Journal of Agricultural and Resource Economics 36(3):488–503

Evaluating the Performance of U.S. Supermarkets: Pricing Strategies, Competition from Hypermarkets, and Private Labels

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This study draws upon literature from the fields of agricultural economics, industrial organization, and business to study the performance of supermarkets in the United States. The empirical work draws from a rich dataset on the characteristics of supermarkets across the U.S. to test several hypotheses. Supermarkets utilizing everyday low pricing operate more efficiently than those using other strategies. Stores increase their performance by using strategies of their closest competitors. Competition with hypermarkets results in decreased supermarket performance, especially for smaller stores. Increases in private label sales relative to national brand sales are not necessarily related to increased performance.

Key words: food retail, market power, pricing strategies, hypermarkets, private labels, supermarkets

Introduction

In American agribusiness and food distribution, the retail sector has emerged as a subject of interest to researchers in agricultural economics, marketing, business, and industrial organization. The factors determining supermarket performance, as measured by profitability and efficiency, are vital to understanding the directions in which the food retail industry is headed in the future. In particular, the drivers of supermarket performance determine the extent to which supermarkets can obtain and exercise market power in both buying and selling. This study examines pricing strategy, competition with hypermarkets, and the success of private label (PL) brands. All of these have been the subject of several publications as well as disagreement or uncertainty among researchers.

Economists have studied market power in food retail for decades, in large part because it enables retailers to set price above wholesale cost, which has direct welfare effects for consumers. Peterson and Connor (1996) attributed a consumer loss of between 7.4 and 8.7% of the total value of branded food shipments in the U.S. to retailer oligopoly power. While market power has proven to be difficult to measure among food retailers (Sexton and Zhang, 2001), standard industrial organizational theory suggests that it is on rise in food retail as a result of several factors. These include increased retailer concentration (Smith, 2004), intensified competition among manufacturers (Messinger and Narasimhan, 1995), the rise in prominence of PLs (Mills, 1999), and the countervailing power of “big box" retailers such as Wal-Mart (Chen, 2004). This paper strives to explore how factors impacting supermarket performance may have implications for consumers and the rest of agribusiness.

Richard Volpe is a Research Economist at the United States Department of Agriculture, Economic Research Service. The views expressed here are those of the author, and may not be attributed to the Economic Research Service or the U.S. Department of Agriculture. The author is thankful for the advice and assistance of Timothy Park, Abigail Okrent, Ephraim Leibtag, Robert King and the rest of TFIC, Abebayehu Tegene, Laurian Unnevehr, John Hession, and Chris Dicken, as well as the editor and two anonymous referees.

Review coordinated by Gary Brester.

The primary purpose of this study is to test empirically a number of hypotheses pertaining to supermarket performance using data collected from over 800 unique supermarkets across the United States. The data come from The Food Industry Center (TFIC) of the University of Minnesota (King, Jacobson, and Seltzer, 2001, 2002; Kinsey et al., 2003; Chung et al., 2010). A major advantage of this data set relative to others that have been used in studies of supermarket characteristics and performance, such as the Food Marketing Institute (2010), is that it is reported at the individual store level rather than the chain level.

Pricing strategies are of economic interest because of their effects on retail price variation. A substantial body of literature has focused on formulating models to explain sales in order to better understand and predict retail pricing (Varian, 1981; Sobel, 1984) and subsequently testing these models and understanding the effects of sales on price variation (Pesendorfer, 2002; Hosken and Reiffen, 2004). Retailers can choose between pricing strategies that favor the heavy use of promotions and those that do not, and thus the performance effects of these pricing strategies in today's retail environment have direct implications for price variation. In addition to their effects on consumers' purchasing decisions, retailer price variations have effects on producer welfare (Sexton, Zhang, and Chalfant, 2003; Sexton, Xia, and Li, 2006).

Hypermarkets are henceforth defined as large retailers that sell full lines of grocery products in addition to the usual offerings of department stores. The most prominent example of such stores is the Wal-Mart Supercenter, and considerable research has focused specifically on these.[1] They have been studied for their effects on prices, market concentration, employment and labor, and much more. This study tests for the effect of hypermarket competition on supermarket performance and investigates the efficacy of strategies proposed by the literature for supermarket use in competition with hypermarkets. Hypermarket competition has been associated with decreased prices and increased variety on the part of supermarkets (Hausman and Leibtag, 2007); these results are driven by the impact of hypermarkets on supermarket profitability and sales.

Private labels, also known as store brads, have seen increases in both popularity and quality over the past two decades in the United States. Their importance in food retail was underscored by the 2007-2009 recession, during which time their popularity increased even more sharply. Little is understood about the effects of PL sales on supermarket performance, particularly as their market share increases come at the expense of national brands (NBs). Many studies have attempted to measure the welfare effects of PLs on consumers, with mixed results. However, a stream of literature (e.g., Ward et al., 2002) has shown that PL introduction leads to higher retail prices, on average, owing to improved NB quality and product differentiation.

In testing these hypotheses, this study accomplishes a secondary objective of uniting several streams of literature on the performance of the food retail sector. Research on various determinants of supermarket performance has been fairly segmented in the past. For example, research on various pricing strategies has been found in marketing journals, while the effects of hypermarkets have been mostly the domain of agricultural economics. This study synthesizes much of the literature on food retail performance and provides a framework for understanding supermarket performance as a function of factors that should be considered jointly.

This research has several empirical findings. First, I find that the everyday low pricing (EDLP) pricing strategy may lead to increases in performance relative to the high-low pricing (HLP) strategy under certain market conditions. Also, supermarkets do see performance gains by using the pricing strategies of their closest competitors. Second, overall competition with hypermarkets is associated with decreased performance, and this effect is exacerbated as hypermarket market share increases. Finally, this study provides no evidence that increased PL sales, relative to NB sales, increases store performance.

[1] Other examples of hypermarkets in the Unites States include Super Targets, Meijer, and Fred Meyer Stores.

Data

The major data source for this study is annual supermarket surveys conducted by The Food Industry Center (TFIC) of the University of Minnesota. For the years 2000, 2001, 2002, 2003, and 2007, TFIC issued *The Annual Supermarket Panel* to a random sample of over 800 food retailers, including stores from all 50 states.[2] *The Supermarket Annual Report* (King, Jacobson, and Seltzer, 2001, 2002; Kinsey et al., 2003; Chung et al., 2010) summarized the major findings from the survey and provided variable definitions. The dataset compiled from these surveys is not a statistical panel, as too few stores participated in the survey in repeated years.

In many respects, the TFIC data are ideal for evaluating the determinants of supermarket performance. Store managers responding to the survey indicate information about their performance according to a number of widely-used measures. The managers also report the goods and services offered throughout the store, the extent to which they utilize a vast array of supply chain and inventory practices, as well as information on characteristics of their closest competitors. Table 1 reports summary statistics for the variables used in this analysis. Unless noted otherwise below, all variables come from the TFIC data. The data have been cleaned of unusual and improbable values, as defined by probable outliers. The first five variables in table 1 are the performance measures, as reported by store managers, which serve as dependent variables for the econometric analysis. Sales per square foot (henceforth *SQFOOT*) is calculated as total weekly dollar sales divided by the total selling space square footage. This is a very commonly-used metric of operating efficiency, as measured by capacity utilization (Banker et al., 1996). Gomez, McLaughlin, and Wittink (2004) point out that *SQFOOT* is not subject to accounting measures, which is an advantage over metrics based on profits or cost measures. Sales per labor hour (*LABOR*) is total weekly dollar sales divided by the total number of weekly labor hours, including full-time and part-time employees. Payroll expenditures as a percentage of total sales (*PAYROLL*), which retailers seek to minimize. Beveridge (2009) shows that these are both key measures of operating efficiency and are ideal for identifying the top competitors in a market. King, Leibtag, and Behl argue that payroll is one of the single largest costs facing food retailers; hence, measuring payroll against sales is an excellent measure of efficiency. Profit as a percentage of total sales (*GROSS*) is also known as gross margin in retail. Stephenson, Cron, and Frazier (1979) explain that gross margin is a widely-used marketing performance measure as it is a powerful profit determinant. Small changes in gross margin in the short term result in proportionally large shifts in net profit. King, Jacobson, and Seltzer (2002) advocate the use of *GROSS* using TFIC data because it can capture a firm's ability to set higher prices while maintaining sales, which connects with the thrust of this paper towards understanding supermarkets' capacity to exercise market power. Finally, profit per square foot (*PROFIT*) is an important performance measure with direct implications to the supply chain. *PROFIT* is another measure of capacity utilization, but it is also a key measure of negotiating power with upstream suppliers (Cairns, 1962). Higher *PROFIT* is indicative of success in negotiating lower wholesale prices.

The TFIC surveys asked managers to indicate their pricing strategies. These include EDLP, which is defined by relatively low prices and few advertised promotions, and HLP (also referred to as Hi-Lo or PROMO in articles), which typically features higher shelf prices and the heavy use of advertised promotions. Managers were not asked to describe their stores according to a single strategy. It was quite common for retailers to answer "yes" to both EDLP and HLP. Hoch, Dreze, and Purk (1994) posited that EDLP is best viewed as a continuum, as many stores practice a hybrid of EDLP and HLP. Bolton and Shankar (2003) showed that pricing strategies often apply at the brand rather than store level, and hence several strategies can coexist within a single supermarket. Therefore *EDLP* is an indicator variable for those stores that practice EDLP and do not practice

[2] Due to incompatibility in question formats and content, this study does not include the results from the 2000 survey.

Table 1. Summary Statistics for the Variables Used in the Econometric Analysis

Variable	N	Mean	Std Dev	1st Quartile	3rd Quartile
SQFOOT	1577	8.24	4.62	5.46	9.80
LABOR	1209	109.53	39.20	85.78	127.72
PAYROLL	1407	10.50	4.86	8.75	11.50
GROSS	1385	22.78	8.08	21.00	27.00
PROFIT	1094	196.06	146.51	117.60	240.21
EDLP	2201	0.19	0.39	0.00	0.00
HLP	2201	0.17	0.37	0.00	0.00
FaceHypermarket	2201	0.20	0.40	0.00	0.00
HyperShare	1964	22.33	14.89	9.40	32.20
HHSize	1954	2.54	0.32	2.40	2.70
AvgMilesComp	2147	7.75	9.75	2.17	7.67
Midwest	2201	0.47	0.49	0.00	1.00
Northeast	2201	0.15	0.36	0.00	0.00
West	2201	0.17	0.38	0.00	0.00
Techscore	1951	48.33	24.11	30.00	69.99
Consumerscore	1967	52.89	33.71	30.00	85.00
PercFulltime	2201	52.15	14.50	44.44	57.14
MHI	1969	42.99	15.38	33.15	49.73
PopDens	2055	1281.00	2509.00	55.00	1523.00
PLSalesPerc	1995	21.75	16.87	11.00	22.00
SellingArea	1895	26.61	18.91	12.00	38.00
MSA	2201	0.52	0.49	0.00	1.00
HHI	1964	0.24	0.08	0.19	0.28
Age	1966	36.37	2.99	34.90	38.00
College	2213	16.72	7.32	14.94	20.28

Notes: Data on *HHI* and *WalMartShare* come from the 1998, 2001, and 2006 editions of the Market Scope. Data on *HHSize*, *MHI*, *PopDens*, *Age*, and *College* are from the 2005 U.S. Census estimates. All other variables are drawn from The Food Industry Center Annual Supermarket Report.

HLP. Likewise *HLP* is a binary variable for stores reporting use of only HLP. All other stores are assumed to practice some hybrid of the two strategies.

Each supermarket manager reported information on the three nearest competitors, geographically. *FaceHypermarket* is a binary variable equal to one if the store manager indicated that one of the three nearest competitors was a large supercenter/hypermarket store. Also included is *HyperShare*, the food retail market share obtained by hypermarket stores, as reported by the 2006 Market Scope, a *Trade Dimensions* publication.[3] Market Scope provides market share data according to Nielsen Designated Marketing Areas (DMAs). There are 205 non-overlapping DMAs in the continental United States, thus each store included in the data corresponds to a single DMA.[4]

[3] The retailers included in this category in the Market Scope data are Wal-Mart Supercenter, Super Target, Meijer, Fred Meyer, and Super Kmart. With the exception of Supercenters, these hypermarkets typically controlled less than 1% of the market share in every DMA.

[4] Market Scope also provides market share data organized by other regional definitions, including the top 100 Metropolitan Statistical Areas (MSAs), the 52 ACNielsen ScanTrack regions, or the 64 IRI InfoScan markets. This study uses the DMAs because they are comprehensive, non-overlapping, and the most disaggregated of all possible market definitions. Disaggregation is important in order to best represent the specific market conditions facing the stores responding to the TFIC survey.

PLSalesPercent is the average percentage of total weekly sales attributed to private labels as reported by store managers. This variable is used to measure the effect of PL sales on overall store performance.

The data contain a number of important control variables and potential instruments. *HHSize* is the average number of people per household for the zip code in which the responding store operates. *Age* is the average age of the population and *College* is the percentage of people over 25 holding at least a bachelor's degree within the metropolitan or micropolitan area containing store *i*. These data were available from 2005-2009 American Community Survey of the U.S. Census. *AvgMilesComp* is a control variable for the average distance, in miles, of the three closest competitors to the responding store, when applicable. *Midwest*, *Northeast*, and *West* are control binaries representing the geographic regions in which the responding stores are located. A fourth category, *South*, represents those stores operating in the southeastern United States and is used as the reference category in the econometric model. Approximately 21% of sample stores are located in the south.

Techscore and *Consumerscore* are both calculated by TFIC using survey results. *Techscore* is a control variable, included to account for potential cost savings through technology, that measures the extent to which responders adopt various electronic or networked technologies for supply chain or inventory management. *Consumerscore* measures the extent to which responders engaged in various practices pertaining to customer service, such as grocery bagging or butchering to order. Such services enable retailers differentiate themselves, build customer loyalty, and ultimately raise prices (Bonanno and Lopez, 2007). Each year TFIC drew up a list of applicable practices for both technology and consumer service and calculated the respective scores as the percentages of possible practices adopted, by store.[5]

SellingArea is the square footage of the responder's selling area, not including areas like storage or management offices. *MSA* is a binary equal to one if the responder is located within an urban Metropolitan Statistical Area, as defined by the US Census. *HHI* reports the Herfindahl Index, a measure of market concentration in which the responders are located, according to the Nielsen DMAs. The *HHI*, used as a control in this study, is calculated as the sum of the squared decimal market share of competitors.[6] Rounding out the control variables, *MHI* is median household income in U.S. $1,000s and *PopDens* is population density in 1,000s of people per square mile, both of which were calculated using data from the U.S. Census.

Econometric Model

The economic and marketing literature provides several testable hypotheses with respect to supermarket performance. In order to examine these, I develop a reduced-form model that incorporates the major determinants of supermarket profitability, market power, and overall financial performance. Broadly speaking, these include market-structure (Connor and Peterson, 1992), consumer demographics that drive demand elasticity (Carpenter and Moore, 2006), and advertising intensity and pricing strategies (Lal and Rao, 1997). Formally, the model to be estimated for store *i*

[5] The complete lists of practices considered for both scores, by year, are available from the TFIC at http://foodindustrycenter.umn.edu/Research/SupermarketPanel/index.htm

[6] Other popular measures of market concentration include the CR4 and the CR8, which are, respectively, the market share controlled by the top four and the top eight players in a market. Both measures showed relatively little variation across the sample, as compared to the *HHI*. In food retail it is common for the top three or four competitors to dominate geographic markets, leaving only very small market shares for assorted fringe players. To illustrate this point, consider that the coefficient of variation (CV), a measure of dispersion calculated as the standard deviation divided by the mean, for the *HHI* is 0.325. The same figure for the CR4 is 0.145 and for the CR8 is 0.109.

and performance measure j is:

$$\begin{aligned}(1)\quad & Performance_{ij} = \beta_1 + \beta_2 EDLP_i + \beta_3 HLP_i + \beta_4 FaceHypermarket_i + \beta_5 HyperShare_i + \\ & \beta_6 HLPHLP_i + \beta_7 EDLPEDLP_i + \beta_8 HLPEDLP_i + \beta_9 EDLPHLP_i + \beta_{10} EDLPMHI_i + \\ & \beta_{11} AvgMilesComp_i + \beta_{12} TechScore_i + \beta_{13} ConsumerScore_i + \beta_{14} EDLPFH_i + \beta_{15} MHI_i + \\ & \beta_{16} PopDens_i + \beta_{17} PercFullTime_i + \beta_{18} PLSalesPerc_i + \beta_{19} SellingArea_i + \beta_{20} SellAreaFH_i + \\ & \beta_{21} MSA_i + \beta_{22} MSAFH_i + \beta_{23} HHI_i + \beta_{24} FHCS_i + \boldsymbol{\beta}_s \mathbf{Regions}_i + \boldsymbol{\beta}_Y \mathbf{Year}_i + u_i,\end{aligned}$$

where *Performance* is an umbrella term for the five performance measures discussed above. Several of the variables in the model were not defined in the previous section. *HLPHLP* and *EDLPEDLP* are indicators for the cases in which, respectively, store i is HLP and at least two of the three closest competitors are also HLP, and likewise for EDLP. Similarly, *EDLPHLP* and *HLPEDLP* indicate when store i engages in EDLP and HLP, respectively, and at least two of the closest competitors engage solely in the opposite strategy.

EDLPMHI and *EDLPFH* are, respectively, the interactions between the use of EDLP with median household income and the *FaceHypermarket* binary. *SellAreaFH* is the interaction between the continuous selling area variable and the *FaceHypermarket* binary. *MSAFH* is a binary equal to one if store i competes with a hypermarket and operates within an MSA, and *FHCS* is the interaction between hypermarket competition and consumer service. **Regions** and **Year** are vectors of binaries representing regions of the U.S. and the survey years, respectively.

Hypothesis Tests and Supporting Literature

The major hypotheses to be tested using equation (1) are drawn from the economics and marketing literature. In certain cases, the literature generates competing hypotheses, and the formulation of equation (1) allows for the empirical evidence to support one or the other. Table 2 summarizes the hypotheses and the formal tests to be performed.

Pricing Strategies: HLP and EDLP

Most journal articles find or assume that retailers use either HLP or EDLP. However, the definitions of these strategies are not uniform across publications pertaining to the supermarket industry. Ellickson and Misra (2008), in defining the two strategies, serve to highlight the issue.

> In many retail industries, pricing strategy can be characterized as a choice between offering relatively stable prices across a wide range of products (EDLP) or emphasizing deep and frequent discounts on a smaller set of goods (HLP). (pg. 3)

Note that these pricing strategies are defined in relation to one another. Hoch, Dreze, and Purk (1994) use similar vocabulary, stating that "The Hi-Lo retailer charges higher prices on an everyday basis but then runs frequent promotions ... lowered below the EDLP level." Also consider that Hoch, Dreze, and Purk (1994) as well as Lal and Rao (1997) have found that purportedly EDLP stores engage heavily in promotions. Such comparative definitions raise the empirical question of where to draw the line between HLP and EDLP stores. Bolton and Shankar (2003) developed an empirical methodology to categorize supermarkets' pricing patterns and discovered that, at the brand level, chains utilize five distinct pricing strategies. This issue of uncertainty serves to underscore a major strength of this data set, that pricing strategies are reported directly by store managers.

In terms of overall performance, Hoch, Dreze, and Purk (1994) found that HLP outperformed EDLP in terms of profitability in three experimental settings. Despite the fact that EDLP incurs lower costs in terms of price changes and advertising changeovers, supermarkets had difficulty in

Table 2. Hypotheses to be Tested, Based on the Results of Estimating Equation (1)

Hypothesis	Test of Coefficients
H_1: HLP and EDLP do not perform equally well as pricing strategies, *ceteris paribus*.	H_0: $\beta_2 = \beta_3$, H_1: $\beta_2 \neq \beta_3$.
H_2: Supermarkets perform better when competing with supermarkets using similar pricing strategies.	H_0: $\beta_6 = \beta_7 = \beta_8 = \beta_9 = 0$, H_1: Otherwise.
H_3: The effect of EDLP on performance is related to the shoppers' income.	Test: H_0: $\beta_{10} = 0$, H_1: $\beta_{10} \neq 0$
H_4: The presence of hypermarkets is associated with decreased performance on the part of supermarkets.	Test: H_0: $\beta_4 = 0$, H_1: $\beta_4 < 0$.
H_5: Large market shares on the part of hypermarkets are associated with reduced performance for supermarkets.	Test: H_0: $\beta_5 = 0$, H_1: $\beta_5 < 0$.
H_6: The use of EDLP is successful in improving performance in competition with hypermarkets.	Test: H_0: $\beta_{14} = 0$, H_1: $\beta_{14} \neq 0$.
H_7: The negative effect of hypermarket competition on performance is mitigated for larger stores.	Test: H_0: $\beta_{20} = 0$, H_1: $\beta_{20} > 0$.
H_8: The effect of hypermarket competition on performance is mitigated in urban areas.	Test: H_0: $\beta_{22} = 0$, H_1: $\beta_{22} > 0$.
H_9: Customer service is associated with the mitigation of the effect of hypermarket competition on performance.	Test: H_0: $\beta_{24} = 0$, H_1: $\beta_{24} > 0$.
H_{10}: Increased PL sales, relative to NB sales, are associated with increases in store performance.	Test: H_0: $\beta_{18} = 0$, H_1: $\beta_{18} > 0$.

convincing consumers of their commitment to genuinely lower prices. The authors make the case that the success of EDLP depends critically on demographics and market conditions. Alternatively, Lal and Rao (1997) demonstrated that the top five EDLP chains were outperforming the top five HLP chains in terms of profit margins, domestically. This study seeks to determine if the exclusive use of one strategy may lead to performance or efficiency gains.

Researchers have also disagreed, albeit indirectly, on a key issue pertaining to the success of EDLP in relation to consumer characteristics. Bell and Lattin (1998) posited that EDLP appeals to "large-basket" shoppers, who tend to be older and with smaller incomes, and that as the proportion of consumers fitting this description increases, EDLP stores can set their average prices closer to those of HLP stores. However, Corstjens and Corstjens (1995) and Lal and Rao (1997) both reached the opposite conclusion in their studies, demonstrating theoretically and with limited empirical evidence that EDLP stores perform the strongest among time-constrained shoppers. Time-constrained shoppers are more likely to have higher incomes and thus have a higher valuation of time.

Several studies have examined the dynamics of EDLP/HLP interaction within markets. Industrial organization theory might predict that retailers would adopt different strategies within markets as a

means of differentiation. However, in practice, researchers have largely determined the opposite effect. Lal and Rao (1997) found that EDLP leads to higher profits in competition with EDLP, which suggests an avenue by which conventional supermarkets can successfully compete with hypermarkets. Shankar and Bolton (2004) determined that the single most important determinant of pricing strategies in food retail is the pricing behavior of close competitors. Steenkamp et al. (2005) reached a similar conclusion with respect to promotions. Ellickson and Misra (2008) found evidence that supermarkets typically cluster in terms of pricing strategies, and thus stores using like strategies are likely to be found within close proximity of each other. Using a game theoretical approach, Jones (2003) showed that promotions are necessary in order to protect market share from competitors' promotions, explaining why stores maintain HLP in competition despite the purported cost-saving effects of EDLP. Hypotheses H_1 through H_3 relate to pricing strategies.

Wal-Mart Hypermarkets and other Hypermarkets

Hypermarkets have existed for several decades. For example, Fred Meyer stores have advertised "one-stop shopping" since opening in 1922. However, no line of hypermarkets can compare to Wal-Mart Supercenters in terms of growth, impact on food retail, geographic scope, and attention garnered in both academic literature and the popular press. Wal-Mart has grown to become the largest food retailer in the United States by a wide margin (Supermarket News, 2009). There are over 2,900 supercenters operating in the United States today (Walmart, 2011). Accordingly, much of the academic discussion about hypermarkets centers on Supercenters.

Several researchers have found that hypermarkets decrease supermarket performance and profitability. The reasons for this effect are two-fold. Consumers value the convenience of "one stop shopping" (Messinger and Narasimhan, 1997), while Wal-Mart's size, purchasing power, and distribution gives them a cost advantage, ensuring that competitors are unable to compete in price (Singh, Hansen, and Blattberg, 2006). Sustained interest in research on the economics of hypermarkets is motivated by the potential for hypermarkets to change the food retail industry fundamentally. This can result from store closings and the adoption of new pricing strategies and practices by competitors, both of which have implications for consumer welfare.

The most readily apparent effect of hypermarket competition is lower prices. Woo et al. (2001), Hausman and Leibtag (2007), and Volpe and Lavoie (2008) all attributed significantly lower supermarket prices to Supercenter competition. The examination of prices is beyond the scope of this study, but the extent to which hypermarkets result in lower supermarket prices is directly related to their effects on supermarket performance. Singh, Hansen, and Blattberg (2006) attributed a permanent loss of revenues equal to 17% for supermarkets following the entry of a Supercenter. The authors found that this loss was due to Supercenters drawing away incumbents' most loyal customers. The finding with respect to customer loss is echoed by Seiders, Simonides, and Tigert (2000), who found that hypermarkets steal 15 to 20% of incumbent stores' most loyal customers once established. Capps and Griffin (1998) attributed a 21% loss in sales among supermarkets in the Dallas/Fort Worth area to Supercenter entry. Artz and Stone (2006) found that Supercenters slow the sales growth for competing supermarkets by 17% within two years following entry. This effect is much smaller for supermarkets within major metropolitan areas, suggesting an important modeling implication with respect to the impact of hypermarkets.

Several studies have explored whether hypermarkets can force store closures and hence influence food retail concentration. Franklin (2001) found that while Supercenters rapidly gained national market share from 1993 through 1998, they had no significant effect on market concentration in metropolitan areas. Most of the firm's gains came in rural and low-income areas. Martens (2008) took on the same research question, but included smaller grocery marketing areas and found that Supercenters resulted in significant concentration increases in many smaller markets between 1999 and 2003. Basker (2007) included but was not limited to food retail and found that competition from

Wal-Mart can reduce sales sufficiently to force closure only for small competitors. Wal-Mart's effect is less pronounced on larger stores.

The literature is not strong on recommendations for successful competition with hypermarkets. The possibility of using EDLP offers an intriguing testable hypothesis. On one hand, the research summarized above suggests that supermarkets may see performance gains by clustering in terms of pricing strategies. However researchers such as Singh, Hansen, and Blattberg (2006) and trade publications such as *Supermarket News* have argued that supermarkets cannot successfully compete with Supercenters in price. Such price competition would likely manifest in supermarkets utilizing EDLP in direct competition with hypermarkets. Singh, Hansen, and Blattberg (2006) propose a strong focus on customer service as a potential avenue for success in competition with hypermarkets. Many of the service components considered by TFIC relate to customer convenience, which has been shown to be very important for consumers in food purchasing decisions (Stewart et al., 2005). H_4 through H_9 are related to the effect of hypermarket competition on supermarket performance.

Private Labels and National Brands

Private labels are products that are marketed as being unique to the chain at which they are sold. Retailers typically obtain them through vertical integration or from fringe processors with regional scope (Bontems, Monier-Dilhan, and Requillart, 1999). The alternative to PLs are NBs, which are generally identical across competing chains. Supermarkets have several economic motivations for offering PLs. Bergès-Sennou, Bontems, and Réquillart (2004) provide a review of the literature on the economic appeal of PLs to retailers, which includes higher margins relative to NBs, increased consumer loyalty, and increased bargaining power with NB manufacturers.

With respect to PLs, this study focuses on the relationship between PL performance and store performance. This linkage is important because PL sales have been climbing steadily for years (Food Marketing Institute, 2009), and a growing body of literature suggests that, *ceteris paribus*, PL introduction and market share are associated with higher overall food prices (Ward et al., 2002; Bonanno and Lopez; Bontemps, Orozco, and Réquillart, 2008). If PL share gain at the expense of NB sales increases store performance, then we might expect supermarkets to continue to promote and expand PL sales throughout the cycles of the economy. H_{10} tests the effects of PL sales, as a share of total sales, on store performance.

Results and Discussion

A number of the explanatory variables in equation (1), including key variables pertaining to pricing strategy, reflect choices on the part of supermarkets. Supermarkets are assumed to commit to these decisions for relatively long time horizons, thus these variables are exogenous to the model. However, the PL sales percentage has the potential for volatility in the short term and depends heavily on supermarkets' promotional and product line decisions, both of which change frequently. Moreover, the opening of Wal-Mart stores has been found be endogenous (Basker, 2005; Neumark, Zhang, and Ciccarella, 2008; Hicks, 2008), suggesting *HyperShare* as a potential source of endogeneity. Three potential instruments for *PLSalesPerc* are *HHSize*, *Age* and *College*, the last being a measure of educational attainment.[7] These demographic instruments are motivated by Batra and Sinha (2000). Following the literature on Wal-Mart endogeneity, I instrument for *HyperShare* using the geographic distance from the zip codes in the data to Bentonville, AK, the birthplace of Wal-Mart.[8] While *Age* and *College* are significant determinants of *PLSalesPerc*, and the distance

[7] Another measure of educational attainment available from the Census is the percentage of the population over 25 with a high school diploma or equivalent. However, this measure shows considerably less variation than the equivalent measure for college graduation and does not serve as an effective instrument.

[8] The distance function was calculated using ArcGIS. The literature proposes several methods for calculating the distance, including driving distance. In both previous studies on instrumenting for Wal-Mart and this one, the selection of the distance function makes no discernible difference on the results.

function explains a great deal of variation in *HyperShare*, the null hypothesis of no endogeneity is not rejected for any combination of the instruments.

The examination of five different measures of supermarket performance provides the opportunity to employ a system-of-equations approach. However right-hand side endogeneity is not an issue, and seemingly unrelated regression would yield no efficiency gains over single-equation methods because the regressors are identical across equations. Ultimately the estimation approach used is ordinary least squares (OLS). The standard errors are corrected for heteroskedasticity using White's method.[9]

Table 3 reports the estimation results. Several of the control variables suggest relationships that warrant interesting future research in their own right. The average distance from competitors is negative and significant for *SQFOOT* and *LABOR*. As these are common measures of operating efficiency, this relationship suggests that as the proximity to competitors increases, incentives for efficiency decrease. *Techscore* has a positive and significant relationship with performance, as measured by *SQFOOT*, *LABOR*, and *PAYROLL*.[10] Therefore the adoption of modern technology for supply chain and inventory applications is associated with increases in performance. Median household income and population density, two factors associated with increased demand, are both associated with increased performance, with the *MHI* finding being robust across three of the five performance measures. Concentration as measured by the *HHI* is associated with positive and significant increases in *LABOR* and *PROFIT*. As markets become more competitive, particularly in this digital age, it is likely that stores will cut labor as much as possible to improve efficiency.

Some of the control variables highlight the potential issues of relying upon a single performance measure. For example, *SQFOOT* and *PROFIT* naturally decrease with selling area, *ceteris paribus*, though increases in selling area are associated with increases in *LABOR*. It is also not surprising that *MHI* is associated with increases in performance as measured by *SQFOOT*, *LABOR*, and *GROSS*, but decreases as measured by *PAYROLL*, as wages are likely to be higher in high-income areas.

Pricing strategies are shown to have an impact on store performance, although many coefficient estimates for strategy variables in all five equations are insignificant. Table 3 shows that the EDLP strategy is associated with a \$1.38 increase in *SQFOOT*, relative to HLP or a hybrid strategy. HLP is also associated with an increase in *PAYROLL* of 0.70%, a result that is significantly mitigated for those stores operating near other HLP supermarkets. Hence, the results reject H_1, finding evidence that EDLP leads to improved performance. With respect to *GROSS*, the results do not reject H2. Performance is significantly improved for stores operating near competitors with similar pricing strategies, and performance is harmed for HLP stores competing with EDLP stores. The results reject H_3, as the coefficient on *EDLPMHI* is insignificant for all five equations. This study therefore provides no evidence that EDLP is particularly effective for a particular income bracket of consumers.

On balance, competition with hypermarkets is associated with reduced performance on the part of supermarkets. The signs of the coefficient on *FaceHypermarket* all have signs that do not reject H_4, showing that supermarkets competing directly with hypermarkets have decreased performance relative to those not. The profit-based measures the effect is significant, with hypermarket presence associated with a decrease in *GROSS* of over 2% and a decrease in *PROFIT* of almost \$22. H_5 is

[9] Other estimation procedures applied to equation (1) include equation-by-equation two-stage least squares, three-stage least squares, and generalized method of moments, each modeling *PLSalesPerc* and *HyperShare* as endogenous. All approaches yielded qualitatively similar results, but differences in statistical significance persisted between single-equation and systems approaches, as systems approaches required several hundred observations to be dropped.

[10] Recall that retailers seek to minimize payroll as a percentage of total sales. Hence a positive (negative) relationship with *PayrollPerc* reflects a negative (positive) relationship with performance.

Table 3. Results of Estimating Equation (1) on the Five Performance Measures

Variable	*SQFOOT*	*LABOR*	*PAYROLL*	*GROSS*	*PROFIT*
EDLP	1.38*	1.49	0.10	−1.56	−10.50
	(0.73)	(7.53)	(0.52)	(1.54)	(25.38)
HLP	−0.02	−1.12	0.58**	0.91	2.60
	(0.39)	(4.38)	(0.25)	(0.94)	(12.20)
FaceHyper	−0.21	−1.77	0.39	−2.36**	−21.75*
	(0.43)	(4.09)	(0.31)	(1.05)	(12.48)
HyperShare	−3.38***	−32.89***	−1.46**	−2.68	−93.99***
	(0.78)	(7.21)	(0.56)	(2.00)	(26.86)
HLPHLP	0.17	−0.09	−0.19*	0.80*	6.92
	(0.28)	(2.51)	(0.11)	(0.48)	(7.03)
EDLPEDLP	−0.11	1.36	0.15	0.82*	6.01
	(0.32)	(2.04)	(0.16)	(0.44)	(8.49)
HLPEDLP	0.09	2.20	−0.06	−0.99*	0.64
	(0.28)	(2.31)	(0.15)	(0.60)	(8.72)
EDLPHLP	0.03	1.91	−0.33	0.12	6.01
	(0.31)	(3.13)	(0.21)	(0.49)	(8.49)
EDLPMHI	−0.01	−0.01	0.01	−0.03	−0.01
	(0.02)	(0.14)	(0.01)	(0.03)	(0.11)
AvgMilesComp	−0.02*	−0.22***	0.04	0.02	−0.26
	(0.01)	(0.081)	(0.10)	(0.20)	(0.32)
Midwest	0.42*	2.48	0.46**	−1.17**	2.64
	(0.25)	(2.29)	(0.20)	(0.60)	(8.21)
Northeast	0.72**	−9.93***	0.56**	−0.86	−2.11
	(0.35)	(2.92)	(0.24)	(0.81)	(11.68)
West	0.77**	8.54***	0.77***	−0.57	11.83
	(0.34)	(3.23)	(0.27)	(0.86)	−11.96
Techscore	0.02***	0.25***	−0.02***	0.02	0.4
	(0.01)	(0.05)	(0.00)	(0.10)	−0.2
Consumerscore	0.03	0.07*	0.01	−0.01	−0.09
	(0.10)	(0.04)	(0.10)	(0.01)	−0.13
PercFulltime	−0.01	−0.10*	0.02***	0.03**	−0.1
	(0.01)	(0.06)	(0.00)	(0.01)	−0.23
MHI	0.05***	0.20**	0.02***	0.05***	1.54***
	(0.01)	(0.08)	(0.01)	(0.02)	−0.41
PopDens	0.21***	0.54	−0.01	−0.06	4.02***
	(0.06)	(0.50)	(0.03)	(0.08)	−1.45
FHCS	0.01	−0.03	−0.04	−0.01	0.02
	(0.01)	(0.07)	(0.10)	(0.02)	−0.24
EDLPFH	0.97*	2.69	−0.11	0.70	40.56***
	(0.59)	(5.67)	(0.39)	(1.11)	−15.51
PLSalesPerc	−0.02***	−0.06	−0.01	−0.01	−0.54***
	(0.01)	(0.07)	(0.10)	(0.01)	−0.18
SellingArea	−0.03***	0.47***	−0.02***	−0.04*	−0.82***
	(0.01)	(0.07)	(0.00)	(0.02)	−0.25
SellAreaFH	−0.03	0.07	−0.02***	0.06**	0.52
	(0.10)	(0.12)	(0.01)	(0.03)	−0.38

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Table 3. – continued from previous page

Variable	*SQFOOT*	*LABOR*	*PAYROLL*	*GROSS*	*PROFIT*
MSA	0.52**	−0.09	0.15	1.22**	16.10*
	(0.26)	(2.24)	(0.21)	(0.57)	−8.8
MSAFH	−1.05**	−2.17	−0.33	−1.84*	−36.20***
	(0.47)	(4.17)	(0.37)	(1.07)	−13.79
HHI	2.14	23.18**	−0.09	2.47	133.10***
	(1.48)	(11.32)	(0.91)	(3.17)	−46.29
2002	−0.13	3.75*	0.31	1.31*	6.48
	(0.22)	(1.96)	(0.20)	(0.74)	−9.53
2003	0.81**	11.15***	0.36	3.79***	30.67***
	(0.35)	(3.15)	(0.27)	(0.85)	−11.52
2007	0.41	8.50***	0.79	4.26***	22.29
	(0.44)	(3.16)	(0.30)	(0.96)	−14.46
Intercept	5.39***	78.69***	9.17***	18.82***	103.49***
	(0.75)	(6.94)	(0.56)	(1.93)	−27.76
N	1,551	1,143	1,208	1,161	1,054
Adj. R^2	0.174	0.310	0.139	0.068	0.131

Notes: Numbers in parentheses are heteroskedasticity-corrected standard errors. Single, double, and triple asterisks (*, **, ***) represent significance at the 10%, 5%, and 1% level.

not rejected for all measures save for *GROSS*, in that the share of hypermarkets is associated with significantly decreased performance. For example, a 1% increase in DMA hypermarket share is associated with a $3.38 drop in *SQFOOT*. The only source of ambiguity with respect to hypermarkets and H_4 or H_5 comes from the effect of Hypermarket share on *PAYROLL*, which is negative and significant. This finding further highlights the importance of not relying upon a single performance measure in research, and is likely explained by the fact that Wal-Mart stores can result in job destruction at competing stores over time (Neumark, Zhang, and Ciccarella, 2008), which would reduce competitors' payrolls.

H_6 is not rejected. The coefficient on *EDLPFH* is positive and significant for *SQFOOT* and *PROFIT*. Hence the results indicate that the adoption of EDLP is effective in mitigating the effects of hypermarket competition on performance. H_7 is not rejected for *PAYROLL* and *GROSS*, thus providing evidence that larger supermarkets are better equipped to compete with hypermarkets. The results reject H_8, and in fact the results indicate that the negative effect of direct hypermarket competition is exacerbated for supermarkets within MSAs. This finding runs counter to expectations and may be explained by the fact that Wal-Mart, in particular, has focused its expansion efforts since the turn of the century on major cities. This study also rejects H_9, that customer service mitigates the effects of hypermarket competition on performance. Consumer service altogether has a discernible positive impact only on *LABOR*.

Rounding out the hypothesis tests, the results reject H_{10}. The share of sales attributed to PLs is associated with significant decreases in *SQFOOT* and *PROFIT*. These results are not intended to explain that PLs do not increase store profits, and such an empirical investigation is warranted in future work. However if PL sales are growing largely at the expense of NB sales, and this does not increase store performance, then it seems supermarkets have limited incentive to enhance and promote their PL lines outside of economic downturns.

Conclusions and Future Work

This study provides a number of empirical insights into supermarket performance, taking into account a number of considerations drawn from a synthesis of literature in agricultural economics,

marketing, and business literature. In terms of pricing strategies, the results provide some evidence that supermarkets using the EDLP strategy have higher sales per square foot than do HLP stores. Particularly in terms of maximizing gross margin, supermarkets perform best by clustering in terms of pricing strategies (that is, by using the same strategies as their closest competitors).

Direct competition with Wal-Mart Supercenters and other hypermarkets has a negative effect on store performance. This study provides support for an emerging consensus in the literature with respect to heterogeneous competition in food retail. The effect of hypermarket competition is weakened for larger supermarkets, as measured by selling area. The literature has proposed certain counterstrategies for use by supermarkets in competition with hypermarkets. The results indicate that utilizing EDLP, the same pricing strategy used by most hypermarkets, is effective in mitigating these negative effects.

Despite the breadth of literature touting the economic benefits of private labels for supermarkets, the results do not indicate that increased private label sales relative to national brands leads to improved store performance. The data cover a period of time during which PL sales grew rapidly at the expense of national brands, and as such this trend may bode well for consumers and PL manufacturers, but not necessarily for retailers.

If we assume that the drivers of supermarket performance are indications of future directions for the retailing sector, then each set of results has important implications beyond the retailing sector. The consolidation of pricing strategies means that retail prices should grow more variable in HLP-dominated markets and more constant in EDLP-dominated markets. The prevalence of EDLP may increase relative to HLP due to its demonstrated performance benefits. Retail price variation has important impacts on many sectors, particularly consumers and producers. For consumers it would be interesting to explore how EDLP supermarket pricing compares to the stylized models of Varian (1981) or Sobel (1984). For producers it is important to understand the extent to which farm price changes impact prices separately at EDLP versus HLP supermarkets, given the linkages between farm-retail price transmission and producer welfare.

Hypermarket gains, going forward, should be most pronounced in metropolitan areas, where they have the greatest effect on competitors' performance and where their market share is currently the smallest. This in turn should lead to increased used of EDLP by supermarkets, which is an effect competitive tool for supermarkets. We will also observe increases in product variety and quality, customer service, and lower prices, all of which have been linked to hypermarket presence and have effects on consumer welfare.

Private labels may continue to grow in food retail, but the results do not suggest that this should happen independently of macroeconomic factors or improving quality standards on the part of manufacturers. Research in the emerging literature on private labels suggests that national brand/private label competition increases social welfare but also that increased private label sales results in higher national brand prices and altogether higher food prices. While certain causal relationships pertaining to private labels remain to be determined, the results indicate that retailers have little incentive to price and promote private labels to overtake national brands, and hence the growth of private labels and their economic impacts may be slowing.

This study suggests many avenues for future work. The results indicate that performance increases with concentration, which is expected, though it decreases with distance to competitors. Future research might seek a resolution to this potential contradiction, possibly by relating concentration and spatial positioning to performance in local markets. Technology use is shown to have significant effects on performance, while customer service practices have less of an effect. The results pertaining to private labels call for an updated examination into the determinants of private label sales and the profit effects of increased private label market share.

[Received February 2011; final revision received August 2011.]

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