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Farmland Values as an Indicator of Regional Economic Performance?

Steven C. Blank

Real values per acre of farmland show that California's agricultural sector has performed better economically than sectors in other leading agricultural states. Nevertheless, urban influences on farmland values are a national phenomena that make it difficult to evaluate local agricultural competitiveness.

Also in this issue

Traditional farmland valuation theory's presumption of a direct link between production income and farmland values means that those values should serve as an indicator of economic performance for a geographic area. Unfortunately, one shortcoming of relying on the traditional theory is that it can lead analysts to overstate the competitiveness of agriculture in states or local areas. For example, it is easy to misinterpret recent increases in farm real estate values as evidence of strong profitability (which is an indicator of competitiveness) in the production agriculture sector because (according to the traditional theory) "in rural areas, agricultural land values are primarily determined by the income earning potential of the land, as measured by expected returns from crops and livestock" (USDA 2000). However, as the following discussion illustrates, a more detailed assessment of the facts related to farmland values across locations gives a much different outlook.

The fact that average farmland values across the United States have risen for two decades masks the fact that long-run performance of farmland values tells a different story for specific locations. Also, recent changes in the markets for farm real estate and the implications of those changes are often overlooked when assessing local agricultural competitiveness. Therefore, to provide a long-run perspective illustrating the need for a modified view of farmland values as an indicator of competitiveness, the next section presents farmland value data for the past three decades and a summary of the U.S. Department of Agriculture's (USDA's) explanation for the recent increases. Then, a simple analysis shows what types of new factors need to be added to valuation theory to make farmland values a better economic indicator.

The Data, Nominal and Real

To begin, Table 1 presents farm real estate average values per acre in nominal and real dollars for the period of 1980 to 2006, as reported by the USDA. Data are presented for the entire United States, plus separate values for the three states with the highest levels of agricultural sales revenue: California, Texas, and Iowa. The farmland nominal value levels in the four columns on the left are quite different, but in each case the effects of the "farm crisis" of the 1980s is apparent. Values peak in some years during the early/mid-1980s, fall for a few years, and then begin a recovery. Farm real estate values had increased rapidly in the decade prior to the "farm crisis," but the changes in lending practices that followed the crisis were supposed to have reestablished the fundamental link between land values and local commodity market performance across the United States. Variation between the aggregate national values and the values in each of the states calls for a closer look.

For the United States, the nominal price peak of $823 per acre occurred in 1982, the bottom was in 1987, and the recovery was completed in 1995 when values rose above the level of the earlier peak. The recovery was even slower if real values are considered instead of nominal values. Using the Consumer Price Index to convert the average farmland values into *real* terms (in 2006 dollars) gives an early peak of $1,603 per acre in 1981 and a low of $947 in 1987. Thus, the real data show that the decline was steeper than indicated by the nominal data: there was a 41 percent drop in real values and a 23 percent drop in nominal values. Also, the U.S. farmland market, on average, did not completely recover until 2005 when real values passed the early peak of $1,603. In other words, farmland values are now about the same as they were a generation ago. So, in real purchasing power terms, farmers' wealth has not increased over that period.

For the three leading agricultural states, very different pictures emerge from the data in Table 1, indicating that Midwestern agriculture has not completely recovered from the farm crisis of the 1980s, whereas California has done well. In nominal dollars, California farm real estate peaked later and recovered sooner (in 1984 and 1991, respectively) than did the national average values. Texas farm real estate values peaked at $694 in 1985 and, after their 1992 bottom, finally rebounded by 2001. In Iowa, nominal farm real estate values peaked at $1,999 in 1981, hit bottom in 1987, and appeared to recover by 2003. However, these values do not reflect the effects of inflation. The real performance of farm real estate in the three states was worse, and it shows the differences in demand for farmland in the three different regions. California's average values recovered to the "pre-crisis" level by 2001, and in 2006 *real* values were about 54 percent above their earlier peak (reached in 1982). Texas farm real estate did not recover to its 1985 peak until 2006, when it was just nine percent above the previous high. Iowa still has not recovered in real terms. Iowa's average value in 2006 was only 74 percent of the real 1980 value. Clearly, the economic performance of the three state agricultural industries has varied over the last three decades, with California doing the best.

Agricultural income generally has not been strong over the last three decades, so what has been pushing up farmland values in recent years? One answer was provided by the USDA:

> "Although average agricultural land values nationally are determined primarily by the income earning potential of the land, nonagricultural factors appear to be playing an important role in many local areas. To some extent, the buoying effect of these nonagricultural factors on agricultural land values could be partially offsetting the effect of lower returns from agricultural production."

Table 1. Farm Real Estate Average Values, 1980–2006 ($/acre)

Year	Nominal Value				Real Value (base=2006)			
	United States	CA	Texas	Iowa	United States	CA	Texas	Iowa
1980	737	1,424	436	1,840	1,578	3,049	933	3,939
1981	819	1,732	468	1,999	1,603	3,390	916	3,912
1982	823	1,900	539	1,889	1,518	3,505	994	3,484
1983	788	1,918	544	1,684	1,398	3,404	965	2,989
1984	801	1,981	612	1,518	1,370	3,388	1,047	2,596
1985	713	1,841	694	1,091	1,183	3,056	1,152	1,811
1986	640	1,730	594	873	1,039	2,809	965	1,418
1987	599	1,554	546	786	947	2,457	863	1,243
1988	632	1,575	544	947	966	2,408	832	1,448
1989	668	1,742	521	1,095	984	2,566	767	1,613
1990	683	1,884	507	1,090	969	2,672	719	1,546
1991	703	2,077	498	1,139	963	2,846	682	1,561
1992	713	2,157	488	1,153	955	2,889	654	1,544
1993	736	2,213	499	1,212	964	2,897	653	1,587
1994	798	2,210	515	1,280	1,023	2,833	660	1,641
1995	844	2,220	525	1,350	1,060	2,789	660	1,696
1996	887	2,400	540	1,450	1,094	2,959	666	1,788
1997	926	2,500	554	1,600	1,123	3,032	672	1,940
1998	974	2,610	593	1,700	1,168	3,130	711	2,039
1999	1,030	2,800	640	1,760	1,218	3,310	757	2,081
2000	1,090	3,000	680	1,800	1,261	3,471	787	2,083
2001	1,150	3,200	730	1,850	1,299	3,616	825	2,090
2002	1,210	3,400	775	1,920	1,344	3,776	861	2,132
2003	1,270	3,600	810	2,010	1,381	3,915	881	2,186
2004	1,360	3,800	855	2,200	1,438	4,018	904	2,326
2005	1,650	5,090	1,030	2,650	1,693	5,224	1,057	2,720
2006	1,900	5,390	1,250	2,930	1,900	5,390	1,250	2,930

Source: "Land Values" spreadsheets on the Webpages of the Economic Research Service, USDA.

What the USDA report called "urban influence" affects only about 17 percent of U.S. farm acreage. The USDA classifies only 515 counties in the United States as being both completely rural (containing no part of a city with at least 2,500 residents) and not adjacent to a metro area. In all remaining counties, the USDA says there is some degree of urban influence on land values. Urban influence has a significant impact on farmland values. The USDA estimated that during 1994–1996 the average value of farmland that was not urban-influenced was $640 per acre, compared to $1,880 for urban-influenced farmland. Thus, USDA concluded that 66 percent of urban-influenced farmland market value was due to nonagricultural factors.

> "The market value for undeveloped farmland in these areas often begins to rise above its value based on agricultural returns alone, reflecting anticipation of eventual nonagricultural uses."

That explains why Rhode Island had the nation's highest average farm real estate value during 2006 at $12,500 per acre. In densely populated areas along the East and West Coasts, the amount of urban influence on farmland values can be extreme. For example, in 2001 a 35-acre parcel of farmland in California's Ventura County was valued at about $300,000 per acre, due almost entirely to its development potential. Such examples can skew the distribution of farmland values within a state and quickly raise the average.

The USDA study results offer two factors as partial explanations for the differences in farmland values observed for the three leading agricultural states. First is the potential profitability of the crops that can be grown on a parcel of land, which is the traditional theory. Second is the potential for nonagricultural uses of a parcel, which is one of the most significant sources of "adjustments" that need to be made to values derived from the traditional theory. For California, the prospects for both factors are better than are the prospects for Texas and Iowa, so farmland values are higher in the Golden State and have made a stronger recovery relative to values observed before the farm crisis of the 1980s.

"Farmland values are higher in the Golden State and have made a stronger recovery relative to values observed before the farm crisis of the 1980s."

So, in the cases of these three states, farmland values generally do serve as an agricultural economic barometer, although the traditional theory of prices is clearly incomplete because it cannot account for the confounding effects of the modern factors requiring "adjustments" to traditional price estimates. Part of the problem is that there has never been an exhaustive evaluation of the many factors that influence farmland values. Such a task may be impossible because each location will have a unique list of factors, but some general categories of factors are beginning to emerge in the literature.

The Relative Importance of Pricing Factors

In addition to the two factors discussed in the USDA report, two others—policy effects and amenity values—may contribute to farmland values according to a growing new literature. There is now little debate remaining about whether agricultural policies influence farmland values as even the government acknowledges that there is an influence (see, for example, USDA 2001). However, many questions remain about the nature, extent, and direction of the influence. It is easy to see that government policies aimed at increasing returns from farming activities would affect farmland values, yet other policies, such as land use restrictions, are less obvious in their effects. The effects of amenities on land values are parcel-specific and can be measured only with individual sales data, thus much less empirical research was done on this subject until recently. As sales data began to become available, studies like that by Torell et al. began to show that "lifestyle amenities" (such as a desirable location and recreational opportunities) explained much more of rural land value than did the productivity of the land in many areas. The range of amenities and the scale of their effects on prices are often surprising.

Thus, the story will differ by location, but the message is the same; there are four categories of influence on farmland values. The first of these categories, agricultural productivity, is the basis of the traditional theory of valuation. The other three categories are types of "adjustments" to the traditional value.

The discussion above implies that farmland valuation has become much more complicated in the last couple decades. An increasing number of factors have been shown to influence farmland values, thus adding to the list of necessary "adjustments" to the traditional model. A recent study by Huang et al. illustrates how involved price analysis has become. They estimated a model of Illinois farmland values using county-level, cross-section time-series data. Explanatory variables included land productivity, parcel size, improvements, distances to Chicago and other large cities, an urban-rural index, livestock production (using swine operation scale and farm density measures), population density, income, and inflation. They concluded that farmland values per acre decline with parcel size, ruralness, distance to Chicago and large cities, and swine farm density and increase with soil productivity,

Table 2. Estimation Results for Farmland Value Equations by Region, 1996–2004

Variable	Northeast	Lake States	Corn Belt	Appalachia	Southeast	Delta	Southern Plains	Northern Plains	Mountain	Pacific
Revenue Per Acre	0.155	-0.020	0.221*	0.012	0.018	0.152*	–0.057	0.298	4.139	0.083
Gov't Payments	–7.184	3.535	33.272	4.378	0.714	–2.455*	–7.007*	1.243	–3.934	0.473
Cost Capital	–0.156*	–0.001	–0.027*	–0.004	–0.028	–0.008	0.006	–0.008	–0.082	0.054
Productivity	0.037	0.035	–0.052	0.030	0.188*	–0.146*	0.067	-0.230	-3.997	-0.058
Population Density	0.007*	0.004*	0.005*	0.008*	0.009*	0.005*	0.004*	0.008*	0.032*	0.028*

The value in each cell is the variable's regression coefficient. ** denotes statistical significance at the 90% confidence level.*

population density, and personal income. Clearly, valuation models are changing!

With so many factors to be considered in modeling farmland values, a natural question arises: which one(s) is (are) the most important in today's market? To answer that question, a simple analysis was conducted. Farm-level survey data from across the continental United States were used to estimate simple equations for farmland values over the 1996–2004 period. To begin, a single equation for the average farmland value was estimated for each of the ten geographic regions of the country. The explanatory variables included were proxies for three of the four categories of influence on farmland values. Productivity of the land was proxied by two variables: revenue per acre and a productivity index. Urban influence was proxied by a county population density measure. Policy effects were proxied by the amount of government payments received per acre. Amenity effects are specific to individual parcels, thus they cannot be estimated using aggregated data and were, therefore, excluded from this analysis. One additional explanatory variable was included: the cost of capital was used to represent the financial factors in a market.

The empirical results of the statistical analysis for each of the ten regions are presented in Table 2. The key result is that the proxy variable for the non-farm demand for farmland—county population density by year—was significant in all regions (meaning there was a 90 percent or better probability that the variable's effect was greater than zero). This is consistent with the growing realization that non-farm demand for farmland is increasingly influencing farmland values, even in areas such as the Corn Belt and Northern Plains where economies were dominated by production agriculture in the last century. The population density variable swamped the effects of the four other variables, meaning that population was much more often significant across the ten regional equations. This result is consistent with the USDA's results, which showed a dramatic increase in farmland value when a parcel was in an urban- influenced area. Thus, the proximity of a farmland parcel relative to nonagricultural development is a key factor in pricing. This implies that no commodity can generate enough revenue to adequately compete with expanding urban development, meaning that land-use ordinances may be needed to preserve farmland in urbanizing areas.

In summary, the traditional theory that farmland values are influenced primarily by the land's ability to generate profits from agricultural production may still be true for some farms in some locations, but for all regions urban influence is the dominant factor in the valuation process. This change in American farmland markets has been caused by the evolution of the national economy. It signals that economic development is ongoing and more change is coming, all making farmland values more of an indicator of *general* economic performance and less an indicator of agricultural competitiveness.

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For more information, the author recommends the following:

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Marketing a Mediterranean Diet: Some Issues and Opportunities

Hoy F. Carman

The popular Mediterranean diet features many products that are produced extensively in California. Some California commodity groups are already emphasizing links to the diet through promotion and research efforts.

Movement toward a Mediterranean diet has significant economic implications for California agriculture, especially the fruit, vegetable, and nut sectors.

Photo courtesy of UC Regents

The Mediterranean diet is a commonly used term denoting tasty cuisine, healthful eating, and a healthy lifestyle. The popular press in the United States has featured articles on the components of the Mediterranean diet, including the healthful effects of moderate consumption of wine, especially red wine; the health benefits of substituting plant-based oils, especially olive oil, for animal fats; and increased fruit, nut, and vegetable consumption. While consumers have responded to articles and news stories about the Mediterranean diet, most have only a vague idea of the overall diet framework.

The existence of some confusion should not be surprising. Many books about the Mediterranean diet have been written. For example, a quick search of the Amazon.com Website for books on the Mediterranean diet brought up a list of 1,569 entries. The titles included diet books, cookbooks, and books on wine, omega-3 fats, diet and disease (arthritis, cancer, diabetes, heart disease, hypertension, allergies and asthma), diet and longevity, weight loss, and many other topics. Organizations that include the Oldways Preservation and Exchange Trust, the Foundation for the Advancement of the Mediterranean Diet, the Mayo Clinic, and the Harvard University School of Public Health have published diet pyramids modeled after the U.S. Department of Agriculture's (USDA's) pyramids.

A brief examination of a world map reveals some 21 countries bordering the Mediterranean Sea, including those typically associated with a Mediterranean lifestyle such as Spain, France, Italy, Greece, and Turkey, Northern African, Middle Eastern and Balkan countries. Major differences in culture, ethnic backgrounds, religion, and climate guarantee significant dietary differences both between and within countries. As noted in the American Heart Association (AHA) Website, there is no one "Mediterranean" diet. The Mediterranean diet, as typically presented, appears to be inspired by traditional diets in Southern Italy, Greece, and Spain. A pyramid illustrating the Oldways Preservation and Exchange Trust version of the Mediterranean diet is on the next page.

The AHA outlines the common Mediterranean dietary pattern as having the following characteristics:

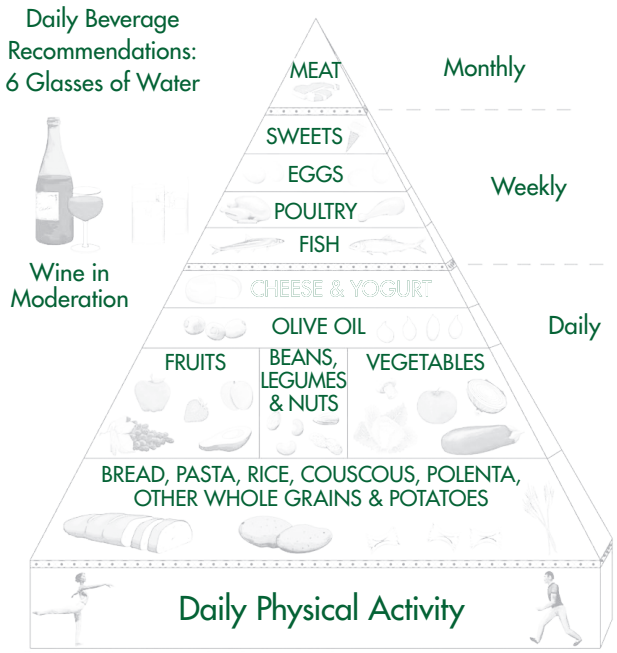
- High consumption of fruits, vegetables, bread and other cereals, potatoes, beans, nuts, and seeds is a primary focus of the plan
- Olive oil is an important monounsaturated fat source
- Dairy products, fish, and poultry are consumed in small to moderate amounts and little red meat is eaten
- Eggs are consumed zero to four times a week
- Wine is consumed in small to moderate amounts.

Diet Impacts

Health problems related to food consumption are described as being in a "crisis stage" in the United States and many other countries. Widespread obesity is obvious in our society. Not so obvious are the health problems directly linked to obesity and diet, including heart disease, stroke, diabetes, various forms of cancer, maladies associated with aging, and numerous quality-of-life problems. Health professionals, government officials, and others concerned with the enormous costs associated with current consumption patterns are promoting policies and programs to improve diets and health outcomes.

Movement toward a Mediterranean diet, and similar consumption patterns based on other dietary plans has significant economic implications for California agriculture, especially the fruit, vegetable, and nut sectors. Buzby, Wells, and Vocke estimated the potential implications if Americans change their consumption patterns to meet the USDA's 2005 dietary guidelines for Americans. They estimate that if Americans were to fully meet 2005 guidelines, they would need to increase daily fruit consumption by 132 percent

Figure 1. The Traditional Healthy Mediterranean Diet Pyramid



Source: The Oldways Preservation and Exchange Trust

(from 0.9 cups to 2.0 cups per day) and vegetable consumption by 31 percent (from 1.9 to 2.5 cups per day). There would also be shifts within the vegetable category from starchy vegetables to legumes and dark green and orange vegetables. These shifts would require that annual U.S. harvested fruit acreage increase from 3.5 to 7.6 million acres and that annual U.S. harvested vegetable acreage increase from 6.5 to 15.3 million acres.

Rickard and Gonsalves examined the economic effects that compliance with seven different dietary plans would have for 50 of the highest value crop markets in California agriculture, many of which are specialty crops. Dietary plans offered as alternatives to the USDA food guidelines include the Harvard model, the Mayo Clinic model, the Mediterranean diet model, the DASH model, and the Atkins Diet model, among others. Rickard and Gonsalves found that six of the seven diets they examined would generate additional revenue for most of the specialty crops grown in California. The lone exception was the Atkins Diet, which resulted in decreased revenue for 41 of the 50 crops. The Harvard model generated the most additional revenue for 38 of the 50 crops but the Mediterranean diet increased revenue nearly as much as the Harvard model. It is interesting to note that estimated changes in gross revenue for each crop vary by diet plan. For example, estimated gross revenue for romaine lettuce increases 67.3 percent for the Harvard plan and 28.0 percent for the DASH model; revenue for carrots increases 45.6 percent for the Harvard plan, 30.8 percent for the Mediterranean diet, and 17.4 percent for the USDA's My Pyramid model.

Individual Product Recommendations

Consumers make individual product-purchase decisions with the overall diet composed of the sum of purchase and preparation decisions. The popularity of health claims placed on food products provides evidence that many consumers include health considerations when making purchase decisions. There is limited evidence, however, that the majority of consumers most in need of diet modification are following an overall diet plan such as those presented by the popular diet pyramids. One can hypothesize that consumers are interested in benefits derived from their food consumption. In addition, they will choose to consume particular food products and commodities based on known benefits and choose to not consume particular food products and commodities based on known or supposed dangers. Using this model, guiding consumers toward consumption of a Mediterranean diet would be best accomplished by conducting nutrition and medical research on individual food products and commodities and emphasizing the consumption of individual diet components through use of a diet logo or similar device. Some U.S. producer organizations are already funding nutrition and medical research for their individual products with interesting results and partnering with health organizations. Following is a brief summary of research and promotion programs being conducted by four large California commodity organizations: the California Walnut Commission, the Almond Board of California, the California Avocado Commission, and the California Strawberry Commission.

Commodity Nutrition and Health Research

The California Walnut Commission (CWC) was one of the first U.S. commodity groups to fund health and nutrition research when it decided to counter diet recommendations urging consumers to reduce or constrain consumption of nuts because of their high oil content. In 1990 the CWC funded its first project with researchers at Loma Linda University on the protective effects of nut consumption on the risk of coronary heart disease. The Almond Board of California (ABC) established a nutrition research program and nutrition subcommittee in 1995 to review the scientific validity of proposals and recommend

studies for funding. During 1997, the California Avocado Commission (CAC) made a strategic change to proactively communicate the nutritional benefits of avocados through national public relations and outreach efforts. The California Strawberry Commission (CSC) began funding nutrition research proposals in 2003 and now issues an annual request for proposals. This research has already yielded results that are being used in the CSC advertising and promotion programs.

The CWC, which has the longest ongoing health and nutrition research program, began with studies on the relationships between walnut consumption and risk from coronary heart disease and cholesterol levels. The examination of relationships between walnut consumption and heart health continued with a combination of epidemiological and clinical studies conducted by leading universities in the United States, France, New Zealand, Spain, Norway, and Japan that were published in medical, nutrition, and science journals. These studies indicate that walnuts reduce LDL cholesterol and heart disease risk, that the fatty acids in walnuts improve the function of arteries, that consuming walnuts reduces cell adhesion molecules and enhances the circulatory system, and that omega-3 fatty acids in walnuts reduce inflammation in arteries. More recent studies indicate that melatonin in walnuts protects against cancer and heart disease and that omega-3s reduce blood pressure, arterial inflammation, and the stickiness of platelets. Additional studies have shown that walnuts have antidepressant-like effects, that they can help in weight management, and that consumption of walnuts is protective for people with Type 2 diabetes. Also, the form of vitamin E found in walnuts might halt the growth of prostate and lung-cancer cells. Walnuts have high concentrations of antioxidants, which help the body ward off life-threatening maladies such as cancer, heart disease, and diabetes, as well as debilitating ailments such as arthritis, osteoporosis, and Alzheimer's disease. Research funded by the other three commodity groups has resulted in reports on the health and nutritional benefits of consuming almonds, avocados, and strawberries.

The California Walnut Commission, which has the longest ongoing health and nutrition research program, began with studies on the relationships between walnut consumption and the risk from coronary heart disease and cholesterol levels.

Photo courtesy of the California Walnut Commission

The CWC used its research results to secure a qualified health claim for walnuts from the U.S. Food and Drug Administration (FDA) in 2003. The final wording for the claim, issued in 2004, states:

> "Supportive but not conclusive research shows that eating 1.5 ounces per day of walnuts as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease. See nutrition information for fat content."

The ABC also submitted research results for almonds as part of a nut-industry submission to the FDA. In 2003 the FDA also approved a qualified health claim for almonds (and other nuts) that states:

> "Scientific evidence suggests but does not prove that eating 1.5 ounces per day of almonds as part of a diet low in saturated fat and cholesterol may reduce the risk of heart disease."

The CSC has a stated goal of assembling the research support necessary to secure approval of a health claim for strawberries from the FDA and the CAC is in the process of determining information needed and the feasibility of submitting a qualified health claim for avocados and heart health.

The nutrition and health research and promotion programs funded by the ABC, the CAC, the CSC, and the CWC have other important similarities and differences. Each commodity group has formed a nutrition or scientific-advisory committee that includes well-known and knowledgeable nutritionists and medical researchers to provide ideas and advice on research areas, nutrition-based programs, and outreach efforts. Each commodity also maintains an Internet Website that provides detailed information on the nutrition and health

benefits of consumption of the commodity. While the research thrusts for the four groups are similar, their advertising and promotion strategies differ. The ABC first emphasized public relations for its health message and then shifted almost all advertising and promotion to a health message. The CSC has focused all consumer communications on a health message since initiation of its program in 2003. The CAC continues to use only public relations for its health message to consumers but targets health and nutritional professionals with promotional materials. The CWC emphasizes public relations for dissemination of its health message but has also included an advertising health message in several export markets (Spain, Italy, and Germany). Overall, consumer and media interest in diet and health issues appears to assure cost-effectiveness for public relations programs. For example, the ABC increased public relations expenditures to $1 million during 1998/1999, but estimated that the advertising value equivalency of exposures related to the health benefits of consuming almonds increased to $7 million. The CWC estimates that publicity generated as a result of the FDA ruling on the qualified health claim for walnuts generated more than 70 million impressions by the end of the 2003/04 crop year from news stories, magazine articles, and associated publicity on diet and health. Media impressions attributed to the CWC public relations program in the United States increased from a little more than one billion in 2001/02 to more than two billion in 2004/05. The cost per million impressions decreased from $0.59 in 2001-02 to $0.37 in 2004-05. Partnering by the ABC, the CAC, and the CWC with organizations such as the AHA, provides product exposure in diets offering particular benefits such as heart-healthy diets, healthy food choices for diabetics, or weight-control diets. The funds allocated to nutrition research by each organization tend to add to total research rather than substitute for traditional research on production and postharvest problems.

Concluding Comments

Health and disease problems related to food consumption are motivating consumers around the world to choose diets that promote healthy outcomes. These same problems are motivating governments and others with a desire for a healthier population to try to improve human diets. The Mediterranean diet, based on historic research of consumption patterns in Crete and Italy that may no longer be descriptive of existing diet patterns, is associated with good health, longevity, and reduced heart disease. The Mediterranean diet has received a large amount of favorable publicity in the United States, but there is no one Mediterranean diet.

While different organizations and individual authors have presented a variety of diets labeled as Mediterranean, foods included in the diet, as commonly presented, are accepted as likely to lead to healthful outcomes. There appears to be a market for a Mediterranean-type diet if properly defined and marketed. Success will depend on proper selection of "target" markets together with imaginative and effective product development and positioning. Careful examination of the effectiveness of relying on a diet pyramid versus promoting the healthful aspects of individual foods that are included in the pyramid is needed. There is an opportunity for a well-organized and properly funded organization with excellent leadership to successfully market a Mediterranean-type diet and improve health outcomes in target markets around the world. It will require vision, commitment, time, and a marketing orientation.

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For more information, the author recommends the following:

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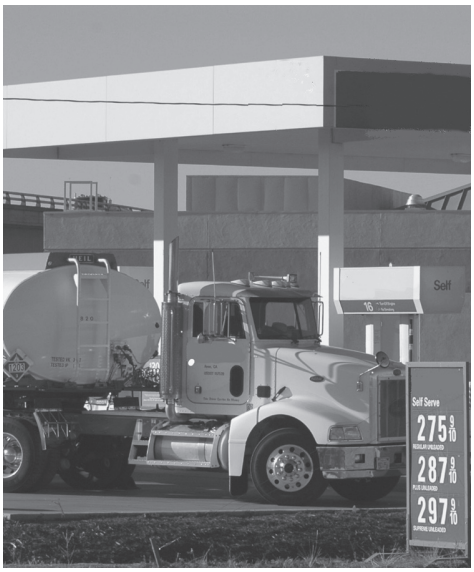
Brand Loyalty and Gasoline Pricing in Sacramento

Jennifer R. Thompson

Retail gasoline prices are known to vary substantially among retail stations. Evidence from gasoline markets in Sacramento suggests that these price differences exist and persist because the marketing of supposed differences in branded gasoline is enough to split the "retail gasoline" market into two submarkets, each supporting a different price.



A brand-loyal consumer may not even be buying gasoline produced by that brand's refiner.

Photo by Jennifer Thompson

One interesting feature of retail gasoline prices is that they can vary at different stations on the same day. The retail station is the last link of a long marketing chain. Once produced at a refinery, gasoline is transported throughout the United States in pipelines and waterborne barges to wholesale terminals found along the network of pipelines and marine ports. Sometimes unfinished gasoline is transported this way to a refinery for completion and then transported a second time through the network.

California consists of four wholesale marketing areas: Eureka, Northern California, Bakersfield, and Southern California. Sacramento is in the Northern California wholesale marketing area. Once at the wholesale terminals (called "racks"), gasoline is stored until the distributors, whose trucks carry 7,500–10,000 gallons, buy gasoline for delivery to retail stations.

In Sacramento during June 2007, differences between retail prices on the same day averaged 11.5 cents per gallon and reached as high as 18.2 cents per gallon. Such price differences can persist for long periods. In Sacramento, the largest daily spatial price spread—the difference between prices at two different retail stations on the same day—never fell below 10 cents per gallon during June.

According to the law of one price, prices at different retail stations should not differ by more than the cost to the consumer of traveling between the two stations. With retail stations clustering on city streets, the consumers' travel cost is negligible. Consequently, the prices among retail stations ought not to differ by much. Therefore, some other force must contribute to the persistent difference in spatial prices. Two possibilities are influences from the marketing chain, price pass-through and consumer preferences, namely as brand loyalty.

Price Pass-through

In 2003 the Energy Information Administration (EIA) conducted a study about gasoline pricing through the marketing chain in the United States. Specifically, the EIA quantified the effect on retail prices of a price-changing shock in the gasoline spot market. The EIA concluded that 100 percent of spot market price changes are transmitted to retail prices. This is the so-called price pass-through effect.

The wholesale market is the marketing level between the spot and retail markets. While the EIA only examined the spot-to-retail effect, implicit in their hypothesis is that prices pass from spot through wholesale to retail. Thus, there should be a visible pass-through effect from wholesale to retail.

Where there is a one-to-one pass-through of a price change from one price series to another, the price series should move together. In a case like gasoline, where the price series represent different marketing levels, there might be a mark-up from, say, wholesale to retail. Such a mark-up will affect the averages of the two series, but the direction, magnitude, and duration of the changes in each series should be comparable regardless.

Figure 1 shows the daily wholesale and retail prices in Sacramento during June 2007. These two price series do not move together. Several explanations might apply. With only twenty-six observations, this could be an anomaly in the data. In addition, the pass-through effect can take up to eight weeks, rendering a single month of data insufficient to capture complete pass-through.

Another explanation is there is more going on in the Sacramento gasoline markets than the simple transmission of price changes from one marketing level to the next. Moreover, price pass-through is a concept about aggregate market prices over time, not about individual company prices at different locations within the same marketing level at the same time. Whether price pass-through applies to Sacramento does not address why there are idiosyncrasies among retail-station prices on a daily basis.

Brand Loyalty

Although consumers are free to buy gasoline from any retail station at any location at any time, many consumers develop preferences for a specific brand of gasoline. Brand loyalty describes consumers' decisions to only buy gasoline affiliated with their preferred brand regardless of the prices at other stations. When many consumers exercise brand loyalty, the competitive force that would keep the prices at neighboring stations in line lessens. A consumer loyal to Brand A may not act on an opportunity to buy Brand B gasoline at a lower price. The result is persistently large differences in retail prices at different locations on a daily basis.

Distributors are similar to consumers in that a distributor will drive into a local rack, see the list of prices on a sign at the pump, and fill the delivery truck. Distributors differ from consumers, however, in that most cannot choose where they buy gasoline. Some 85 percent of distributors buy gasoline under a long-term supply contract. Specified in supplier contracts are branding arrangements and required purchase locations. Whereas consumers exercise brand loyalty, distributors have obligatory purchase points with specific brands.

To examine the differences among gasoline prices at different locations, spatial price relationships (SPR) were calculated for wholesale and retail markets. The SPR examined here is the simple law of one price, adjusted for transportation. For simplicity, assume transportation costs are the only costs of moving product between terminals. The SPR is:

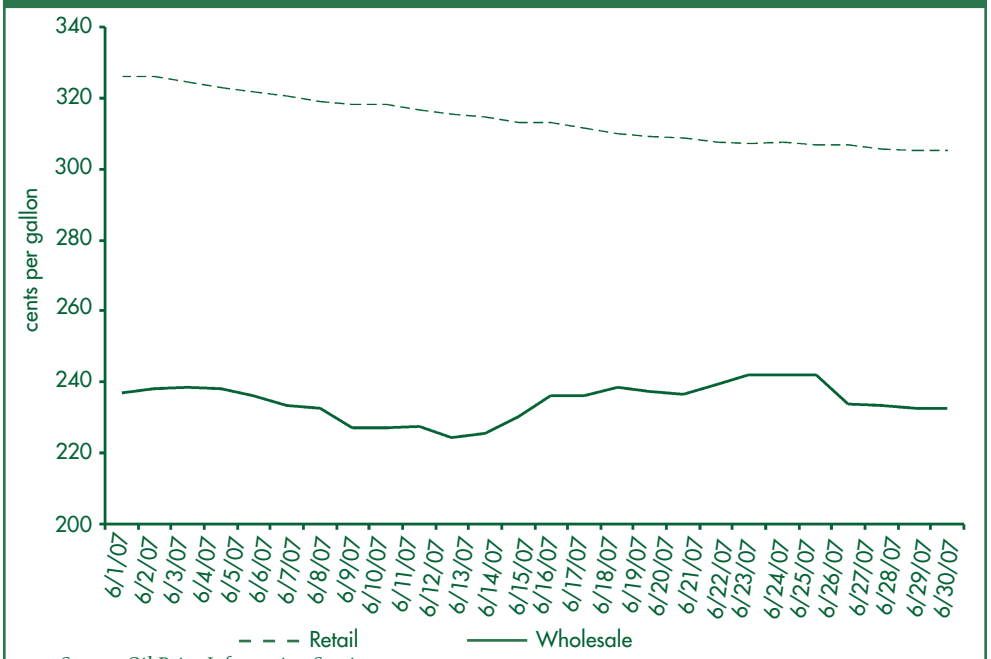
|Price of supplier i – Price of supplier j| - Transportation cost between i and j = 0

The wholesale supplier prices are the prices at which wholesale distributors buy gasoline for resale to retail stations. The gasoline sold under a branding agreement is classified as "branded" while the gasoline not sold under contract is classified as "unbranded." This information is gathered by the Oil Price Information Service and was provided with the price data. Wholesale branded gasoline is sold only under contract with the right to sell the brand as much a part of the contract as the product itself.

Figure 2 shows SPRs for three pairs of wholesale supplier prices. The first, the "branded spread," is the SPR between two branded suppliers in Sacramento. The second, the "unbranded spread," is the SPR between two unbranded suppliers in Sacramento. The third, the "branded-unbranded spread," is the SPR between a branded and an unbranded supplier in Sacramento.

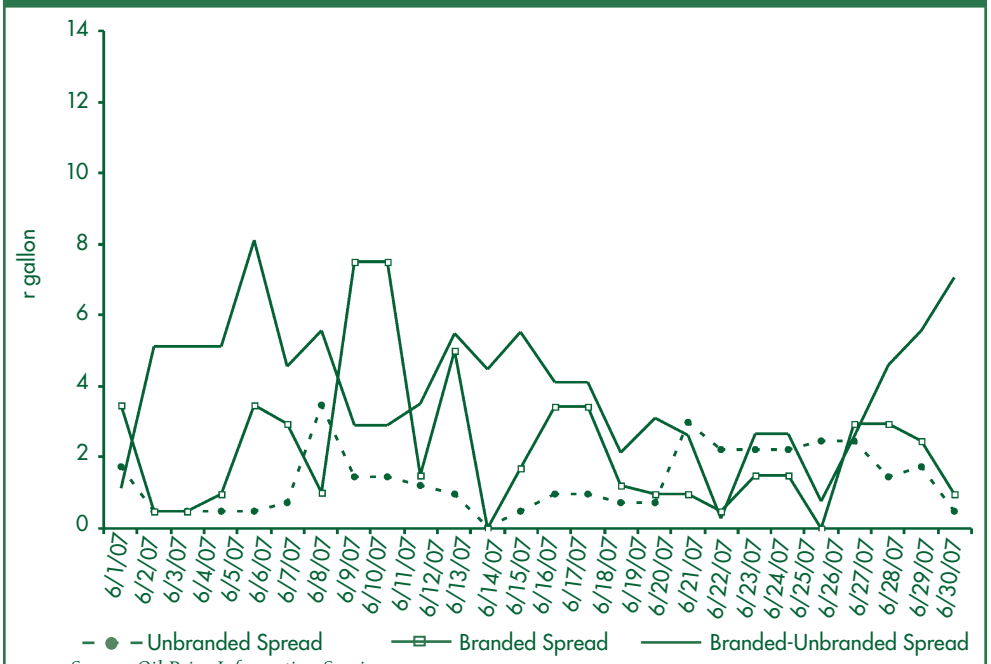
Because branded gasoline is only sold under contract, distributors cannot

Figure 1. Retail and Wholesale Gasoline Prices in Sacramento



Source: Oil Price Information Service

Figure 2. Wholesale Spatial Price Relationships in Sacramento



Source: Oil Price Information Service

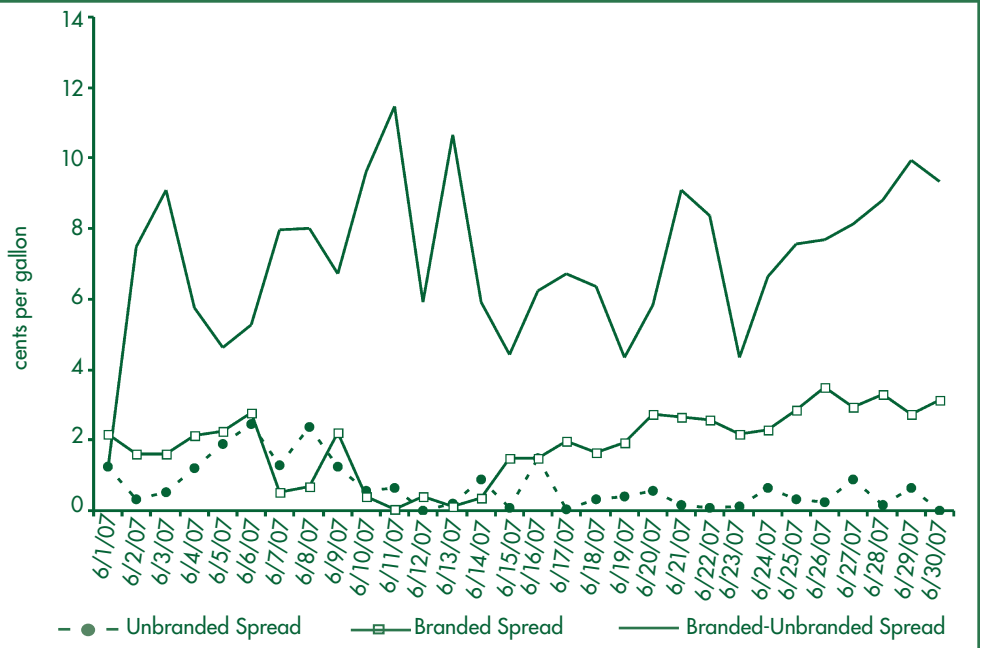
exercise spatial arbitrage across these suppliers. That is, a distributor under contract to buy gasoline from Brand A cannot buy gasoline from Brand B even if the price is lower. Therefore, there ought to be more unexploited spatial arbitrage opportunities, represented by nonzero values of the spatial price relationship, involving branded gasoline prices. On the other hand, distributors do not need contracts to buy unbranded gasoline and are free to arbitrage across these suppliers. Thus, there ought to be fewer unexploited arbitrage opportunities among unbranded suppliers. Figure 2 shows just that. The unbranded SPR is lower on average and less volatile than the SPRs involving branded prices.

Consumers do not face the constraint on buying gasoline that wholesale distributors face. Consumers are free to buy gasoline from any retail supplier, regardless of brand and location, at any time. Moreover, studies have shown that retail gasoline is the same across the board. Although proprietary, brand-specific additives are mixed into the gasoline, no substantial differences exist in the performance or emissions across gasoline brands. The only differentiating factor in retail gasoline is marketing.

Interestingly, the consumer does not know which gasoline is supplied to which retail station. A retailer may be supplied with branded or unbranded gasoline regardless of the retailer's affiliation. It all depends upon the contracts and relationships between the refiner, wholesaler, and retailer. The branding designation only signifies whether the gasoline was sold under a branded contract at the wholesale level. Therefore, a brand-loyal consumer may not even be buying gasoline produced by that brand's refiner. This reinforces that retail branding is about marketing.

Figure 3 shows the same SPRs for retail gasoline as Figure 2 shows for wholesale gasoline. The pattern among the retail SPRs mimics the pattern among the wholesale SPRs and is more pronounced. Like its wholesale counterpart, the retail unbranded SPR is the lowest on average and has the least variability of the three SPRs. The retail branded SPR is similar in magnitude and variability to the unbranded SPR. The branded-unbranded SPR stands out as much higher and more volatile than the other two SPRs. Taken together, these SPRs show that consumers do not have a preference for a particular brand so much as a preference for the general designation as branded or unbranded. That is, if a consumer prefers unbranded gasoline, he will arbitrage among unbranded stations. If a consumer prefers branded gasoline, he will arbitrage among branded stations. However, a consumer who prefers branded gasoline will not arbitrage unbranded gasoline, and vice versa.

Figure 3. Daily Retail Spatial Price Relationships in Sacramento



Source: Oil Price Information Service

Conclusion

Retail prices typically vary among retail stations on a daily basis. Evidence from gasoline markets in Sacramento supports the concept of brand loyalty among consumers. Specifically, consumers associate themselves with a general branding designation, either "branded" or "unbranded." The resulting effects on retail prices are comparable to wholesale prices, for which distributors are associated with both general branding designations and specific brands.

Consumers' association with some preferred branding designation introduces a split in the population that suppliers might use as a guide for price discrimination. Indeed, many suppliers offer both branded and unbranded gasoline from the same refiner at different prices. Whether retail gasoline is characterized by brand loyalty of consumers or price discrimination by suppliers, or some combination of both, the effect on prices is similar. The variation among retail gasoline prices on a daily basis persists because retail gasoline is sufficiently differentiated by brand to support two pricing schemes.

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