	8.3%	200	1,070.6	17.9%	204	832.7	-1.2%
1993	441	783.1	7.8%	206	1,086.4	18.3%	235	517.1	-1.4%
1994	254	1,035.9	9.5%	123	1,597.2	17.3%	131	508.9	2.2%
1995	302	1,057.4	7.5%	129	1,732.3	17.2%	173	554.1	0.2%
1996	255	1,058.9	7.4%	107	1,610.2	16.8%	148	660.4	0.6%
1997	298	1,176.6	7.6%	135	1,845.3	17.4%	163	622.7	-0.5%
1998	303	1,239.2	8.1%	133	1,660.7	17.5%	170	909.5	0.8%
1999	322	1,232.3	8.3%	145	1,799.3	18.7%	177	767.8	-0.2%
2000	356	1,325.3	6.0%	140	1,914.4	19.5%	216	943.4	-2.7%
2001	289	1,491.0	9.0%	134	1,923.8	20.3%	155	1,116.8	-0.7%

[a]Average ratio of operating income to assets as a percentage.
[b]Business segments with profit above the median.
[c]Business segments with profit below the median.

Table 2. Pooled Estimated Effects in Percentage under the First Approach (Order of Introduction: Year, Industry, Corporate, Segment)

	Year g_t	Industry $a_{i,t}$	Corporate[a] $b_{k,t}$	Segment $f_{i,k,t}$	Sum $r_{i,k,t}$
All sectors:					
Mean[b]	0.10	1.88	0.96	6.10	9.04
Standard Deviation[c]	1.74	7.01	4.41	10.42	10.69
Avg. Fixed Component[d]	0.93	2.14	2.03	4.12	9.98
Avg. Incremental Component[d]	-0.83	-0.26	-1.07	1.98	-0.94
Processing:					
Mean[b]	0.02	3.78	1.32	5.70	10.82
Standard Deviation[c]	1.75	9.03	4.99	11.58	12.25
Avg. Fixed Component[d]	1.81	4.18	3.41	2.07	13.21
Avg. Incremental Component[d]	-1.79	-0.41	-2.09	3.63	-2.39
Wholesale:					
Mean[b]	0.20	1.04	0.70	4.06	6.00
Standard Deviation[c]	1.70	6.31	3.59	7.93	7.75
Avg. Fixed Component[d]	-0.56	1.47	0.80	0.01	5.71
Avg. Incremental Component[d]	0.76	-0.42	-0.10	4.05	0.30
Retail:					
Mean[b]	0.00	0.20	0.13	4.46	4.79
Standard Deviation[c]	1.80	2.32	2.62	4.70	4.26
Avg. Fixed Component[d]	-0.52	0.21	0.92	7.90	5.14
Avg. Incremental Component[d]	0.52	-0.01	-0.79	-3.44	-0.35
Restaurant:					
Mean[b]	0.25	-0.03	0.84	8.13	9.19
Standard Deviation[c]	1.69	3.25	4.28	10.72	10.19
Avg. Fixed Component[d]	0.74	0.05	0.81	7.12	8.60
Avg. Incremental Component[d]	-0.49	-0.08	0.03	1.01	0.59

[a]Corporate effects are means of all corporations and not just diversified corporations.
[b]Pooled mean of estimated effects for business segments with returns above the mean with the negative of the estimated effects for business segments with returns below the mean.
[c]Standard deviation of the estimated difference from the mean.
[d]The mean fixed and incremental components are derived using equations from which equations (3) through (7) are derived. Both the fixed and incremental components are means of all corporations and sum to the overall mean.

Table 3. Estimated Effects in Percentage under the Second Approach (Order of Introduction: Year, Corporate, Segment, Industry)

	Year g_t	Industry $a_{i,t}$	Corporate[a] $b_{k,t}$	Segment $f_{i,k,t}$	Sum $r_{i,k,t}$
All Sectors:					
Mean[b]	0.10	0.47	1.33	7.14	9.04
Standard Deviation[c]	1.74	3.26	5.03	10.60	10.69
Avg. Fixed Component[d]	0.93	0.46	1.42	7.04	9.98
Avg. Incremental Component[d]	-0.83	0.01	-0.09	0.10	-0.94
Processing:					
Mean[b]	0.02	0.81	2.06	7.92	10.82
Standard Deviation[c]	1.75	4.22	5.94	11.93	12.25
Avg. Fixed Component[d]	1.81	0.83	1.84	7.57	13.21
Avg. Incremental Component[d]	-1.79	-0.02	0.23	0.36	-2.39
Wholesale:					
Mean[b]	0.20	0.52	0.87	4.42	6.00
Standard Deviation[c]	1.70	4.05	3.21	7.40	7.75
Avg. Fixed Component[d]	-0.56	0.44	1.49	4.23	5.71
Avg. Incremental Component[d]	0.76	0.08	-0.62	0.18	0.30
Retail:					
Mean[b]	0.00	0.12	0.11	4.56	4.79
Standard Deviation[c]	1.80	1.40	2.52	4.72	4.26
Avg. Fixed Component[d]	-0.52	0.06	1.15	4.86	5.14
Avg. Incremental Component[d]	0.52	0.06	-1.04	-0.30	-0.35
Restaurant:					
Mean[b]	0.25	0.09	0.86	7.99	9.19
Standard Deviation[c]	1.69	0.92	4.65	10.85	10.19
Avg. Fixed Component[d]	0.74	0.08	0.86	8.14	8.60
Avg. Incremental Component[d]	-0.49	0.00	0.01	-0.16	0.59

[a]Corporate effects are means of all corporations and not just diversified corporations.
[b]Pooled mean of estimated effects for business segments with returns above the mean with the negative of the estimated effects for business segments with returns below the mean.
[c]Standard deviation of the estimated difference from the mean.
[d]The mean fixed and incremental components are derived using equations from which equations (3) through (7) are derived. Both the average fixed and average incremental components are means of all corporations and sum to the overall mean.

Table 4. Persistence Rates in Percentage (Order of Introduction: Year, Industry, Corporate, Segment)

	Year	Industry	Corporate[a]	Segment	Sum
Symbol	$r_{YR,i,k}$	$r_{IN,i,k}$	$r_{CP,i,k}$	$r_{BS,i,k}$	$r_{i,k}$
All Sectors:					
Avg. Estimate:					
Unbias., OLS[b]	22.98, 40.30	22.33, 38.08	5.64, 10.02	19.66, 35.07	27.41, 44.36
Standard Error:					
Unbias., OLS [c]	25.17, 23.57	31.11, 30.36	9.36, 9.15	31.41, 3.068	28.99, 28.00
Avg. R-squared[d]	0.52	0.24	0.21	0.25	0.33
Processing:					
Avg. Estimate:					
Unbias., OLS[b]	22.89, 40.14	21.62, 37.58	7.43, 13.27	16.00, 30.86	24.38, 40.59
Standard Error:					
Unbias., OLS [c]	25.20, 2360	30.20, 29.46	12.55, 12.26	31.59, 30.94	28.64, 27.75
Avg. R-squared[d]	0.52	0.23	0.21	0.23	0.30
Wholesale:					
Avg. Estimate:					
Unbias., OLS[b]	21.80, 39.29	9.09, 22.61	7.07, 12.13	11.39, 25.81	26.66, 45.83
Standard Error:					
Unbias., OLS [c]	25.84, 24.27	33.82, 33.38	12.05, 1188	34.54, 33.90	32.13, 30.91
Avg. R-squared[d]	0.48	0.146	0.15	0.20	0.31
Retail:					
Avg. Estimate:					
Unbias., OLS[b]	36.78, 55.70	57.11, 79.53	4.35, 7.79	30.47, 46.59	30.57, 46.77
Standard Error:					
Unbias., OLS [c]	23.35, 21.58	22.15, 20.20	7.35, 7.22	29.01, 28.18	28.82, 27.94
Avg. R-squared[d]	0.59	0.64	0.20	0.32	0.32
Restaurant:					
Avg. Estimate:					
Unbias., OLS[b]	18.29, 35.03	14.95, 28.65	2.89, 5.13	24.13, 40.49	31.12, 46.86
Standard Error:					
Unbias., OLS [c]	25.58, 24.02	34.95, 34.53	4.25, 4.14	30.92, 30.05	28.44, 27.35
Avg. R-squared[d]	0.51	0.13	0.27	0.27	0.35

[a]Corporate effects are means of all corporations and not just diversified corporations.
[b]The estimates are means of the estimates on each segment.
[c]The standard error is the mean of the standard error of each segment estimate.
[d]This measure is the mean R-square in the OLS regression on each segment.

Table 5. Persistence Rates in Percentage (Order of Introduction: Year, Corporate, Segment, Industry)

	Year	Industry	Corporate	Segment	Sum
Symbol	$r_{YR,i,k}$	$r_{IN,i,k}$	$r_{CP,i,k}$	$r_{BS,i,k}$	$r_{i,k}$
All Sectors:					
Avg. Estimate:					
Unbias., OLS[b]	22.98, 40.30	9.77, 23.22	6.86, 11.41	19.03, 34.39	27.41, 44.36
Standard Error:					
Unbias., OLS [c]	25.05, 23.57	32.11, 31.62	8.85, 27.92	30.51, 29.76	28.99, 28.00
Avg. R-squared[d]	0.52	0.13	0.08	0.25	0.32
Processing:					
Avg. Estimate:					
Unbias., OLS[b]	22.89, 40.14	7.28, 20.39	8.26, 14.33	12.33, 26.29	24.38, 40.59
Standard Error:					
Unbias., OLS [c]	25.20, 23.60	31.36, 30.85	11.68, 27.84	30.24, 29.65	28.64, 27.75
Avg. R-squared[d]	0.52	0.15	0.11	0.21	0.30
Wholesale:					
Avg. Estimate:					
Unbias., OLS[b]	21.80, 39.29	3.82, 16.93	9.41, 14.67	13.77, 29.64	26.66, 45.83
Standard Error:					
Unbias., OLS [c]	25.84, 24.27	34.15, 33.66	11.09, 27.43	34.64, 33.89	32.13, 30.91
Avg. R-squared[d]	0.48	0.15	0.08	0.21	0.31
Retail:					
Avg. Estimate:					
Unbias., OLS[b]	36.78, 55.70	41.11, 58.74	7.79, 11.48	31.85, 48.16	30.57, 46.77
Standard Error:					
Unbias., OLS [c]	23.35, 21.58	32.47, 31.70	7.59, 30.28	28.99, 28.13	28.82, 27.94
Avg. R-squared[d]	0.59	0.30	0.07	0.32	0.32
Restaurant:					
Avg. Estimate:					
Unbias., OLS[b]	18.29, 35.03	3.78, 16.28	3.44, 5.73	26.31, 43.27	31.12, 46.86
Standard Error:					
Unbias., OLS [c]	25.58, 24.02	32.39, 32.02	4.20, 27.21	30.01, 29.05	28.44, 27.35
Avg. R-squared[d]	0.51	0.04	0.04	0.30	0.35

[a]Corporate effects are means of all corporations and not just diversified corporations.
[b]The estimates are means of the estimates on each segment.
[c]The standard error is the mean of the standard error of each segment estimate.
[d]This measure is the mean R-square in the OLS regression on each segment.

Table 6. Estimated t-statistics Comparing Persistence Rates Within Sectors

Industry vs. Corporate

	First Approach			Second Approach		
	Null hypothesis	t-statistic[a]		Null hypothesis	t-statistic	
All sectors	$r_{IN,i,k} \leq r_{CP,i,k}$	12.74	*	$r_{IN,i,k} \leq r_{CP,i,k}$	6.87	*
Processing	$r_{IN,i,k} \leq r_{CP,i,k}$	6.28	*	$r_{IN,i,k} \leq r_{CP,i,k}$	2.15	*
Wholesale	$r_{IN,i,k} \leq r_{CP,i,k}$	2.30	*	$r_{IN,i,k} \leq r_{CP,i,k}$	0.39	
Retail	$r_{IN,i,k} \leq r_{CP,i,k}$	13.54	*	$r_{IN,i,k} \leq r_{CP,i,k}$	11.64	*
Restaurant	$r_{IN,i,k} \leq r_{CP,i,k}$	10.72	*	$r_{IN,i,k} \leq r_{CP,i,k}$	6.15	*

Industry vs. Segment

	First Approach			Second Approach		
	Null hypothesis	t-statistic		Null hypothesis	t-statistic	
All sectors	$r_{IN,i,k} \leq r_{BS,i,k}$	1.35	*	$r_{IN,i,k} \geq r_{BS,i,k}$	-5.52	*
Processing	$r_{IN,i,k} \leq r_{BS,i,k}$	2.00	*	$r_{IN,i,k} \geq r_{BS,i,k}$	-1.99	*
Wholesale	$r_{IN,i,k} \geq r_{BS,i,k}$	-0.50		$r_{IN,i,k} \geq r_{BS,i,k}$	-2.20	*
Retail	$r_{IN,i,k} \leq r_{BS,i,k}$	4.88	*	$r_{IN,i,k} \leq r_{BS,i,k}$	1.95	*
Restaurant	$r_{IN,i,k} \geq r_{BS,i,k}$	-3.56	*	$r_{IN,i,k} \geq r_{BS,i,k}$	-7.83	*

[a]The t-statistic is estimated using the distribution of differences between the pair of estimate for each business segment. An asterisk indicates significance at the 0.10 level.

Table 7. Estimated t-statistics Comparing Persistence Rates Across Sectors

	Industry Persistence[a]		Corporate Persistence		Segment Persistence	
Approach 1						
Processing vs. Wholesale	3.0843	*	0.2368		0.7547	
Processing vs. Retail	-10.3840	*	1.2044		-2.5411	*
Processing vs. Restaurant	3.0008	*	2.4232	*	-2.3737	*
Wholesale vs. Retail	-10.6807	*	0.8502		-2.5375	*
Wholesale vs. Restaurant	-1.3210	*	1.7171	*	-2.1837	*
Retail vs. Restaurant	13.7528	*	0.7107		0.9790	
Approach 2						
Processing vs. Wholesale	0.6060		-0.0885		-0.4912	
Processing vs. Retail	-12.6679	*	0.6809		-3.7961	*
Processing vs. Restaurant	1.9023	*	3.3699	*	-4.0164	*
Wholesale vs. Retail	-7.1655	*	0.6599		-2.2672	*
Wholesale vs. Restaurant	0.1190		2.5452	*	-1.9016	*
Retail vs. Restaurant	17.2461	*	1.4660	*	0.7922	

[a]The t-statistic is estimated using the difference between the mean of each persistent estimate across sectors. An asterisk indicates significance at the 0.10 level.

Figure 1. Return on Assets for Four Sectors of the Food and Agribusiness Industry Over Time, 1981 to 2001